



Hornsea Project Four

Applicant's comments on Relevant Representations

Deadline 1, Date: 8 March 2022

Document Reference: G1.9

Revision: 01

Prepared Faye McGinn, Orsted, February 2022
Checked Thomas Watts, Orsted, March 2022
Accepted Hannah Towner-Roethe, Orsted, March 2022
Approved Julian Carolan, Orsted, March 2022

G1.9
Ver. no. A

Revision Summary

<i>Rev</i>	<i>Date</i>	<i>Prepared by</i>	<i>Checked by</i>	<i>Approved by</i>
01	08/02/2022	Faye McGinn, Orsted, February 2022	Hannah Towner- Roethe, Orsted, March 2022	Julian Carolan, Orsted, March 2022

Revision Change Log

<i>Rev</i>	<i>Page</i>	<i>Section</i>	<i>Description</i>
01	N/A	N/A	Submitted at Deadline 1

Table of Contents

1	Applicant's Comments on Relevant Representations	6
2	Applicant's Response to Relevant Representations	7
2.1	Addleshaw Goddard LLP on behalf of Network Rail Infrastructure Limited (RR-001).....	7
2.2	Bridge Petroleum Limited (RR-002).....	10
2.3	Christopher Thomas Watt (RR-003).....	11
2.4	CMS Cameron McKenna Nabarro Olswang LLP on behalf of NEO Energy (SNS Limited) (RR-004).....	12
2.5	Dee Atkinson and Harrison on behalf of Mr CW and Mrs CF Foreman (RR-005)	16
2.6	DFDS (RR-006).....	17
2.7	DRAX Power Limited (RR-007)	17
2.8	East Riding of Yorkshire Council (RR-008).....	18
2.9	East Suffolk Council (RR-009).....	19
2.10	Environment Agency (RR-010).....	20
2.11	Equinor (RR-011).....	21
2.12	Eversheds Sutherland (International) LLP on behalf of Viking Link (RR-012)	23
2.13	Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013)	24
2.14	Harbour Energy (RR-014)	26
2.15	Historic England (RR-015)	27
2.16	Humber Fire and Rescue (RR-016)	30
2.17	Jane Taylor (RR-017).....	30
2.18	Lockington Parish Council (RR-018)	31
2.19	Malcolm Taylor (RR-019).....	32
2.20	Marine Management Organisation (RR-020)	33
2.21	Maritime and Coastguard Agency (RR-021).....	34
2.22	Ministry of Defence (RR-022).....	35
2.23	Mr PS Goatley (RR-023).....	37
2.24	National Grid Carbon Limited (RR-024).....	39
2.25	National Grid Electricity Transmission PLC (RR-025).....	41
2.26	National Grid Gas plc (RR-026).....	43
2.27	National Grid Interconnector Holding Limited (RR-027).....	45
2.28	NATS (RR-028)	47

2.29	Natural England (RR-029).....	48
2.30	Northern Gas Networks (Limited) (RR-030).....	51
2.31	Perenco UK Limited (RR-031).....	52
2.32	Professor Ian Reid / Andrew Hersom on behalf of East Riding of Yorkshire and Kingston upon Hull Joint Local Access Forum (RR-032)	54
2.33	RSPB (RR-033).....	55
2.34	Savills on behalf of the Hotham Family Trust (RR-034).....	57
2.35	Shell U.K Ltd (RR-035).....	57
2.36	The Corporation of Trinity House (RR-036).....	58
2.37	The Crown Estate (RR-037).....	58
2.38	The Ramblers, East Yorkshire and Derwent Area (RR-038).....	59
2.39	The Wildlife Trusts (RR-039).....	61
2.40	UK Chamber of Shipping (RR-040).....	64
2.41	UK Health Security Agency (formerly Public Health England) (RR-041)	65
2.42	Weightmans on behalf of Northern Powergrid (Yorkshire) PLC (RR-042).....	66
2.43	Yorkshire Wildlife Trust (RR-043).....	67
2.44	Hull City Council (AS-001).....	69
2.45	Holderness Fishing Industry Group (AS-025-A)	71
2.46	The National Federation of Fishermen's Organisations	77
3	Annex 1 – Full response to Environment Agency (RR-010).....	81
4	Annex 2 – Full response to Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013).....	103
5	Annex 3 – Full response to Jane Taylor (RR-017) and Malcolm Taylor (RR-019).....	121
6	Annex 4 – Full Response to Lockington Parish Council (RR-018)	129
7	Annex 5 – Full response to Natural England (RR-029)	136
8	Annex 6 – Full response to Marine Management Organisation (MMO) (RR-020)	500
9	Annex 7 – Full response to Royal Society of Protection of Birds (RSPB) (RR-033).....	610
10	References.....	637

List of Tables

None

List of Figure

None

1 Applicant's Comments on Relevant Representations

- 1.1.1.1 Following closure of the Orsted Hornsea Project Four Limited statutory consultation period under section 56 of the Planning Act 2008, the Applicant has taken the opportunity to review each of the Relevant Representations received. Details of the Applicant's responses to each of those representations are set out within this document in subsequent sections and tables below.
- 1.1.1.2 A glossary of terms can be found in [G1.45: Overarching Glossary](#) and an acronyms list can be found in [G1.1: Overarching Acronyms List](#).
- 1.1.1.3 For ease of referencing and to facilitate future cross-referencing, the Applicant has included the existing Relevant Representation references (e.g. Comment 1.1.1 from the MMO RR (RR-020-1.1.1)) and where these were not available the Applicant has created a reference for each response by itemizing the RR into paragraphs and giving these a unique identifier (e.g. RSPB) The references can be found in the first column of each table.
- 1.1.1.4 The aim of the references is to be able to quickly identify the Applicant's responses to each Relevant Representation point. The references may be referred to during examination.
- 1.1.1.5 A total of 45 representations have been made, of which 2 were submitted as an Additional Submission
- 3 representations from local planning authorities;
 - 1 representations from parish councils;
 - 10 prescribed consultees;
 - 6 representations from affected persons;
 - 17 representations from members of the public/businesses; and
 - 8 representations from other organisations.
- 1.1.1.6 Where the response to a representation is long, a separate 'full response' is provided for in the supporting Annex's to this submission. These include:
- Annex 1 –Environment Agency (RR-010);
 - Annex 2 – Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013);
 - Annex 3 – Jane Taylor (RR-017) and Malcolm Taylor (RR-019);
 - Annex 4 – Lockington Parish Council (RR-018);
 - Annex 5 – Natural England (RR-029);
 - Annex 6 – Marine Management Organisations (MMO) (RR-020); and
 - Annex 7 – Royal Society of Protection of Birds (RSPB) (RR-033).

2 Applicant's Response to Relevant Representations

2.1 Addleshaw Goddard LLP on behalf of Network Rail Infrastructure Limited (RR-001)

Reference	Relevant Representation Comment	Applicant's Response
RR-001-A	<p>This section 56 representation of Network Rail Infrastructure Limited (NR) is in respect of Orsted Hornsea Project Four Limited's (Applicant) application for a Development Consent Order (Order) which seeks powers to enable the construction of an offshore wind farm. NR is a statutory undertaker and owns, operates and maintains majority of the rail infrastructure of Great Britain. The Book of Reference (BoR) identifies plot 176 (Plot 176) as land owned by NR, over which compulsory acquisition powers to acquire new rights and imposition of restrictions are sought (Compulsory Powers). The Compulsory Powers are in relation to operational railway land forming part of the operational Yorkshire Coast Line. Additionally, the Environmental Statement identifies construction traffic routes involving HGVs and other vehicles (HGV Route) passing over seven level crossings (Crossings).</p>	<p>Noted. The Applicant agrees that this is an accurate summary of the interaction between Hornsea Four and Network Rail's land and apparatus.</p>
RR-001-B	<p>To safeguard NR's interests and the safety and integrity of the operational railway, NR objects to the inclusion of Plot 176 in the Order and the Compulsory Powers in respect of it. Plot 176 constitutes land acquired by NR for the purpose of its statutory undertaking and, accordingly, this representation is made under sections 56, 127 and 138 of the Planning Act 2008. NR considers that there is no compelling case in the public interest for the Compulsory Powers and that the Secretary of State, in applying section 127 of the Planning Act 2008, cannot conclude that new rights and restrictions over the railway land can be created without serious detriment to NR's undertaking; no other land is available to NR by which to make good the detriment.</p>	<p>The E1.2: Statement of Reasons (APP-227) sets out the compelling case in the public interest for securing compulsory acquisition powers over Plot 176. As set out in Appendix C of the E1.2: Statement of Reasons (APP-227), the C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) at Part 4 of Schedule 9 includes Protective Provisions for the benefit of Network Rail that sufficiently protects the integrity of Network Rail's apparatus and the operational railway.</p> <p>The Applicant is not intending to extinguish any rights belonging to Network Rail.</p> <p>The Applicant has been engaged in constructive commercial negotiations with Network Rail for a voluntary land agreement over Plot 176 since April 2019. The Applicant is confident that a voluntary land agreement can be entered into shortly. However, in order to ensure the deliverability of Hornsea Four, the</p>

		<p>Applicant cannot agree not to utilise its compulsory acquisition powers until a voluntary agreement for the necessary property rights has been entered in to.</p> <p>For these reasons, the Applicant considers that the compulsory acquisition of rights is justified and can be granted without serious detriment to Network Rail's undertaking.</p>
RR-001-C	<p>Additionally, NR objects to the inclusion of the Crossings in the HGV Route. The Outline Construction Traffic Management Plan has not been furnished and the Applicant has not meaningfully engaged with NR to provide a proper understanding of the level of impact the HGV vehicles will have on the Crossings and the safety of the railway and its users.</p>	<p>The Applicant has undertaken further consultation with Network Rail (meeting 15 February 2022) to clarify the level of impact that HGVs will have on level crossings. During the meeting, the Applicant directed Network Rail to Table 7.18 of A3.7: Traffic and Transport (APP-031) which includes detail of the peak and average increase in total and HGV traffic along all links arising from the construction of Hornsea Four.</p> <p>It was agreed with Network Rail during the meeting that minor amendments would be incorporated into the outline Construction Traffic Management Plan (oCTMP), which forms Appendix F of F2.2 Outline Code of Construction Practice (APP-237), to address outstanding concerns in relation to:</p> <ul style="list-style-type: none"> the requirement for enhanced HGV driver instructions for crossing level crossings; and the movement of 'large or slow' vehicles (large being defined as over 18.75 long, 2.9 m wide or 44 tonnes total weight, slow defined as 5mph or less) across level crossings. <p>The Applicant has updated F2.2 Outline Code of Construction Practice (APP-237) as part of the submission at Deadline 1 to account for these amendments to Appendix F.</p> <p>The Applicant and Network Rail also discussed (on 15 February 2022) concerns in relation to the impact of increased HGV movements across level crossings on the existing Network Rail asset. The Applicant is in ongoing constructive negotiations to finalise an Asset Protection Agreement that will apply in addition to the protective provisions included in the draft DCO.</p>

<p>RR-001-D</p>	<p>In order for NR to be in a position to withdraw its objection NR requires:</p> <p>(a) agreements that regulate:</p> <p>(i) the manner in which rights over Plot 176 and any other railway property are acquired and the relevant works are carried out including terms which protect NR's statutory undertaking and agreement that compulsory acquisition powers will not be exercised in relation to such land;</p> <p>(ii) the carrying out of works in the vicinity of the operational railway network to safeguard NR's statutory undertaking; and</p> <p>(iii) the use of the Crossings by HGVs, and the liability of the Applicant for any necessary repairs and upgrades to the Crossings as a result of the HGV Route, including terms which protect NR's statutory undertaking; and</p> <p>(b) the inclusion of appropriate protective provisions in the Order for its benefit.</p>	<p>Noted. The Applicant and Network Rail are in ongoing constructive commercial negotiations to finalise a suite of voluntary agreements which includes a Land Agreement, Asset Protection Agreement and Framework Agreement that will apply in addition to the protective provisions included in the draft DCO. The Applicant is confident that these agreements will be entered into shortly.</p> <p>Section 5.2.6 of the outline Construction Traffic Management Plan (oCTMP), which forms Appendix F of F2.2: Outline Code of Construction Practice (APP-237), includes a commitment to undertaking highway condition surveys (on roads that are not specifically designated for HGV movements) prior to the commencement of the relevant part of the onshore connection works and after the substantial completion of construction works. Any damage to the existing road network as a consequence of Hornsea Four will be made good or a financial contribution made to the highway authorities to cover the cost of remedial works.</p> <p>As set out in Appendix C of E1.2: Statement of Reasons (APP-227), the C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) at Part 4 of Schedule 9 includes Protective Provisions for the benefit of Network Rail that sufficiently protects the integrity of Network Rail's apparatus and the operational railway and ensures that there will not be any serious detriment to their undertaking.</p>
<p>RR-001-E</p>	<p>NR notes the inclusion of protective provisions for its benefit in the Order and, if necessary, will provide detailed comments on, and amendments to, the protective provisions in its Written Representation.</p>	<p>Noted.</p>
<p>RR-001-F</p>	<p>NR requests that the Examining Authority treat NR as an Interested Party for the purposes of the Examination and reserves the right to produce additional grounds of concern when further details of the Project and its effects on the operational railway are available.</p>	<p>Noted.</p>

2.2 Bridge Petroleum Limited (RR-002)

Reference	Relevant Representation Comment	Applicant's Response
RR-002	<p>Bridge Petroleum Limited (BPL) is sole equity holder (100%) and Operator of Seaward Production Licence P2426 for the discovered Kumatage natural gas field, which comprises UKCS blocks 42/30d and 43/26c. Ørsted Hornsea Project Four Limited (Ørsted) proposes to develop the Hornsea Project Four offshore wind farm (Hornsea Four). A section of the proposed Hornsea Four offshore wind turbine and supporting infrastructure array will be located within the 43/26c block area. BPL plans to develop the gas reservoir either through a platform or subsea development and associated pipeline(s) and umbilical(s) (if required) to tie into existing gas export infrastructure. The approximate locations of the proposed Kumatage appraisal well and Kumatage development drill centre within the 43/26c block, based on ED50-UTM31 coordinate system are: • Appraisal: 371387E 5998808N • Development: 371314E 5999837N BPL emphasise that these locations will be subject to seabed survey and detailed design findings. BPL will seek to minimise time to first gas production, subject to commercial and project considerations, however the back-stop Kumatage licence timeline for key activities is as follows: • Commitment to appraisal well by 30th September 2022. • Drilling of appraisal well by 30th September 2024. • First gas production by 30th September 2028. The Kumatage development area may also include commercial reserves in a North Eastern terrace of the 43/26c block area, referred to as Kumatage Prospect 2. Prospect 2 commerciality will be assessed during the Kumatage development phase and may be accessed from a well drilled from the Kumatage development drill centre or via another subsea well in the 43/26c block. BPL and Ørsted are in discussions with the aim of ensuring co-existence of Kumatage and Hornsea Project Four facilities and operations. BPL is supportive of Hornsea Project Four but allowance must be included within the Hornsea Project</p>	<p>The Applicant confirms that BP2 has provided the Applicant with possible coordinates for the Kumatage development, and that the parties are engaged in constructive discussions in an attempt to mitigate possible risks of disruption to their respective projects.</p> <p>This response has been agreed between the Applicant and BPL. The parties intend to provide an update on the commercial discussions between them at Deadline 2 of the Examination on Tuesday 29 March 2022.</p>

	<p>Four design, such that Hornsea Project Four does not hinder, compromise or adversely affect the Kumatage field's future activities in compliance with all relevant legislation, including, but not limited to, survey (including seismic data acquisition), drilling, installation, production operations and decommissioning activities, nor the exercise or enjoyment of any of the rights and benefits or the performance of any of the obligations under Licence P2426.</p>	
--	--	--

2.3 Christopher Thomas Watt (RR-003)

Reference	Relevant Representation Comment	Applicant's Response
RR-003	<p>I wish to register an objection to the Hornsea Four Offshore Wind Farm on the grounds of: -Potential significant adverse impacts on seabird populations of the Filey & Flamborough SPA through collision and displacement, with many of the species listed as red-listed and have declined sharply over recent decades. -Contribution to cumulative impacts facing seabird populations such as marine pollution, over pollution and climate change. -Clash with current policy environment, in particular the Environment Act 2021 which seeks to demonstrate biodiversity net gain from large infrastructure projects. There is no evidence the proposed compensatory measures will mitigate impacts on seabird populations arising from the development. -Over development in the former Round 3 Hornsea development area with 3 large consented developments contributing to renewable energy targets. Sustainable development principles must account for this and seek a balance. There is clear evidence the Hornsea 4 area is utilized by seabird populations for foraging purposes and further development will impinge on said features of the SPA. Many thanks</p>	<p>The Applicant has presented assessments for collision risk and displacement within A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and within B2.2 Report to Inform Appropriate Assessment Part 1 (APP-167). In relation to concerns raised relating to the ornithological effects including cumulative impacts please see detailed responses on these matters provided in the Applicant's comments to Offshore Ornithology Relevant Representations to Natural England (RR-029). For example, please refer to the Applicant's response to RR-029-APDX:B-81 with regards to the approach and methodology to cumulative and in-combination assessments.</p> <p>Regarding biodiversity net gain, the Applicant is committed to reducing any net loss to biodiversity and this is demonstrated through the production of the F2.16: Outline Net Gain Strategy (APP-251), which fulfils the project's commitment Co199. Please see the Applicant's response to Onshore Relevant Representations to the Environment Agency (RR-010) specifically response RR-010-R.</p> <p>The Applicant has presented a detailed review of evidence supporting each of the compensation measures for each seabird species with the relevant ecological evidence reports:</p> <ul style="list-style-type: none"> • 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);

		<ul style="list-style-type: none"> • B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194); • B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196); and • B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198). <p>The Applicant has demonstrated that the package of compensatory measures meets necessary legal tests including that the compensation is viable, effective and can be secured and delivered.</p>
--	--	--

2.4 CMS Cameron McKenna Nabarro Olswang LLP on behalf of NEO Energy (SNS Limited) (RR-004)

Reference	Relevant Representation Comment	Applicant's Response
RR-004-A	<p>Letter of Objection to Proposed Hornsea Project Four Offshore Windfarm (the "Proposed Development"). NEO Energy (SNS) Limited ("NEO") owns and operates the producing Babbage Field (Licence P.456, Block 48/2a), which is located 4.3 km from the proposed Hornsea Project Four Windfarm. NEO and its joint venture partner Dana Petroleum (E&P) Limited, in collaboration with Offshore Design Engineering Limited ("ODE"), as Duty Holder, Installation and Pipeline Operator, must ensure that its activities and assets continue to operate safely. The Proposed Development would have an adverse effect on the operation of the Babbage asset. Consultation and information exchange have taken place with Orsted Hornsea Project Four Limited ("Orsted"), but there are some outstanding issues:</p>	<p>The Applicant notes the comments made by NEO.</p> <p>The Applicant confirms that the operational assets noted have been identified within Section 11.7, specifically Tables 11.8 and 11.9 of A2.11 Environmental Statement Volume A2 Chapter 11: Infrastructure and Other Users (APP-023) of the Environmental Statement and impacts are considered to be broadly acceptable. The effect therefore is considered to be not significant. The detailed assessment is at Section 19 of the A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086). The risk assessment at Table 19.2 summarises the Applicant's position as broadly acceptable.</p>
RR-004-1	<p>1. Shipping and Navigation. Due to the presence of the Proposed Development, there is a potential for increased allision risk to the Babbage platform as vessels deviate from existing routes. The proximity of the wind turbines and associated works may restrict access to the Babbage asset, e.g. vessels providing routine support may be impacted. Access is already constrained by the Hornsea Project Two. The necessary</p>	<p><i>Shipping and Navigation – General</i></p> <p>Impacts on allision risk to oil and gas platforms arising from third party deviations around Hornsea Four and access issues have been assessed within A2.11 Environmental Statement Volume A2 Chapter 11: Infrastructure and Other Users (APP-023), noting that impact assessment was informed by overarching</p>

	<p>modifications, both on and offshore, to mitigate navigation risks, as well as the appropriate reimbursement mechanism, will need to be discussed further. Orsted must also engage with the relevant authorities on navigation risk mitigation, such as emergency response procedures.</p>	<p>assessment to oil and gas operators in A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086) and dedicated assessment of impacts to the Babbage platform within Appendix C of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087).</p> <p><i>Allision</i></p> <p>The assessment in Appendix C of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087) concludes no significant impact in terms of changes in allision risk to the Babbage platform given numbers of vessels in proximity to the platform are not expected to increase notably above baseline figures as shown in Table 7.2.</p> <p><i>Access</i></p> <p>As per Section 8.3.2.2 of Appendix C of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087), the assessment concludes no significant impact in terms of vessel access to the Babbage platform assuming communication protocols are agreed between the Applicant and the operator to ensure simultaneous operations can be suitably managed.</p>
RR-004-2	<p>2. Aviation. Given the close proximity of the Babbage asset to the Proposed Development, helicopter operations may be affected, including access, payload, increased number of flights, which could have a safety and commercial impact. Current proven methods used by UK oil and gas operators in the Southern North Sea (SNS) should be taken into account in the impact assessment, as well as a broader approach that includes the use of other aircraft that operate in the SNS, albeit with less frequency. The following areas of concern remain: • En Route Descent Minima for Airborne Radar Approach (ARA); • Limited Icing Protection Systems; • ARA Minima; • Supplement 97 Enhanced Offshore Profile; and • Aircraft Performance.</p>	<p><i>Helicopter Access General:</i></p> <p>Impacts on helicopter access to oil and gas platforms arising from Hornsea Four have been assessed within A2.8 Environmental Statement Volume A2 Chapter 8: Aviation and Radar (APP-020), noting that impact assessment was informed by overarching assessment to oil and gas operators in A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086) and dedicated assessment of helicopter access to the Babbage platform within Appendix A1 of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087). The assessment used seven years of meteorological data, from the nearby Ravenspurn North Platform, and applied the regulatory aviation limits, confirmed with the helicopter operators. The assessment indicates that there would be no significant effects on helicopter access during the construction, operation and maintenance or decommissioning</p>

		<p>phases to the Babbage Platform on the grounds that it is unlikely that there will be any extended periods of time when oil and gas platform helicopter operations are inhibited. Furthermore, the assessment showed there would be no impact on Search and Rescue helicopter operations.</p> <p><i>En-Route Descent Minima and Airborne Radar Approach (ARA):</i> The en-route descent and ARA requirements are shown in Appendix A1 of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087). The analysis of meteorological data specific to the Babbage platform is shown in Section 3. The assessment takes full account of the aviation regulations and current industry best practice, which have both been confirmed with the helicopter operators. The data shows that there would be no significant effects on access.</p> <p><i>Limited Icing protection Systems</i> Effects associated with icing have been considered within Appendix A1 of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087).</p> <p><i>Supplement 97 and Aircraft Performance:</i> Following discussions with the helicopter operators, the source of the one engine inoperative performance graphs was changed from the AW 139 Flight Manual Supplement 97 to Supplement 50. The use of Supplement 97 had previously been agreed with the relevant helicopter operators during a joint workshop for Hornsea Project Three. Appendix A of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087) was updated using data from Supplement 50, with the additional analysis shown in Section 5.6. The change had a minor effect on the one engine inoperative take-off distance required, which has been noted by the Applicant.</p>
RR-004-3	<p>3. Proximity and Crossing of Assets. Further consultation is needed to determine what formal agreements would be needed if there are any crossings or proximity to the Babbage platform. The Babbage platform has a 500m safety zone that no third-party vessel may enter without prior</p>	<p>The Applicant intends to consult with NEO post consent with a view, where required, to entering into a proximity agreement for the installation of the offshore export cable and proximate wind turbine generators.</p>

	<p>written agreement. To facilitate the need for simultaneous operations, a protocol for effective operational communications should be developed.</p>	<p>The Applicant agrees that to facilitate the need for simultaneous operations a protocol for effective operational communications may be developed either as part of the proximity agreement or as a separate co-operation agreement.</p>
<p>RR-004-4</p>	<p>4. Maximising Economic Recovery and Net Zero. There needs to be a discussion about how the proposed development will affect NEO's obligation in relation to the regulator's (the Oil and Gas Authority) strategy to maximise economic recovery from strata beneath UK waters. The Proposed Development may also preclude future reuse of Babbage infrastructure, such as for carbon capture and storage.</p>	<p>The Applicant has considered the maximising economic recovery strategy established pursuant to section 9G of the Petroleum Act 1998 and considers that Hornsea Four will not have an impact on the continuing production of the Babbage field.</p> <p>Helpfully the latest strategy dated February 2021 recognises Net Zero targets. Volume F1.6: Statement of Need (APP-234) sets out the needs case for Hornsea Four with reference to three important national policy aims of decarbonisation: (1) Net Zero and the importance of deploying zero-carbon generation assets at scale; (2) Security of Supply and (3) Affordability. Chapter 3 of Volume F1.6: Statement of Need (APP-234) sets out the Policy framework established by the National Policy Statements and the support for significant low carbon electricity generation infrastructure in order to achieve Net Zero.</p> <p>The Applicant notes the reference to the preclusion of future reuse of Babbage infrastructure for carbon capture and storage. The Applicant cannot consider the potential for spatial and temporal interactions for a future reuse which are entirely uncertain. NEO has not provided any information, nor is there any information in the public domain regarding the future reuse of the Babbage infrastructure for such a purpose. The Environmental Statement has only been able to consider those licensed blocks with potential for spatial and temporal interactions and specific activities for which the licence operator has the appropriate licences and consents needed to undertake the specific activity which is being assessed; and/or there is sufficient information in the public domain (available either through consultation or public available documents) regarding the future activity for an assessment to be undertaken. Where this criteria does not apply, the potential reuse is outside the scope of the Environmental Statement. This approach is aligned with the methodology for Cumulative Effect Assessment (CEA) and certainty in development proposals.</p>

		The Applicant is continually engaging with operators to ensure we are informed of future developments at the earliest opportunity. Once sufficient details become available and there is sufficient certainty of the proposal then an assessment will take place and A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086) updated.
RR-004-B	As new technical details/information becomes available, additional concerns may be raised. However, it should be noted that positive dialogue has occurred with Orsted to date, and we recognise the opportunities/synergies that may exist between the parties in relation to the development	The Applicant agrees that there has been positive dialogue with NEO. The Applicant and NEO are developing a position statement to be submitted at Deadline 2. The Applicant is confident that the spatial and temporal interfaces between the Hornsea Four and the Babbage asset can be addressed as part of that continuing positive dialogue.

2.5 Dee Atkinson and Harrison on behalf of Mr CW and Mrs CF Foreman (RR-005)

Reference	Relevant Representation Comment	Applicant's Response
RR-005-A	The extent, application and impact of the Compulsory Acquisition Rights applied for by the Developer (specifically in relation to rights in land for the on-shore export cables and the imposition of restrictions);	The E1.2: Statement of Reasons (APP-227) describes and justifies the extent and impact of the compulsory acquisition powers sought in C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) .
RR-005-B	Unresolved issues associated with the Voluntary Agreement process and the impact of entering the proposed Voluntary Agreement compared to the Compulsorily Acquisition Process	<p>The Applicant has been regular contact with Mr and Mrs Foreman and their agents since June 2018. On 28th April 2021 the Applicant and Mr and Mrs Foreman signed Heads of Terms of agreement which detailed all the principal matters in negotiation (including the extent of the land required for the project).</p> <p>The Applicant believes that the only outstanding area of concern for Mr and Mrs Foreman is any commercial impact on their dairy farming business, as outlined in the recently received dairy report. The Applicant is confident that there are appropriate construction and engineering measures, which are used routinely in the industry, which can be used to minimise disruption and mitigate losses. In addition, compensation for any loss or damage will be paid by the Applicant. The Applicant is confident of entering into a voluntary agreement shortly.</p>

2.6 DFDS (RR-006)

Reference	Relevant Representation Comment	Applicant's Response
RR-006	DFDS have a firm interest in ensuring a direct route passing through the Gab of the Horn Sea projects, both to secure our customers a steady service connecting UK, Scandinavia and Continent, but also in the interest of not burning more fossil fuels than necessary in doing so. Hence, we are interested to see and follow the further development of these projects.	The Applicant notes DFDS's continued involvement with the project and welcomes the continued constructive dialogue. The Applicant can confirm a Letter of No Objection between Hornsea Four and DFDS has been signed.

2.7 DRAX Power Limited (RR-007)

Reference	Relevant Representation Comment	Applicant's Response
RR-007	Drax Power Limited ("Drax") is the developer of the Drax Bioenergy with Carbon Capture and Storage ("BECCS") Project (the "BECCS Project"). The BECCS Project is currently at the pre-application stage of its own development consent order process and aims to fit carbon capture technology to two biomass units at the existing Drax Power Station before 2030, capturing 8 million tonnes of carbon dioxide per annum in the process. The BECCS Project is a Greenhouse Gas Removal (GGR) project and one of a number of CCS projects in the Humber and Teesside regions that are looking to commission in the 2020s following the recent award of "track 1" priority status for the deployment of CCS infrastructure in the area - https://questions-statements.parliament.uk/written-statements/detail/2021-10-19/hcws325 . The carbon dioxide from these CCS projects is expected to be stored in the Endurance aquifer in the Southern North Sea which is	<p>The Applicant notes that Drax's BECCS Project is a potential user of the proposed CCS projects in the Humber and Teesside regions, which expect to store carbon dioxide in the Endurance aquifer.</p> <p>The Applicant has assessed the potential impacts of Hornsea Four on the Endurance carbon store within A2.11 Environmental Statement Volume A2 Chapter 11 Infrastructure and Other Users (APP-023) which concludes that, with mitigation, the potential impact is "slight" and not significant.</p> <p>Notwithstanding the above conclusion, to facilitate coexistence between the projects, the Applicant has included protective provisions in the draft DCO. Those provide for cooperation on planned proposed development activities, communication and liaison via an Interface Management Group.</p>

<p>located in the vicinity of the Hornsea Project Four Offshore Wind Farm (“Hornsea Four”). Drax directs the attention of the Examining Authority to recent published media articles indicating that construction and operation of Hornsea Four may impact on the use of and monitoring of the Endurance aquifer (https://www.thisismoney.co.uk/money/markets/article-9703765/BP-battles-Danish-giant-North-Sea-green-power-storm.html). Drax believes that offshore wind generation, GGRs including BECCS and other CCS technologies all have an important role to play in enabling the UK to meet its 2050 Net Zero target and that it is critical that solutions are found that enable these technologies to co-exist in a way that ensures the UK can reach Net Zero. Consideration ought to be given as to whether any restrictions on the viability, operation or capacity of Endurance may (i) detrimentally impact on CCS projects in the Humber and/or Teesside that are planning to utilise Endurance; and (ii) prevent the UK Government achieving its target in the Net Zero Strategy of capturing 20-30 million tonnes of carbon dioxide per year across the UK by 2030 and at least five million tonnes of carbon dioxide captured per year from GGR projects specifically. We ask that the Examining Authority includes the interaction between Endurance and Hornsea Four on its initial assessment of the principal issues for Examination with the aim of ensuring that the capacity of Endurance is not hindered by the location of the wind farm array, ensuring that these projects can co-exist, and both assist the UK in meeting its Net Zero target.</p>	<p>The Applicant firmly believes that co-location between Hornsea Four and Endurance is possible, and that the protective provisions offer a reliable mechanism to facilitate the delivery of Hornsea Four and Endurance in the overlap zone.</p> <p>Hornsea Four notes that, in contrast to the approach taken in the Hornsea Four DCO, the Net Zero Teesside (NZE) DCO application does not assess the impacts of the wider carbon capture storage project on Hornsea Four, and as a result, no mitigation is proposed. The Applicant also notes that the informal scoping exercise relating to the Endurance project (i.e. the offshore elements of the carbon capture scheme) on which it was consulted did not assess the potential impacts of Endurance on Hornsea Four, or identify any mitigation measures to avoid, prevent, reduce or offset any adverse effects.</p> <p>The Applicant does not intend to progress a separate position statement with Drax, however, acknowledges that further discussion may be needed between the parties should Drax continue to make representations.</p> <p>However, in relation to the offshore interface and to support the Examining Authority’s consideration of coexistence between Hornsea Four and Endurance, the Applicant and bp have prepared G1.29: Position Statement between Hornsea Project Four and bp, which is included in the Applicant’s submissions for Deadline 1.</p>
--	--

2.8 East Riding of Yorkshire Council (RR-008)

Reference	Relevant Representation Comment	Applicant’s Response
RR-008	As one of the host local authorities I would like to register East Riding of Yorkshire Council as an interested party in this DCO. Our interests include land fall works on the beach and cliff, ecology, landscape and	It is noted that ERYC is the only host authority for Hornsea Four.

	<p>visual, highway, flood risk and drainage, noise and air quality. I confirm that The East Riding of Yorkshire Council (A164 Castle Hill Roundabout to A164 Regiment Roundabout) Compulsory Purchase Order 2021 and The East Riding of Yorkshire Council (A164 Castle Hill Roundabout to A164 Regiment Roundabout Classified Road) (Side Roads) Order 2021 were confirmed by the Secretary of State for Transport on 7 October 2021. The highways scheme to be delivered by The East Riding of Yorkshire Council ("the Council") intersects the scheme proposed under the DCO. I wish to place and sustain an objection to the DCO on behalf of the Council until such time as either a collaboration agreement is in place or appropriate protection contained within the DCO in accordance with clause 5.4.1.2 of the Statement of Case dated September 2021.</p>	<p>The Applicant has welcomed the significant consultation undertaken with ERYC over the years prior to submission of the DCO application. This consultation is summarised in F3.1: Statement of Common Ground Between Hornsea Project Four and East Riding of Yorkshire Council (APP-255). This consultation has covered all the environmental topics outlined in the ERYC Relevant Representation response. The Applicant understands that the objection to the DCO does not represent the council's overall view of Hornsea Four but is instead a holding objection to protect the interests of the consented highways improvement scheme until agreement has been reached.</p> <p>The Applicant has been in contact with the ERYC team responsible for the A164 / Jocks Lodge Highways Improvement Scheme and has made amendments to the Hornsea Four Order Limits to accommodate co-location (as identified in agreement reference G3.1:1.7 in the Statement of Common Ground (APP-255)). The Applicant and ERYC are in ongoing discussions regarding the overlap between the two projects and it has already been agreed that the two projects can co-exist from a technical perspective.</p> <p>Discussions are ongoing, and are in advanced stages, between the legal representatives of the Applicant and ERYC to agree and finalise a set of Protective Provisions for the benefit ERYC's interests.</p>
--	--	--

2.9 East Suffolk Council (RR-009)

Reference	Relevant Representation Comment	Applicant's Response
RR-009	<p>East Suffolk Council would like to be registered as an interested party for the Hornsea Project Four Offshore Wind Farm DCO application/examination. We are particularly interested in matters relating to any forthcoming kittiwake compensation measures, whether onshore structures or nearshore structures requiring consideration by technical officers covering topic areas including (but not limited to)</p>	<p>The Applicant notes East Suffolk Council's interest, with particular reference to kittiwake compensation measures. The Applicant's preference is for an offshore repurposed artificial nesting structure; however the Applicant is also working in parallel to develop the onshore site selection and design, building upon lessons learned during the securing of Hornsea Three's artificial nesting proposals (B2.7.5 Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design (APP-191)). Onshore artificial nesting structures have been accepted by the</p>

	ecology, design and conservation, coastal management, environmental health or landscape.	Secretary of State as a feasible compensation measure for Hornsea Three, Norfolk Boreas and Norfolk Vanguard. The Applicant’s parent company, Ørsted, is working collaboratively with other offshore wind developers and the UK Government to seek strategic alignment on a number of compensatory measures, including artificial nesting.
--	--	--

2.10 Environment Agency (RR-010)

Reference	Relevant Representation Comment	Applicant’s Response
<p>RR-010 summary</p>	<p>Summary</p> <p>These Relevant Representations contain an overview of the project issues which fall within our remit. They are given without prejudice to any future detailed representations that we may make throughout the examination process. We may also have further representations to make when supplementary information becomes available in relation to the project.</p> <p>We have reviewed the draft DCO, Environmental Statement (ES) and supporting documents submitted to the Planning Inspectorate on the 20 September 2018, as part of the above-mentioned application. We are pleased that some of the concerns and issues raised by the Environment Agency during pre-application consultation have been considered and addressed.</p> <p>We can confirm at this stage that we consider that the ES provides a satisfactory assessment of the potential impacts of the scheme with reference to flood risk, water resources, groundwater and ecology.</p> <p>The mitigation and enhancement measures identified for the construction of the development are considered appropriate. However, we are unable at this stage to confirm that we are content to disapply the provisions of the Environmental Permitting Regulations (England and Wales) 2016 (“the EPR”),</p>	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 1 – Full Response to Environmental Agency (RR-010)</p> <p><i>Summary of Applicant’s Response to RR-010</i></p> <p>The Applicant has had due consideration of the Environment Agency’s Relevant Representation, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Confirmation that potential impacts in relation to landfills have been considered in APP-025 and APP-088, with no formal landfills identified; • Detail of the Onshore Crossing Schedule (APP-040) and clarification regarding the requirement of baily bridge or alternative clear span bridge crossings of Main Rivers; • Clarification regarding the decommissioning of the onshore ECC, including the current approach to leave assets in place beneath watercourses and any associated flood defence infrastructure; • Confirmation that the Environment Agency agrees in principle to the disapplication of the provisions of the Environmental Permitting Regulations (England and Wales) 2016, subject to the inclusion of protective provisions and further consideration regarding the works at Watton Beck. • Confirmation that sufficient allowance has been included within the design at landfall to account for coastal erosion; • Welcomed that the Environment Agency acknowledge that suitable consideration of flood risk at the OnSS has been undertaken;

	<p>which relate to permits for flood risk activities. Further information on this is provided below.</p> <p>In addition, we are considering the effect on our land interests and whether the proposed acquisitions would cause us a problem in operational terms.</p>	<ul style="list-style-type: none"> • Provided further context regarding the works at Watton Beck and ongoing discussions, which forms an area of outstanding agreement; • Clarification regarding the location of one logistics compound partially located within flood zone 3; • Acknowledged that the Environment Agency conclude the WFD compliance assessment adequately identifies and suitably mitigates potential impacts; • Responded to recommended best practice measures; and • Responded to points associated with onshore ecology, enhancement and biodiversity net gain.
--	---	---

2.11 Equinor (RR-011)

Reference	Relevant Representation Comment	Applicant's Response
RR-011	<p>Hornsea Project Four Offshore Wind Farm, PINS ref: EN010098 Relevant Representation by Equinor New Energy Limited Equinor New Energy Limited, hereafter Equinor, wishes to make a Relevant Representation to the Planning Inspectorate requesting that Equinor is treated as an Interested Party throughout the examination process of the Development Consent Order (DCO) application for the Hornsea Four Offshore Wind Farm (Generating Stations) Project (Hornsea Four Project), PINS ref: EN010098. The East Coast Cluster (ECC), enabled by the Northern Endurance Partnership (NEP) and covering Teesside and the Humber, was selected by the UK Government in October 2021 as one of the UK's first carbon capture, usage and storage (CCUS) clusters. The Department for Business, Energy & Industrial Strategy (BEIS) has selected the ECC as a Track-1 cluster with the objective of deployment of CCUS on the East Coast by the mid-2020s. The ECC will now be taken forward into Track-1 negotiations regarding potential Government support for development. Equinor is a partner in the NEP, a project proposing to construct and operate a carbon dioxide (CO2) pipeline network that will enable CO2 captured by primary emitter projects on both Teesside and the Humber to be transported offshore for safe,</p>	<p>The Applicant notes Equinor is a partner of NEP and also has interests in both hydrogen production and power generation with CCS projects situated in the Humber and Teesside, the realisation of which is dependent upon development of the Endurance carbon store.</p> <p>The Applicant has assessed the potential impacts of Hornsea Four on the Endurance carbon store within A2.11 Environmental Statement Volume A2 Chapter 11 Infrastructure and Other Users (APP-023) which concludes that, with mitigation, the potential impact is "slight" and not significant.</p> <p>Notwithstanding the above conclusion, to facilitate co-location between the projects, the Applicant has included protective provisions in the draft DCO. Those provide for cooperation on planned proposed development activities, communication and liaison via an Interface Management Group.</p> <p>The Applicant firmly believes that coexistence between Hornsea Four and Endurance is possible, and that the protective provisions offer a reliable mechanism to facilitate the delivery of Hornsea Four and Endurance in the overlap zone.</p>

secure offshore geological storage in the Endurance saline aquifer under the North Sea. During 2022 the UK Government will select which onshore primary emitter projects may be supported to connect to the Endurance store. The Net Zero Teesside Project DCO application, PINS ref: EN010103, was accepted for examination by the Planning Inspectorate on 16 August 2021. The application covers certain onshore elements of NEP in Teesside including the onshore section of the CO₂ export pipeline, above Mean Low Water Springs (MLWS). National Grid Ventures (NGV) is the promotor of the Humber Low Carbon Pipelines Project (HLCP) DCO, PINS ref: EN070006, which forms part of the ECC. This project is to establish a dual pipeline network in the Humber to transport CO₂ and hydrogen to facilitate CCUS. The onshore Humber CO₂ pipeline will connect to the NEP offshore pipeline to enable transport of CO₂ generated by primary emitters in the Humber to the Endurance storage site. The CO₂ export pipelines below MLWS at both Teesside and Humber and the offshore Endurance CO₂ storage site will be the subject of separate consent applications, primarily under the Petroleum Act 1998 and the Energy Act 2008, supported by an Environmental Statement. Equinor's interest in the Hornsea Project Four Offshore Wind Farm (Generating Stations) DCO: The location of the wind farm and associated infrastructure covered by the Hornsea Project Four Offshore Wind Farm (Generating Stations) DCO in part overlaps with the Endurance storage site. Equinor has interests in both hydrogen production and power generation with CCS projects situated in the Humber and Teesside, the realisation of which is dependent upon development of the NEP CO₂ transport and storage infrastructure which includes the Endurance storage site. Equinor understands that bp and Ørsted have had, and will continue to hold, discussions regarding the interface between the Hornsea Four Project and the Endurance storage site, the NEP and the ECC. Dependent upon the outcome of ongoing discussions, Equinor may wish to make representations on the interface, and the form of protective provisions to be included in the Hornsea Project Four Offshore Wind Farm (Generating Stations) DCO, to preserve the delivery and viability of NEP (including the Endurance storage site) and, by extension, the onshore emitter projects located in the Humber

Hornsea Four notes that, in contrast to the approach taken in the Hornsea Four DCO, the Net Zero Teesside (NZN) DCO application does not assess the impacts of the wider carbon capture storage project on Hornsea Four, and as a result, no mitigation is proposed. The Applicant also notes that the informal scoping exercise relating to the Endurance project (i.e. the offshore elements of the carbon capture scheme) on which it was consulted did not assess the potential impacts of Endurance on Hornsea Four, or identify any mitigation measures to avoid, prevent, reduce or offset any adverse effects.

The Applicant does not intend to progress a separate position statement with Equinor, however, acknowledges that further discussion may be needed between the parties should Equinor continue to make representations.

However, in relation to the offshore interface and to support the Examining Authority's consideration of coexistence between Hornsea Four and Endurance, the Applicant and bp have prepared [G1.29: Position Statement between Hornsea Project Four and bp](#), which is included in the Applicant's submissions for Deadline 1.

	<p>and Teesside forming part of the ECC. Equinor may also wish to make representations on aspects of the Environmental Statement, to the extent it is relevant to and/or references NEP (e.g. in relation to the cumulative effects assessment). Equinor wishes to reserve the right to make further representations as part of the examination process. We trust that this Relevant Representation is of assistance and look forward, where appropriate, to participating in the forthcoming examination process.</p>	
--	--	--

2.12 Eversheds Sutherland (International) LLP on behalf of Viking Link (RR-012)

Reference	Relevant Representation Comment	Applicant's Response
RR-012	<p>Representation by Viking Link to the Hornsea Project Four Offshore Wind Farm project ("the Project") Introduction Viking Link is a 1400MW electricity interconnector between the high voltage networks of Great Britain and Denmark, and is being developed and constructed by Energinet and National Grid Viking Link Limited. Viking Link is fully permitted in all jurisdictions, and awarded contracts in 2019 for the supply and installation of equipment based on an accepted risk position along the length of the project. The project is expecting to enter commercial operation at end 2023, with an operational life of 40 years. Cable installation for Viking Link is currently taking place in the UK Sector and the project will be operational by end 2023. Viking Link wishes to make a relevant representation to the Project in order to protect its infrastructure which is in close proximity to the Project and will be adversely impacted by it. Interaction between Viking Link and the Project In the initial plans shared with Viking Link by the Promoter, the Viking Link cables ran through the proposed site for the wind turbines. This interaction could easily have been managed by a crossing agreement. However, Viking Link were then made aware of a 'Structures Exclusion Zone ("SEZ")' which has been introduced by the Promoter. This SEZ forms a narrow gap of approximately two nautical miles between the Project and the Hornsea 2 wind farm and has been introduced to allow</p>	<p>The Applicant has met and consulted regularly with Viking Link both pre and post submission of the Application.</p> <p>Through regular consultation, the Applicant understands Viking Link's concerns arising out of the Viking Link interconnector being located within in the gap formed between the existing Hornsea Project Two and the proposed Hornsea Project Four Wind Farms.</p> <p>The Applicant is confident in reaching an agreement with Viking Link and is continuing constructive commercial negotiations with Viking Link to address Viking Link's concerns.</p>

	<p>marine traffic to navigate between the wind farms as a direct route to the harbour. The SEZ is directly above the Viking Link cable and allows a constrained route for the navigation of marine vehicles. Increased Risk to the Viking Link Cable as a result of the Project Viking Link believe that that a section of the Viking offshore cable route would be subject to a higher risk of anchor strike and vessel sinking over the design lifetime of the Viking Link Interconnector as a direct result of the presence of the Project and this SEZ which has been introduced between the Project and Hornsea 2. The Promoter's Navigation Risk Assessment suggests that the risk of ship collision in the area is increased. In addition, any cable repair works in the area between the projects is subject to increased risk because of the constrained area and numbers of close ship passages. Suggested Mitigation Viking Link consider that mitigation will be required to ensure that the risk to the Viking Link cable from the Project is limited. It is considered that this mitigation could consist of either deeper cable burial or rock placement over the Viking Link cable, in addition to some form of traffic management (IMO routeing measures). Viking Link have been engaging with the Promoter and are keen to continue this engagement with a view to finding a mutually agreeable solution to allow both projects to come forward safely and effectively.</p>	
--	---	--

2.13 Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013)

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-013 summary</p>	<p>Please see the Relevant Representation in Annex 2.</p>	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 2 – Full Response to Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013)</p> <p><i>Summary of Applicant's Response to RR-013</i></p> <p>The Applicant has had due consideration of Mr and Mrs Dransfield's Relevant Representation, and a summary of the key points of response is set out below:</p>

- Clarification of the full list of correspondence between the Applicant's solicitors and Mr and Mrs Dransfield's solicitors, including numerous letters and emails which sought to address concerns raised, in addition to a conference call between the parties in 22 September 2020;
- Clarification of adequacy of consultation, including a timeline of events and the way the Applicant responded upon notification that Mr and Mrs Dransfield had not received notice of the statutory consultation carried out in 2019. This comprised sending a further notice in July 2020 to Mr and Mrs Dransfield pursuant to section 42 of the Planning Act 2008, to which Mr and Mrs Dransfield responded. The Applicant has had regard to that response in accordance with section 49 of the Planning Act 2008, in addition to the outcomes assessments and other representations received;
- Rejection of the assertion that it was too late in the process for Mr and Mrs Dransfield to influence the design decision, noting that a change was made to the location of the junction on the A1079 to address concerns raised by Mr and Mrs Dransfield; the design of which was issued in draft to Mr and Mrs Dransfield's solicitors on 15 January 2021 inviting comments on the proposal, with a follow up reminder email sent on 19 February 2021;
- Addressed comments regarding the 150 distance from the OnSS access road;
- Acknowledgement the Relevant Representation as submitted differs from that sent in draft to the Applicant – noting that a number of point have been removed due to an early response by the Applicant;
- Strong rejection of the assertion that Mr and Mrs Dransfield have been significantly prejudiced – at no point during the statutory consultation process were decisions made that were irreversible;
- Confirmation that requested disclosures have been made;
- Strong rejection of the suggestion that information contained in the DCO application is misleading or accurate;
- Location of meeting minutes in the DCO application;
- Details of the noise assessment undertaken (including methodology and mitigation) and buffer zone adequacy at the Birkhill ancient woodland;

		<ul style="list-style-type: none"> • Details of the A1079 access design amendments and relevant work undertaken to inform the process, including correspondence with ERYC; • Correction regarding the interpretation of traffic and transport numbers; and • Clarifications regarding the OnSS site selection process.
--	--	---

2.14 Harbour Energy (RR-014)

Reference	Relevant Representation Comment	Applicant's Response
RR-014	<p>Harbour Energy operates and is an owner in the P686 and P380 licence which contains the Johnston Subsea Gas Field which is a producing gas field in Blocks 43/26a 43/27a on the southern western edge of the proposed windfarm turbine array. Harbour and its co-venturer have an obligation under the existing licence arrangements to maximise the economic recovery from the gas field and to responsibly decommission the wells and production facilities at the end of field life which could coincide with the construction and operation of the proposed windfarm development. Impacts on subsea field facilities are expected to be minimal during operation, but the construction and operation of the Hornsea Offshore Windfarm development could impact on the safe and efficient decommissioning of the field facilities at the end of field life. Harbour has been consulted and engaged constructively with Orsted during the pre-development process, but as yet agreement has not been reached as to how to best avoid unnecessary disruption to the licensees existing obligation to safely and efficiently decommission the field.</p>	<p>The Applicant notes the comments made by Harbour Energy.</p> <p>The Applicant confirms that the operational asset noted has been identified within Section 11.7, specifically Table 11.7 of A2.11 Environmental Statement Volume A2 Chapter 11: Infrastructure and Other Users (APP-023) of the Environmental Statement.</p> <p>The Applicant agrees that there has been positive and constructive dialogue with Harbour Energy.</p> <p>The Applicant notes Harbour's concerns relating to the decommissioning of the Johnston subsea infrastructure following cessation of production. The Applicant is continuing constructive commercial negotiations to address Harbour's concerns.</p>

2.15 Historic England (RR-015)

Reference	Relevant Representation Comment	Applicant's Response
RR-015-A	The Historic Buildings and Monuments Commission for England (Historic England) is a statutory consultee in relation to the historic environment, the lead body for the heritage sector and the Government's principal adviser on the historic environment. We summarise our representation regarding this proposed project as follows. It has been split up below.	Historic England's responsibility is noted by the Applicant.
RR-015-1	1. Environmental Statement (ES), Volume A2, Chapter 9 Marine Archaeology describes how some potential impacts on marine archaeology receptors have been "scoped out" from this assessment. It states that this was done on the "condition" that Historic England will be consulted on the delivery of proposed mitigations strategies, as agreed with the Planning Inspectorate (EIA Scoping Opinion, November 2018).	<p>The proposed mitigation strategies (known as Commitments within the Hornsea Four DCO Application) relevant to marine archaeology are detailed in Table 9.9 of Volume A2, Chapter 9: Marine Archaeology (APP-021), alongside references to the DCO and DML conditions within which these commitments are secured Volume C1, Chapter 1: Draft DCO including Draft DMLs (APP-203). These commitments are expanded on in Volume F2, Chapter 4: Outline Marine Written Scheme of Investigation (APP-239) and consultation has been undertaken with Historic England during the pre-application stage in relation to this document and the commitments contained within.</p> <p>The Applicant continues to welcome dialogue on the delivery of the proposed commitments and notes that DCO Schedule 11, Part 2 - Condition 13(2) and 13(3) and Schedule 12, Part 2 - Condition 13(2) and 13(3) include for the provision for delivery of a marine written scheme of archaeological investigation to be agreed with the Marine Management Organisation (MMO) in consultation with Historic England prior to the commencement of construction activities.</p> <p>The Applicant hopes to continue engagement with Historic England through the Statement of Common Ground (SoCG) process in relation to the issues raised in their representation.</p>
RR-015-2	2. Chapter 9 sets out the anticipated impact assessment in different phases with the Applicant determining that there is no likely significant effect in EIA terms during construction and decommissioning phases, in accordance with their "proportionate approach to EIA". However, the Applicant also explains that as part of this approach, marine archaeology has not been "scoped out" from the overall EIA process with	By means of the scoping process, the Applicant agreed with the Planning Inspectorate (PINS) to scope out several marine archaeology impacts. In line with the Applicant's proportionate approach to EIA, these scoped out impacts were not assessed in full within Volume A2, Chapter 9: Marine Archaeology (APP-021) . Consideration of these scoped out impacts is provided in Volume A4, Annex 5.1: Impacts Register (APP-049) . The Impacts Register is a cornerstone of the Applicant's proportionate approach to EIA and the delivery of

	<p>mitigation commitments for the historic environment, as might be encountered by this proposed project, inclusive of primary design principles; installation techniques; and engineering designs/modifications.</p>	<p>commitments. Further detail on the Applicant's proportionate approach to EIA is presented in Volume A1, Chapter 5: Environmental Impact Assessment Methodology (APP-011). Further information regarding the Applicant's proportionate approach to EIA is provided as Appendix A: EIA Proportionality Memo submitted to the Planning Inspectorate as part of the Applicant's updated G1.4 Applicant Response to Section 51 Advice.</p>
<p>RR-015-3</p>	<p>3. The appropriateness of the "precautionary approach" promoted by the Applicant requires attention in reference to the acknowledgement of risk that this project could encounter presently unknown heritage assets during pre-construction, construction, operation and maintenance or decommissioning phases. We are therefore unclear as to how marine archaeology commitments will be formally delivered, so that this proposed project is fully informed through all post-consent evaluation stages, should permission be obtained.</p>	<p>The proposed mitigation strategies (known as Commitments within the Hornsea Four DCO Application) relevant to marine archaeology are detailed in Table 9.9 of Volume A2, Chapter 9: Marine Archaeology (APP-021), alongside references to the DCO and DML conditions within which these commitments are secured Volume C1, Chapter 1: Draft DCO including Draft DMLs (APP-203). These commitments are expanded on in Volume F2, Chapter 4: Outline Marine Written Scheme of Investigation (APP-239) which includes a project-specific protocol for archaeological discoveries (Appendix A). It also describes the reporting procedures to ensure that the results of archaeological work are made publicly available.</p> <p>DCO Schedule 11, Part 2 - Condition 13(2) and 13(3) and Schedule 12, Part 2 - Condition 13(2) and 13(3) include for the provision for delivery of a marine written scheme of archaeological investigation to be agreed with the Marine Management Organisation (MMO) in consultation with the statutory historic body prior to the commencement of construction activities. The conditions require that the marine written scheme of archaeological investigation must accord with the outline marine scheme of investigation and as such, Volume F2, Chapter 4: Outline Marine Written Scheme of Investigation (APP-239) is a document certified by the Secretary of State for the purposes of the Hornsea Four DCO under article 38.</p>
<p>RR-015-4</p>	<p>4. We understand that it is the purpose of the Commitments Register (Volume A4, Annex 5.2) to deliver embedded mitigation measures including: micro siting around identified archaeological receptors (Co. 46); the production of a Marine Written Scheme of Investigation (WSI) (Co. 140); undertaking geophysical survey and archaeologically assessing the data (Co. 166), and undertaking geotechnical survey and archaeologically assessing the data (Co. 167). This is the first Nationally Significant Infrastructure Project where we have encountered the use of a Commitments Register and therefore we are uncertain as to how it will be enacted as it does not appear to be identifiable within the articles of the draft Development Consent Order including (draft) deemed Marine</p>	<p>The purpose of the Commitments Register is to provide a tool to review key information associated with all commitments, allowing easy cross reference with the Impacts Register, ES chapters and the relevant documents, plans, and/or protocols that secure their commitment and where those are secured in the DCO. Both Volume A4, Annex 5.2: Commitments Register (APP-050) and the Volume A4, Annex 6.4: Compensation Commitments Register (APP-060), include a column entitled "How is the Commitment secured". This column indicates how each individual commitment is secured via a DCO requirement and associated document, plan and/or protocol.</p> <p>An example of this is Co. 166, the commitment to undertake an offshore geotechnical survey (including UXO survey) prior to construction and subject to consultation with Historic England.</p>

	<p>Licences for generation assets (Schedule 11) and transmission assets (Schedule 12). We also note that the Commitments Register is included in the list of “documents to be certified” within the draft Development Consent Order (Schedule 15).</p>	<p>This is secured via DCO Schedules 11 and 12, Part 2, Conditions 13 (2) and 13(3), which require a Marine Written Scheme of Investigation.</p> <p>The column entitled "Relevant Application Documents" then details any specific documents provided at DCO application that a stakeholder can review to confirm that this commitment has been included in the relevant document, plans and/or protocol to satisfy the DCO requirement. For the example of Co. 166 this is in the Volume F2, Chapter 4: Outline Marine Written Scheme of Investigation (APP-239).</p>
RR-015-5	<p>5. The route of the cable connection from landfall to substation traverses an area of considerable archaeological potential. The ES documents includes an Outline WSI for Onshore Archaeology, (PINS Doc Ref F2.10), but further elaboration is needed. For example, consultation with Humber Archaeology Partnership and Historic England is described as “where appropriate”, However, it is an important matter requiring acknowledgement that there should be effective involvement by Historic England so that high-level research questions are identified and used to focus attention.</p>	<p>F2.10: Outline Written Scheme of Investigation for Onshore Archaeology (APP-245) uses the term ‘where appropriate’ when referring to Historic England’s involvement at the post-consent stage as it is understood by the Applicant that the Humber Archaeology Partnership will take the lead on reviewing, approving and monitoring the archaeological strategy as outlined in the Outline Written Scheme of Investigation (OWSI) on behalf of ERYC, and that Historic England’s involvement will generally be at the request of Humber Archaeology Partnership as and when required by them. It is however envisioned that in matters of archaeological science and high-level research questions, Historic England would be consulted.</p>
RR-015-6	<p>6. The onshore substation and associated buildings constitute a large intervention in a sensitive landscape. The assessment of its impact on the cultural landscape is limited to views from existing access points and Public Rights of Way. This does not provide a comprehensive assessment of impact. Opportunities to minimise the harm generated are described as “aspirations” but need to be more considered and definite.</p>	<p>The Applicant consulted with Historic England regarding the setting assessment methodology (which follows Historic England’s guidance document ‘Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition)’ (HE, 2017)) and which heritage assets were to be considered for assessment at the Historic Environment Technical Panel meetings held on 16/01/19 and 14/11/19 (see Consultation Responses Table 5.3 in A3.5: Historic Environment (APP-029)). Heritage-specific and relevant landscape viewpoints were identified in relation to these heritage assets; this included Beverley Minster tower and St Mary’s Church tower as not easily publicly accessible locations. There are a number of photomontages based on photographs taken from existing access points and Public Rights of Way, however the setting assessment is further supported by additional photographs from and to individual heritage assets considered as part of the setting assessment. The opportunities identified within the ES to further reduce the impact on the cultural landscape have been included in F2.13: Outline Design Plan (APP-248) and F2.8: Outline Landscape Management Plan (APP-243) which are secured by Requirements 7 and 8</p>

		<p>of C1.1: Draft DCO including Draft DML (APP-203). It can be confirmed that such measures are not aspirational and are secured via outline plans, which will inform the detailed design in correspondence with ERYC. Heritage setting will continue to be a consideration in advancing the detailed design further in the post-consent stages as outlined in Section 6.9 of A3.5: Historic Environment (APP-029).</p>
--	--	---

2.16 Humber Fire and Rescue (RR-016)

Reference	Relevant Representation Comment	Applicant's Response
RR-016	Information for the Applicant to advise them that there is no off shore firefighting capability in the proposed area for development.	Noted. For the avoidance of any doubt, Humber Fire and Rescue are the relevant 'local Fire and Rescue Service' referenced in F2.12: Outline Energy balancing infrastructure HazID Report (APP-247) , as they will be consulted during the design phase for the onshore energy balancing infrastructure.

2.17 Jane Taylor (RR-017)

Reference	Relevant Representation Comment	Applicant's Response
RR-017 and RR-019 summary	Please see the relevant representation comment in Annex 3.	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 3 – Full Response to Jane Taylor (RR-017) and Malcolm Taylor (RR-019) of this document</p> <p><i>Summary of Applicant's Response to RR-017 and RR-019</i></p> <p>The Applicant has had due consideration of Mr Taylor and Mrs Taylor's Relevant Representations, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Acknowledged Mr Taylor and Mrs Taylor's concerns;

		<ul style="list-style-type: none"> • Noted the Applicant has entered into a voluntary agreement with Mr and Mrs Taylor's landlord which includes a requirement on the Applicant to provide additional mitigation measures in respect of Burn Park Farm; • Outlined the OnSS site selection process; • Responded to concerns associated with livestock and horses; • Welcomed information with regards to flood risk in the area surrounding the OnSS and outlined the findings of the Flood Risk Assessment, which has been agreed with the Environment Agency; • Responded to comments raised in respect of onshore ecology, inclusive of surveys undertaken and mitigation measures identified; • Responded to comments raised in respect of the landscape and visual impact assessment, acknowledging significant effects within a localised area and an overview of mitigation measures proposed including landscape planting and built design measures; • Outlined the reinstatement process and potential impacts in relation to agricultural land; and • Outlined mitigation measures secured for public rights of way and traffic and transport.
--	--	--

2.18 Lockington Parish Council (RR-018)

Reference	Relevant Representation Comment	Applicant's Response
RR-018 Summary	Please see the relevant representation comment in Annex 4.	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 4 – Full Response to Lockington Parish Council (RR-018) of this document</p> <p><i>Summary of Applicant's Response to RR-018</i></p> <p>The Applicant has had due consideration of Lockington Parish Council's Relevant Representation, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Confirmation of the site selection process for the primary logistics compound located east of Lockington, inclusive of rationale for the location and overview of the significant consultation undertaken;

		<ul style="list-style-type: none"> • Clarification and responses to comments raised regarding traffic and transport, inclusive of the enforceability of vehicle control measures, vehicle numbers, accidents and road safety and vehicle movements through Lockington village; and • Overview of mitigation measures secured for the construction of Hornsea Four.
--	--	--

2.19 Malcolm Taylor (RR-019)

Reference	Relevant Representation Comment	Applicant's Response
RR-019	<p>Onshore Substation. The area of land for the proposed Substation is too close to Burn Park Farm house and buildings. It will cause severe disruption to myself and an animal welfare issue to the livestock from the noise, dust, vibrations and light pollution. Flooding. The area of land chosen is prone to regular flooding particularly the North Eastern boundary. Around 3 acres here has not been cropped for several years and acts as a natural flood area. Flood risk is an important issue for the local area. Wildlife. There are a considerable number of ground-nesting and protected birds and also deer, foxes, hares, hedgehogs and bats. The construction work over a long period of time will destroy their habitats and nesting sites as will the removal of mature hedgerows and trees. These have all provided the wildlife with a safe, undisturbed environment which will be lost. Visual Impact. The impact on a rural landscape of long, high structures will be detrimental to the whole surrounding area. The extent of land disturbed by the wide cable corridor will leave parcels of land which are unworkable by modern agricultural machinery. Walkers, cyclists and horse riders will be unable to have the peaceful recreational enjoyment of their usual routes. Traffic. The increase in the number of Heavy Goods lorries and light vehicles on already congested roads will cause further delays to local traffic and greatly increased air pollution for everyone. I strongly object to the development for all the reasons stated and wish to emphasize the impact it will have on Burn Park Farm, the welfare of the livestock and</p>	<p>Applicant has combined the response with Mrs Jane Taylor above (RR-017)].</p> <p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 3 – Full Response to Jane Taylor (RR-017) and Malcolm Taylor (RR-019) of this document</p>

Burn Park Farmhouse. I would be most grateful if the points raised could be given careful consideration. Yours sincerely Malcolm Taylor

2.20 Marine Management Organisation (RR-020)

Reference	Relevant Representation Comment	Applicant's Response
RR-020-summary	Please see the relevant representation comment in Annex 6.	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 6 – Full Response to Marine Management Organisation (MMO) (RR-020).</p> <p><i>Summary of Applicant's Response to RR-020</i></p> <p>The Applicant has had due consideration of the Marine Management Organisation's (MMO) Relevant Representation, and has responded with the following key points (but not limited to):</p> <ul style="list-style-type: none"> • Confirmation the Applicant is proposing to submit a number of pre-construction documents 6-month prior to the commencement of activities rather than the originally proposed 4-month to allow sufficient time to review the submissions and resolve any issues; • Noted concerns regarding underwater noise and disturbance impacts to fish and marine mammals and intends to provide further clarification in support of the existing seasonal restriction timescales proposed. • Confirmation that The Applicant has made updates to demonstrate the project adheres to all the relevant marine plans and policies in the area. • The Applicant proposes to undertake additional work or analysis to validate the marine processes baseline characterisation. The outputs will be submitted at a future Examination deadline. • Clarifying that impacts on the Flamborough Front identified no significant effects and as such, the Applicant considers there will be no indirect effects (positive or negative) on biogeochemistry associated with the front. • Confirms that when taking account of the precautionary approach to assessment, there are considered to be no significant uncertainties in the assessment conclusions

		<p>and therefore no monitoring requirements specifically related to marine processes have been identified, beyond standard geophysical surveys.</p> <ul style="list-style-type: none"> • Clarifies that although <i>Sabellaria spinulosa</i> individuals were identified within benthic grab samples at five sampling stations, the only aggregation observed in drop-down video footage was a small patch encrusting a pebble, which was not therefore classified as potential Annex I reef. • The Applicant considers the risk to fish and shellfish species from EMF during operations is not significant. • The Applicant has prepared a clarification note (G1.8 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction) to provide further analysis and justification of the “peak” spawning period for herring, using the methodology proposed by Cefas as part of the Hornsea Four Evidence Plan process. • Highlights that Hornsea Four does not represent a new potential vector for invasive non-native species due to the presence of other existing offshore infrastructure. • The Applicant notes that the approach in the marine mammal assessment to not assess magnitude/sensitivity/significance of TTS-onset was agreed through the Evidence Plan process. This is in line with the latest guidance from Natural England. • In relation to the Marine Mammal Mitigation Protocol (MMMP) the Applicant confirms that the specific mitigation measure will be determined in consultation with the relevant SNCBs, following confirmation of final hammer energies and foundation types, collection of additional geological data, acquisition of noise monitoring data and/or information on maturation of emerging technologies. • The Applicant has updated F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244) in line with requested updates.
--	--	--

2.21 Maritime and Coastguard Agency (RR-021)

Reference	Relevant Representation Comment	Applicant’s Response
RR-021	MCA will be responding the ExA on matters concerning the safety of maritime navigation and maritime Search and Rescue. MCA will provide comments on the Navigation Risk Assessment, Shipping & Navigation	Noted. The Applicant continues to engage with the MCA through the Statement of Common Ground (SoCG) process. (see G1.25 Statement of Common Ground between Hornsea Four and the Maritime Coastguard Agency).

	<p>chapter of the EIA Report, and the content of the DCO and DML. The main issues for MCA are concerning vessel routeing, vessels' ability for continued safe passage in the North Sea, that risks to all vessels and craft are at an acceptable level, and the project is not at the detriment to the provision of Search and Rescue, and other emergency response.</p>	
--	--	--

2.22 Ministry of Defence (RR-022)

Reference	Relevant Representation Comment	Applicant's Response
RR-022-A	<p>Dear Sir/Madam, The Hornsea Project Four Offshore Wind Farm Application for a Development Consent Order under Section 37 of the Planning Act 2008, I write to confirm the safeguarding position of the Ministry of Defence (MOD) in relation to the above application to construct and operate the Hornsea Project Four offshore wind farm. This scheme will comprise of up to 180 wind turbines, up to 370m in height (to blade tip) that will be located in the North Sea in a development zone situated approximately 69km east of Flamborough Head. In addition to the turbine structures there will be up to 1 offshore accommodation platform, up to 6 offshore transformer substations, up to 3 offshore high voltage booster or convertor stations, subsea cabling and other associated infrastructure. The onshore element of the project includes subterranean cabling as well as, electrical substations and other associated infrastructure to transfer the generated power from the Yorkshire coast, north of Barmston to connect with the National Grid via the existing substation located to the west of Cottingham. In relation to the onshore element of the proposed development, the route identified for the installation of the export cable and the locations identified for the development of new infrastructure will not occupy any MOD statutory safeguarding zones. The cables will be installed in subterranean ducts. Taking this into account in conjunction with the scale of the associated surface infrastructure, it is not anticipated that the onshore development will adversely affect MOD interests.</p>	<p>The Applicant notes this comment.</p>

<p>RR-022-B</p>	<p>The MOD has assessed the location and layout of the offshore element of the development scheme proposed. The scheme outlined will not physically impact upon MOD offshore Danger and Exercise Areas or adversely affect defence maritime navigational interests. However, the turbines and some of the tall ancillary offshore structures will affect military low flying training activities that may be conducted in this area. As such, it will be necessary for these structures to be fitted with appropriate aviation warning lighting to maintain the safety of military air traffic.</p>	<p>Consideration of aviation warning lighting is detailed within Section 8.8.3 et seq. Aids to navigation (marking and lighting) will be deployed in accordance with the latest relevant available standard industry guidance and as advised by Trinity House, Maritime Coastguard Agency (MCA) and CAA and MOD as appropriate. This commitment (Co93) is detailed in Table 8.8 and Volume A4, Annex 5.2: Commitments Register (APP-050). Aviation lighting specifications are provided in Section 8.8.3 of Volume A2, Chapter 8: Aviation and Radar (APP-020) and will satisfy the requirements of Article 223 of CAP 393.</p>
<p>RR-022-C</p>	<p>In relation to the operation of defence radars, taking account of the location and scale of wind turbines that may be utilised, it has been determined that the proposed wind farm will be in line of sight and detectable to air defence radar operated at Remote Radar Head (RRH) Staxton Wold. Wind turbines have been shown to have detrimental effects on the operation of air defence radar. These include the desensitisation of the radar in the vicinity of wind turbines, and the creation of "false" aircraft returns. The probability of the radar detecting aircraft flying over or in the locality of the turbines would be reduced, hence turbine proliferation within a specific locality can result in unacceptable degradation of the radar's operational integrity. This would reduce the RAF's ability to detect and manage aircraft in United Kingdom sovereign airspace, thereby preventing it from effectively performing its primary function of Air Defence of the United Kingdom. Our assessments have determined that, when operational, the proposed wind farm will cause unacceptable and unmanageable interference to the effective operation of air defence radar deployed at RRH Staxton Wold. The need to mitigate the impacts of the proposed development upon the effective operation of RRH Staxton Wold has been recognised by the applicant. The applicant has identified means by which a technical mitigation of these impacts may be delivered. There has been dialogue between the MOD and the applicant on the preparation of a Requirement for inclusion in a draft Development Consent Order (dDCO) requiring the provision of a radar mitigation scheme. However, the wording of such a Requirement</p>	<p>The Applicant understands that an Air Defence Radar (ADR) may now be installed and fully operational at Staxton Wold. The Applicant did submit at DCO Application an evaluation based on the legacy Staxton Wold TPS-77 ADR parameters, an approach agreed with the MOD (DIO). The results of this evaluation, provided in Volume A5, Annex 8.1: Aviation and Radar Technical Report, indicate that, if a TPS-77 ADR or similar were installed at Staxton Wold, wind turbines within the Hornsea Four array area would theoretically be detectable. The Applicant had understood that information regarding the nature of impact upon the MoD's recently procured Indra LR-25 ADR would become available in Q4 2021 and that information gathered through 2021 performance-testing of said system could inform an understanding of expected Hornsea Four effects. However, this information has not been made available at the time of writing and therefore impacts have not been evaluated further in order to facilitate a full impact assessment for the LR-25 ADR. The Applicant is committed to working with the MOD to identify, develop and implement an ADR mitigation solution for Staxton Wold. To this end, the Applicant is engaged in an ongoing and extensive programme of work - through the MoD-OWIC Air Defence and Offshore Wind Windfarm Mitigation Task Force - that aims to identify, trial, and procure an appropriate mitigation solution. The Applicant is currently working with the MOD (DIO) to reach agreement on the proposed draft Development Consent Order (DCO) (see C1.: Draft DCO including Draft DML (APP-203)) wording through the Statement of Common Ground process.</p>

	was not finalised between both parties prior to the submission of this application.	
RR-022-D	<p>The dDCO submitted contains Requirement 10 - Aviation Safety, to address aviation lighting and charting requirements, and Requirement 23 – Ministry of Defence Radar Mitigation. The MOD does not consider the precise wording of these two Requirements satisfactory to address defence safeguarding needs. Attached at Annexes A and B are alternatively worded Requirements which use wording that the MOD considers suitable to maintain defence requirements. The wording used in these matches that used in the equivalent Requirements included in the Development Consent Order (DCO) granted for the Boreas Offshore windfarm to implement MOD requirements for an air defence radar mitigation and to provide aviation lighting and charting information. The MOD respectively requests that Requirements 10 and 23 as included in the current dDCO are replaced with the alternatives provided below. Please note that the address for the Defence Infrastructure Organisation used in the dDCO has now changed and this should be amended to that included in the Annex B. I can confirm that subject to the inclusion of the Requirements contained at Annexes A and B, in any DCO that may be granted for this proposed development, the MOD maintains no objections to this application. I trust this adequately explains our position on this matter. Annexes A and B.</p>	<p>The Applicant notes and accepts the addition of the following text to Requirement 10 Aviation Safety 10.—(1) (see C1.1: Draft DCO including Draft DML (APP-203)) “Lighting installed specifically to meet Ministry of Defence aviation safety requirements must remain operational for the life of the authorised development unless otherwise agreed in writing with the Ministry of Defence.”</p> <p>With regards to Requirement 23 of C1.1: Draft DCO including Draft DML (APP-203), the Applicant has proposed alternative wording to that contained in Annex B of the MoD (DIO) Relevant Representation. The Applicant is currently working with the MOD (DIO) to reach agreement on the wording of Requirement 23((2)a through the Statement of Common Ground process.</p>

2.23 Mr PS Goatley (RR-023)

Reference	Relevant Representation Comment	Applicant’s Response
RR-023	I should make plain by way of preamble that neither I nor my wife have any objection to what Orsted are planning in terms of building a new wind farm or indeed about the particular route planned for the cable connecting this facility to the onshore electricity sub-station. I and my wife have since 2007 owned the above property as our main residence. It has	The Applicant acknowledges Mr Goatley’s concerns and is seeking to continue voluntary negotiations with him and his agent. The Applicant acknowledges that the ownership position of the subsoil in plot numbers 148, 149, 150, 151 is unique and is considering alternative means of reaching agreement on the protection of the onshore cables without compromise to consistency across the entire cable route length or undermining the powers

connected sub-soil rights for 56 feet of land to the south of the house and gardens through which the applicant plans to run the cable connecting their offshore wind farm to the onshore electricity sub-station. These rights are completely incidental and irrelevant to our reasonable quiet enjoyment of our home. Further, this sub-soil has for many decades before we assumed ownership been overlaid by an adopted single track highway that is currently maintained under statutory authority by the East Riding of Yorkshire Council. Orsted and their advisers want my wife and I to sign an agreement whereby we will indemnify them for up to £10m costs if they disturb any "contamination" in installing their cable and/or any damage occurs to their "apparatus" once installed for the length of their lease which is 99 years. Given that we are domestic property owners with no ownership, connection with or control over the sub-soil under the highway before 2007 we similarly can have had, unlike for example surrounding landowners, no involvement or connection with any contaminants that might be disturbed by earthworks carried out on behalf of Orsted. Further we have no locus to prevent any highways authority, who's functions are underpinned by statute, from carrying out works which, depending on the depth at which contractors working on behalf of Orsted place the cable and its protective conduit, may run a risk of damaging this. As such we believe that Orsted's unwavering demands that we sign up to providing such indemnities is Wednesbury unreasonable and we have to date resisted signing any "voluntary" agreement which would require us to do this. Our property has been for sale for nearly 6 months and we are highly concerned that the demands of Orsted effectively could blight the sale of our property, thereby effectively imprisoning us in it for the rest of our natural lives. It may, in continuing to do this for the length of the lease at 99 years, also have significant detrimental financial effects on the next two generations of our family. We have offered Orsted the freehold rights to the land through which they wish to install their cable and have made plain that we require no material financial consideration to transfer these to them. They have declined our offer despite their being no financial consequences yet they are an

sought under the [C1.1 Development Consent Order \(DCO\) Volume C1 draft DCO \(APP-203\)](#). It would not be proportionate nor consistent to seek outright freehold acquisition of this land where rights are all that is necessary to successfully deliver the project. The Applicant has been in regular contact with Mr Goatley and his agents since July 2018 and has sought to bring the signed Heads of Terms to legal completion as evidenced by [B1.1 Consultation Report \(APP-129\)](#) and in addition the Applicant is aware that in February 2022 Mr Goatley's property was granted a change of use from dwelling house to children's care home and the Applicant understands that East Riding of Yorkshire Council intends to purchase the land affected shortly.

international company capitalised in \$billions. So far all attempts by us and our advisers to resolve this issue to our satisfaction whilst placing no additional requirements on Orsted have been rebuffed. We are frankly now at something of a loss as to how we take this issue forward and our hope is that the planning process may be used to get Orsted to see reason.

2.24 National Grid Carbon Limited (RR-024)

Reference	Relevant Representation Comment	Applicant's Response
RR-024	<p>This is a Relevant Representation submitted by National Grid Carbon Limited (NGCL) requesting that NGCL is treated as an Interested Party throughout the Examination process of the Development Consent Order (DCO) application for the Hornsea Four Offshore Wind Farm (Generating Stations) Project (PINS ref: EN010098) (Hornsea Four Project). NGCL, as part of National Grid Ventures (NGV), a division of National Grid plc, responsible for both developing and operating businesses in our UK and US territories, is proposing to develop Humber Low Carbon Pipelines (HLCP); the deployment of a terrestrial pipeline network in the Humber region. THE HLCP PROJECT The HLCP Project intends to establish a pipeline network in the region to transport carbon dioxide (CO2) and hydrogen (H2) to facilitate Carbon Capture Usage and Storage (CCUS). NGCL are currently investigating potential corridors within which separate CO2 and H2 pipelines could be routed and will be carrying out surveys and further public consultations to help inform the corridor selection process. HLCP is in the pre-application stage, with stakeholder engagement underway. This includes dialogue with the Planning Inspectorate over the potential form and content of its future Development Consent Order application(s), which will be inclusive of the terrestrial environment only to Mean Low Water Springs (MLWS) (PINS ref: EN070006). A non-statutory public consultation on potential onshore route corridors concluded in October 2021, with further public consultation and engagement planned for 2022. The CO2 export pipeline below MLWS and the CO2 storage site</p>	<p>The Applicant notes that NGCL's HLCP Project seeks to rely on the carbon dioxide storage opportunity of the Endurance aquifer.</p> <p>The Applicant has assessed the potential impacts of Hornsea Four on the Endurance carbon store within A2.11 Environmental Statement Volume A2 Chapter 11 Infrastructure and Other Users (APP-023) which concludes that, with mitigation, the potential impact is "slight" and not significant.</p> <p>Notwithstanding the above conclusion, to facilitate coexistence between the projects, the Applicant has included protective provisions in the draft DCO. Those provide for cooperation on planned proposed development activities, communication and liaison via an Interface Management Group.</p> <p>The Applicant firmly believes that coexistence between Hornsea Four and Endurance is possible, and that the protective provisions offer a reliable mechanism to facilitate the delivery of Hornsea Four and Endurance in the overlap zone.</p> <p>Hornsea Four notes that, in contrast to the approach taken in the Hornsea Four DCO, the Net Zero Teesside (NZT) DCO application does not assess the impacts of the wider carbon capture storage project on Hornsea Four, and as a result, no mitigation is proposed. The Applicant also notes that the informal scoping exercise relating to the Endurance project (i.e. the offshore elements of the carbon capture scheme) on which it was consulted did not</p>

under the North Sea (known as the Endurance saline aquifer) will be the subject of separate consent applications, under the Petroleum Act 1998 and the Energy Act 2008, being promoted by the licensed operator of the store, bp, on behalf of the Northern Endurance Partnership. NGCL is part of the East Coast Cluster (ECC) bid, combining the Humber and Teesside regions, as submitted to the department of Business Energy and Industrial Strategy (BEIS) as part of the CCUS cluster sequencing consultation. On 19 October 2021, BEIS announced that ECC, along with the HyNet north west cluster, had been confirmed as Track-1 clusters for deployment in the mid-2020s and would therefore now be taken forward into Track-1 negotiations. NGV'S INTEREST IN THE HORNSEA FOUR PROJECT There is no direct physical interface between the Hornsea Four Project and the HLCP Project. For the avoidance of doubt, therefore, NGCL is not seeking to agree protective provisions for the benefit of the HLCP Project in the Hornsea Four Project Order. However, a critical component of the successful delivery of the full CCUS chain for the Humber, within the ECC, is the storage opportunity provided by the Endurance saline aquifer, which does have a direct physical interface with the Hornsea Four Project. Hence the compatibility of the Hornsea Four Project with Endurance, is of critical interest and importance to NGCL, and to the wider public interest in the delivery of the government's national net zero policy objectives within the Humber and Teesside. NGCL seeks comfort and assurance that the integrity of the Endurance store (including any associated export pipeline(s) below MLWS), to enable full chain CCUS in the Humber, will not be compromised by the Hornsea 4 proposals. NGCL's review of the Hornsea Four Project application leads it to conclude that is not, currently, the position. We trust that this relevant representation is of assistance and look forward, where appropriate, to participating in the forthcoming examination process

assess the potential impacts of Endurance on Hornsea Four, or identify any mitigation measures to avoid, prevent, reduce or offset any adverse effects.

The Applicant does not intend to progress a separate position statement with NGCL, however, acknowledges that further discussion may be needed between the parties should NGCL continue to make representations.

However, in relation to the offshore interface and to support the Examining Authority's consideration of coexistence between Hornsea Four and Endurance, the Applicant and bp have prepared [G1.29: Position Statement between Hornsea Project Four and bp](#), which is included in the Applicant's submissions for Deadline 1.

2.25 National Grid Electricity Transmission PLC (RR-025)

Reference	Relevant Representation Comment	Applicant's Response
RR-025-A	<p>Representation by National Grid Electricity Transmission Plc ("NGET") in respect of the Hornsea Project Four Offshore Wind Farm (Generating Stations) DCO Application (the "Project") This relevant representation is submitted on behalf of NGET Electricity Transmission Plc ("NGET") in respect of the Project, and in particular with regard to NGET's infrastructure and land which is within or in close proximity to the proposed Order Limits. NGET will require appropriate protection for retained apparatus including compliance with relevant standards for works proposed within close proximity of its apparatus. NGET's rights of access to inspect, maintain, renew and repair such apparatus must also be maintained at all times and access to inspect and maintain such apparatus must not be restricted. Further, where Orsted Hornsea Project Four Limited (the "Promoter") intends to acquire land or rights, or interfere with any of NGET's interests in land or NGET's apparatus, NGET will require appropriate protection and further discussion is required on the impact to its apparatus and rights. Further detail is set out below. NGET infrastructure within/in close proximity to the proposed Order Limits NGET owns or operates the following infrastructure within or in close proximity to the proposed Order Limits for the Project: Electricity Transmission NGET has a number of substations and high voltage electricity overhead transmission line within or in close proximity to the proposed Order Limits. The substations and overhead line forms an essential part of the electricity transmission network in England and Wales. The details of the electricity assets are as follows: Substations - Creyke Beck 400kV Substation Overhead Lines - 4ZR (400kV overhead line) - 4ZQ (400kV overhead line)</p>	<p>Noted. The Applicant has included Protective Provisions for the benefit of NGET in Part 3 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) to address these points.</p>
RR-025-B	<p>Subject to obtaining all necessary consents, NGET intends to construct and install a converter station and other associated equipment on land immediately adjacent to the Creyke Beck 400kV Substation. This converter station will be for the benefit of the Promoter and will facilitate</p>	<p>The Applicant has drawn the proposed Order Limits more widely around the Creyke Beck 400kV Substation to allow for maximum flexibility as to the final design and layout of the works being undertaken by NGET at Creyke Beck. If the location and design for the converter station and associated infrastructure proposed by NGET becomes more developed and</p>

	<p>the Project's connection to the national electricity transmission network. Taking the above into account, NGET wishes to explore with the Promoter the reasons why the proposed Order Limits have been drawn widely around the Creyke Beck 400kV Substation.</p>	<p>certain prior to the close of the Examination, the Applicant may be able to refine the Order Limits. The Applicant will continue to work with NGET to document the confirmed connection point.</p> <p>However, at this time the Applicant must continue to seek powers over all that land contained in plot numbers 342 through to 356 around the existing substation to be certain that Hornsea Four can be successfully delivered.</p>
RR-025-C	<p>Scotland to England Green Link – SEGL2 Project NGET are aware of the neighbouring proposals and are in regular dialog with Orsted and will continue to be throughout the evolution of both projects. A proximity agreement with Orsted will likely be agreed in due course. Details of the SEGL2 Marine Scheme are available at https://www.nationalgrid.com/uk/electricity-transmission/network-and-infrastructure/segl2.</p>	<p>The Applicant and NGET have been in regular discussions regarding the SEGL2 Project and will continue to do so with a view to reaching any agreement that is deemed necessary. The Applicant does not propose to include any more detail on SEGL2 Project in its application documentation at this stage as it remains at an early stage.</p>
RR-025-D	<p>Protection of NGET Assets As a responsible statutory undertaker, NGET's primary concern is to meet its statutory obligations and ensure that any development does not impact in any adverse way upon those statutory obligations. As such, NGET has a duty to protect its position in relation to infrastructure and land which is within or in close proximity to the Order Limits of the proposed Project. As noted, NGET's rights to retain its apparatus in situ and rights of access to inspect, maintain, renew and repair such apparatus located within or in close proximity to the Order limits should be maintained at all times and access to inspect and maintain such apparatus must not be restricted.</p>	<p>Part 3 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) includes Protective Provisions for the benefit of NGET to ensure that NGET's apparatus will be protected and access maintained at all times during construction in order that NGET can continue to meet its statutory obligations.</p>
RR-025-E	<p>NGET will require protective provisions to be included within the draft Development Consent Order for the Project to ensure that its interests are adequately protected and to ensure compliance with relevant safety standards. NGET is liaising with the Promoter in relation to such protective provisions, along with any supplementary agreements which may be required. NGET requests that the Promoter continues to engage with it to provide explanation and reassurances as to how the Promoter's works pursuant to the Order (if made) will ensure protection for those NGET assets which will remain in situ, along with facilitating all future access and</p>	<p>Discussions are ongoing between the legal representatives of both the Applicant and NGET with regards to the protective provisions and a side agreement, to ensure specific protection for NGET assets and allow NGET to properly discharge its statutory obligations.</p>

	other rights as are necessary to allow NGET to properly discharge its statutory obligations. NGET will continue to liaise with the Promoter in this regard with a view to concluding matters as soon as possible during the DCO Examination and will keep the Examining Authority updated in relation to these discussions.	
RR-025-F	Compulsory Acquisition Powers in respect of the Project As noted, where the Promoter intends to acquire land or rights, or interfere with any of NGET's interests in land, NGET will require further discussion with the Promoter. NGET reserves the right to make further representations as part of the Examination process but in the meantime will continue to liaise with the Promoter with a view to reaching a satisfactory agreement.	Discussions are ongoing between the Applicant and NGET with a view to agreeing terms for a voluntary agreement relating to plot number 343 and NGET's other land interests.

2.26 National Grid Gas plc (RR-026)

Reference	Relevant Representation Comment	Applicant's Response
RR-026-A	Representation by National Grid Gas Plc ("NGG") in respect of the Hornsea Project Four Offshore Wind Farm (Generating Stations) DCO Application (the "Project") This relevant representation is submitted on behalf of National Grid Gas Plc ("NGG") in respect of the Project, and in particular with regard to NGG's infrastructure and land which is within or in close proximity to the proposed Order Limits. NGG will require appropriate protection for retained apparatus including compliance with relevant standards for works proposed within close proximity of its apparatus. NGG's rights of access to inspect, maintain, renew and repair such apparatus must also be maintained at all times and access to inspect and maintain such apparatus must not be restricted. Further, where Orsted Hornsea Project Four Limited (the "Promoter") intends to acquire land or rights, or interfere with any of NGG's interests in land or NGG's apparatus, NGG will require appropriate protection and further discussion is required on the impact to its apparatus and rights. Further detail is set out below. NGG infrastructure within/in close proximity to the proposed Order Limits NGG owns or operates the following infrastructure within or in close	Noted. The Applicant has included Protective Provisions for the benefit of NGG in Part 3 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) to address these points.

	<p>proximity to the proposed Order Limits for the Project: Gas Transmission NGG has two high pressure gas transmission pipelines and above ground installations ("AGI") located within or in close proximity to the proposed Order Limits. The transmission pipelines and AGI form an essential part of the gas transmission network in England, Wales and Scotland.</p>	
RR-026-B	<p>Protection of NGG Assets As a responsible statutory undertaker, NGG's primary concern is to meet its statutory obligations and ensure that any development does not impact in any adverse way upon those statutory obligations. As such, NGG has a duty to protect its position in relation to infrastructure and land which is within or in close proximity to the Order Limits of the proposed Project. As noted, NGG's rights to retain its apparatus in situ and rights of access to inspect, maintain, renew and repair such apparatus located within or in close proximity to the Order limits should be maintained at all times and access to inspect and maintain such apparatus must not be restricted.</p>	<p>Part 3 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) includes Protective Provisions for the benefit of National Grid to ensure that NGG's apparatus will be protected and access maintained at all times during construction in order that NGG can continue to meet its statutory obligations.</p>
RR-026-C	<p>NGG will require protective provisions to be included within the draft Development Consent Order for the Project to ensure that its interests are adequately protected and to ensure compliance with relevant safety standards. NGG is liaising with the Promoter in relation to such protective provisions, along with any supplementary agreements which may be required. NGG requests that the Promoter continues to engage with it to provide explanation and reassurances as to how the Promoter's works pursuant to the Order (if made) will ensure protection for those NGG assets which will remain in situ, along with facilitating all future access and other rights as are necessary to allow NGG to properly discharge its statutory obligations. NGG will continue to liaise with the Promoter in this regard with a view to concluding matters as soon as possible during the DCO Examination and will keep the Examining Authority updated in relation to these discussions.</p>	<p>Discussions are ongoing between the legal representatives of both the Applicant and National Grid with regards to the protective provisions and a side agreement, to ensure specific protection for NGG assets and allow NGG to properly discharge its statutory obligations.</p>
RR-026-D	<p>Compulsory Acquisition Powers in respect of the Project As noted, where the Promoter intends to acquire land or rights, or interfere with any of NGG's interests in land, NGG will require further discussion with the Promoter. NGG reserves the right to make further representations as part</p>	<p>Discussions are ongoing between the Applicant and National Grid with a view to agreeing terms for a voluntary agreement relating to NGG interests in the Order Limits.</p>

of the Examination process but in the meantime will continue to liaise with the Promoter with a view to reaching a satisfactory agreement.

2.27 National Grid Interconnector Holding Limited (RR-027)

Reference	Relevant Representation Comment	Applicant's Response
RR-027	<p>This is a Relevant Representation submitted by National Grid Interconnector Holdings Limited (NGIHL), requesting that NGIHL is treated as an Interested Party throughout the Examination process of the Development Consent Order (DCO) application for the Hornsea Four Offshore Wind Farm (Generating Stations) Project (PINS ref: EN010098) (Hornsea Four Project). National Grid Interconnector Holdings Limited (NGIHL), as part of National Grid Ventures (NGV), is a division of National Grid plc, responsible for both developing and operating businesses in our UK and US territories. NGIHL has entered into a connection agreement with National Grid Electricity System Operator Limited (ESO) for a 1.8 GW interconnector connection, currently known as the Continental Link Multi-Purpose Interconnector. CONTINENTAL LINK MULTI-PURPOSE INTERCONNECTOR The Continental Link Multi-Purpose Interconnector is a high voltage direct current (HVDC) electricity interconnector that can connect Great Britain to other European markets, to be connected to the British National Transmission System (NTS) via the Creyke Beck substation near Cottingham, East Yorkshire. In addition, as a multi-purpose interconnector, Continental Link would also have the potential to deliver benefits from combining offshore transmission with market-to-market interconnection – enabling reduced curtailment of offshore wind, reducing landfall points and capital expenditure. On 18th August 2021, the Secretary of State for Business, Energy and Industrial Strategy (BEIS) endorsed NGIHL's request under s35 of the Planning Act 2008 for Continental Link to be considered as development for which development consent is required.</p>	<p>The Applicant acknowledges this Relevant Representation and encloses a joint position statement, G1.11: Hornsea Project Four and NGIHL Continental Link Position Statement, with the Applicant's submissions for Deadline 1.</p>

<https://www.gov.uk/government/publications/national-grid-ventures-ngv-continental-link-multi-purpose-interconnector-section-35-direction-planning-act-2008> Continental Link is in the pre-application stage, with stakeholder engagement due to commence in 2022; including dialogue with the Planning Inspectorate over the potential form and content of its future Development Consent Order application which will be inclusive of the terrestrial and marine environments to the Exclusive Economic Zone (EEZ). NGIHL'S INTEREST IN THE HORNSEA FOUR PROJECT NGIHL is aware of and is actively participating in the ongoing Offshore Transmission Network Review (OTNR) being carried out by BEIS, Ofgem and NGESO. NGIHL recognises the objective of the OTNR which is to encourage developers to work together to co-ordinate and develop transmission infrastructure, understanding the ability to optimise the delivery of inflight projects and minimising impacts on local communities and stakeholders. NGIHL has also responded to the draft energy National Policy Statements (NPS) consultation, which encourages co-ordinated transmission systems. Mindful of the direction of policy and the government and sector ambition for greater co-ordination, discussions have taken place between NGIHL and Orsted to explore and understand co-ordination opportunities between our two projects in this geography; a signed Position Statement to this affect is in place and will be submitted to the ExA. Discussions between Orsted and NGIHL are at present focussing on activities related to co-ordination of respective transmission infrastructure of the Orsted and NGV projects, (for example, use of nearshore cable routes, landfalls, onshore cable routes and substation / converter station sites), inclusive of development and delivery aspects of these matters. NGIHL would be happy to conclude a Statement of Common Ground with the Applicant. We trust that this relevant representation is of assistance and look forward, where appropriate, to participating in the forthcoming examination process.

2.28 NATS (RR-028)

Reference	Relevant Representation Comment	Applicant's Response
RR-028-A	<p>We refer to the application above. The proposed development has been examined from an en-route infrastructure technical safeguarding perspective and the findings show that it will infringe NERL safeguarding criteria for the following reason: The proximity, physical size and relative orientation of the development, is sufficient to generate false tracks. Accordingly, NATS (En Route) plc objects to the proposal.</p>	<p>The Applicant has been and remains proactively engaged with the National Air Traffic Service (NATS) on the need for, and the implementation of, an acceptable radar mitigation solution. The need to mitigate impacts created by Hornsea Four upon the operation of NATS's Claxby Primary Surveillance Radar (PSR) are recognised by the Applicant in Section 8.1.1.2.22 of Volume A2, Chapter 8: Aviation and Radar (APP-020). The Applicant and NATS have jointly identified means by which a technical mitigation solution to impacts may be delivered. This is secured through Requirement 28 of the draft Development Consent Order (dDCO) Volume C1, Chapter 1: Draft DCO including Draft DMLs (APP-203) which ensures that no wind turbine generators are constructed until appropriate measures to mitigate any adverse effects arising from the operation of the turbines on the primary surveillance radar at Claxby and NATS' air surveillance and control operations are available and that arrangements have been put in place with NATS to ensure that such mitigation is implemented.</p>
RR-028-B	<p>We would like to take this opportunity to draw your attention to the legal obligation of local authorities to consult NATS before granting planning permission. The obligation to consult arises in respect of certain applications that would affect a technical site operated by or on behalf of NATS (such sites being identified by safeguarding plans that are issued to local planning authorities). In the event that any recommendations made by NATS are not accepted, local authorities are obliged to follow the relevant directions within Planning Circular 2 2003 - Scottish Planning Series: Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas) (Scotland) Direction 2003 or Annex 1 - The Town And Country Planning (Safeguarded Aerodromes, Technical Sites And Military Explosives Storage Areas) Direction 2002. These directions require that the planning authority notify both NATS and the Civil Aviation Authority ("CAA") of their intention. As this further notification is intended to allow the CAA to consider whether further</p>	<p>The Applicant notes this comment.</p>

scrutiny is required, the notification should be provided prior to any granting of permission. It should also be noted that the failure to consult NATS, or to take into account NATS's comments when determining a planning application, could cause serious safety risks for air traffic. Should you have any queries, please contact us using the details below.

2.29 Natural England (RR-029)

Reference	Relevant Representation Comment	Applicant's Response
RR-029 summary	<p>Please see the relevant representation comment in Annex 5.</p>	<p>The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 5 – Full Response to Natural England (RR-029)</p> <p>The Applicant has had due consideration of Natural England's Relevant Representation. In addition to responding to points raised within the main Relevant Representation document (not summarised, which include the identification of designated sites, Natural England's overall view of the application, key environmental concerns and overarching comments on the application), the Applicant has responded to the detailed responses presented in Appendix A to Appendix H. A summary of these responses is presented below:</p> <p><i>Development Consent Order, Project Description and Monitoring plans (Appendix A):</i></p> <ul style="list-style-type: none"> • Responded to all matters raised in respect of DCO wording, involving either agreement and confirmation that changes have been or are to be made to the dDCO, or push back with justification in instances that no update is deemed justifiable or necessary by the Applicant; • Clarified the use of LAT when referring to distances in design in relation to sea levels as standard within Orsted; and Clarified the maximum footprint per individual structure according to foundation type. <p><i>Offshore Ornithology (Appendix B)</i></p>

- The Applicant has held an additional Ornithology Technical Panel Meeting (17 Feb 2022) to discuss the MRSea comments;
- Committed to submit a Baseline Sensitivity Report addressing MRSea baseline comments and concerns;
- Committed to submit an Assessment Sensitivity Report presenting the Applicant and Natural England's position on ornithology assessment parameters;
- The Applicant has revisited its conclusion of no potential for adverse effects on integrity (AEol) in respect of the black-legged kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and projects;
- Submitted supplementary information on Auk Displacement and Mortality Evidence Review (G1.47);
- Considering potential supplementary work on indirect-effects between forage fish and seabirds (anticipated to be delivered at Deadline 3);
- Confirmed that the Maximum Design Scenario (MDS) as assessed, to which uncertainty in ground conditions are attributed, are justified and assessed by the provision of sufficient baseline data;
- Clarified the Applicant's weighted approach to assessing auks in August and September and the Applicant's apportionment process;
- The Applicant has committed to updating all displacement analysis for auk species to account for both flying and sitting birds;
- The Applicant commits to a watching brief on potential for cumulative and in-combination impact values to change throughout the examination process
- Confirms that the 'source-pathway-receptor' model is effective in the identification of potential environmental effects.

Derogation Case (Appendix C)

- Revisited the conclusion of no Adverse Effect on Integrity (AEol) in respect of the black-legged kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and projects, and therefore the derogation case and compensation measures put forward for kittiwake are no longer 'without prejudice'. The position remains for all other species and their compensation measures remain 'without prejudice';

- Referred Natural England to detailed responses on baseline characterisation and impact levels (which would determine the compensation levels) provided in the Applicant's comments to Offshore Ornithology Relevant Representations;
- Justified the use of the 1:2 ratio for the suite of compensation measures;
- Committed to delivering a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill);
- Committed to implementing the nesting structure three breeding seasons ahead of operation of any turbine forming part of the authorised development;
- Provided updates on the site selection and implementation studies for the suite of compensation measures; and
- Referred to the ongoing engagement with stakeholders and the increased confidence following implementation study updates.

Offshore Matters (Appendix D, E, F, G)

- Noted Natural England's concern with potential in-combination impacts to the Southern North Sea SAC (SNS SAC). Confirmed the SIP process continues to be the most appropriate mechanism for managing in-combination impacts and the Applicant will use the most appropriate measures based on best knowledge, evidence and proven available technology at the time of construction;
- Confirmed that geophysical survey is not included in the Hornsea Four DCO Application since the precise timing, scope and scale of geophysical surveys associated with Hornsea Four are not known at this stage;
- Confirmed that UXO clearance is not included in the Hornsea Four DCO Application since the number, location and size of any potential UXOs is unknown; however, a high-level assessment is provided and justified;
- Clarified the Applicant's approach to marine processes assessment represents standard practice which considers source, pathway and receptor (when the receptor is related to marine and coastal processes);
- Noted Natural England's concerns with a number of the maximum design scenarios being overly precautionary;

		<ul style="list-style-type: none"> • Noted Natural England concerns regarding alone and in-combination impacts on the form and function of Smithic Bank; • Clarified that climate change predictions indicate offshore waves are not expected to increase over the lifetime of the project and further, mean sea level variations are predicted to be nominal; and • Noted Natural England’s concern with the peak herring spawning assessment. The Applicant considers that the assessment undertaken is robust and that further modelling will not alter the outcomes of the assessment but has provided further analysis and justification of the peak spawning period using the methodology proposed by Cefas. <p><i>Onshore Matters (Appendix H)</i></p> <ul style="list-style-type: none"> • Confirmed how commitments relevant to the River Hull SSSI are secured; • Acknowledged the current status of the Yorkshire Wolds AONB and the potential impact of such a designation on Hornsea Four’s LVIA assessment; • Noted that Natural England have confirmed mitigation associated with BMV soils is considered to be adequate; • Clarified which commitments are included within the Onshore Crossing Schedule and why, noting that the schedule itself does not secure any commitments; and • Acknowledged the omission of references to the River Hull SSSI in two documents noting that it doesn’t affect the content of the documents or the outcome of the application.
--	--	--

2.30 Northern Gas Networks (Limited) (RR-030)

Reference	Relevant Representation Comment	Applicant’s Response
RR-030-A	Representation in Relation to Gas Apparatus Northern Gas Networks (NGN) own and operate the Gas Distribution Network in the North of England, NGN are a Licensed Gas Transporter as defined by the Gas Act 1986. NGN have been provided with a route for the on-shore cable route for this project, NGN note that the cable route crosses two of NGN high pressure bulks supply gas pipeline and 3 medium pressure gas main as	Part 1 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) includes Protective Provisions for the benefit of gas undertakers to ensure that apparatus will be protected and access maintained at all times during construction in order that the gas undertaker can continue to meet its statutory obligations. These protective provisions apply to apparatus owned by Northern Gas Networks.

	<p>follows:- Cable Crossing South of Gembling - Burton Agnes to Wawne 300mm Steel high pressure pipeline Miles Lane, Leconfield - 125mm PE medium pressure gas main A1035 Malton Road, Beverley - 125mm PE medium pressure gas gain York Road, Beverley - 6" spun Iron medium pressure gas main. Platwoods Farm, Cottingham, Wawne to Elloughton 1050mm high pressure gas pipeline We note there is an Access Road Crossing Jillywoods, Cottingham - Wawne to Elloughton 1050mm high pressure gas pipeline. All the crossings of NGN apparatus with the cables are of concern. However, it is the high-pressure pipe crossings that are of greater concern because of the safety issues and the large volumes of gas involved. The safety aspect of working close to HP pipelines which are classed as hazardous installations should not be underestimated. Further all these pipes are critical to the supply of gas to many 1000's of customers on the East Coast of Yorkshire and the City of Hull. We are pleased to confirm that NGN are already in contact with the project team discussing this issue and hope to have a written agreement in place by the way of a private crossing deed for each of the above crossing. Subject that our respective legal parties can agree this deed then NGN would not intend to take this representation any further forward.</p>	<p>The Applicant and NGN are also in ongoing discussions to agree an Asset Protection Agreement and, if applicable, a series of crossing deeds for the crossings identified by NGN.</p>
RR-030-B	<p>We should just add that no test digs should take place on or close to the high-pressure gas pipelines without NGN has representative on site, this same requirement will continue through construction phase.</p>	<p>The Applicant can confirm that in accordance with industry practice, no test digs shall take place within close proximity to the high pressure gas pipelines without a representative from NGN on site.</p>

2.31 Perenco UK Limited (RR-031)

Reference	Relevant Representation Comment	Applicant's Response
RR-031-A	<p>Perenco UK Limited has an interest in the Hornsea Project Four Offshore Wind Farm for the following reasons:</p>	<p>The Applicant is committed to continuing discussions with Perenco UK Limited and will keep the Examining Authority updated in this regard.</p>
RR-031-1	<p>1. Obstruction of access by helicopter to the 43/26 Ravenspurn North platform, the proposed windfarm array zone is 1.6nm away from the</p>	<p><i>Helicopter Access:</i> Impacts on helicopter access to oil and gas platforms arising from Hornsea Four have been assessed within A2.8 Environmental Statement Volume A2 Chapter 8: Aviation and Radar</p>

	<p>platform, and current operator/aircraft type in use requires a minimum of 6.3nm for approach take off/landing.</p>	<p>(APP-020), noting that impact assessment was informed by overarching assessment to oil and gas operators in A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086) and dedicated assessment of helicopter access to the Ravenspurn North platform within Appendix A of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087). The assessment used seven years of meteorological data from the Ravenspurn North Platform, and applied the regulatory aviation limits, confirmed with the helicopter operators. The assessment indicates that there would be no significant effects on helicopter access during the construction, operation and maintenance or decommissioning phases to the Ravenspurn North Platform on the grounds that it is unlikely that there will be any extended periods of time when oil and gas platform helicopter operations are inhibited. Furthermore, the assessment showed there would be no impact on Search and Rescue helicopter operations.</p> <p><i>Take-off / Approach Distances Required:</i></p> <p>The take-off distance required for the helicopter type currently used for this installation is shown in Appendix A of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087). Section 5.6 shows a take-off distance of between 2.1nm and 3.0nm is required. The figure of 6.3nm applies to legacy helicopters that are no longer used on the North Sea, and which do not meet current safety requirements such as crashworthy seating, high sea state floatation gear, and large escape exits and windows. The assessment also indicates a distance of 6.3nm would offer no additional benefit in terms of approach distance requirements under Instrument Meteorological Conditions.</p>
RR-O31-2	<p>2. Obstruction of communications with the 43/24A Trent platform. A microwave link between the 43/26 Ravenspurn North platform and the Trent platform requires 150mtrs wide line of sight which will be obscured by the proposed windfarm array.</p>	<p>Impacts on microwave communication between Perenco's Ravenspurn North and Trent platforms are assessed in Section 16.6.15 of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 1 (APP-086). This concludes that microwave links are not used for essential communication relating to safety management. Interference with a microwave link will therefore not in itself introduce additional safety risk, and as such the potential impact is considered to be broadly acceptable. It is also noted that there are microwave links in operation, successfully running through windfarms without obstruction or interference from the windfarm. E.g. Spirit Energy's North Morecambe DPPA to Barrow terminals; and South Morecambe CPP to Barrow terminals (via Dalton-in-Furness)</p>

		pass through Ørsted's West of Duddon Sands offshore wind farm within less than 50m of the closest turbine centres.
RR-031-3	3. Obstruction of the marine/shipping collision Radar Early Warning system located on the Ravenspurn North platform.	<p>The potential impact of the proposed Hornsea Project Four on the operation of Radar Early Warning Systems (REWS) has been assessed in Appendix B of A5.11.1 Environmental Statement Volume 5 Annex 11.1: Offshore Installation Interfaces Part 2 (APP-087). An updated version of Appendix B has been submitted at Deadline 1 on 8th March 2022. This technical report considered the obstruction to the REWS coverage caused by the radar shadowing as well as the masking of targets due to the high radar returns from the turbines. The technical study concluded that both types of obstructions will not have significant effect on the REWS's ability to detect vessels in the region.</p> <p>The radar shadowing will reduce in severity/effect with increasing distances due to the diffraction effect of the radar waves as shown in Figure 1 in Section 2.2. Additionally, REWS is equipped with advanced tracking software that will compensate for momentary loss of detection (Section 2.5). REWS also uses adaptive thresholding techniques to adjust the detection threshold (Section 2.4), which will greatly assist in detecting moving objects within the proposed project area. Finally, the radar returns/detection are also integrated with the Automatic Identification System (AIS) data, which is largely unaffected by the presence of wind farms. Therefore, when considering the distances and sizes of the showing regions, the tracking and thresholding software, and the integration with AIS data, the technical study concludes that the presence of wind turbines would not cause notable obstruction to the REWS or its ability to detect and track vessels in the region.</p>

2.32 Professor Ian Reid / Andrew Hersom on behalf of East Riding of Yorkshire and Kingston upon Hull Joint Local Access Forum (RR-032)

Reference	Relevant Representation Comment	Applicant's Response
RR-032	The Local Access Forum (LAF) asks that the following issues be considered: 1. There is a need for greater clarity and specific details about PRoW (Public Right of Way) diversions, currently described as to be installed "if feasible"; e.g. Skidby FP16 is given only as a "diversion area" of c. 6 ha; and there are no details for all but two other PRoWs. The LAF wonders why	The Applicant can confirm that Skidby Footpath 16 will be permanently diverted. The purpose of the diversion area (rather than a specific route) is to allow for maximum flexibility during the detailed design phase of the OnSS, EBI and associated landscaping, to ensure the most appropriate route is established in coordination with ERYC.

routes have not been defined and permissions sought. LAF asks that, in each case, diversions be in place before temporary or permanent closure is effected. 2. Temporary closure of each PRoW is too long at up to 3 months on each occasion and < 6 months over the project duration of 36 months, potentially up to one-sixth of the total installation period at each affected crossing. The LAF seeks a shortening of the periods to safeguard, as much as possible, the physical and mental public health benefits of countryside access whilst acknowledging the need for limited disruption at any one PRoW crossing. 3. The Applicant, and/or subsequent owners of the cables, should be required to adopt long-term responsibility for restoration of surface settlement where PRoWs cross ground that has been disturbed. This was dismissed during pre-application consultation. But, given the easily-poached, heavy-clay soils of Holderness and typical dilated and consolidated soil bulk densities, soil settlement is eventually likely to be around 15 - 25 cm (6 – 10 inches). This will attract pools of water and plasticise the soil, resulting de facto in 19 cul-de-sac PRoWs, severely reducing usage and the public health benefits of countryside access. LAF suggests a period of at least seven years to allow time for soil settlement. 4. The National Planning Policy (2021 Revision, para. 100) indicates that development should enhance PRoWs affected. The LAF seeks a commitment, post-development, to provision of earmarked funds to be used to improve PRoWs in parishes crossed by the corridor.

It is noted that the Outline Public Right of Way Management Plan (which forms Appendix C of [F2.2: Outline Code of Construction Practice \(APP-237\)](#) identifies in Table 3 the various management measures required to address impacts to PRoW. Due to use rates indicated by ERYC on connectivity importance to the wider PRoW network, some PRoWs have been identified for temporary diversions where feasible instead of full stopping up for up to six months or three months at a time (Co165). The feasibility of these diversions is dependent on landowner agreements and the viability of diversion options (including necessary distance and suitability of ground conditions). The impact assessment presented in [A3.6: Land Use and Agriculture \(APP-030\)](#) has not accounted for such temporary diversions and as such assumes a worst-case scenario of all PRoWs requiring stopping up in accordance with Co79.

Co165 imposes logistical limitations on the construction of Hornsea Four. The limitations committed to are required to facilitate the various stages of construction and are based on multiple potential scenarios associated with construction processes and methodology which will be undetermined until the appointment of a Principal Contractor. The Applicant considers that Co165 is a positive commitment that safeguards PRoWs as far as reasonably practical for a construction project of national significance at this scale.

It can be assured that valued comments raised regarding settlement were considered by the Applicant pre-application. The consultation feedback referred to has been responded to in comment ID S42_0050_006 in [B1.1.4: Applicant Regard to Section 42 Consultation Responses \(APP-133\)](#) (page 162).

Comments regarding enhancement of PRoWs have been responded to under comment ID S42_0050_007 of [APP-133](#) (page 163).

2.33 RSPB (RR-033)

Reference	Relevant Representation Comment	Applicant's Response
RR-033 summary	Please see the relevant representation comment in Annex 7.	The Applicant has responded to each of the detailed points from this Relevant Representation in Annex 7 – Full Response to RSPB (RR-033)

Summary of Applicant's Response to RR-033

The Applicant has had due consideration of RSPB's Relevant Representation. In addition to responding to points raised within the main Relevant Representation document, a summary of these responses is presented below:

Responses are provided to the Relevant Representations on Ornithology and Derogation/Compensation for RSPB. The Applicant has responded with the following points (but not limited to):

- Committed to submit a Baseline Sensitivity Report addressing MRSea baseline comments and concerns
- Committed to submit an Assessment Sensitivity Report presenting the Applicant and SNCB position on ornithology assessment parameters
- Revisited the conclusion of no Adverse Effect on Integrity (AEoI) in respect of the black-legged kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and projects, and therefore the derogation case and compensation measures put forward for kittiwake are no longer 'without prejudice'. The position remains for all other species and their compensation measures remain 'without prejudice';
- Refers RSPB to the Derogation Case, Compensation Plans, Evidence reports and Roadmaps for the relevant compensation measures and states these demonstrate through the package of compensation measures the compensation is viable, effective and can be secured and delivered;
- Justified the use of the 1:2 ratio for the suite of compensation measures and compensation values;
- Committed to delivering a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill);
- Committed to implementing the nesting structure three breeding seasons ahead of operation of any turbine forming part of the authorised development;
- Provided updates on the site selection and implementation studies for the suite of compensation measures; and
- Refers to the ongoing engagement with stakeholders and the increased confidence following implementation study updates.

2.34 Savills on behalf of the Hotham Family Trust (RR-034)

Reference	Relevant Representation Comment	Applicant's Response
RR-034	Our client has an interest in the location of the compound at Lockington and would like to reserve the right to be able to make representations should it be necessary.	Noted. The Applicant has reached a voluntary agreement with this party in respect of the land required for the onshore export cable route and compound at Lockington.

2.35 Shell U.K Ltd (RR-035)

Reference	Relevant Representation Comment	Applicant's Response
RR-035	Shell is a participating party in the Northern Endurance Partnership. We wish to make the point that successful co-location with Hornsea 4 is critical to both projects' maturation and we therefore apply to be an interested party	<p>The Applicant has assessed the potential impacts of Hornsea Four on the Endurance carbon store within A2.11 Environmental Statement Volume A2 Chapter 11 Infrastructure and Other Users (APP-023) which concludes that, with mitigation, the potential impact is "slight" and not significant.</p> <p>Notwithstanding the above conclusion, to facilitate coexistence between the projects, the Applicant has included protective provisions in the draft DCO. Those provide for cooperation on planned proposed development activities, communication and liaison via an Interface Management Group.</p> <p>The Applicant firmly believes that coexistence between Hornsea Four and Endurance is possible, and that the protective provisions offer a reliable mechanism to facilitate the delivery of Hornsea Four and Endurance in the overlap zone.</p> <p>Hornsea Four notes that, in contrast to the approach taken in the Hornsea Four DCO, the Net Zero Teesside (NZN) DCO application does not assess the impacts of the wider carbon capture storage project on Hornsea Four, and as a result, no mitigation is proposed. The Applicant also notes that the informal scoping exercise relating to the Endurance project (i.e. the offshore elements of the carbon capture scheme) on which it was consulted did not</p>

		<p>assess the potential impacts of Endurance on Hornsea Four, or identify any mitigation measures to avoid, prevent, reduce or offset any adverse effects.</p> <p>However, in relation to the offshore interface and to support the Examining Authority's consideration of coexistence between Hornsea Four and Endurance, the Applicant and bp have prepared G1.29: Position Statement between Hornsea Project Four and bp, which is included in the Applicant's submissions for Deadline 1.</p>
--	--	---

2.36 The Corporation of Trinity House (RR-036)

Reference	Relevant Representation Comment	Applicant's Response
RR-036	<p>We refer to the above application for development consent. Trinity House is the General Lighthouse Authority for England, Wales, the Channel Islands and Gibraltar with powers principally derived from the Merchant Shipping Act 1995 (as amended). The role of Trinity House as a General Lighthouse Authority under the Act includes the superintendence and management of all lighthouses, buoys and beacons within its area of jurisdiction. Trinity House wishes to be a registered interested party due to the impact the development may have on navigation within Trinity House's area of jurisdiction. It is likely that we will have further comments to make on the application and the draft Order throughout the application process. Please address all correspondence regarding this matter to myself at russell.dunham@trinityhouse.co.uk and to Mr Steve Vanstone at navigation.directorate@trinityhouse.co.uk</p>	<p>Noted. The Applicant continues to engage with Trinity House through the Statement of Common Ground (SoCG) process. (see G1.26 Statement of Common Ground between Hornsea Four and Trinity House).</p>

2.37 The Crown Estate (RR-037)

Reference	Relevant Representation Comment	Applicant's Response
RR-037	<p>The Crown Estate requests to be registered as an Interested Party in the examination of the Hornsea Project Four Offshore Windfarm. Our interest</p>	<p>The Applicant notes this comment.</p>

in the project is that Orsted Hornsea Project Four Ltd holds an Agreement for Lease from The Crown Estate.

2.38 The Ramblers, East Yorkshire and Derwent Area (RR-038)

Reference	Relevant Representation Comment	Applicant's Response
RR-038	<p>We wish to register in order to seek clarification over some issues arising from the Hornsea Project Four Wind Farm, at its site at Creyke Beck near Cottingham, East Yorkshire. During the extended consultation process, we have attended several meetings and responded to questionnaires sent to interested parties. We have on occasions written to ask for clarification on specific points concerning the effect of the development on rights of way and the local vegetation, but have not always received a reply. Therefore we would like to be assured during this examination process that the applicant has carried out surveys of these features, particularly for those required in law, eg Hedgerow Regulations 1997. We would point out that some of the features within or close to this site have regional historical significance, especially Jillywoods Lane, which was an ancient drovers' road. (It is possible that some of this information is included in Hornsea Four's submission to the Inspectorate, but we have found it difficult to sift through the large volume of information.) An example of a query relates to receipt of an e-mail from the Project representative Mr Carolan titled 'S42 Targetted Consultation'. Mr Chris Prince of Beverley Ramblers Group replied to Mr Carolan on 5 July 2021 : "...My only concern... is continued access for walkers travelling north, from the south using the non-motorised/agricultural 'old road'. This is important for access to the Jillywoods Lane Public Right of Way (Skidby - actually should read "Rowley"- Footpath 12) thereby allowing walkers access to other routes to the east of Jillywoods Lane running north/south. Jillywoods Lane footpath is an important link route allowing excellent, popular circular walks from the Beverley and Cottingham areas. It is noted in your cover</p>	<p><i>Surveys and assessment</i></p> <p>An assessment of impacts to Public Rights of Way (PRoW), ecology and heritage was undertaken as part of the Environmental Impact Assessment (EIA). An overview of the assessments and conclusions can be found in the impact register (A4.5.1: Impacts Register (APP-049)), with further information, including the surveys undertaken to inform assessments, provided within the following relevant EIA chapters:</p> <ul style="list-style-type: none"> • A3.6: Land Use and Agriculture (APP-030); • A3.3: Ecology and Nature Conservation (APP-027); and • A3.5: Historic Environment (APP-029). <p>The Applicant can confirm that appropriate surveys, such as those required by the Hedgerow Regulations 1997 were carried out in consultation with the appropriate bodies, with these surveys also including comprehensive Extended Phase 1 Habitat Surveys which then directed the need for further ecology surveys such as those to ascertain the presence of protected species. The Applicant is confident that all statutory surveys have been completed to the required standards within the Order limits and buffer areas.</p> <p>Details of the PRoW management measures to be undertaken can be found within the PRoW Outline Management Plan which forms appendix C of the Outline CoCP (F2.2: Outline Code of Construction Practice (APP-237)).</p> <p><i>Rowley Footpath No.12</i></p>

letter under 'Proposed Change' that, "construction traffic volume is anticipated to be low in this location". Could you please confirm access to the above PRow will still be available whilst also used for construction access. Thank you, Christopher Prince, Beverley Ramblers Group." Sadly, no reply having been received, the matter was re-sent to Mr Carolan on 17 Sept 2021. No reply was received from the second e-mail. A disappointing response on a consultation matter sent out by the company.

Whilst Rowley Footpath No.12 is not recorded within the Humber Historic Environment Record as a specific heritage asset, it does form part of the wider historic landscape character and is considered as such in the Historic Environment ES Chapter ([A3.5 Volume A3, Chapter 5: Historic Environment \(APP-029\)](#)). Where important hedgerows (as defined by The Hedgerow Regulations Act 1997) are to be impacted by the project, the Applicant will record these features prior to construction, as set out within the Outline Written Scheme of Investigation ([F2.10: Outline Written Scheme of Investigation for Onshore Archaeology \(APP-245\)](#)).

Due to the complicated network of PRow surrounding the OnSS, the impact of the stopping up of these PRow has been reviewed to ensure minimum long-term impact to the wider PRow network at the OnSS. Full details can be found within the PRow Outline Management Plan which forms appendix C of the Outline CoCP ([F2.2: Outline Code of Construction Practice \(APP-237\)](#)).

Rowley Footpath No. 12 crosses the cable route near to the western edge of the OnSS area of the Hornsea Four Order Limits (see Figure 3 in the PRow Outline Management Plan which forms Appendix C of the Outline CoCP ([F2.2: Outline Code of Construction Practice \(APP-237\)](#))). The cable route will require the PRow be stopped-up for short-term periods within the construction phase (as per Co165, see [A4.5.2: Commitments Register \(APP-050\)](#)) when construction activities are taking place nearby. Short-Term in this case relates to a period no longer than three months at any one time, or six months in total over the whole construction period.

Additional impact avoidance measures are required to be implemented at the western end of this PRow, where the PRow meets a proposed temporary access track for Hornsea Four (currently a tarmac path). These measures will ensure the PRow route remains open to public access where feasible, without requiring a diversion, outside of the initial construction period for the access track itself (a period of no longer than three months). The Applicant will work with ERYC on this matter during construction.

		<p>In relation to the not responded email queries, Dr Carolan acknowledges this and offers an apology. The emails were received at a particularly busy time when the Applicant was finalising the DCO application.</p>
--	--	--

2.39 The Wildlife Trusts (RR-039)

Reference	Relevant Representation Comment	Applicant's Response
RR-039-A	<p>Introduction The Wildlife Trusts (TWT), with more than 850,000 members are the largest UK voluntary organisation dedicated to conserving the full range of the UK's habitats and species, whether they be in the countryside, in cities or at sea. TWT manages 2,300 reserves covering more than 100,000 hectares of land including coastal reserves; TWT stand up for wildlife, inspire people about the natural world and foster sustainable living. TWT support action to tackle climate change and recognise the serious threat to nature if action is not taken. However, we also face an ecological emergency with 41% of species in decline in the UK. Therefore, infrastructure projects to reduce emissions to net zero such as offshore wind must not be at the expense of wildlife and must use the right technology in the right location. TWT has engaged with Hornsea Four during the pre-application stage, providing input into the assessment of impacts on marine mammals. We have also engaged on the development of compensation for impacts to Flamborough and Filey Coast SPA. TWT is also interested in the impacts on benthic ecology. Due to resource constraint and the sheer volume of documents included in the Hornsea Four application, TWT is still in the process of reviewing the application. TWT will provide a more detailed view on our position as part of our written representation.</p>	<p>The Applicant acknowledges the Wildlife Trust's comments. The Applicant appreciates the advice from the Wildlife Trust throughout the stakeholder engagement and evidence process for compensation and appreciate the resource constraints and attendance a workshop specifically on compensation measures in summer 2021.</p>
RR-039-1	<p>Summary of views 1. Flamborough and Filey Coast SPA compensation TWT welcomes that the applicant has taken steps to develop compensation measures pre-application and engaged with interested</p>	<p>The Applicant is pleased TWT welcomes that the applicant has taken steps to develop compensation measures pre-application and engaged with interested stakeholders. The Applicant is also greatly appreciative of the excellent advice, support and willingness to take</p>

stakeholders, although a number of outstanding issues need addressing. TWTs preference as a compensation measure is the implementation of strategic measures such fisheries management. The removal of fisheries pressure will have one of the biggest impacts in providing environmental head room for further development. Evidence is also available to support ecosystem recovery following the removal of fishing pressure e.g. Lyme Bay. TWT agree with the applicant that it is not within the power of developers to deliver fisheries management and therefore must be done at a strategic level, led by Government. TWT has received legal advice which demonstrates that a number of legal mechanisms are in place which the Government can implement to deliver fisheries management as compensation. TWT is happy to share further details in our written representation. In principle, TWT does not have confidence in the applicants proposed compensation measures. They are either unsustainable or their effectiveness not supported by evidence. Initial comments can be found in document Volume B1, Annex 1.37 – non-statutory targeted compensation measures consultation responses. TWT will provide further information in our written representation. TWT welcome that the applicant has undertaken analysis of the compensation measures (Volume B2, Annex 6.1: compensation criteria), although we do not necessarily agree with the conclusions. The applicant has highlighted that Article 6(4) of the Habitats Directive states: “Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected” Analysis to determine if compensatory measures will ensure the overall coherence of the UK National Sites Network is missing. It is also been missing from recent Secretary of State decision making such as for Hornsea Three and Norfolk Boreas. This must be addressed to ensure that compensation is fit for purpose and meets the requirements of the Habitats Regulations.

a collaborative approach from the local Wildlife Trusts, in particular Alderney Wildlife Trust and Yorkshire Wildlife Trust.

The Applicant welcomes TWT agreement with the applicant that it is not within the power of developers to deliver fisheries management and therefore must be done at a strategic level, led by Government.

The Applicant’s parent company, Ørsted, is currently leading an offshore wind developer collaboration to take forward more strategic ecological compensation options, and is engaging with UK Government stakeholders. to promote a strategic approach to the delivery and securing of compensation, including supporting the delivery of more strategic measures such as prey resource management. The collaboration is currently hosted under the Offshore Wind Industry Council’s Developer Group and is working in close collaboration with UK Governments.

In order to inform Government-led management of seabird prey resource, the Applicant has made a commitment to contribute towards prey resource research ([B2.6 Compensation measures for FFC SPA: Overview \(APP-183\)](#)).

The Applicant will contribute to a fund (£100,000 per year for 5 years) to support evidence gathering to inform Government-led management of key fish stocks, in accordance with research gaps identified by the Offshore Wind Strategic Monitoring and Research Forum (OWSMRF) (see [B2.10 Without Prejudice Derogation Funding Statement \(APP-202\)](#) and [B2.6.2 Appendix A Ørsted’s Strategic Compensation Approach \(APP-185\)](#)). The Applicant will work in close collaboration with Hornsea Project Three to build upon the growing evidence base so as to maximise the benefits of the evidence gathering programme.

The detailed Evidence reports, Compensation Plans and Roadmaps demonstrate the substantial information provided in the DCO submission on the suite of compensation measures. Further updates on the implementation study progress and securing agreements will be submitted to the Examination. The Applicant has demonstrated through the package of compensation measures the compensation is viable, effective, and can be secured and delivered to ensure the overall coherence of the UK National Sites Network.

RR-039-2A	<p>2. Impacts on marine mammals and the Southern North Sea SAC TWT is pleased to see the recognition that “additional monitoring may be required for marine mammals within the Southern North Sea SAC” given the sensitivity of harbour porpoise to underwater noise. We look forward to further engaging with the applicant on the form this monitoring will take.</p>	<p>The Applicant notes this comment.</p>
RR-039-2B	<p>However, we are disappointed that the applicant does not include any seasonal mitigation measures within the Outline Marine Mammal Mitigation Protocol (F2.5). Mitigation for the functionally-linked bottlenose dolphin which visit the Yorkshire coast in summer must be put in place to avoid impacting a new, and potentially vulnerable, population.</p>	<p>The Applicant considers that the suite of mitigation measures detailed in Volume F2, Chapter 5: Outline Marine Mammal Mitigation Protocol (APP-240) are both appropriate and sufficient to reduce to negligible the risk of Permanent Threshold Shift (PTS) auditory injury to any marine mammal species in close proximity of the pile driving for the installation of Hornsea Four foundation structures.</p>
RR-039-2C	<p>TWTs continued position is that we cannot rule out no adverse effect on the Southern North Sea SAC due to a lack of regulatory mechanism to manage underwater noise impacts. Previously we have provided in-principle support for the use of Site Integrity Plans (SIPs). However, TWT is increasingly concerned by the Marine Management Organisation’s (MMO) approach to signing off SIPs post-consent and therefore we have less confidence in the use of SIPs. TWT acknowledge that this is outside the control of the applicant but would welcome further information from the MMO during examination to give us greater confidence in the use of the SIP for Hornsea Four and for future projects.</p>	<p>Noted. Industry wide, each project is required to submit a SIP for approval by the MMO prior to piling in accordance with the conditions of its Marine Licence(s). This will be once construction and piling programmes are known and can therefore be considered by the MMO and form part of its overall determination. This matter was discussed during a SoCG meeting with TWT on the 25th March 2021 and it is understood by the Applicant that TWT’s comments are related to industry-wide management and are not project-specific.</p>
RR-039-3	<p>3. Benthic ecology impacts TWT continues to review the benthic ecology chapter and therefore we reserve comment until we enter our written representation.</p>	<p>The Applicant notes this comment.</p>
RR-039-4	<p>4. Concern around the deferment of detail of mitigation, compensation and monitoring to post-consent Across all projects, including Hornsea Four, we are increasingly seeing the deferment of the detail of mitigation, compensation and monitoring plans until post-consent. TWT understands this is often a result of the Rochdale Envelope parameters, which are refined post-consent. However, this approach is resulting in increasing uncertainty on the effectiveness of measures to ensure no adverse effect on MPAs, the coherence of the UK National Sites Network and the MPA network. TWT requests as much refinement as possible to increase</p>	<p>The Applicant notes this comment.</p>

confidence on the effectiveness of environmental measures. Finally, TWT recognise that there will be further refinement of some elements of the environmental measures post-consent. If deferment to the post-consent stage is to be approved by the Secretary of State, he must ensure that the procedures in place are compliant with provisions of the UNECE Aarhus Convention concerning public participation.

2.40 UK Chamber of Shipping (RR-040)

Reference	Relevant Representation Comment	Applicant's Response
RR-040-A	<p>The UK Chamber of Shipping is the trade association for the UK shipping industry, representing some 200 members, operating 900 vessels equalling 18 million GT in capacity, trading around the UK and globally. The Chamber represents the full breadth of the industry, including dry and wet trades, passenger transport (cruise & ferry), offshore supply and construction, towage and specialist, as well as professional service providers with shipping interests. The Chamber fully supports the Government's obligations to achieve Net Zero Carbon by 2050, 2045 in Scotland, and welcomes the development of offshore renewable energy to succeed. The ports and shipping industries play an essential in enabling those targets to be achieved by providing bases and vessels for construction, operation & maintenance, and decommissioning. The Chamber also asserts that the planning process and framework must support both the UK's offshore renewable goals for decarbonisation and the wider shipping industry to ensure that navigational safety is not compromised nor economic contribution from the shipping industry jeopardised, as stated within Paragraph 2.6.162 of NPS EN-3. The Chamber seeks to ensure navigational safety is upheld and that developments are appropriately positioned to enable existing commercial navigation to continue safely and efficiently. Shipping is the greenest form of cargo transport and proposed offshore renewable</p>	<p>The UK Chamber of Shipping's remit is noted by the Applicant.</p>

	developments must take fully into consideration the routing and operations of commercial shipping to enable this to continue.	
RR-040-B	The Chamber has been closely involved in the planning process for Hornsea Four prior to DCO application, through PEIR, Hazard Workshops and the NRA, advocating for enhanced mitigation measures for navigation safety and environmental efficiency of commercial shipping.	The Applicant notes and welcomes the UK Chamber of Shipping's continued involvement with the project and welcomes the continued constructive dialogue.
RR-040-C	The Chamber welcomes the measures introduced by Orsted, for example the "gap" between Hornsea 2 and Hornsea 4, and wishes to have opportunity to provide further representation on navigation in other areas.	The Applicant notes this comment.

2.41 UK Health Security Agency (formerly Public Health England) (RR-041)

Reference	Relevant Representation Comment	Applicant's Response
RR-041	Thank you for your consultation regarding the above development. The UK Health Security Agency (UKHSA) and the Office for Health Improvement and Disparities (OHID) (formerly Public Health England) welcome the opportunity to comment on your proposals at this stage of the project. Advice offered by UKHSA and OHID is impartial and independent. We can confirm that: With respect to Registration of Interest documentation, we are reassured that earlier comments raised by us on 7 September 2021 have been addressed. In addition, we acknowledge that the Environmental Statement (ES) has not identified any issues which could significantly affect public health. Following our review of the submitted documentation we are satisfied that the proposed development should not result in any significant adverse impact on public health. On that basis, we have no additional comments to make at this stage and can confirm that we have chosen NOT to register an interest with the Planning Inspectorate on this occasion. Please do not hesitate to contact us if you have any questions or concerns.	Noted. The Applicant thanks the stakeholder for early engagement.

2.42 Weightmans on behalf of Northern Powergrid (Yorkshire) PLC (RR-042)

Reference	Relevant Representation Comment	Applicant's Response
RR-042-A	<p>The following representations are submitted on behalf of Northern Powergrid (Yorkshire) PLC as an electricity undertaker for the area within which the Hornsea Project Four Offshore Wind Farm (Generating Stations) project is located: Northern Powergrid is in principle supportive of the above project but has concerns regarding the impacts the proposed scheme will have on existing assets and their pending improvement works. Areas shown within the proposed development boundary have a direct impact on Northern Powergrid's existing critical national infrastructure which serve significant numbers of customers in the local and wider area, and the rights for these assets are essential in maintaining an uninterrupted power supply to the customers we serve. The proposed development seeks to interfere with Northern Powergrid's existing 132kV primary substation, pylons, overhead cables, underground cables and access and servicing rights. Each of these are vital for Northern Powergrid's existing operations.</p>	<p>Part 1 of Schedule 9 of C1.1 Development Consent Order (DCO) Volume C1 draft DCO (APP-203) includes Protective Provisions for the benefit of electricity undertakers to ensure that apparatus will be protected and access maintained at all times during construction in order that the electricity undertaker can continue to meet its statutory obligations. These protective provisions will apply to Northern Powergrid's apparatus.</p>
RR-042-B	<p>The accompanying compulsory purchase order for the development seeks to acquire land and interests which, if acquired, would adversely affect Northern Powergrid's ability to use, access and maintain its substation. It is not necessary to acquire these interests where an agreement between the parties would be more appropriate.</p>	<p>The submitted document E1.2: Statement of Reasons (APP-227) sets out the Applicants reasons for the inclusion of compulsory acquisition powers for land and interests within the Order. The protective provisions ensure that the exercise of such powers would not adversely affect Northern Powergrid's ability to use, access and maintain its substation.</p> <p>The Applicant considers that the necessary rights can be created without serious detriment to Northern Powergrid's undertaking and the Applicant is not intending to extinguish any rights belonging to Northern Powergrid.</p>
RR-042-C	<p>In addition to the technical impacts of the proposed development, Northern Powergrid have concerns over the proposed protective provisions contained within the draft order as they do not take into account site specific issues and do not accord with Northern Powergrid's standard protective provision requirements. Northern Powergrid is keen to</p>	<p>Discussions are ongoing between the legal representatives of the Applicant and Northern Powergrid with a view to finalising a side agreement and specific protective provisions for Northern Powergrid's assets and infrastructure.</p>

engage with the applicant's legal representative to agree appropriate amendments.

2.43 Yorkshire Wildlife Trust (RR-043)

Reference	Relevant Representation Comment	Applicant's Response
RR-043	<p>Yorkshire Wildlife Trust have engaged with the Ecology Evidence Plan Technical Panel along with partners including Natural England, Environment Agency and Royal Society for Protection of Birds, which has allowed us to influence elements such as the survey design. Due to the large amount of documentation provided, we do not have the resources to review all the information at this stage, but wish to give notice of interest in this project. Yorkshire Wildlife Trust's response deals with the on-shore terrestrial elements of the scheme. A separate response to the off-shore elements will be provided by The Royal Society of Wildlife Trusts (RSWT – the Wildlife Trusts umbrella organisation), which we fully support. We advocate that all work related to upgrading the power network should be considered as a single project and cumulative impacts upon ecologically sensitive and biodiverse sites to be fully taken into account. We appreciate the development of an impacts and commitments register, which allows impacts and associated mitigation commitments to be clearly identified and linked. The proposed route initially presented directly impacted Skerne Wetlands Yorkshire Wildlife Trust Reserve and through our involvement in the Technical Panel we are supportive that the route has now been relocated outside of the reserve, to an arable field to the south. We will explore potential indirect impacts on our reserve in a written representation. We request that our reserves are shown in projects plans. Impacts are predicted to designated sites and our representation will relate to these, as we object to impacts to statutory and non-statutory wildlife sites. Whilst the use of HDD techniques to drill underneath the River Hull headwater SSSI are proposed as a method of reducing ecological impacts, we may comment on the</p>	<p>The Applicant would like to thank the Yorkshire Wildlife Trust for their positive comments on project documentation and effective consultation process. Please note that the locations of all statutory and non-statutory designated sites for nature, including wildlife reserves are presented in A3.3: Ecology and Nature Conservation (APP-027). With regard to impacts (direct or indirect) that are predicted to designated sites, mitigation measures have been discussed and agreed with stakeholders throughout the consultation period. This includes (but not limited to) discussion around the entry and exit pits for the HDD at the River Hull Headwaters SSSI. The entry and exit pits will be located outside of any habitats considered to be associated with the River Hull Headwaters SSSI, within adjacent arable fields. No indirect impacts on Skerne Wetlands Yorkshire Wildlife Trust Reserve have been predicted, as presented in A3.3: Ecology and Nature Conservation (APP-027). Post consent and pre-construction, an updated Ecological Management Plan will be produced, in line with the F2.3: Outline Ecological Management Plan (APP-238), taking into consideration baseline conditions as reported as well as updated information from the pre-construction surveys. Should there be any significant changes to baseline conditions observed during the pre-construction surveys, these will be communicated to stakeholders alongside an invitation to discuss any adaptations to the current mitigation measures, should they be required.</p> <p>Please refer to the Applicant's response to the Environment Agency (RR-010) regarding biodiversity net gain.</p> <p>A copy of the full excel biodiversity net gain metric will be provided as part of the approval of the detailed Net Gain Strategy through DCO Requirement 6. Accompanying this detailed Net Gain Strategy will be the supporting information (including, in addition to the full excel metric, justification for habitat classifications and conditions pre and post development).</p>

impacts of the launch and reception pits. Six Local Wildlife Sites are to be impacted. We fully support further consultation with relevant stakeholders to avoid adverse impacts to these locally sensitive sites in line with the mitigation hierarchy. We will need to ensure a thorough Construction Environmental Plan has been produced and that any compounds, lay down areas, access routes which are determined after consent has been granted will receive rigorous ecological assessment. In accordance with NPPF para 175d, the proposals should demonstrate a 'measurable' net gain in biodiversity. The recently passed Environment Act puts a requirement for all proposals to achieve a 10% net gain in biodiversity; including Nationally Significant Infrastructure Projects such as this. We note that an outline net gain strategy using Defra metric 2.0 has been provided at Chapter 16. The detailed net gain strategy will require supporting information including sufficient justification for habitat classifications and conditions, pre and post development made clear and consideration of how the project complies with the good practice principles for Biodiversity Net Gain. At present, BNG measures are only proposed in certain areas and no calculation of the post development proposals has been undertaken. There is clearly more work to do in order to demonstrate that the project can achieve Biodiversity Net Gain and we will comment further when more information is available. We request that the full metric (excel file) is submitted for scrutiny, not just the headline results.

2.44 Hull City Council (AS-001)

Reference	Relevant Representation Comment	Applicant's Response
AS-001-A	<p>Hull City Council have been advised by Orsted Hornsea Project Four Ltd that an application for a Development Consent Order (reference EN010098) has been accepted by the Planning Inspectorate for examination.</p> <p>This Relevant Representations is focused on aspects of the project which have the potential to affect the Hull City Council local authority area. The Council has reviewed the draft Development Consent Order, Environmental Statement, and supporting reports and documents submitted to HM Planning Inspectorate, and is pleased to note the inclusion of issues raised during pre-application consultation.</p> <p>Particular areas of interest for Hull City Council are as follows:</p>	<p>Noted. The Applicant thanks Hull City Council for early and sustained consultation.</p>
RR-044-B	<p>ES Volume A3 Chapter 7 Traffic and Transport</p> <p>The Council has reviewed this chapter, Annex 7.1 Traffic and Transport Technical Report, Volume A3, and Appendix F of the Outline Code of Construction Practice (which sets out the Outline Construction Traffic Management Plan) and that the scope and methodology of these documents is appropriate for the level of detail that is currently available with regards to the traffic and transportation.</p> <p>As raised during pre-application consultation once the materials source, transport routes, timing, of vehicle movements are identified, further detailed junction assessments may be required. The Council would therefore request that the authority be consulted on the Construction traffic Management Plan required under Requirement 18 to the DCO, and any further modelling and assessments informing the same.</p>	<p>Noted. The Applicant welcomes confirmation from Hull City Council that the scope and methodology is appropriate for the level of detail that is currently available with regards to the traffic and transport.</p> <p>Section 1.2 of the outline CTMP (submitted as Appendix F of F2.2: Outline Code of Construction Practice (APP-237)) forms the basis for a final CTMP, which will be prepared and submitted prior to the commencement of construction of the connection works for approval by the relevant planning authority (ERYC) in by consultation with the relevant highway authorities, i.e. East Riding of Yorkshire Council, National Highways and Hull City Council. This commitment to producing a final CTMP is supported by inclusion of Requirement 18 of the draft Development Consent Order (DCO) (C.1.1: Draft DCO including draft Deemed Marine Licence (DML) (APP-203)).</p>

<p>RR-044-C</p>	<p>ES Volume A3 Chapter 8 Noise and Vibration</p> <p>The Council has reviewed this Chapter and associated documents provided with the submission, and is generally content with scope and methodologies. As raised during preapplication consultation, uncertainty at this stage of the project over the source of materials, transport routes, and timing of vehicle movements means that there remains a potential for noise and vibration impacts to register with sensitive receptors within the hull City Council area.</p> <p>The Council would therefore request that the authority be consulted on the Construction traffic Management Plan required under Requirement 18 to the DCO, and any noise and vibration assessments informing the same.</p>	<p>As set out above, section 1.2 of the outline CTMP (submitted as Appendix F of F2.2: Outline Code of Construction Practice (APP-237)) forms the basis for a final CTMP, which will be prepared and submitted prior to the commencement of construction of the connection works for approval by the relevant planning authority (ERYC) in consultation with the relevant highway authorities, i.e. East Riding of Yorkshire Council, National Highways and Hull City Council. This commitment to producing a final CTMP is supported by inclusion of Requirement 18 of the draft Development Consent Order (DCO) (C.1.1: Draft DCO including draft Deemed Marine Licence (DML) (APP-203)).</p>
<p>RR-044-D</p>	<p>ES Volume A3 Chapter 9 Air Quality</p> <p>The Council has reviewed this Chapter and associated documents provided with the submission, and is generally content with scope and methodologies. As raised during preapplication consultation, uncertainty at this stage of the project over the source of materials, transport routes, and timing of vehicle movements means that there remains a potential for Air Quality impacts to register with sensitive receptors within the hull City Council area including the city's AQMA.</p> <p>The Council would therefore request that the authority be consulted on the Construction traffic Management Plan required under Requirement 18 to the DCO, and any air quality assessment work informing the same.</p>	<p>As set out above, section 1.2 of the outline CTMP (submitted as Appendix F of F2.2: Outline Code of Construction Practice (APP-237)) forms the basis for a final CTMP, which will be prepared and submitted prior to the commencement of construction of the connection works for approval by the relevant planning authority (ERYC) in consultation with the relevant highway authorities, i.e. East Riding of Yorkshire Council, National Highways and Hull City Council. This commitment to producing a final CTMP is supported by inclusion of Requirement 18 of the draft Development Consent Order (DCO) (C.1.1: Draft DCO including draft Deemed Marine Licence (DML) (APP-203)).</p>
<p>RR-044-E</p>	<p>Volume A3 Chapter 10 Socio economics & Outline Employment and Skills Plan</p> <p>Hull has a population of over 260,000 and serves as the primary sub-regional economic and service centre for East Yorkshire and the Humber, and the £310m Green Port Hull investment in the city's port estate and continued investment in SGRE's wind turbine blade factory at Alexander</p>	<p>Noted</p>

	<p>Dock therein, strengthens the Hull and Humber as a key hub for offshore wind. The Council recognises the positive potential of the project for employment and skills and is keen to contribute to supporting the promotion of opportunities in the region.</p>	
--	---	--

2.45 Holderness Fishing Industry Group (AS-025-A)

Reference	Relevant Representation Comment	Applicant's Response
AS-025-A	<p>The Holderness Fishing Industry Group (HFIG) is a fishers organisation based in Bridlington, UK. HFIG represents vessels that prosecute the Holderness region operating from Bridlington, Hornsea and Withernsea, with a range of vessel length from 6 m – 15m. The fishery is predominantly a static gear fishery using strings of pots located on the seabed for differing periods of time to target Brown Crab and European Lobster (subsequently referred to as crab and lobster). The Holderness region represents the largest fishery in Europe for lobster (338 tonnes in 2020) and a substantial crab fishery (1900 tonnes in 2020). Both fisheries have seen an increase in both volume, and commercial value in recent years (13% combined increase since 2015). This is due to increased effort and efficiency within the fleets, increased market prices (specifically crab) and an outwards expansion of the fishery to grounds further offshore from traditional grounds.</p>	<p>Noted. The Applicant continues to engage with The Holderness Fishing Industry Group (HFIG) through the SoCG process in relation to the issues raised in the HFIG representation. (see G1.21 Statement of Common Ground between Hornsea Four, HFIG and NFFO).</p>
AS-025-B	<p>The nature of the fishing practice (occupying an area of seabed for periods) requires considerable areas of the seabed, individual fishers can have strong fidelity to a particular site or area. These spatial needs often come into conflict with other marine users and fishery types. This is most prevalent in the region with regards to the recent expansion of the offshore wind energy sector, with the region currently seeing two nearshore developments in the operational phase (Westermost Rough and Humber Gateway) and considerable developments being undertaken in the offshore zone either operational (Hornsea One), under construction</p>	<p>The Applicant notes this comment.</p>

	<p>(Hornsea Two), consented (Creyke Beck developments) or pre-consent (Hornsea Four). All of which has involved disruption to the regional fishery through direct displacement of fishing effort through pre-construction surveys and through the construction phase.</p>	
<p>AS-025-C</p>	<p>Whilst HFIG have entered into co-existence agreements for other developments (specifically with Ørsted) we still have concerns with regards to the Preliminary Environmental Information Report (PEIR) and the data presented and assumptions made with regards to the Commercial Fisheries and Fish and Shellfish Ecology Chapters (Chapters 3 & 7) and their associated technical reports. These concerns were raised and submitted as part of the public consultation, and we were unaware of the part of the process that required registration of the relevant representation status (having already consulted on the project). Therefore, the below information presented is in reference to HFIG being a relevant stakeholder where our members will be directly affected by the proposed Hornsea Four offshore wind farm and associated export cable corridor.</p>	<p>Noted. The Applicant highlights that comments from HFIG in relation to the Hornsea Four PEIR were taken into account in the preparation of the Environmental Statement. Specifically, updates were made to Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), Volume A2, Chapter 6: Commercial Fisheries (APP-018), Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), and Volume A5, Annex 6.1: Commercial Fisheries Technical Report (APP-080) to provide additional detail and further clarifications requested by HFIG. Applicant regard to the HFIG's Section 42 comments are provided in Table 1, Annex 1.4 of B1.1: Consultation Report (APP-129). It is understood that the issues raised by the HFIG in this representation largely relates to the information presented in the Hornsea Four PEIR.</p>
<p>AS-025-D</p>	<p>Fish and Shellfish Ecology PEIR</p> <p>We are concerned about the lack of detail given to the shellfish element of this chapter and associated technical report. The Hornsea Four array and associated export cable corridor supports extensive crustacean fisheries, therefore the effects of construction and operation of the development on the resident crustacean populations is of considerable concern to the fishers whose livelihood depend on them.</p>	<p>The Applicant notes that relevant statutory stakeholders were consulted via the Marine Ecology & Processes Evidence Plan process and it was agreed the focus of fish and shellfish assessment, as detailed in Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), would be primarily on herring and sandeel, as these species are considered to be the most sensitive receptors in the region. Alongside the HFIG request for additional detail on shellfish, Cefas provided additional information during the S42 consultation period for scallops, crab, lobster and <i>Nephrops</i> which has been incorporated into Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071).</p> <p>The Applicant highlights that comments from HFIG in relation to the Hornsea Four PEIR were taken into account in the preparation of the Environmental Statement. Specifically, updates were made to Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), Volume A2, Chapter 6: Commercial Fisheries (APP-018), Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), and Volume A5, Annex 6.1: Commercial Fisheries Technical Report (APP-080) to provide additional detail and further clarifications requested</p>

		<p>by HFIG. Applicant regard to the HFIG’s Section 42 comments are provided in Table 1, Annex 1.4 of B1.1: Consultation Report (APP-129).</p> <p>The Applicant acknowledges the comments raised in relation to the local shellfish fisheries during both the construction and operational phases of Hornsea Four. The effect on commercial fisheries, has been assessed in Volume A2, Chapter 6: Commercial Fisheries (APP-018), including impacts of affected commercial fisheries resources, with the ecological effects on crustacean populations assessed in Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015). The Commercial Fisheries assessment concludes that for potting fisheries, the reduction in access to, or exclusion from established fishing grounds is considered to lead to moderate adverse effects during construction, with slight adverse effects predicted to occur during the operational phase. It is acknowledged that the local potting fleet has increased sensitivity to this construction impact and that, unmitigated, the effect would be significant. As such, further mitigation measures have been proposed as outlined in paragraphs 6.11.1.20 and 6.11.1.37 of Volume A2, Chapter 6: Commercial Fisheries (APP-018). These are also set out in F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244). This mitigation is secured via the DMLs (C1.1: Draft DCO including Draft DML (APP-203)), which require fisheries coexistence and liaison plans to be approved by the MMO prior to commencement of works (Part 2 - Condition 13(7) of DCO Schedules 11 and 12). Based on this further mitigation, the residual significance is considered to lead to slight adverse effects during construction.</p>
AS-025-E	<p>The chapter generally assesses the effects on shellfish as medium sensitivity with minor significance with no mitigation needed. However, we feel, the data used to make these assumptions is inadequate at best and generally poor with regards to the two crustacean species raised (crab and lobster). The use of mobile gear (otter and beam trawls) is suitable to assess fish assemblages, but with regards to these methods being used for crustaceans is scientifically inadequate. The fact that crabs were abundant, and lobster seen occasionally with these inappropriate methods highlights the importance of the area for these species. More suitable sampling, e.g., potting surveys, would have given a greater portrayal of the stocks structure and its susceptibility to construction and operation effects. Therefore, we believe that the PEIR has under-</p>	<p>The importance of the inshore part of the study area to crustaceans (and other shellfish species) is recognised in Section 3.5 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071). It is important to note that the surveys identified by HFIG are not the sole data sources used to inform the study area, with a full, detailed desktop study undertaken and the limitations of the survey data used in this desktop study area acknowledged in the ES.</p> <p>Specifically, the assessment identified the study area as overlapping with potential overwintering grounds for brown crab, with the sensitivity of the species based on the likely stationary nature of this species during overwintering.</p>

	estimated the importance of these species to the Hornsea Four development areas.	Additionally, the Applicant highlights that both the MMO and Natural England confirmed within their representations (RR-020 and RR-029, respectively) that the fish and shellfish ecology baseline characterisation is appropriate.
AS-025-F	Additionally for crab and lobster, there was no site-specific assessment conducted. The assumptions presented were derived from studies undertaken for other developments. Studies using data from Hornsea Zone projects is understandable but presenting data from Triton Knoll (~55 km closest distance) and the Dogger Bank developments (~ 70 km closest distance) is not suitable.	The Applicant notes that the surveys identified within the HFIG representation were not the sole data sources used to inform the study area, with a full detailed desktop study undertaken. The Applicant highlights Figures 29 and 31 of Volume A5, Annex 3.1: Fish and Shellfish Technical Report (APP-071) , which show survey data collected across the Hornsea Four site as part of studies undertaken for other developments. Due consideration was given to the Dogger Bank Offshore Wind Farm surveys due to overlap with the Hornsea Four ECC. Reference was also made to data collected for Triton Knoll Offshore Wind Farm to provide regional context. The Applicant is therefore confident that a thorough site-specific assessment of lobster and crab has been conducted.
AS-025-C	There is a contradiction in the evidence presented in this chapter. The chapter supports an assumption of low abundance in lobster and crab but refers to high exploitation rates (CEFAS 2014 stock assessment), these directly contradict each other.	The surveys of crab and lobster abundances presented in Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) , provide site-specific data only, whereas the Cefas stock assessments cover a much broader area, and will therefore capture areas outwith those relevant to Hornsea Four. These data sources don't necessarily contradict each other as the combined datasets suggest that Hornsea Four is not an important site for lobster and crab in the context of the wider area, therefore supporting the conclusion of no significant effects within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) .
AS-025-H	The assessment for the behaviour responses of shellfish to the presence of the export cable was assessed as negligible. However, recent studies have highlighted that crustaceans, specifically crab species, demonstrate behavioural and physiological responses to the presence of EMF associated with sub-sea cables (Scott et al., 2018, 2021). Whilst many of these studies are laboratory based, they still highlight possible long-term responses in the resident crab populations associated with a large power generating development such as Hornsea Four and are a direct concern of the fishers.	The Applicant acknowledges recent research conducted in this field, notably papers by Scott et al. (2018 & 2021) investigating the effects of EMF on crustacea. It is to be noted that these studies investigated EMF strengths significantly higher than produced by offshore wind cables in the marine environment. Specifically, the lowest experimental EMF used in Scott et al. (2021) was a factor of 10 higher than that expected from Hornsea Four cables, with no impacts identified at this EMF strength. Effects were only noted in these studies using EMF strengths which were a factor of 20 to 1,000 times higher than those expected from Hornsea Four cables. Therefore, it is considered that it is unlikely that there would be any impacts to crustaceans from EMF emitted from Hornsea Four cables. As such, the Applicant considers that impacts from EMF should remain scoped out.
AS-025-I	Due to these concerns we as a fishery would like to see a pre- and post-construction monitoring project undertaken within the array and at extensive sites along the export cable route.	Previous long-term monitoring campaigns at the Westernmost Rough Offshore Wind Farm has demonstrated no population level impacts from the construction and operation of an offshore wind farm, even for the studied project which was constructed in a noted breeding ground for brown crab (Roach et al, 2018). The Applicant notes that the Hornsea Four array

		<p>area does not overlap with any identified breeding grounds for crustaceans and the cable route will only result in temporary, short-term impacts in any specific area. As such, it is expected that the conclusions of the monitoring from Westernmost Rough Offshore Wind Farm (i.e. no significant impacts) are equally applicable to Hornsea Four. Taking this into consideration, no monitoring has been proposed.</p>
<p>AS-025-J</p>	<p>Commercial Fisheries PEIR</p> <p>The commercial potting fisheries within this chapter, for the different stressors, are generally assessed as medium sensitivity with moderately adverse significance which are reduced to minor adverse when disruption payments following FLOWW guidelines are applied. We appreciate this presentation of a direct effect on the commercial fisheries prosecuting the development area and a commitment for mitigation. However, we also believe that the data presented vastly underestimated the extent and intensity of fishing activity taking place in the area. Vessel monitoring system (VMS) data was the predominant tool used to understand fishing activity alongside sighting from government agencies (e.g., NEIFCA, MMO). The VMS data only presented vessels that were over 15 m in overall length which actually represents a very small proportion of the fleet which is predominantly between 10 m and 12 m in length. Sightings data are also sporadic with no concerted effort made to capture fleet movements; it was only recorded during routine activities of the patrol vessel rather than a standardised protocol. These data lead to an under-representation of the size, intensity, and extent of the fishery. This leads to a flawed assumption that displaced vessels can fish in otherwise unfished areas as the data presented alludes to this possibility. The reality is that there are no other areas in the region that are not prosecuted that are economically viable and do not currently have fishers prosecuting the areas. This is also further compounded by potential conflict with other fishery types (under-estimated in this chapter) and the spatial squeeze of consecutive and parallel marine developments in the region. The chapter discusses work undertaken in the export cable corridor scouting for fishing gear, these data are not presented within the chapter. These data could have demonstrated the importance of the area to the regional fisheries.</p>	<p>VMS data informed the assessment, but was not the predominant tool used to understand the fishing activity. This is specifically true for the potting fleet which contains predominantly vessels under 12m in length which are not represented within the VMS data set. The uncertainties and limitations of VMS data and surveillance are understood and taken into account within the assessment. The regional importance of the area to the potting fleet is recognised within the assessment.</p> <p>The Applicant highlights that comments from HFIG in relation to the Hornsea Four PEIR were taken into account in the preparation of the ES. Specifically, updates were made to Volume A2, Chapter 6: Commercial Fisheries (APP-018) and Volume A5, Annex 6.1: Commercial Fisheries Technical Report (APP-080) to clarify the data limitations in the VMS potting and sightings data figures as requested by HFIG. Applicant regard to the HFIG's Section 42 comments are provided in Table 1, Annex 1.4 of B1.1: Consultation Report (APP-129).</p> <p>The Applicant will continue to take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Relevant commitments (Co90, Co95, Co180) are detailed in Volume A4, Annex 5.2: Commitment Register (APP-050). This includes a commitment to developing a Fisheries Coexistence and Liaison Plan (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)). This mitigation is secured via the DMLs (C1.: Draft DCO including Draft DML (APP-203)), which require fisheries coexistence and liaison plans to be approved by the MMO prior to commencement of works (Part 2 - Condition 13(7) of DCO Schedules 11 and 12). The Applicant will continue to work with HFIG to minimise any impacts to their members.</p>

AS-025-K	<p>This chapter presented research undertaken by (Roach et al., 2018) in the context of benefits of construction to fisheries, this was not however presented in the ecology chapter. This research was undertaken at a small-scale, inshore wind farm and specifically designed to understand the effects on lobster in the survey specifics such as bait used, and season surveyed. In comparison, the Hornsea Four project, is a large-scale, offshore development with a crab population as dominant crustacean species in the region. Assuming that benefits from one site can be transferred to another site that demonstrates very different ecology and environmental factors is flawed. The technical report behind the Roach et al., (2018) paper, actually highlighted a reduction in brown crab during the construction period, it was postulated to be an effect of increased lobster abundance being present but this was only postulated and not proven, therefore there may have been an effect on brown crab abundance that was not measured for (Roach and Cohen, 2015). Therefore, assumptions made from this work should be used with caution when predicting negligible effects and possible benefits.</p>	<p>The Applicant notes that numerous other studies (as reviewed in Linley et al. (2007)) support the conclusions drawn within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), and as such the assessment has not solely relied solely on the Roach et al. (2018) study.</p>
AS-025-L	<p>This chapter, in response to queries about monitoring states maintaining liaison with the fishing industry as a commitment to monitoring. In our view this is not monitoring but best practice for the industries involved. Monitoring should involve assessing changes in fleet behaviour, landings, catch statistics and effort. There is no mechanism provided to monitor these possible changes. We appreciate the commitment to minimise disruption through closures and liaising these closure periods with industry.</p>	<p>Noted. The Applicant will continue to take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation, including relevant commitments (Co90, Co95, Co180) detailed in Volume A4, Annex 5.2: Commitment Register (APP-050). This includes a commitment to developing a Fisheries Coexistence and Liaison Plan (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)). This mitigation is secured via the DMLs (C1.: Draft DCO including Draft DML (APP-203)). The Applicant will continue to work with HFIG to minimise any impacts to their members. Based on these commitments and continued liaison with fishers and HFIG, the Applicant does not propose any further monitoring of fleet characteristics, effort or landings data.</p>
AS-025-M	<p>Recommendations</p> <p>We would like to see a pre- and post-construction monitoring program initiated within the array and along the export cable corridor, using correct methodology and focussing on brown crab specifically.</p> <p>With the introduction of mandatory iVMS, there is an opportunity for industry and the developer to demonstrate displacement effects of a</p>	<p>Previous long-term monitoring campaigns at the Westermost Rough Offshore Wind Farm have demonstrated no population level impacts from the construction and operation of an offshore wind farm, even for the studied project which was constructed on a noted breeding ground for brown crab (Roach et al, 2018). The Applicant notes that the Hornsea Four array area does not overlap with any identified breeding grounds for crustaceans and the cable route will only result in temporary, short-term impacts in any specific area. As such, it is expected that the conclusions of the monitoring from Westermost Rough Offshore Wind</p>

<p>construction of this scale. We would like to see an initiative undertaken to investigate this possibility.</p> <p>Maintain the levels of engagement between the developer and the fishing industry.</p>	<p>Farm (i.e. no significant impacts) are equally applicable to Hornsea Four. As assessed within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), there will be no significant adverse effects on brown crab populations as a result of the construction, operation and decommissioning of Hornsea Four. Taking this into consideration, no monitoring is proposed for brown crab.</p> <p>The implementation of iVMS on all commercial fishing vessels under 12m in 2022 is noted. The availability of this data in amalgamated form to provide spatial data on the footprint of the fishery, including effort and value, remains uncertain. It is noted that vessels between 12-15m required VMS from 2012, yet VMS data sets for this portion of the fleet is yet to be made publicly available by the MMO. It is therefore considered unlikely that iVMS will be available in a form that can be interrogated to demonstrate displacement effects..</p> <p>In relation to liaison with HFIG, the Applicant intends to secure via the DMLs (C1.1: Draft DCO including Draft DML (APP-203)) a fisheries coexistence and liaison plan, which will describe the approach to liaison and consultation with the fishing industry throughout the lifetime of Hornsea Four. This will have to be approved by the MMO prior to commencement of works (Condition 13(7) of Schedule 11 and Condition 13(6) of Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203)). An outline of this plan, which the final plans must accord with, was submitted as part of the DCO Application (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)).</p>
--	---

2.46 The National Federation of Fishermen's Organisations

Reference	Relevant Representation Comment	Applicant's Response
AS-026-A	<p>The Hornsea Four development encroaches on long-established static and mobile gear fisheries and some degree of adverse impact on fishing businesses is inevitable. The potting fishery for crab and lobster is likely both to be the most impacted and least able to adapt. Potting grounds are established because of the presence of resident populations of commercially valuable species in those locations. Potters cannot simply</p>	<p>Noted. The sensitivity of the potting fleet is assessed based on the level of alternative fishing grounds, as well as operational range of the fleet, concluding a medium sensitivity to exclusion from existing fishing grounds. The Applicant continues to engage with the National Federation of Fishermen's Organisations (NFFO) through the SoCG process in relation to the issues raised in the NFFO representation (see G1.21 Statement of Common Ground between Hornsea Four, HFIG and NFFO).</p>

	<p>move their gear and fish somewhere new: were there anything to catch elsewhere, someone would already be catching it.</p>	
AS-026-B	<p>The Environmental Statement acknowledges that potters will lose valuable access to their established grounds during construction and we applaud the developer's commitment to compensate for the economic damage that cannot be obviated, in line with established best practice.</p>	<p>Noted.</p>
AS-026-C	<p>We note and echo the developer's desire to see the coexistence of fishing fleets and operational wind farms. While such coexistence is very much to be hoped for, we do not think that it is sensible to assume that it will be achieved. There are instances of successful co-location of fishing and wind farms elsewhere - the nearby Westermost Rough OWF is one example – but conditions in those sites cannot be equated automatically with Hornsea Four site. Hornsea Four is much further offshore and much more exposed to wave and weather than Westermost Rough, for example. To make distant trips economically viable, potting boats must deploy longer strings of pots, which require more room: making the inter-turbine distances crucial. If these prove insufficient, then fishing operations may no longer be possible within the site. The de facto exclusion of fishing activity from all, or a significant part, of the site is a realistic worst case scenario which will only be prevented through good communication and the design and operation of the wind farm with coexistence in mind. We do not agree, therefore, with the characterisation of this risk as minor (ES section 6.11.2.15).</p>	<p>During the operational phase of Hornsea Four, the assessment assumes that fishing will resume around and between infrastructure within the Hornsea Four array area where possible, with the exception of an assumed 50 m operating distance from infrastructure, areas of cable protection, and safety zones around infrastructure undergoing major maintenance or replacement.</p> <p>A minimum turbine spacing of 810 m is defined within the maximum design scenario (as set out in A4.4.7 ES Volume A4 Annex 4.7 Layout Principles (A4.4.7)).</p> <p>Furthermore, the individual decisions made by skippers with their own perception of risk will determine the likelihood of whether their fishing will resume within the Hornsea Four array area. Inclement weather will be a significant contributor to this risk perception. In addition, certain gear types including pelagic trawl, twin rigged trawls and demersal seine / fly shooting will not be practically deployed within the operational array.</p> <p>The Applicant considers, that subject to the above assumptions, the UK potting will resume fishing within the array area. This assumption aligns with the assessments made for Hornsea Projects One, Two and Three.</p>
AS-026-D	<p>Proper cable burial will be crucial to the safe resumption of fishing both within the array and along the cable route. There should be regular monitoring and a procedure agreed for rapidly informing the fishing fleet of any deburial incidents.</p>	<p>Appropriate communication with the fishing industry (as set out in F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244) and secured by Condition 13(7) of Schedule 11 and Condition 13(6) of Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203)) will be undertaken in the event that cables become exposed during the operational phase of Hornsea Four (i.e. through the FLO and appropriate channels such as the Kingfisher Information Service and notices to mariners). The communication of cable exposures is secured under Condition 7 of Schedule 11 and Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203)).</p>

		<p>In addition, as secured under Condition 13(h) of Schedule 11 and Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203), the cable specification and installation plan will include proposals for monitoring offshore cables within that stage including cable protection during the operational lifetime of the authorised project which includes a risk based approach to the management of unburied or shallow buried cables.</p>
AS-026-E	<p>With any major construction project such as this, there should be ongoing monitoring of the health of the impacted ecosystems. We are concerned, however, that the data used in compiling this report do not represent an adequate ecological baseline to allow this. Table 6.6 shows that site specific survey data used in the analysis is both outdated (collected in 2010, 11, and 12) and was collected using methods that are inappropriate to accurately characterise the key commercial species present in the site. Beam and otter trawls do not catch crabs and lobsters, so it is unsurprising that those species were hardly encountered in the environmental surveys cited, while simultaneously supporting a prolific and valuable commercial fishery.</p>	<p>The potential management measures to be implemented within Marine Protected Areas (MPAs), including MCZs, is dependent on the features that are being protected with the designated site. Typically, for MPAs with benthic features (including specific habitats and/or marine invertebrate species) management measures are more likely to effect bottom-contact trawled gear, which has a higher potential to interact with the protected feature(s) based on the nature of the penetrative fishing gear.</p> <p>The Applicant will continue to take steps to minimise the effects upon the fishing industry in the area through appropriate mitigation where required. Relevant commitments (Co90, Co95, Co180) are detailed in Volume A4, Annex 5.2: Commitment Register (APP-050). This includes a commitment to developing a Fisheries Coexistence and Liaison Plan (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)). This mitigation is secured via the DMLs (C1.1: Draft DCO including Draft DML (APP-203)), which require fisheries coexistence and liaison plans to be approved by the MMO prior to commencement of works (Condition 13(7) of DCO Schedules 11 and 12). The Applicant will continue to work with NFFO to minimise any impacts to their members.</p>
AS-026-F	<p>With any major construction project such as this, there should be ongoing monitoring of the health of the impacted ecosystems. We are concerned, however, that the data used in compiling this report do not represent an adequate ecological baseline to allow this. Table 6.6 shows that site specific survey data used in the analysis is both outdated (collected in 2010, 11, and 12) and was collected using methods that are inappropriate to accurately characterise the key commercial species present in the site. Beam and otter trawls do not catch crabs and lobsters, so it is unsurprising that those species were hardly encountered in the environmental surveys cited, while simultaneously supporting a prolific and valuable commercial fishery.</p>	<p>The importance of the inshore part of the study area to crustaceans (and other shellfish species) is recognised in Section 3.5 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071). It is important to note that the surveys identified by HFIG are not the sole data sources used to inform the study area, with a full, detailed desktop study undertaken and the limitations of the survey data used in this desktop study area acknowledged in the ES. Specifically, the assessment identified the study area as overlapping with potential overwintering grounds for brown crab, with the sensitivity of the species based on the likely stationary nature of this species during overwintering.</p> <p>Additionally, the Applicant highlights that both the MMO and Natural England confirmed within their representations (RR-020 and RR-029, respectively) that the fish and shellfish ecology baseline characterisation is appropriate.</p>

AS-026-G

There is an acknowledged lack of accurate detail in the Environmental Statement on fishing activity carried out by the local potting fleet. The large majority (>90%) of local potting vessels are under 15m overall length and thus are not apparent from VMS data. Sporadic observer data is never adequate to accurately capture the extent of a fishery, where the presence and absence of fishing boats changes from day to day with weather and tides and varies across the year with seasonal changes in target species behaviour. Good communication with local fishermen's organisations will be able to produce accurate and current information about the location and extent of fishing activity.

The Applicant notes that VMS data informed the assessment, but was not the predominant tool used to understand the fishing activity. This is specifically true for the potting fleet which contains predominantly vessels under 12m in length which are not represented within the VMS data set. The uncertainties and limitations of VMS data and surveillance are understood and taken into account within the assessment. The regional importance of the area to the potting fleet is recognised within the assessment.

The Commercial Fisheries assessment ([Volume A2, Chapter 6: Commercial Fisheries \(APP-018\)](#)) concludes that for potting fisheries, the reduction in access to, or exclusion from established fishing grounds is considered to lead to moderate adverse effects during construction, with slight adverse effects predicted to occur during the operational phase. It is acknowledged that the local potting fleet has increased sensitivity to this construction impact and that, unmitigated, the effect would be significant. As such, further mitigation measures have been proposed as outlined in paragraphs 6.11.1.20 and 6.11.1.37 of [Volume A2, Chapter 6: Commercial Fisheries \(APP-018\)](#). These are also set out in [F2.9: Outline Fisheries Coexistence and Liaison Plan \(APP-244\)](#). This mitigation is secured via the DMLs ([C1.1: Draft DCO including Draft DML \(APP-203\)](#)), which require fisheries coexistence and liaison plans to be approved by the MMO prior to commencement of works (Condition 13(7) of DCO Schedules 11 and 12).

3 **Annex 1 – Full response to Environment Agency (RR-010)**

1 Annex 1 – Full response to Environment Agency (RR-010)

Reference	Relevant Representation Comment	Applicant's Response
RR-010 summary		<p data-bbox="1144 392 1592 416"><i>Summary of Applicant's Response to RR-010</i></p> <p data-bbox="1144 467 2007 528">The Applicant has had due consideration of the Environment Agency's Relevant Representation, and a summary of the key points of response is set out below:</p> <ul data-bbox="1144 539 2007 1358" style="list-style-type: none"> <li data-bbox="1144 539 2007 600">• Confirmation that potential impacts in relation to landfills have been considered in APP-025 and APP-088, with no formal landfills identified; <li data-bbox="1144 611 2007 708">• Detail of the Onshore Crossing Schedule (APP-040) and clarification regarding the requirement of baily bridge or alternative clear span bridge crossings of Main Rivers; <li data-bbox="1144 719 2007 817">• Clarification regarding the decommissioning of the onshore ECC, including the current approach to leave assets in place beneath watercourses and any associated flood defence infrastructure; <li data-bbox="1144 828 2007 962">• Confirmation that the Environment Agency agrees in principle to the disapplication of the provisions of the Environmental Permitting Regulations (England and Wales) 2016, subject to the inclusion of protective provisions and further consideration regarding the works at Watton Beck. <li data-bbox="1144 973 2007 1034">• Confirmation that sufficient allowance has been included within the design at landfall to account for coastal erosion; <li data-bbox="1144 1045 2007 1106">• Welcomed that the Environment Agency acknowledge that suitable consideration of flood risk at the OnSS has been undertaken; <li data-bbox="1144 1117 2007 1177">• Provided further context regarding the works at Watton Beck and ongoing discussions, which forms an area of outstanding agreement; <li data-bbox="1144 1189 2007 1249">• Clarification regarding the location of one logistics compound partially located within flood zone 3; <li data-bbox="1144 1260 2007 1321">• Acknowledged that the Environment Agency conclude the WFD compliance assessment adequately identifies and suitably mitigates potential impacts; <li data-bbox="1144 1332 2007 1358">• Responded to recommended best practice measures; and

		Responded to points associated with onshore ecology, enhancement and biodiversity net gain.
RR-010-A	<p>Summary</p> <p>These Relevant Representations contain an overview of the project issues which fall within our remit. They are given without prejudice to any future detailed representations that we may make throughout the examination process. We may also have further representations to make when supplementary information becomes available in relation to the project.</p> <p>We have reviewed the draft DCO, Environmental Statement (ES) and supporting documents submitted to the Planning Inspectorate on the 20 September 2018, as part of the above-mentioned application. We are pleased that some of the concerns and issues raised by the Environment Agency during pre-application consultation have been considered and addressed.</p> <p>We can confirm at this stage that we consider that the ES provides a satisfactory assessment of the potential impacts of the scheme with reference to flood risk, water resources, groundwater and ecology.</p> <p>The mitigation and enhancement measures identified for the construction of the development are considered appropriate. However, we are unable at this stage to confirm that we are content to disapply the provisions of the Environmental Permitting Regulations (England and Wales) 2016 ("the EPR"), which relate to permits for flood risk activities. Further information on this is provided below.</p> <p>In addition, we are considering the effect on our land interests and whether the proposed acquisitions would cause us a problem in operational terms.</p>	Noted.
RR-010-B	<p>Draft DCO Schedule 1, Part 3: Requirements</p> <p>We are supportive of Requirements 6, 10, 13, 14, 15 (which relates specifically to the onshore substation), 17, 19, and 22.</p>	The Applicant can confirm that potential impacts in relation to landfills have been considered in A3.1: Geology and Ground Conditions (APP-025) and A6.1.1: Land Quality Preliminary Risk Assessment (APP-088) . No formal landfills have been identified. There are numerous areas of backfilled mineral workings (extraction for

Requirement 14 The Scoping Report highlights that a number of authorised, historic or possible landfills are in close proximity to the proposed development and therefore careful consideration of any potential impacts these landfills may pose to the environment will need to be assessed, should any landfill be impacted upon.

Requirement 17 We are supportive of the inclusion of Requirement 17. An outline Code of Construction Practice (CoCP) has been provided and updated in consultation with the Environment Agency (ref. AAI Volume F2.2). There are a number of activities of interest to us through the construction activities given the interaction with watercourses identified as 'main rivers' and also their associated floodplains. We are satisfied that the applicant has considered aspects in relation to the CoCP that are of relevance to our interests, and as a result of earlier consultations.

Consideration has also been given the environmental measures that would accompany those activities where a flood risk activity permit may otherwise have been required, for example environmental protection measures and those associated with protecting the integrity and function of flood defence infrastructure.

We are supportive of the clarification that culverts will not be used at any point on any 'main rivers' which follows our general position with regards new culverts. This is confirmed within Commitment Co172. This commitment also includes the possibility of temporary bridges for temporary access tracks over 'main rivers.' We would like to see greater clarity of these specific locations, after consideration of whether there may be existing bridge crossings available. Some of the larger main rivers will not be appropriate to install temporary bridges, and this is noted in A3.2 Hydrology and Flood Risk chapter of the ES.

gravel, sand and chalk) within the DCO order limits. If an impact is identified, then localised ground investigation will be undertaken to determine what if any plausible pollutant linkage exists in accordance with the Contaminated land and groundwater scheme (DCO Requirement 14) and the measures outlined in paragraph 6.2.2.2 **F2.2: Outline Code of Construction Practice (APP-237)**. There is always the potential for unforeseen landfilling activities to have taken place and this will be dealt with as an unforeseen contamination during the construction phase and suitable mitigation will be implemented as required.

Full details of the proposed onshore locations of temporary watercourse crossings are provided in **A4.4.2: Onshore Crossing Schedule (APP-040)** and are denoted by the initials "WA" after the identifier for the permanent infrastructure element with which they are associated (e.g. all temporary watercourse crossings associated with the onshore export cable corridor are denoted by "ECC_WA..."). Although crossings of Main Rivers will be avoided where possible, the Applicant can confirm that White Dike, Driffield Canal, Scurf Dike, Watton Beck and Bryan Mills Beck (each of which are Main Rivers) will require crossing using a Bailey bridge or alternative clear span bridge to facilitate access during construction. The Applicant considers that it is feasible and appropriate to install temporary crossings in these specific locations. These temporary crossings will be removed following completion of construction and the banks will be reinstated where appropriate.

The Applicant's current approach recommends that the decommissioned assets (e.g. cable ducting) would remain in place beneath watercourses and any associated flood defence infrastructure specifically to avoid impacts on these receptors during asset removal; however, the Applicant will undertake more detailed consultation with the local authority in the future as part of the development of the Onshore Decommissioning Plan (Co127 of **A4.5.2: Commitment Register (APP-050)**) which would include specific crossing instances where necessary.

The Applicant understands that the Environment Agency agrees in principle to the disapplication of the provisions of the Environmental Permitting Regulations (England and Wales) 2016 ("the EPR"), which relate to permits for flood risk activities, subject

A number of commitments, including Co172 (reinstating bed and banks), 175 (condition surveys) and 186 (consents / permits) are noted as being agreed with the Environment Agency with respect temporary construction activities that may affect 'main rivers.'

Requirement 24 Reference is made to an Onshore Decommissioning Plan (Co127 in the Commitments Register), and Requirement 24 has been included in the DCO. This makes reference to the need to consider decommissioning of infrastructure, including drainage and with consideration of flood risk. We understand that a number of elements are detailed as having "preferred approaches" and "will take account of suitable guidelines at time of decommissioning." The general approach outlined is to undertake decommissioning approximately in reverse of the construction sequence, leaving some infrastructure in place to minimise disturbance. We note that this includes specifically assets that will remain in place below the riverbed and below existing flood infrastructure. We highlight that in some locations the flood defences in situ are likely to require some works over the lifetime of the development. Concerns have been identified by flood risk management authorities if infrastructure remains in situ, including degradation, subsidence, theft, and vandalism. This aspect may benefit from ongoing discussions and clarification as new understanding and/or guidance becomes available.

Schedule 9, Part 5: Protective Provisions for the Environment Agency The applicant seeks to disapply the provisions of the Environmental Permitting Regulations (England and Wales) 2016 ("the EPR"), which relate to permits for flood risk activities. The applicant has included a suggested form of protective provisions for the benefit of the Environment Agency. We are content to consider giving our consent to the disapplication of the EPR in relation to flood risk activity permits. We do however have outstanding concerns regarding works which the applicant seeks to carry out to the Watton Beck crossing. Therefore, at this point we are unable to confirm that we consent to the disapplication of the EPR. We are in discussions with the

to the inclusion of protective provisions in Part 5 of Schedule 9 and further consideration regarding the works at Watton Beck. The Applicant notes that the Environment Agency has not yet secured funding for any flood defence maintenance or improvements along Watton Beck and cannot definitively state that this will be available in the future. Discussions are ongoing between the Applicant and the Environment Agency regarding the co-location of the proposed flood defences adjacent to the proposed cable crossing point at Watton Beck.

	<p>applicant on this issue and will update the Examining Authority on progress at the next opportunity.</p> <p>Environmental Permit: Flood Risk Activities The applicant has acknowledged our main river permitting requirements at various points within their Consents Management Plan (ref. AAI Volume F1.5) and Hydrology and Flood Risk chapter (ref. A3.2 ES Volume A3 Chapter 2). This includes a number of flood risk activities, as defined by the 2016 Environmental Permitting Regulations, where a permit will be required for any works within 8m (16m if tidal) from the top of the bank of a main river. The applicant has also acknowledged that any works in, under, or over a flood defence, or within 8m (16m if tidal), of the toe of a defence will also require a permit. A permit is separate to and in addition to any planning permission/DCO granted. Further details are available at www.gov.uk/guidance/flood-risk-activities-environmental-permits</p> <p>Where reference has been made to the “Flood Defence Consent” regime (e.g. Volume 1 Chapter 4 of the application form), we have taken this to have the same meaning as the 2016 Environmental Permitting Regulations. All applications for consent for the erection of any culvert and/or any alteration likely to affect the flow in an ordinary watercourse must be made to the local internal drainage board. A series of commitments have been outlined in relation to these flood risk activities, and relevant parameters have been incorporated into the DCO, such as Requirement 17, which requires a CoCP to be agreed in consultation with the Environment Agency.</p>	
RR-010-C	<p>Environmental Statement</p> <p>A2.1 Marine Geology, Oceanography and Physical Processes We have reviewed this chapter, together with A5.1.1 Marine Processes Technical Report and are satisfied that the assessment has considered the full range of likely effects, and that the impacts to coastal geomorphology will be temporary and localised (mostly associated with the construction phase, due to the requirement for cofferdams during exit pit construction).</p>	<p>Noted. Regarding the location of transition joint bays (TJBs) at landfall, further information is set out in Section 4.9 of A1.4: Project Description (APP-010), which states “The preliminary HDD entry locations, along with the respective indicative HDD drill lengths take cliff erosion and a 35 year design life into consideration. The precise location of the transition joint bays would be subject to detailed engineering of the Landfall HDD works and any other consenting or technical consideration, such as detailed geotechnical information required to finalise the Landfall HDD Drill</p>

	<p>In general, the proposed construction methods have been designed to minimise impacts (e.g. trenchless techniques), which we support. We're also satisfied that the modelling work demonstrates no discernible impact on nearshore wave climate as a result of the array itself.</p> <p>At landfall, a commitment has been made to install cables using Horizontal Directional Drilling (HDD) due to the issues related to coastal erosion. This is discussed in more detail to our satisfaction in the Selection and Refinement of the Cable Landfall document (ref. ES Volume A4 Annex 3.1). At the point of landfall, the cables will cross an area of active coastal erosion, as recognised in this chapter. We are satisfied with the assessment provided, which indicates that the cable will be installed in a position outside the anticipated area of coastal erosion. This is detailed further in the Selection and Refinement of the Cable Landfall chapter (ref. ES Volume A4 Annex 3.1). Indicatively, the location of the cables is approximately 200 metres from the cliff edge, and the assessment indicates an anticipated duration of at least 125 years before cables would be exposed to the effects of coastal erosion (ES Volume A4 Annex 3.1, pg. 33). Our understanding is that the final location of the exit pits is yet to be confirmed, so there may be some additional examination of local cliff recession and beach elevation trends required to determine the optimum design.</p>	<p>design." As such, sufficient allowance has been included within the design for Hornsea Four to account for coastal recession.</p>
RR-010-D	<p>A3.1 Geology and Ground Conditions As noted in this chapter (para. 1.7.1.10), part of the onshore Export Cable Corridor (ECC) and the Onshore Substation (OnSS) are located within Source Protection Zones (SPZs) 1, 2 and 3 (see Figures 2 to 6 of Volume A6, Annex 1.1: Land Quality Preliminary Risk Assessment). However, Co18 states that where the project crosses sites of particular sensitivity (e.g. embanked EA watercourses, SSSIs or groundwater Inner Source Protection Zones (SPZs)) a hydrogeological risk assessment will be undertaken to inform a site specific crossing method statement which will also be agreed with the relevant authorities prior to construction. This is to be secured via Requirement 17, under which a CoCP must be submitted. We welcome the acknowledgement that parts of the corridor and of both</p>	Noted.

	the temporary and permanent station is proposed to be located in SPZ1 (for the main drinking water supplies for the area) and that a hydrogeological risk assessment will be undertaken.	
RR-010-E	<p>A3.2 Hydrology and Flood Risk and A6.2.2 Onshore Infrastructure Flood Risk Assessment Permanent Structures Overall, we are satisfied that the draft DCO adequately mitigates flood risk in relation to the following permanent structures:</p> <ul style="list-style-type: none"> • The onshore substation • The high voltage cables, where these are in close proximity to watercourses identified as 'main rivers' • The proximity of the cables at landfall to that part of the coastline exposed to coastal change (i.e. coastal erosion) • Drainage Strategy • Permanent access track at the onshore substation 	Noted.
RR-010-F	<p>With respect the onshore substation, the applicant has undertaken a site selection that takes into account flood risk associated with the local watercourses. Consideration has also been given to the effects of climate change, through checks against additional detailed modelling, as detailed within the Onshore Infrastructure Flood Risk Assessment document (ref. Volume A6 Annex 2.2, pg. 71). Furthermore, freeboard has been incorporated to ensure that uncertainties relating to credible maximum climate scenarios have been considered, as detailed on page 72 of the same document. There does not appear to be a specific Requirement within the DCO that relates to flood mitigation measures for the onshore substation, but we are satisfied that the Flood Risk Assessment provided gives an accurate account of the issues within our remit, and shows a sequential approach to development, accompanied by satisfactory mitigation proposals. Consideration has also been given to other sources of flood risk, such as flowpaths associated with risk of flooding from surface water, and potential groundwater issues. A number of the cables will be installed underneath watercourses classified as 'main rivers' and therefore potentially affecting those watercourses and their associated flood defence infrastructure. With respect to the permanent infrastructure, this</p>	<p>The Applicant welcomes the Environment Agency's acknowledgement that suitable consideration of flood risk at the OnSS has been undertaken. The Applicant would like to reiterate that it is committed to the provision of appropriate flood risk mitigation measures at the OnSS, which is reflected in Co19, Co184, Co185 and Co191 of A4.5.2: Commitment Register (APP-050). The Applicant confirms that the Onshore Infrastructure Drainage Strategy will be developed in line with the latest relevant drainage guidance notes in consultation with the Environment Agency, the Lead Local Flood Authority and relevant Internal Drainage Board as appropriate. The Applicant therefore considers that Requirements 13 and 15 adequately secure flood mitigation measures.</p>

	<p>will be installed at a minimum depth below the hard riverbed. Where flood defences are present, the minimum depth of 1.2m also applies below the outermost toe of those flood defences (see Commitment Co18). It should however be noted that the optimal depth will be subject to ongoing discussions at each location.</p>	
RR-010-G	<p>A specific area of concern was raised around the Watton Beck crossing, in relation to likely works associated with securing future stabilisation and improvements to that defence. The Watton Beck crossing was specifically discussed in a recent meeting with the applicant (on 7 September 2021). The applicant acknowledged the potential implications once the cables are installed. A suggested approach was indicated within the record of that meeting and included in brief within Table 2.3 of the Hydrology and Flood Risk Chapter (page 29). This indicated the possibility of further discussion and site investigations. Both parties agreed that it would appear to be advantageous for flood defence works (depending on the specific design) to be installed prior to the Hornsea Four cables. However, it is unknown at this stage if that is a possibility. Further discussion is required with this respect.</p> <p>A single permanent access track is proposed within the floodplain (Flood Zone 3) and crossing an ordinary watercourse within the Onshore Infrastructure Flood Risk Assessment (ref. Volume A6 Annex 2.2, pg. 73). This is to be constructed in a manner to retain sufficient floodplain capacity and flow conveyance. Consideration is also given to the need to ensure that associated access tracks within the wider floodplain associated with this permanent access track minimise the implications on existing flow paths. We are satisfied that the detailed design elements relating to this can be resolved at later detailed design, subject to input from the Environment Agency and (where appropriate) the Lead Local Flood Authority (LLFA) and/or the Internal Drainage Board (IDB).</p> <p>Joint bays and link boxes will be located at least 20 metres from any watercourses identified as 'main rivers.' Following our meeting with the applicant on 7 September 2021, a further point was raised in areas where</p>	<p>The Applicant notes that the Environment Agency has not yet secured funding for any flood defence maintenance or improvements along Watton Beck and cannot definitively state that this will be available in the future. Discussions are ongoing between the Applicant and the Environment Agency regarding the co-location of the proposed flood defences adjacent to the proposed cable crossing point at Watton Beck.</p> <p>The Applicant would like to clarify that it has already made a commitment to install cable infrastructure at least 1.2 m beneath flood defence infrastructure (Co18 of A4.5.2: Commitment Register (APP-050)) to avoid direct disturbance to the flood defence. However, it is acknowledged that the presence of buried cable infrastructure could potentially limit the options available for any future works to the flood defences.</p> <p>The Applicant notes that the Environment Agency cannot currently commit to maintaining the existing flood defences in the wider area, including the River Hull catchment. However, the Applicant notes that the operational infrastructure would be primarily located below ground and would not therefore be reliant on the ongoing protection against above-ground flooding provided by these defences. In addition, above ground infrastructure such as the OnSS has been sited to ensure that it is at the lowest possible flood risk and therefore is not reliant on the presence of the defences.</p>

	<p>flood defence investment is uncertain, including the possibility of removal or modification of flood defences. The applicant confirmed they would review their proposal in light of this. This is more likely to affect the working corridor within the River Hull catchments, and not the area around the onshore substation. We welcome ongoing dialogue with the applicant and the opportunity to review potential locations and mitigation for the joint bays and link boxes should these be located in areas that may be subject to flooding now or in the future, including where flood defences may be withdrawn or modified.</p>	
RR-010-H	<p>Temporary Structures Overall, we are satisfied that the draft DCO adequately mitigates flood risk in relation to the following construction activities and temporary structures:</p> <ul style="list-style-type: none"> • The crossings of watercourses identified as 'main rivers' • Construction compounds and temporary storage of materials • Activities within the landfall area • Drainage Strategy associated with temporary activities 	Noted.
RR-010-I	<p>The applicant has confirmed that they will use HDD (or similar) to undertake the works under watercourses classified as 'main rivers.' This mirrors requirements on other similar projects within the area. This approach will minimise the risks associated with working around rivers and flood infrastructure. Acceptable controls are also outlined with respect ancillary activities, such as reception pits being located at least 20 metres from sensitive locations. Methodology and standoff distances have also been discussed and agreed with the Internal Drainage Board regarding ordinary watercourses. Further details can be found in the Hydrology and Flood Risk document (ref. ES Volume A3 Chapter 2), specifically page 63 and summarised within Table 2.10. We are satisfied that the DCO Requirement 17 (Code of Construction Practice) will reflect these requirements. Construction compounds will ordinarily be located outside identified flood risk areas. However, this is unlikely to be possible for the whole construction programme. The Outline Code of Construction Practice document (ref. Volume F2, Chapter 2) refers to the need to ensure (where reasonably practical) to avoid the stockpiling of topsoil and subsoil within the floodplain</p>	<p>Paragraph 4.3.3.6 of A6.2.2: Onshore Infrastructure Flood Risk Assessment (APP-098) notes that seven of the identified eight onshore ECC logistics compounds are located in Flood Zone 1. The proposed onshore ECC logistics compound at Carr Lane is partially located in an area identified as being in Flood Zone 3. However, this location is also identified by the Environment Agency Product 4 data as benefitting from defences, meaning it is not currently at risk of flooding from fluvial sources (i.e. this would be classed as Flood Zone 3a, rather than Flood Zone 3b – functional floodplain). The Applicant therefore concludes that these elements have been sequentially located, to avoid the areas of flood risk. The Applicant does not therefore consider that flood risk to the logistics compounds will be a significant issue throughout the duration of the construction programme. Furthermore, Section 5.5 of F2.2: Outline Code of Construction Practice (APP-237) cross-references to procedures relevant to emergency flood response (set out in the Onshore Infrastructure Flood Risk Assessment) and details necessary liaison and measures to be undertaken by the project during construction in the event of extreme weather.</p>

	<p>(flood zones 3 & 2). We support the removal of all logistic compounds and reinstatement of ground as set out in the A6.2.2 Onshore Infrastructure Flood Risk Assessment and Commitment Co68. A6.2.2 Onshore Infrastructure Flood Risk Assessment also contains a series of mitigation measures where compound and temporary activities interact with known flood risk, principally from fluvial, pluvial (surface water) and groundwater. We note that, in response to our earlier advice, a number of the compounds have been adjusted in view of flood risk issues. A3.3 Ecology and Nature Conservation Table 3.3: Key International and UK legislation relevant to ecology and nature conservation: the Water Framework Directive should be added to this list, as The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. We believe that this chapter has identified all the ecological risks and has robust mitigation in place to either eliminate or reduce these risks to an acceptable level.</p>	<p>The Applicant acknowledges the importance of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended by the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019, with regards to aquatic biodiversity. The implications of the proposed project on the WFD Regulations are discussed in A5.2.2: WFD Compliance Assessment (APP-069) (coastal aspects) and A6.2.3: WFD Compliance Assessment (APP-099) (onshore aspects).</p>
RR-010-J	<p>A6.1.1 Land Quality Preliminary Risk Assessment This document is a preliminary assessment that precedes any intrusive investigations and remediation strategies. We recommend that the applicant should:</p> <ol style="list-style-type: none"> 1. Follow the risk management framework provided in 'Land contamination: risk management' when dealing with land affected by contamination. 2. Refer to our Guiding principles for land contamination for the type of information that we require in order to assess risks to controlled waters from the site – the local authority can advise on risk to other receptors, such as human health. 3. Consider using the National Quality Mark Scheme for Land Contamination Management which involves the use of competent persons to ensure that land contamination risks are appropriately managed. 4. Refer to the contaminated land pages on Gov.uk for more information. 	<p>Noted, the Applicant has outlined best practice mitigation measures in F2.2: Outline Code of Construction Practice (APP-237). Paragraph 6.2.2.2 refers to the development of the Contaminated land and groundwater scheme (DCO Requirement 14), in line with Land Contamination: Risk Management Framework (Environment Agency 2021) (or latest available guidance).</p> <p>A6.1.1: Land Quality Preliminary Risk Assessment (APP-088) is referenced as following Environment Agency Land Contamination L Risk Management 2019 in various sections. The Applicant acknowledges that the latest iteration of this guidance is dated 2021 however this updated guidance does not change the assessment outcome.</p> <p>The guiding principles and contaminated land pages on the Gov.uk website have been referred to and have been used as a basis for the formulation of the assessment contained in A6.1.1: Land Quality Preliminary Risk Assessment (APP-088).</p>
RR-010-K	<p>A6.2.3 Water Framework Directive Compliance Assessment It is slightly confusing that there are two separate Water Framework Directive (WFD) assessments provided in two separate annexes – A5.2.2 (coastal aspects) and A6.2.3 (onshore / fluvial aspects). However, we have reviewed the</p>	<p>Noted. It is acknowledged that the Environment Agency's conclusions on the WFD compliance assessments state that potential impacts have been accurately identified and suitably mitigated by the commitments set out in A4.5.2: Commitment Register (APP-050) and the relevant requirements in the DCO. As such it is agreed</p>

	<p>A6.2.3 Water Framework Directive Compliance Assessment and believe that it has accurately identified all the potential impacts and outlined how they will be suitably mitigated to prevent deterioration. We therefore believe that the works will not cause any significant deterioration to the Moderate WFD status of the Yorkshire South Coastal Waterbody. We agree with the conclusion that, following implementation of the control measures set out in Volume A4, Annex 5.2: Commitments Register, there will be no permanent impacts on the status of any river surface water bodies that are sufficient to result in deterioration in status of these water bodies. Furthermore, based on the information provided, we agree that the onshore aspects of the project will not prevent water body status objectives from being achieved in the future and therefore the onshore aspects of the project are considered to be compliant with the requirements of the WFD. Notable commitments that will help to ensure potential impacts on morphology are avoided, or mitigated, include:</p> <ul style="list-style-type: none"> • All Environment Agency Main Rivers, IDB maintained drains, main roads and railways will be crossed by HDD or other trenchless technology (Co1). • HDD entry and exit points will be located at least 20 m away from Environment Agency surface watercourses (Co18) and joint bays and link boxes will also be located a minimum of 20 m away from Environment Agency Main Rivers (Co170). 	<p>that the works will not cause any significant deterioration in water body status, prevent status objectives being achieved in the future, or reduce the effectiveness of any mitigation measures set out in the River Basin Management Plan.</p>
RR-010-L	<p>A6.2.1 Geomorphology Baselines Survey Report We have reviewed this document and believe that it accurately describes the baseline geomorphology and character of the relevant river surface water bodies. We agree with the conclusions drawn from the geomorphology baseline survey, as presented in A3.2 ES Volume A3 Chapter 2 Hydrology and Flood Risk, that in general the watercourses are typically characterised by low energy conditions, with depositional processes dominant. Based on this, the likelihood of channel change (particularly channel bed incision and/or lateral channel migration) resulting in interaction with the proposed infrastructure is limited.</p>	Noted.

RR-010-M	A6.3.5 Great Crested Newt Environmental DNA eDNA Survey report We believe that the mitigation proposed within the report will avoid any negative impacts on this European protected species.	Noted.
RR-010-N	A6.3.6 Water Vole Survey Report We have reviewed this report and are confident that the use of HDD in the majority of ditch crossings where water voles are present will prevent damage to both water voles and their habitat. 5.1.1.4: If an open cut method is used to cross ditch B39, mitigation must be employed and overseen by a qualified ecologist, as outlined in paragraph 3.3.5.4 of the Outline Ecological Management Plan. This would include a vegetation strip over the footprint of the working area and leaving the bare area for three to four days, which should persuade the water voles to relocate. Plywood boards should then be dug in at the tow of the watercourse and at the two sides of the working area. These works should be overseen on site by a qualified ecologist.	Noted. As stated in A6.3.6: Water Vole Survey Report (APP-105) , should open cut methodology be used to cross ditch B39, all displacement activities will be undertaken in accordance with the displacement methodology provided in Appendix 1 of the Water Vole Mitigation Handbook (Dean et al 2016) and will be subject to a Natural England Water Vole Mitigation Licence. All works subject to this licence will be undertaken under the supervision of the ecologist named on, or who holds the licence, such as the Ecological Clerk of Works (ECoW). This commitment is secured by Requirement 10 of the draft DCO.
RR-010-O	<p>Plans & Strategies F2.3 Outline Ecological Management Plan We have reviewed the Outline Ecological Management Plan and believe the mitigation proposed within it should address all of the potential risks. We would support the Ecological Clerk of Works (ECoW) establishing clearly marked and signed buffer zones around features such as hedges and trees. The report states that due to the period of time which will have lapsed between the pre-application surveys and the start of construction, there is a need to re-survey the features just prior to construction; the findings will then be included in the updated EMP. We would support this and ask that if there is a significant development in terms of protected species and the need for updated mitigation, we would like to be re-consulted.</p> <p>3.3.1.7: This paragraph states that “Where measures to help deter ground-nesting prior to the commencement of works have not been possible (as identified by the ECoW), any habitat identified as being suitable for nesting birds and which needs to be cleared within the breeding bird season will be visually inspected by the ECoW for active bird nests 24 to 48 hours before the commencement of any vegetation clearance works. Should an active nest or nests be noted, then further ecological advice with regards to</p>	<p>The Applicant confirms that any significant changes to baseline conditions following completion of the pre-construction onshore ecological surveys will be subject to further consultation with stakeholders (including statutory nature conservation bodies and the local authority). The updated baseline surveys are set out in F2.3: Outline Ecological Management Plan (APP-238). Where required, agreement will be sought by the Applicant on updated mitigation measures.</p> <p>The Applicant confirms that if an active bird nest is noted, a watching brief will be prepared and implemented by the appointed ECoW. The Applicant has updated F2.3: Outline Ecological Management Plan (APP-238) to include this detail as part of the submission at Deadline 1.,</p> <p>The Applicant notes the Environment Agency’s recommendation of using camera traps, followed by the use of sticks and double-sided tape for monitoring the activity of a badger sett. The methods used to monitor badger sett activity will be determined by the appointed ECoW (in accordance with any required licence) and on a site-by-site basis.</p>

	<p>required stand-off distances will be sought from the ECoW prior to works commencing." In such situations, the ECoW should undertake a watching brief while the work is actually taking place and can then stop works if nesting birds are discovered.</p> <p>3.3.3.4; This paragraph states that "A suite of pre-construction surveys will be undertaken of all areas within the Hornsea Four Order Limits. These surveys will be undertaken between October and November, for a period of 21 days during the breeding season and by a suitably qualified ecologist (Natural England 2009). These surveys will avoid the use of tightly packed straw due to potential implications of infringement of animal welfare, suitable alternatives to be considered for determining occupancy include the placement of sticks in and around the entrance, use of camera traps, double-side tape and/or damp sand." We consider that the most useful method would be the camera traps, followed by the use of sticks and double-sided tape.</p>	
RR-010-P	<p>F2.6 Outline Onshore Infrastructure [Drainage] Strategy We confirm that the indicative proposals set out in this chapter are satisfactory to us. This confirms that sustainable urban drainage systems will be utilised, where appropriate, and suitably designed to limit discharge rates (to greenfield rates) and provide adequate attenuation. As per this document, we would expect being consulted where any diverted drainage arrangements would result in direct interaction with watercourses classified as 'main rivers.' An attenuation feature is proposed in association with the permanent OnSS area, and discussed in section 7.4 of this document, whose exact position and design is to be confirmed. This should be designed to ensure it does not reduce flood storage available. This is covered by Requirement 15. We are supportive of the inclusion of this Requirement and the need for further details confirming its arrangement. We highlight that in many cases the detailed design comments relating to drainage design will come from the Lead Local Flood Authority, or the Internal Drainage Board where affecting a watercourse that they maintain.</p>	Noted

RR-010-Q	<p>F2.14 Outline Enhancement Strategy Table 1 Enhancement Commitments</p> <p>Co194: Where agreed with landowners, removed hedgerows and trees will be replaced with hedgerows of a more diverse and locally native species composition than that which was removed: Please ensure that these are of UK provenance and ideally local provenance. Co196: The design of the attenuation feature will incorporate an appropriate landscaping to create an area of biodiverse habitat, as outlined in the Outline Enhancement Strategy. Requirement 22 of the DCO requires an Enhancement Strategy to be produced. This should describe the attenuation feature in more detail. Co198: Proposed enhancement measures include ...wider biodiversity, hydrological and social enhancement measures across the onshore Order Limits. Requirement 22 of the DCO requires an Enhancement Strategy to be produced. This should describe the attenuation feature in more detail.</p> <p>Table 5: Proposed Natural Environment Enhancement Initiatives: Subject to land owner agreement, the applicant should investigate the potential to plant a double row of hedgerow shrubs and trees with 1.5 - 2m wide strip up the centre. These could then be allowed to overgrow and benefit a wide range of wildlife. Both the East Yorkshire Rivers Trust and RSPB are planting wet woodland in East Yorkshire. The rivers trust has been concentrating on the old Poplar plantations near Lowthorpe, while the RSPB is planting trees on the worked out sections of Broomfleet Tile Works. Both projects could benefit from financial support for additional planting, which would allow some more off-site enhancement for this project.</p>	<p>The Applicant confirms that the species to be planted as replacement for removed hedgerows and trees will be of either local or UK provenance (as outlined in Table 3 of F2.8: Outline Landscape Management Plan (APP-243)). The proposed landscaping (including the species schedules) will be developed further post-consent and presented within the updated Landscape Management Plan that will be submitted to discharge the draft DCO Requirement 8. This will include a requirement for planting contractors to consider the source and plant stock and prioritise local provenance where feasible subject to supply chain. The Applicant has updated F2.8: Outline Landscape Management Plan (APP-243) to include this detail as part of the submission at Deadline 1.</p> <p>The Applicant can confirm that further details regarding the design of the attenuation feature will be provided in respective details plans pre-construction (Landscape Management Plan, Biodiversity Net Gain Strategy, Enhancement Strategy (dependant on which aspects fit within each respective levels of the mitigation hierarchy), as required).</p> <p>The Applicant notes and thanks the Environment Agency for the recommendation regarding offsite biodiversity enhancement works.</p>
RR-010-R	<p>F2.16 Outline Net Gain Strategy The Outline Net Gain Strategy only appears to apply to part of the onshore red line boundary (i.e. the OnSS). However, the onshore red line boundary covers a much wider geographical area (including the landfall area and entire Onshore ECC). At present, the baseline Biodiversity Metric calculation only assesses the habitat value within the OnSS. It is not clear why the other habitats within the red line boundary, which include river and stream habitat has not been assessed, and is not being considered for net gain.</p>	<p>The Applicant acknowledges that through the Environment Act 2021, BNG is a mandatory requirement for new development, including Nationally Significant Infrastructure Projects (NSIPs). However, these provisions are not yet in force and the Applicant understands that BNG is unlikely to become mandatory until 2023 for Town and Country Planning Act applications and 2025 for NSIPs. In addition, it is not yet known whether the provisions will apply equally to the entire Order limits for NSIPs or whether some activities may be “excluded development” as referred to in Schedule 15 of the Environment Act 2021 (such as underground cables). The Applicant notes that Defra is currently consulting on how BNG will be applied to</p>

We strongly recommend that the Net Gain strategy includes all habitat within the entire red line boundary. We remind the applicant that Biodiversity Net Gain (BNG) is principally about enhancement (leaving a site in a better state than it was found), not mitigation, and so a lack of impact on a habitat shouldn't (and doesn't) omit the need for delivery of net gain within that habitat. Also note, that as well as accounting for area-based habitats, the Biodiversity Metric includes two distinct supplementary modules for linear habitats (A: Hedgerows and lines of trees & B: Rivers and streams). The Biodiversity Metric user guidance states that "it is an important rule of the metric that the biodiversity units calculated through the core habitat area-based metric and each of the linear units are unique and cannot be summed or converted. When reporting biodiversity gains or losses with the metric, the different biodiversity unit types must be reported separately and not summed to give an overall biodiversity unit value". Essentially, this means that net gains are required separately in each of the habitat units present. As a significant number of surface water bodies (including rivers, streams and ditches) run through the proposed development site, the BNG assessment should include the rivers and stream habitat element, and the development should deliver measurable net gain for river habitats. Ideally, this should be done on-site, through improvements to the water bodies within the site. However, where this is not deemed feasible, in line with the DEFRA Biodiversity Metric guidance, off-site enhancement of river habitat should be pursued. A good candidate for off-site delivery of biodiversity net gain would be the River Hull Headwaters.

Off-site enhancements could be designed to deliver, or compliment, measures outlined within the River Hull Headwaters SSSI restoration plan. The work is being delivered in partnership with the Yorkshire Wildlife Trust and East Yorkshire Rivers Trust.

The Outline Net Gain Strategy states that Hornsea Four is committed to reducing any net loss to biodiversity as a result of the onshore development of the OnSS. We believe this should be "committed to preventing any net

NSIPs with the consultation closing on 11 April 2022. The consultation covers a number of different aspects including exemptions, ensuring there is sufficient time to plan for BNG requirements (such as a two-year lead in time) and use of off-site mitigation. It is noted that the consultation expresses a preference for the delivery of gains within the existing project boundary or through purchase of market off-site gains without resorting to additional compulsory acquisition of land.

As presented in Paragraph 1.2.1.1 of **F2.16: Outline Net Gain Strategy (APP-251)**, the Applicant at this time has therefore proposed Biodiversity Net Gain (BNG) measures for the OnSS only. The Chartered Institute of Ecology and Environmental Management (CIEEM) defines Biodiversity Net Gain as development that leaves biodiversity in a better state than before. It is an approach where developers work with local governments, wildlife groups, landowners and other stakeholders to support their priorities for nature conservation (CIEEM 2016). The Applicant is committed to reducing any net loss to biodiversity and this is demonstrated through the production of the Outline Net Gain Strategy which fulfils the project's commitment Co199. Furthermore, the implementation of BNG opportunities at the OnSS will be secured through DCO Requirement 6.

As presented in Section 5.2 of the **F2.16: Outline Net Gain Strategy (APP-251)**, the BNG opportunities at the OnSS include:

- Ecologically diverse landscape planting;
- Creation of a water attenuation feature; and
- Hedgerow creation and planting.

Details of BNG measures at the OnSS site, such as the number of boxes (and associated materials) and design of the attenuation features, will be provided as part of the final Biodiversity Net Gain Strategy, which will be submitted to discharge Requirement 6 of the DCO.

	<p>loss” and, in fact, suggest that the aspiration of the Outline Net Gain Strategy is revised to commit a specific percentage net gain value (rather than stating a commitment to reduce net loss). As previously mentioned, both the East Yorkshire Rivers Trust and RSPB are currently planting areas of wet woodland in East Yorkshire. Both projects would benefit from financial support for additional planting, which would allow some more off-site BNG for this project.</p> <p>5.2.1.4: Retention of brash as deadwood, for the creation of hibernacula and inclusion of bird (i.e. barn owl) and bat (and other small mammal) boxes may be considered.</p> <p>We would like the applicant to confirm how many boxes will be installed and to please use woodcrete, as these have a far longer life than those made of timber.</p> <p>5.2.1.7: Ecological value may be further obtained through the creation of small pools around the margins of any attenuation basin. We would support the creation of these.</p>	<p>As set out in Table 5 of F2.14: Outline Enhancement Strategy (APP-249), the Applicant is intending to carry out a number of biodiversity enhancement measures (subject to landowner agreement) including:</p> <ul style="list-style-type: none"> • replacement hedgerows being of a more diverse and locally native composition; • ground flora planting; and • improvements to bat habitat. <p>As set out in the Statement of Reasons (APP-227), the Applicant has reached agreement with 77% of landowners and 92% of occupiers along the Onshore ECC (representing 95% and 93% of the length of the onshore export cable route respectively). These agreements include provisions relating to replacement planting.</p> <p>It is therefore anticipated that some of these enhancement activities along the Onshore ECC may contribute to a biodiversity net gain within the existing Order limits. However, it will not be possible to quantify the percentage of any net gain in accordance with the biodiversity metric until the detailed design stage as the pre-development biodiversity value of every affected hedgerow at the point of construction and exact amount of replacement hedgerow along the 39km Onshore ECC is not currently known.</p> <p>Whilst the Applicant may explore opportunities in the future for off-site enhancements and net gain, the Applicant does not consider it necessary or appropriate for any such off-site measures to be secured through the DCO.</p>
RR-010-S	<p>Additional Advice for the Applicant Pollution Control The applicant is reminded that any oil, fuel or chemical spill within the marine / intertidal environment is reported to the Marine Management Organisation (MMO), Marine Pollution Response Team. Within office hours: 0300 200 2024 Outside office hours: 07770 977 825 Defra duty room (if no response at previous numbers): 0345 0818486 MMO emergency fax number (not</p>	<p>Noted. F2.2: Outline Code of Construction Practice (APP-237) includes measures relevant to pollution control. Aspects relevant to works seawards of MHWS will be agreed with the local authority in consultation with the MMO. Details such as reporting mechanisms will be established with the MMO. In particular, the MMO will review the Emergency Response and Pollution Control Plan, as set out in Table 2 of the F2.2: Outline Code of Construction Practice (APP-237). Details of pollution prevention methods are set out in Appendix D: Outline Pollution Prevention Plan.</p>

manned 24 hours): 0191 3762682
dispersants@marinemanagement.org.uk.

Groundwater Pollution The Environmental Permitting (England & Wales) Regulations 2016 make it an offence to cause or knowingly permit a groundwater activity unless authorised by an Environmental Permit which we will issue. A groundwater activity includes any discharge that will result in the input of pollutants to groundwater. 'The Environment Agency's approach to groundwater protection', sets out our position for a wide range of activities and developments. Sub water table storage, underground storage & associated pipework: Underground storage of polluting substances poses particular risks to groundwater because of the problems of leak detection. It is advisable that a scheme to install any underground tanks, tank surround, associated pipework and monitoring system is designed in detail. Sub water table storage is more problematic than above ground or underground storage, as a leak is more likely to contravene EPR. Where risk assessment demonstrates a high risk of groundwater pollution, the Environment Agency will normally object to storage below the water table. A full detailed risk assessment should be conducted for any proposals that may include sub-water table storage, pipelines or fluid filled cables that transport pollutants.

Piling, other foundation designs and deep ground workings: Penetrative methods can result in risks to groundwater from, for example, pollution/turbidity, mobilising contamination, drilling through different aquifers or creating preferential pathways. Deep, and other foundation designs could physically disturb aquifers, lower groundwater levels, impede or intercept groundwater flow. Any proposed activities that present a hazard to groundwater resources, quality or abstractions must identify appropriate mitigation where a hydrogeological risk assessment identifies unacceptable risks.

The Applicant recognises that dewatering may be required during cable installation, and has committed to develop a Construction Drainage Scheme via Requirement 13 of the draft DCO (Co14 of [A4.5.2: Commitment Register \(APP-050\)](#)). This will ensure that existing land drainage is maintained during construction and will identify specific drainage measures for each area of land. The Applicant notes that discharge permits may be required for the discharge of water if volumes of greater than 20 m³ per day would be discharged, or if dewatering would take place for more than three consecutive months.

The Applicant notes the comment regarding the potential for abstraction licences and discharge permits and will obtain any required licences and permits for such activities.

Storage of Materials / Chemicals / Oil Materials and chemicals likely to cause pollution should be stored in appropriate containers and adhere to guidance for the storage of drums and intermediate bulk containers. Any facilities, above ground, for the storage of oils, fuels or chemicals shall be sited on impervious bases and surrounded by impervious bund walls. The volume of the bunded compound should be at least equivalent to the capacity of the tank plus 10%. All filling points, vents, gauges and sight glasses must be located within the bund. The drainage system of the bund shall be sealed with no discharge to any watercourse, land or underground strata. Associated pipework should be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets should be detailed to discharge downwards into the bund. Appropriate procedures, training and equipment should be provided for the site to adequately control and respond to any emergencies including the clean up of spillages, to prevent environmental pollution from the site operations. We advise that polluting materials and chemicals are stored in an area with sealed drainage. We recommend that all pesticide sale and supply/distribution stores meet the recommendations of the Code of Practice for suppliers of pesticides to agriculture, horticulture and forestry and where appropriate membership of the BASIS government recognised inspection scheme. Please contact our National Customer Call Centre (Tel: 03708 506 506) for further information and guidance. Additional information and guidance is available at: Oil storage regulations for businesses Ciria: Containment systems for the prevention of pollution Trade Effluent Effluent discharged from any premises carrying on a trade or industry and effluent generated by a commercial enterprise where the effluent is different to that which would arise from domestic activities in a normal home is described as trade effluent. If you are not able to discharge effluent it will be classed as waste and you must then comply with your duty of care responsibilities. If proposing to discharge to non-mains: If you wish to discharge effluent after appropriately treating it to groundwater or surface water please contact the Environment Agency (Tel: 03708 506 506) as a permit under the Environmental Permit Regulations will be required. If

proposing to discharge to mains: A trade effluent consent or a trade effluent agreement with your water and sewerage company must be obtained before you discharge trade effluent to a public foul sewer or a private sewer that connects to a public foul sewer. Further guidance is available at: Pollution prevention for businesses Waste The developer must apply the waste hierarchy as a priority order of prevention, re-use, recycling before considering other recovery or disposal options. Government guidance on the waste hierarchy in England can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf Observance of the waste hierarchy objectives and principles of the circular economy will depend upon the selection of the most sustainable option at every phase of a development project, from reduction through design and architecture, to the selection of the most efficient recovery process for the treatment and use of waste. Site Waste Management Plans (SWMP) are no longer a legal requirement. However, in terms of meeting the objectives of the waste hierarchy and your duty of care, they are a useful tool and considered to be best practice. Consideration should be given to the potential storage, treatment and disposal of any waste produced, including waste produced as a result of construction, drilling, boring, tunneling and excavations. The applicant is advised to contact YorkshireWaste@environment-agency.gov.uk regarding any reuse or disposal of waste, specifically onshore. The circular economy is a concept designed to keep materials in use as long as possible, thus promoting resource efficient practice and deriving economic benefits. Adherence to the waste hierarchy and adoption of best practice in relation to site waste management planning will help you deliver against circular economy objectives. Waste On Site The CL:AIRE Definition of Waste: Development Industry Code of Practice (version 2) provides operators with a framework for determining whether or not excavated material arising from site during remediation and/or land development works is waste or has ceased to be waste. Under the Code of Practice:

We recommend that developers should refer to:

- the position statement on the Definition of Waste: Development Industry Code of Practice
- the waste management page on Gov.uk. Waste Taken Off Site Contaminated soil that is (or must be) disposed of is waste. Therefore, its handling, transport, treatment and disposal are subject to waste management legislation, which includes:
- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Environmental Permitting (England and Wales) Regulations 2016
- The Waste (England and Wales) Regulations 2011. Developers should ensure that all contaminated materials are adequately characterised both chemically and physically in line with British Standard BS EN 14899:2005 'Characterization of Waste - Sampling of Waste Materials - Framework for the Preparation and Application of a Sampling Plan' and that the permitting status of any proposed treatment or disposal activity is clear. If in doubt, the Environment Agency should be contacted for advice at an early stage to avoid any delays. If the total quantity of hazardous waste material produced or taken off-site is 500kg or greater in any 12 month period, the developer will need to register with us as a hazardous waste producer. Refer to the hazardous waste pages on Gov.uk for more information.

Dewatering A1.4 Project Description mentions the onshore ECC in paragraphs 4.10.1.2 to 4.10.1.11. In Table 4.38: 'Maximum design parameters for onshore export cable installation' the trench depth appears to be somewhere between 1.2 and 1.5 metres and in Table 4.35: 'Maximum design parameters for joint bays' it states they will need to be constructed 2.5 metres deep. No mention is made of the requirement to dewater the cable trenches as they progress along the cable corridor. In addition, paragraph 2.1.1.5 F2.6 Outline Onshore Infrastructure Drainage Strategy states that "Drainage systems, however, will not be installed into areas

where they are not already present.” Please be aware that if water is encountered during the cable trench construction phase, an abstraction licences and discharge permits may be required: Dewatering is the removal/abstraction of water (predominantly, but not confined to, groundwater) in order to locally lower water levels near the excavation. This can allow operations to take place, such as mining, quarrying, building, engineering works or other operations, whether underground or on the surface. Dewatering activities on-site could have an impact upon local wells, water supplies and/or nearby watercourses and environmental interests. This activity was previously exempt from requiring an abstraction licence. Since 1 January 2018, most cases of new planned dewatering operations above 20 cubic metres a day will require a water abstraction licence from us prior to the commencement of dewatering activities at the site. If you intend to abstract more than 20 cubic metres of water per day from a surface water source e.g. a stream or from underground strata (via borehole or well) for any particular purpose then you will need an abstraction licence from the Environment Agency. There is no guarantee that a licence will be granted as this is dependent on available water resources and existing protected rights. More information on how to apply for an abstraction licence is available on Gov.uk. We trust this advice is useful.

- 4 **Annex 2 – Full response to Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013)**

Annex 2 – Full Response to Gordons LLP on behalf of Mr Paul Dransfield and Mrs Joanne Dransfield (RR-013)

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-013 summary</p>		<p><i>Summary of Applicant's Response to RR-013</i></p> <p>The Applicant has had due consideration of Mr and Mrs Dransfield's Relevant Representation, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Clarification of the full list of correspondence between the Applicant's solicitors and Mr and Mrs Dransfield's solicitors, including numerous letters and emails which sought to address concerns raised, in addition to a conference call between the parties in 22 September 2020; • Clarification of adequacy of consultation, including a timeline of events and the way the Applicant responded upon notification that Mr and Mrs Dransfield had not received notice of the statutory consultation carried out in 2019. This comprised sending a further notice in July 2020 to Mr and Mrs Dransfield pursuant to section 42 of the Planning Act 2008, to which Mr and Mrs Dransfield responded. The Applicant has had regard to that response in accordance with section 49 of the Planning Act 2008, in addition to the outcomes assessments and other representations received; • Rejection of the assertion that it was too late in the process for Mr and Mrs Dransfield to influence the design decision, noting that a change was made to the location of the junction on the A1079 to address concerns raised by Mr and Mrs Dransfield; the design of which was issued in draft to Mr and Mrs Dransfield's solicitors on 15 January 2021 inviting comments on the proposal, with a follow up reminder email sent on 19 February 2021; • Addressed comments regarding the 150 distance from the OnSS access road; • Acknowledgement the Relevant Representation as submitted differs from that sent in draft to the Applicant – noting that a number of point have been removed due to an early response by the Applicant;

		<ul style="list-style-type: none"> • Strong rejection of the assertion that Mr and Mrs Dransfield have been significantly prejudiced – at no point during the statutory consultation process were decisions made that were irreversible; • Confirmation that requested disclosures have been made; • Strong rejection of the suggestion that information contained in the DCO application is misleading or accurate; • Location of meeting minutes in the DCO application; • Details of the noise assessment undertaken (including methodology and mitigation) and buffer zone adequacy at the Birkhill ancient woodland; • Details of the A1079 access design amendments and relevant work undertaken to inform the process, including correspondence with ERYC; • Correction regarding the interpretation of traffic and transport numbers; and <p>Clarifications regarding the OnSS site selection process.</p>
RR-013	<p>Letter from Gordons LLP:</p> <p>We act for Mr Paul Dransfield and Mrs Joanne Dransfield. Our clients reside at the above address and wish to become an Interested Party to take part in the Examination of the above application for development consent which has been submitted to the Planning Inspectorate.</p> <p>This letter, the enclosed letter from Mr Beynon of Quod and addended documentation is our clients' Relevant Representation as an Interested Party.</p> <p>We have been in correspondence with the Applicant and their legal representatives, Pinsent Masons, over the past sixteen months regarding the Development. Our clients are extremely concerned about a number of issues surrounding the Application. The Applicant only began a consultation process with our client during the third round of targeted S42 consultation in August 2020.</p> <p>As a result of this late engagement and the Applicant's failure to include our client in the first two rounds of consultation, our clients are extremely concerned that, important and irreversible decisions have already been made without their voices having been heard. Due to our clients being excluded from</p>	<p>The Applicant refers to its response to representations made on behalf of Mr and Mrs Dransfield in the Consultation Report set out in pages 452 to 469 of B1.1.4 RP Volume B1 Annex 1.4 Applicant Regard to Section 42 Consultation Responses (APP-133). The Applicant also refers to the responses it provided to the Applicant's solicitors in November 2021 contained in Appendix 5 of the Relevant Representation.</p> <p>The Applicant notes that the relevant representation does not include or reference all of the correspondence between the Applicant's solicitors and Mr and Mrs Dransfield's solicitors. There have been numerous letters and emails sent on behalf of the Applicant including those dated 6 July 2020, 21 August 2020, 2 October 2020, 15 January 2021, 19 February 2021, 24 November 2021 and 9 December 2021 which sought to address Mr and Mrs Dransfield's concerns and provide the requested information. In addition, a conference call took place between the parties on 22 September 2020. The Applicant is not proposing to submit copies of this correspondence into the Examination, as the information is repeated in the Consultation Report and this response, but copies can be provided if it would assist the Examining Authority.</p> <p>The Applicant did not deliberately exclude Mr and Mrs Dransfield from the statutory consultation. As set out in Appendix 5 to the Relevant Representation, the Applicant became aware in June 2020 that Mr and Mrs Dransfield had not received a notice of the</p>

consultation in this way, they were unable to influence decisions that have now been made without the Applicant having proper (if any) regard to our clients' representations.

To summarise our client's other primary concerns:

1. The Applicant has failed to engage with our clients, and/or provide them with the necessary information to allow them to do so;
2. The Applicant's noise assessment is inadequate to consider the true impact on the Property; and,
3. The "timeline of correspondence" the Applicant relies on is misleading and inaccurate — it asserts that the Applicant has sent documents to our clients, which they never received, and attended site visits when our clients were not in the country.

During our correspondence with the Applicant and Pinsent Masons, we raised these serious issues. Our client reasonably requested the disclosure of certain documents to enable them to produce a Relevant Representation. The Applicant has still not adequately responded to our multiple disclosure requests or produced a substantive response to our letters.

Our clients believe that the Applicant has not carried out the sufficient consultation and subsequently avoided meaningful (or indeed any) reconsideration of the development plans in light of our clients' concerns.

Given this list of failings, and grave concern about the Applicant's approach to its statutory duty to consult, our clients instructed Quod, a planning consultant to prepare, their Relevant Representation as an Interested Party.

We would highlight the points made in Quod's draft letter relating to the Engagement to Date (page 2 of Quod's letter). The Applicant still has not disclosed any evidence that our client was consulted before the third round of targeted S42 consultation in August 2020. The documents provided in the Applicant's 2 October 2020 and 24 November 2021 disclosures were not a sufficient response to our clients reasonable requests for disclosure. Specifically the disclosure does not evidence that our clients were not in

statutory consultation carried out in 2019 in accordance with section 42 of the Planning Act 2008. In response, the Applicant sent a further notice in July 2020 and consulted with Mr and Mrs Dransfield pursuant to section 42 of the Planning Act 2008. Mr and Mrs Dransfield submitted a response to that consultation notice. The Applicant has had regard to that response in accordance with section 49 of the Planning Act 2008 (as set out in the Consultation Report). However, as previously communicated to Mr and Mrs Dransfield, the Applicant also had to have regard to the outcomes of its own assessment and other representations received from ERYC, parish councils and residents of Cottingham regarding the location of access road to the OnSS. Taking into account all of these factors, the Applicant considered that it was preferable for the construction and operational access to the OnSS to be from the A1079.

The Applicant rejects the assertion that it was too late in the process for Mr and Mrs Dransfield to influence design decisions. In fact, a change was made to the location of the junction on the A1079 to address the concerns raised by Mr and Mrs Dransfield regarding the potential interaction between the access road to the OnSS and the new access to Jillywood Farm as a result of the A164 Jock's Lodge Improvement Scheme. The Applicant's solicitors provided Mr and Mrs Dransfield's solicitors with details of the updated junction design on 15 January 2021 and invited comments on the proposal. A reminder was sent by email to Mr and Mrs Dransfield's solicitors on 19 February 2021. The Applicant considered a direct request for comments to be appropriate and proportionate for this type of change and in light of the ongoing discussions between the parties. The Applicant notes that no comments were received.

The Applicant has provided Mr and Mrs Dransfield's solicitors with the requested documents.

	<p>receipt of any correspondence relating to the first and second rounds of consultation at all. It wasn't until one of our clients, Mr Dransfield, informed Dalcour Maclaren on 10 June 2020 that he had not received the section 42 notifications dated 8 August 2019, that some limited correspondence to our client was initiated. It is deeply concerning that the Applicant not only failed to notify our clients of the development prior to that date, but also that it was only our clients' actions that prompted any notification at all.</p> <p>We would also emphasise the point made in Quod's draft letter that the proposed relocation of the substation access road (bullet point 1 on page 6 of Quod's letter) has not been subject to a consultation process pursuant to s42 of the Planning Act 2008 despite similar modifications being subject to targeted consultations in July 2021. Our clients consider this to be a significant failing. We enclose a further copy of our letter of 22 January 2021, as this sets out our clients' concerns in more detail (we do not see the need to repeat them in full in this letter).</p> <p>Due to the Applicant's approach to the application for development consent, the serious procedural failings, including principally the failure to consult, our clients have had no option but to produce a comprehensive Relevant Representation which accurately reflects the events over the last 2 years.</p> <p>Our clients hope that the Planning Inspectorate understands the seriousness of this position and addresses their concerns urgently. Our clients believe that the only way they can be properly consulted is for a full consultation to be run together with a real willingness on the part of the Applicant to take representations into account and to alter its proposals accordingly.</p>	
<p>RR-0130- APDX:A-A</p>	<p>Letter from Quod:</p> <p>Relevant Background</p> <p>Jillywood Farm is currently accessed from the west via a junction with the A164 that provides both ingress and egress. These arrangements are subject</p>	<p>The Applicant agrees with this summary of the factual situation.</p> <p>It is noted that the OnSS access road is located more than 150m from the habitable buildings at Jillywood Farm. A plan detailing this distance was provided to Mr and Mrs Dransfield's solicitors on 2 October 2020.</p>

	<p>to change under a recent planning permission granted by East Riding of Yorkshire Council (ERoYC) for highways improvements to both the A1079 and A164 (ref. 20/01073/STPL). This would amend the existing access route from the A164 to egress only, with a new access created from an existing layby on the A1079 to the north.</p> <p>As part of the DCO, access to the onshore substation is proposed via a new route that extends south/south-east from the above-mentioned layby on the A1079 via a new left-in, left-out junction. This access road would route around Jillywood Farm and at its closet be just c. 100m east of the property boundary.</p> <p>As originally proposed, the substation access road from the lay-by required it to cross the new access road to Jillywood Farm that is consented by the above planning consent. Orsted have since notified my client on 15 January 2021 that the substation access road will be marginally relocated south-east, avoiding the need to cross this access (see plan at Appendix 2).</p> <p>On 24 November 2021, after much chasing and correspondence going back more than a year. Orsted's solicitors provided a document called "HOW04 – Response to comments on behalf of Mr and Mrs Dransfield" (Appendix 5 – referred to as HOW04). This document purports to address some of the points raised in this objection but in our view fails to do so.</p>	<p>The location of the proposed access road to the OnSS included in the DCO Application is as notified on 15 January 2021. The location of the access point was marginally amended to directly account for consultation feedback issued to the Applicant by Mr Dransfield and Mrs Dransfield. As set out above, an updated draft design was issued for review and comment.</p> <p>As shown in Appendix 5 of the Relevant Representation, the Applicant took time to respond to each of the points raised in the draft Relevant Representation provided in advance by Mr and Mrs Dransfield's solicitors. It is noted that a number of points have been amended or removed as a result of the Applicant's response, demonstrating that certain points were satisfactorily addressed. The Applicant maintains its position that it has adequately responded to the points raised on behalf of Mr and Mrs Dransfield.</p>
RR-0130-APDX:A-B	<p>Engagement To Date</p> <p>As part of the pre-application engagement, Orsted undertook four rounds of public consultation pursuant to Section 42 of the Planning Act 2008 as follows: (i) formal consultation between August and September 2019; (ii) targeted consultation in March 2020; (iii) further targeted consultation in August 2020; and (iv) a final targeted consultation in July 2021.</p> <p>Despite being an interested and affected party, and therefore subject to a statutory duty on the promoters to be consulted as part of the DCO process,</p>	<p>It is noted that the Applicant has identified Mr and Mrs Dransfield as potential Category 3 interests due to the proximity of Jillywood Farm to the Order limits. The Applicant is not seeking to acquire any land or interests belonging to Mr and Mrs Dransfield. The Applicant has entered into a voluntary agreement with the owner of the land where the access road to the OnSS is to be located. The decision to include Mr and Mrs Dransfield as potential Category 3 interests was taken on a precautionary basis. With the mitigation measures identified in the ES and secured by the DCO in place, the Applicant does not consider it likely that Mr and Mrs Dransfield will have grounds to make a relevant claim. (as defined in section 44 of the Planning Act 2008).</p>

my client was only formally consulted and made aware of the proposals through the third round of consultation, i.e. the targeted S42 consultation in August 2020. Objections were submitted to this later consultation by Quod and Gordons on behalf of my client (enclosed at Appendix 3 to this letter).

It should be noted that it was not until my client informed Dalcour Maclaren on 10 June 2020 (and the subsequent correspondence from my client's solicitors) that correspondence was initiated. It was, therefore, only as a result of my client's actions that they were subject to any consultation at all. My client was also notified of the subsequent and final (fourth) targeted consultation process although did not submit representations as it was of no relevance to their interests.

Importantly, however, no notification was given to my client of the first two stages of the consultation process. In HOW04, Orsted accept that it "does not have any evidence that the section 42 notifications were received". Orsted states that notifications were sent by first class post, but my client is certain that they were not received, and no evidence has been provided to demonstrate that the notifications were sent as Orsted claimed. Orsted's solicitors have provided some images to demonstrate that the notifications were sent as Orsted claimed. Orsted's solicitors have provided some images showing alleged mailing lists in the form of excel spreadsheets, which include my client's names; however, Orsted are seeking to rely on these images as definitive evidence that letters were sent to my client, which is contrary to my client's understanding.

These images are not sufficient evidence as they do not show; (1) when the names were added; (2) when the spreadsheet was created; or (3) if the spreadsheet was actually used.

My clients therefore did not have the opportunity to comment on any aspects of the DCO at this stage, meaning that the proposals had become defined by the time my client was formally notified. These procedural failings are set out

As set out in Appendix 5, Mr Dransfield and Mrs Dransfield were included in the mailing list for consultees pursuant to section 44(4) of the Planning Act 2008 and should have received notification of the statutory consultation between August and September 2019 pursuant to section 42 of the Planning Act 2008 (as shown on the extract from the mailing list sent to Mr and Mrs Dransfield's solicitors). There is no statutory requirement for section 42 notifications to be sent by registered or recorded post. The section 42 notifications were sent by first class post and therefore the Applicant does not have any evidence that the section 42 notifications were received.

In addition, Mr Dransfield and Mrs Dransfield were on the community mailing list (as shown on extracts from the mailing list sent to Mr and Mrs Dransfield's solicitors). The community letters and newsletters were not sent by registered or recorded post and therefore the Applicant does not have any evidence that these communications were received.

The Applicant provided the screen shots of the mailing lists in response to a direct request for such documents from Mr and Mrs Dransfield's solicitors.

We note that Mr Dransfield did receive a copy of the Intrusive Survey Licence sent on 15 February 2019 as he sent an email regarding the terms of the licence to the Applicant's land agents, Dalcour Maclaren, on 19 February 2019. Mr Dransfield also received a copy of the Non Intrusive Survey Licence sent on 24 May 2019 as he sent an email regarding the terms of the licence to Dalcour Maclaren on 3 June 2019. It is therefore not correct to state that correspondence relating to Hornsea Four was first initiated in June 2020.

In May 2020, the Applicant sent out a Community Newsletter informing the local community of the Applicant's decision to make the access road to the OnSS from the A1079 permanent, removing the temporary construction access to the OnSS from the south. In addition, the newsletter confirmed that the location of the access road would be moved to west (closer to Jillywood Farm). The Applicant understands that Mr Dransfield did not receive a copy of this newsletter.

in correspondence from my client's solicitors, Gordons LLP, which have been provided at the same time as this letter and should be treated. That correspondence from Gordons LLP forms part of my client's objection and is supplemental to this letter.

Following the submission of representations to the targeted consultation (Appendix 3), my client and their advisors met with representatives of Orsted. Further information was subsequently requested from Orsted by Gordons LLP, although as explained below not all this information has been provided and many of our objections remain unresolved. Gordons LLP received a letter on 02 October 2020 which included a limited number of the requested documents. This disclosure mainly consisted of links to generic newsletters and leaflets on the Hornsea Project Four website. Our client was not provided with any of the requested documents which specifically related to their individual concerns. As such, we do not consider this to be adequate disclosure. This remains the case notwithstanding that a preliminary draft of this objection was provided to Orsted and its lawyers on 15 October, but that only prompted some minimal disclosure on 24 November.

There have been serious procedural failings in this consultation process. Most importantly, there was a complete failure to consult with my client until after the first two consultation stages had closed and important decisions about the development (such as the location of the permanent access to the substation) had already been decided.

The example of the access location is an important one, as that decision was taken after feedback from local residents about the location of the originally proposed permanent access to the south. If my client had been able to voice its own concerns as part of that process, alternatives, such as access from the west along the cabling route, might have been considered. What actually happened was that a decision was taken to route the access in the currently proposed location without any input from my client and then my client was

The Applicant understands that Mr Dransfield spoke to Andrew Acum (the community liaison officer listed on the community newsletter) and Dalcour Maclaren and sent an email with a number of queries on 20 May 2020.

The Applicant's land agent responded to these queries in a letter dated 4 June 2020.

On 10 June 2020 Mr Dransfield informed Dalcour Maclaren that he had not received the section 42 notifications dated 8 August 2019.

On 31 July 2020, in conjunction with a further round of Targeted Consultation, Mr Dransfield and Mrs Dransfield were sent the section 42 notifications by recorded delivery providing them with an opportunity to comment on the whole Project (in addition to the matters that were subject of the Targeted Consultation).

A response to the consultation was submitted on behalf of Mr Dransfield and Mrs Dransfield. The Applicant has had regard to the comments made in accordance with section 49 of the Planning Act 2008. Details of how the Applicant has had regard and responds to the comments are set out in pages 452 to 469 of **B1.1.4: Applicant Regard to Section 42 Consultation Responses (APP-133)**. It is considered that the responses provided are comprehensive and robust and include a design change to the OnSS access as a result of Mr and Mrs Dransfield's response to the statutory consultation.

Paragraph 51 of the Guidance Note "Planning Act 2008: guidance on the pre-application process for major infrastructure projects" acknowledges that interests may emerge after an applicant has concluded statutory consultation. In such a situation, the applicant should provide a proportionate opportunity to the person to make their views known on the application. The Applicant considers that it has given Mr Dransfield and Mrs Dransfield a proportionate opportunity to make their views known.

The Applicant has also had sufficient time (over 12 months) to have proper regard to representations made on behalf of Mr and Mrs Dransfield prior to submission of the DCO. Mr and Mrs Dransfield's representations were considered in the context of the outcome of the site selection process, environmental impact assessment and other representations

	<p>belatedly (after legal correspondence_ invited to comment and give representations about a decision Orsted had already taken.</p> <p>My client has been significantly prejudiced in having to provide its observations after the relevant decisions had already been taken. This has made it very difficult for my client's representations to be taken into account or given proper regard. Following my client's representations (Appendix 3), Orsted made very modest modifications only to the substation entrance to avoid conflict with the emerging Jocks Lodge scheme; however, the fundamental principles underpinning the specific location and route of the substation access were already established by the time my client was afforded the opportunity to engage.</p> <p>Unfortunately, it is still difficult to see how my client's representations have been taken in to account or given proper regard. HOW04 states: <i>"Details of how the Applicant has had regard to the comments are set out in pages 452 to 469 of B1.1.4 RP Volume B1 Annex 1.4 Applicant Regard to Section 42 Consultation Responses"</i>. Examination of these pages does not reveal <i>"how the Applicant has had regard to the comments."</i> Instead there is a defensive explanation of how each decision has been taken. This serves to demonstrate that the relevant decisions had already been taken and my client did not have the ability to engage with the process. When consultation was attempted, it was too late and all that ensued was a description of how the relevant decisions were made. It was not possible for the Applicant to have regard for my client's representations without being prepared to reconsider existing decisions and the document referred to demonstrates that no such reconsideration took place. The decisions had already been taken.</p>	<p>received from the local highway authority, parish councils, landowners and other local residents. Having regard to all of the information available, the Applicant concluded that it would not change the design of the OnSS access from the A1079 to the A164.</p> <p>The Applicant strongly rejects the assertion that Mr and Mrs Dransfield have been significantly prejudiced. At no point during the statutory consultation process were irreversible decisions made related to site selection or design. Each phase of consultation provided opportunity for changes to be made and decisions to be altered and this is demonstrated by project changes being made after this point in time. On receipt of Mr and Mrs Dransfield's comments, the Applicant had regard to those comments by internally reviewing the decisions it had made regarding the OnSS location and access approach to establish whether those decisions remained valid in light of the new information. As mentioned above, the Applicant concluded that the comments received from Mr and Mrs Dransfield did not outweigh other considerations and as a result a change to the location of the OnSS or access approach was not considered necessary. The Applicant does not agree with the suggestion that there may have been a different outcome regarding the OnSS location or access approach if consultation responses had been made earlier.</p> <p>In respect of the requested disclosure, the Applicant maintains its position that it has provided the requested information. The Applicant notes that Mr and Mrs Dransfield's professional advisers continue to request copies of documents that the Applicant has either already provided or confirmed do not exist (for example, the Applicant has provided a copy of the minutes of a meeting with Natural England on 1 April 2020 regarding the 15m buffer with Birkhill Wood but has confirmed several times that there is no further correspondence with Natural England on this point).</p>
RR-0130-APDX:A-C	<p>Objections to the DCO Consultation</p>	<p>See comments provided by the Applicant for a similar comment entitled 'Engagement to date', reference RR-0130-APDX:A-B.</p>

	My client has not been adequately consulted upon in accordance with statutory requirements and was excluded from the first two rounds of consultation during the preapplication stage.	
RR-0130-APDX:A-D	<p>Orsted suggest that my client was consulted during these initial consultation rounds and have provided a consultation form allegedly filled in by my client as evidence of this. This is addressed further in the enclosed correspondence from Gordons LLP, but in summary my client has no knowledge of this consultation taking place and can prove that they were not in the United Kingdom on the date that Orsted allege that their input was provided. In HOW04, however, Orsted now tells a different story. First, they say: <i>"The Applicant has never suggested that Mr Dransfield signed a consultation document."</i> This is misleading. The Applicant's agent said in a letter dated 4 June 2020 addressed to my client (Appendix 6): <i>"I understand you filled in a Land Interest Questionnaire on 24 July 2019"</i>. On 10 June 2020 the Applicant's agent provided a copy of this form, filled out by hand, as evidence to support this untrue suggestion that my client "filled in a Land Interest Questionnaire on 24 July 2019" (Appendix 7). Since my client demonstrated that he was out of the country at the time the Land Interest Questionnaire was allegedly filled in, Orsted's position changed to the one now outlined in HOW04. This position simply is not credible and is entirely reactive to the discovery on Orsted's part that there may have been some dishonesty on the part of its agents who were carrying out the consultation on its behalf. This suggests that (1) the Applicant's account of its consultation process cannot be relied upon; and (2) the Applicant's record keeping, which is essential to accurate and effective consultation is likely to be wholly defective. My client feels very strongly that this is something the Inspectorate should investigate in greater detail, not only concerning my client's position but also the veracity of the consultation process as a whole.</p>	<p>The Applicant has not suggested that Mr Dransfield signed a consultation document. The Applicant's land agent visited Jillywood Farm on 24 July 2019 to complete the Land Interest Questionnaire (LIQ). During the site visit the LIQ was updated to confirm that the land was residential.</p> <p>A copy of the unsigned Land Interest Questionnaire (LIQ) referred to in a letter from the Applicant's solicitors, Pinsent Masons LLP, dated 6 July 2020 was sent to Gordons LLP by email on 3 August 2020.</p> <p>The person who undertook the site visit no longer works at Dalcour Maclaren so the Applicant was unable to clarify the matter internally. It had incorrectly been assumed that Mr Dransfield or Mrs Dransfield had been present at the site visit but the Applicant now knows that not to be the case and has accepted this error. However, the Applicant strongly rejects any suggestion of dishonesty or wider defective record keeping and requests that Mr and Mrs Dransfield's representatives withdraw these allegations.</p>
RR-0130-APDX:A-E	In relation to the access road, it is our client's position that due to the lack of adequate consultation, the Applicant has not sufficiently evaluated alternative options.	<p>The Applicant strongly rejects the suggestion that information contained in the DCO application is misleading or inaccurate.</p> <p>The Applicant considers that the DCO Application was prepared properly and that consultation was not only carried out adequately, but indeed played a key role in the pre-</p>

	<ul style="list-style-type: none"> • In volume A1, Chapter 3: Site Selection and Consideration of Alternatives, Paragraph 3.5.1.2 the Applicant states “The applicant has developed a ‘Commit. Consult, Design’ ethos as part of the approach to proportionate EIA with commitments integrated into this project design via consultation.” • Additionally at 3.5.1.3 it is stated that the Applicant “has had material consideration for all feedback received, resulting in changes being made to route planning and site selection of Hornsea Four...” • Finally at 3.5.1.4 where the Applicant states that “in addition to designing a technically feasible project, the Applicant further aims to avoid or reduce impacts by assimilating information received from landowners, occupiers and statutory consultees, while committing to avoid the most sensitive, important and valuable features early in the project design.” • The above statements are misleading. As we have stated already, the Applicant only began a consultation process with our client after Mr Dransfield initiated contact on 10 June 2020. This is more than a year after the decision was made regarding the reduction of search to one onshore substation site. According to the Applicant’s ‘Site Selection Timeline’, this decision was made in Q1 2019 (Volume A1, Chapter 3: Site Selection and Consideration of Alternatives, Page 19 figure A1.3 Version B). <p>In light of these facts it is inaccurate to claim that consultation has been a key part of this DCO application process. Our client has not been adequately consulted, and in any case was only consulted long after the decision regarding the site location had been made. Our client had no input into the Applicant’s evaluation of alternatives options, and therefore their interests have not been taken into account during the relevant periods of statutory consultation.</p>	<p>application process. The significant consultation undertaken across the entire project footprint has enabled amendments to the project Order Limits, additional and amended commitments and input on design at the OnSS. The Applicant has received positive feedback during consultation events, including the final OnSS Parish Council Webinar, held on 23 June 2021, at which the comprehensiveness and quality of consultation was specifically commented upon by attendees (brief minutes are provided in B1.1.33: Stakeholder Working Group Meetings Letters of Comfort and Letters of No Objection (APP-162)).</p>
RR-0130-APDX:A-F	Disclosure	Further to a meeting between the parties on 22 September 2020 and a subsequent email from Gordons LLP on 23 September 2020, some additional data and documents were provided in a letter from Pinsent Masons LLP to Gordons LLP dated 2 October 2020.

Despite requesting further information from Orsted, the following has not been provided:

- Copies of all consultation responses and engagement between Orsted and EROYC regarding the access road, relationship with the consented works under 20/01073/STPL and evaluation of alternative options.
- A noise assessment of the impacts within the Jillywood Farm demise itself. The specific noise implications arising from both the construction and operational phases upon my client's land are therefore unknown and unproven.
- Correspondence between Orsted and Natural England regarding the ecological impacts of the proposals, which was referenced by Orsted in their discussions with my client.
 - As mentioned above, the disclosure Gordons LLP received on 02 October 2020 included a link to a report on the general Hornsea Project Four website: Preliminary Environmental Information Report (PEIR) Volume 3, Chapter 3: Ecology and Nature Conservation. This was not the correspondence our client requested but a generic report about the project as a whole.
 - We have not had sight of any correspondence between the Applicant and Natural England. We have only been provided with one set of restricted minutes of a meeting "Hornsea Four Evidence Plan: Onshore Ecology Technical Panel Meeting 6 – dated 01 April 2020". We do not consider this sufficient disclosure, or that it has met our reasonable request for the correspondence between Orsted and Natural England regarding the ecological impacts of the proposals.
- Further evidence that consultation documents were provided to my client for the first two rounds of consultation. In the absence of any further evidence beyond that references in HOW4, it appears that no additional evidence exists. The above has noted flaws in the Applicant's record keeping during the consultation process, and it is impossible to know definitively whether it has met (or even come close to) the statutory requirements as a consequence.

In response to a letter from Gordons LLP dated 22 January 2021, copies of minutes of meetings with ERYC that informed the selection and location of the access road were provided by Pinsent Masons LLP to Gordons LLP on 19 February 2021. No response was received in respect of this information until 15 October 2021. The minutes related to meetings with ERYC on:

- 21 November 2018;
- 7 January 2019;
- 1 May 2019;
- 2 October 2019; and
- 29 April 2020.

Further details of the consultation process can be found in [B1.1: Consultation Report \(APP-129\)](#) which accompanies the DCO Application.

All of the meeting minutes with ERYC that took place under the evidence plan process can be found in Appendix C of Annex 1 of the Consultation Report ([APP-130](#)).

All the meeting minutes in relation to the Onshore Substation Consultation Group (OSCG), alongside meetings from minutes with parish councils and working groups can be found in Annex 1.33 of the Consultation Report ([APP-162](#)).

In addition, the Applicant attended a number of other meetings with ERYC on various topics relating to Hornsea Four. A full list of these meetings can be found in Section 2 of the Statement of Common Ground with ERYC ([APP-255](#)). However, the Applicant provided the minutes of the meetings that related to access to the OnSS on 19 February 2021.

[A3.8: Noise and Vibration \(APP-032\)](#) outlines the assessment of noise, inclusive of impacts within the Jillywood Farm demise.

Minutes of the meeting with Natural England where details of the woodland buffer were discussed and agreed were also provided on 19 February 2021. No response was received in respect of this information until 15 October 2021. The Applicant does not recall referring

		<p>to any other correspondence with Natural England on the buffer at the meeting on 22 September 2020. The Applicant referred to a guidance note, the details of which were set out in the letter dated 2 October 2020. The Applicant can confirm that there is no further correspondence with Natural England on the buffer. In light of the comments received by Mr and Mrs Dransfield, agreement with Natural England on this matter has been documented at G3.5 – 4.1.3 in F3.5: SoCG between Hornsea Project Four and Natural England (APP-258).</p> <p>As stated above, the Applicant does not have any evidence that the section 42 notifications were received by Mr and Mrs Dransfield in August 2019 as the notices were sent by first class post.</p>
<p>RR-0130- APDX:A-G</p>	<p>Relocation of Access Road</p> <p>The proposed relocation of the substation access road (Appendix 2) has not been subject to a statutory targeted consultation process pursuant to S42 of the Planning Act 2008. This is despite similar modifications to the A164 being subject to a targeted S42 consultation in July 2021. In HOW04 the Applicant accepts that this proposed relocation has not been subject to a statutory targeted consultation process. The explanation provided appears to be that my client is not significant to merit proper consultation, but that is not my understanding of the statutory framework – a formal consultation was necessary. This further demonstrates a failure of the Applicant to properly comply with their statutory consultation requirements.</p>	<p>It is acknowledged that the Applicant amended the location of the OnSS access road from the A1079 in direct response to concerns raised on behalf of Mr Dransfield and Mrs Dransfield, due to the interaction with the A164 Jocks Lodge works and new access to Jillywood Farm. Whilst designs were available to retain the existing access location, work was undertaken to move the access road to the south-east to address these concerns. The updated design was sent to Gordons LLP on 15 January 2021, providing an opportunity for Mr Dransfield and Mrs Dransfield to comment on the design. A reminder was sent by email to Gordons LLP on 19 February 2021. It is noted that no comments were received. Consultation on the A1079 access road change was focussed on three affected parties, ERYC, the landowner and Mr Dransfield and Mrs Dransfield. Due to the nature of the change, no other stakeholders would be materially affected by the change. The Applicant is not clear what is meant by “proper consultation” in the Relevant Representation as Mr and Mrs Dransfield were sent the information and asked to comment on it. However, the Applicant considers that it has complied with the requirements set out in the Planning Act 2008 and associated guidance.</p> <p>The A164 access change was subject to a formal section 42 consultation as it constituted a larger change (in comparison to the A1079 change) and had the potential to impact more individuals and stakeholders that were unknown without a wider consultation distribution, such as users of the proposed cycle way and non-agricultural user track.</p>

RR-0130-APDX:A-H	<p>It is not apparent, therefore, whether the relocated substation access road (Appendix 2) is technically appropriate, given that this moves the substation access closer to the lay-by entry from the A1079. Whilst a Stage 1 Road Safety Audit (RSA) was provided by Orsted (Appendix 4) in addition, the RSA makes no reference to breaking distances required to enter the access road, nor does it consider the implications of parked vehicles upon the ability to enter safely (other than stating that swept path analysis should be undertaken – Quod are not aware that this has been completed). It also does not consider the impact of vehicles simultaneously using this layby to access the substation and Jillywood Farm. HOW4 suggests this information will be confirmed by a subsequent Stage 2 RSA, although the potential impacts are at best unproven at the current time.</p> <p>In Volume A1, Chapter 3: Site Selection and Consideration of Alternatives, Paragraph 3.10.2 Post Scoping to PEIR Search Refinement Area, various consultation events are mentioned. The stated intention of these events was to allow “residents and landowners to comment on the proposed boundary. Their responses allowed for greater refinement of the location of the OnSS post-scoping.” The dates for these instances of consultation are: October 2018, 12 March 2019, and 21 May 2019. Again this was before our client initiated correspondence with the Applicant on 10 June 2020 during the Section 42 consultation stage. Thus our client’s interests were not given adequate consideration in the earlier stages of ONSS Refinement, site selection and consideration of alternatives. In 2020 these decisions had already been made without any input from our client.</p>	<p>The layby revision and entry lane has been designed to National Highways standards, Design Manual for Roads and Bridges (DMRB), CD169 The design of lay-bys, maintenance hard standings, rest areas, service areas and observation platforms (March 2021)) – for a design speed of 120Kph. The designs for the amendment of the A1079 layby and OnSS access have been shared and agreed with ERYC (Statement of Common Ground, Reference G3.1:9.2 (APP-255)), as well as being subject to an independent Stage 1 Road Safety Audit (RSA).</p> <p>The RSA Team has identified all ‘problems’ [the term problem is used in road safety audits to identify aspects of a scheme that could give rise to collisions] associated with the design and breaking distance was not identified.</p> <p>Appropriate parking controls will be developed during the detailed design stage in consultation with the extent of any controls informed by swept path analysis. The detailed design and supporting swept path analysis would form part of a package of drawings to be agreed with the East Riding of Yorkshire Council (ERYC) through the finalisation of the CTMP. The detailed design package would be subject to an independent Stage 2 Road Safety Audit. This commitment to producing a final CTMP is supported by inclusion of Requirement 18 of the draft DCO (C.1.1: Draft DCO including draft Deemed Marine Licence (DML) (APP-203)).</p> <p>See comments provided by the Applicant above for a similar comment entitled ‘Engagement to date’, reference RR-0130-APDX:A-B.</p>
RR-0130-APDX:A-I	<p>Several technical aspects of Quod’s previous objections (Appendix 3) remain unproven, including:</p> <ul style="list-style-type: none"> • There is a lack of consideration of the ‘dual use’ of the A1079 lay-by to support both Jillywood Farm and the substation during the construction (in particular, as traffic will be considerably higher) and operational periods. • The consented highways works pursuant to 20/01073/STPL, particularly on the A1079, have not informed the technical appraisal of 	<p>The Applicant has worked closely with ERYC to develop a design that can accommodate both the proposed new access to Jillywood Farm and the proposed access to Hornsea Four. Various access and route options were considered previously for the OnSS access road prior to stakeholder consultation; however, ERYC has stated a clear preference for an access off the A1079, rather than the A164. Relevant meeting minutes were provided previously summarising the conversations held. Agreement on the location and design of the access road can be found in F3.1: Statement of Common Ground between Hornsea Project Four and East Riding of Yorkshire Council (APP-255), notably agreement numbers G3.1:1.7 and</p>

access options. This means an unproven requirement for a substation access in this location, and a substation location that is not founded on sound evidence.

- There is a lack of analysis of the vehicular movements during construction and operation and particularly the associated amenity impacts upon Jillywood Farm, given the proximity of the access road to my client's property. By way of example, the number of anticipated vehicle movements during construction equates to 1.3 oneway movements every two minutes within c. 100m of my client's demise (assuming a construction period of 8am to 6pm).
- No assessment appears to have been carried out to determine if the proposed access could be delivered from the A164 alongside the construction of the cabling route, to limit the impact to a single area.
- Orsted's assumption that access from the A1079 is "mandatory" is therefore unfounded and must be substantiated further with regard to reasonable alternatives.
- Despite our previous requests, there has been no assessment of the potential noise impacts directly upon the Jillywood Farm demise, only those extrapolated from the surrounding area. Indeed, Jillywood Farm is only mentioned once in this context at paragraph 8.11.1.16 of A3.8: Noise and Vibration. Our client is of the opinion that their single and brief mention within a 76-page technical report, is a direct a direct response to their robust objection. Our client is extremely concerned that other potentially interested parties' views have not been considered, particularly if these parties were unable to make similarly vigorous objections. As such, our client believes these parties' views have likely not been given any consideration at all, not even limited consideration our client received from the Applicant.
- As mentioned previously we have received extremely limited disclosure. Very few of the documents our client requested have been disclosed. In particular, the correspondence between Orsted and Natural England regarding the ecological impacts of the proposals has not been disclosed. Considerably further disclosure was received by Gordons LLP

G3.1:9.2. Additionally, local stakeholders have indicated a clear preference for access to be taken and retained from the north.

To manage the interaction between both proposed accesses, an access strategy was developed to ensure that the access road to the Hornsea Four OnSS was located east of the proposed access to Jillywood Farm. This access strategy is to ensure that Hornsea Four traffic would not need to cross the access road to Jillywood Farm, thus removing a potential point of conflict. To achieve this access strategy, the Applicant has made the commitment to lengthen the layby and to ensure both accesses can be accommodated. The detailed design of the layby and OnSS would be agreed with the ERYC as part of the finalisation of the CTMP, which is secured by the inclusion of Requirement 18 of the draft DCO ([C.1.1: Draft DCO including draft Deemed Marine Licence \(DML\) \(APP-203\)](#)).

It should be noted that upon completion of construction of Hornsea Four, operation and maintenance will be largely preventative and corrective, with remote monitoring of the OnSS facilitating much of the activity, and as such vehicle movement will be negligible.

It can be confirmed that the A164 Jocks Lodge Highways Improvement scheme was included in the cumulative effects assessment (CEA) for Hornsea Four. The assessments can be found in the relevant sections of onshore ES Chapters in [Volume A3 \(APP-025 to -034\)](#) of the DCO application.

Analysis of vehicle movements arising from Hornsea Four has been included in [A3.7: Traffic and Transport \(APP-031\)](#).

A comprehensive assessment of vehicle movements has been included in [A3.7: Traffic and Transport \(APP-031\)](#) of the DCO application. The Applicant does not recognise the numbers quoted. It is identified (Appendix F of [A6.7.1: Traffic and Transport Technical Report \(APP-125\)](#)) that during the peak construction phase there could be worst case of up to 244 two-way HGV movements per day via access AP_025 (via the access road to the OnSS). This is equivalent to approximately 12 arrivals and 12 departures per hour (i.e. one, two-way HGV movement every two and half minutes). It is however noteworthy that this represents the peak period, average two-way HGV movements are forecast to be 138 per

on 09 December 2021. However, these documents still do not sufficiently deal with the matters raised in our client's multiple disclosure requests. As such, we do not consider this adequate disclosure.

- Additionally as you will be aware, a disclosure at this date leaves less than 5 working days for our client to review the documents and make a Relevant Representation. Our client does not feel that this behaviour is in the spirit of the statutory consultation process.

day (Appendix F of [A6.7.1: Traffic and Transport Technical Report \(APP-125\)](#)), equivalent to approximately seven arrivals and seven departures per hour (i.e. one, two-way HGV movement every 4 - 5 minutes).

An assessment of the Hornsea Four construction traffic movements upon pedestrian amenity is included within [A3.7: Traffic and Transport \(APP-031\)](#). No significant residual pedestrian amenity impacts are identified.

'Mandatory' is a reference to the absolutes expressed by statutory consultee and has been covered comprehensively in past correspondence, including a phone call with Mr Dransfield and legal and consultant team. As detailed in table 1.1 and section 11.6 of [B1.1: Consultation Report \(APP-129\)](#), statutory consultees and numerous members of the public, including nearby residents, requested that all temporary and permanent access was removed from the south of the OnSS site and that the proposed access road to the north of the OnSS, off the A1079, to remain permanent for the lifetime of the project.

The Applicant has committed to the adherence of several commitments relating to the control of noise during the construction and operation phases of the Hornsea Four project. Noise impacts at noise sensitive receptors will be controlled through implementation of the appropriate noise mitigation measures secured through for example, but not limited to, Co123 (which secures the commitment that where noise has the potential to cause significant effects, mufflers and acoustic barrier will be used). This is secured via the Code of Construction Practice under Requirement 17 of [C1.1: Draft DCO including Draft DML \(APP-203\)](#), and outline of which is provided at [F2.2: Outline Code of Construction Practice \(APP-237\)](#).

Paragraph 8.11.1.15 to 8.11.1.19 of [A3.8: Noise and Vibration \(APP-032\)](#) presents the assessment of construction traffic noise impacts on Jillywood Farm (where SAR1 is assigned to Jillywood Farm). The assessment concludes that the impact is negligible, and this is not significant in EIA terms.

		<p>Operational noise impacts from the OnSS will be controlled by Co159 (secured via Requirement 21 of C1.1: Draft DCO including Draft DML (APP-203)) which ensures that operational noise levels will be no more than 5 dB above the background noise level at any identified sensitive receptor, which includes Jillywood Farm. On this basis, significant operational noise effects are not anticipated to be experienced at Jillywood Farm.</p> <p>As presented in A3.3: Ecology and Nature Conservation (APP-027), Birkhill Wood is acknowledged as being designated an Ancient Woodland. The Applicant has consulted with Natural England regarding the potential impacts to Birkhill Wood as part of the Evidence Plan Process. Agreements have been obtained between The Applicant and Natural England at the Technical Panel Meeting held on the 1 April 2020 that an appropriate buffer of 15 m would be implemented between the proposed permanent OnSS access road and Birkhill Wood. This avoids any impact on the root protection area of the outermost trees associated with Birkhill Wood and is in accordance with Natural England’s standing advice on Ancient Woodland. This position is confirmed as agreement G3.5 – 4.1.3 in F3.5: SoCG between Hornsea Project Four and Natural England (APP-258), which demonstrates an agreement with Natural England on this matter.</p> <p>As mentioned above, the Applicant considers that it has provided the requested information. The documents provided on 9 December 2021 included copies of three letters: two community letters from 2018 and 2019 and a copy of a reminder letter for the LIQ in 2019 all of which Mr and Mrs Dransfield claimed not to have received. The correspondence on 9 December 2021 also included copies of documents that had previously been sent to Mr and Mrs Dransfield’s solicitors but had been requested again. The Applicant rejects any suggestion of not acting in the spirit of the statutory consultation process.</p>
RR-0130-APDX:A-J	A significant proportion of my client’s objection does not arise from comments on Orsted’s analysis that has been made publicly available as part of the various consultation stages. Rather, it arises because Orsted has failed to carry out or provide (upon request) the relevant analysis. Coupled with Orsted’s failure to properly carry out the required statutory consultation, this	The Applicant provided copies of the requested documents by email on 19 February 2021. The Applicant considers that it has carried out the relevant analysis and undertaken proper statutory consultation. The information requested was provided on 19 February 2021. No response was received in respect of this information until 15 October 2021.

suggests that the DCO comprises a development that is not properly considered or prepared.

This is a grave concern for a development of this scale and we trust that the Planning Inspectorate will have due regard to this when considering the DCO application more widely, given the extraordinary significantly potential technical and environmental aspects of the entire scheme.

I trust that these objections will be given due regard and consideration, and we look forward to engaging further through the DCO process. Should you have any queries regarding this letter and its enclosures, please do not hesitate to contact me.

For the reasons set out above, the Applicant considers that the DCO Application has been properly prepared and considered.

5 Annex 3 – Full response to Jane Taylor (RR-017) and Malcolm Taylor (RR-019)

Annex 3 – Full Response to Jane Taylor (RR-017) and Malcolm Taylor (RR-019)

Jane Taylor (RR-017) and Malcolm Taylor (RR-019)

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-017 and RR-019 summary</p>		<p><i>Summary of Applicant's Response to RR-017 and RR-019</i></p> <p>The Applicant has had due consideration of Mr Taylor and Mrs Taylor's Relevant Representations, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Acknowledged Mr Taylor and Mrs Taylor's concerns; • Noted the Applicant has entered into a voluntary agreement with Mr and Mrs Taylor's landlord which includes a requirement on the Applicant to provide additional mitigation measures in respect of Burn Park Farm; • Outlined the OnSS site selection process; • Responded to concerns associated with livestock and horses; • Welcomed information with regards to flood risk in the area surrounding the OnSS and outlined the findings of the Flood Risk Assessment, which has been agreed with the Environment Agency; • Responded to comments raised in respect of onshore ecology, inclusive of surveys undertaken and mitigation measures identified; • Responded to comments raised in respect of the landscape and visual impact assessment, acknowledging significant effects within a localised area and an overview of mitigation measures proposed including landscape planting and built design measures; • Outlined the reinstatement process and potential impacts in relation to agricultural land; and • Outlined mitigation measures secured for public rights of way and traffic and transport.
<p>RR-017</p>	<p>Onshore Substation. The area of land for the proposed Substation is too close to Burn Park Farmhouse and buildings. It will cause severe disruption to myself and also an animal welfare issue to the livestock, due to noise, dust, vibration and light pollution.</p>	<p>The Applicant notes that RR-017 and RR-019 differ slightly in respect of wording; however, the points raised are similar. As such, this response is in relation to both of the Relevant Representations.</p> <p>The Applicant acknowledges Mr Taylor and Mrs Taylor's concerns and has been in discussions with them, as occupiers of Burn Park Farm, since July 2018. The Applicant has entered into a</p>

Flooding. This area is prone to flood regularly. Three acres along the North Eastern boundary have not been cropped for several years and acts as a natural flood area. Flood risk is an important issue for the local area. Wildlife.

There are a considerable number of ground-nesting and protected birds also deer, foxes, hares and bats. The construction work over a long period of time will destroy their habitats and nesting sights. The removal of mature trees and hedgerows means a loss of their safe environment.

Visual Impact. Tall, long buildings and other structures in this rural landscape will be detrimental to the surrounding area. The land disturbed by the wide cable corridor will leave parcels of land unworkable by modern agricultural machinery.

Walkers, cyclists and horse riders. This group will no longer be able to have the quiet recreational enjoyment of their usual footpaths, tracks and bridle-paths.

Traffic. The increase in the volume of H.G.V.s and light vans on already heavily congested roads causing even slower moving traffic will contribute to even greater air pollution.

I strongly object to this development for all the reasons stated and wish to stress the impact on Burn Park Farm and the welfare of the livestock. I would be most grateful if the points raised could be given careful consideration. Yours sincerely Jane Taylor (Mrs)

voluntary agreement with Mr and Mrs Taylor's landlord which includes a requirement on the Applicant to provide additional mitigation measures in respect of Burn Park Farm.

The OnSS site selection process outlined in [A4.3.3: Selection and Refinement of Onshore Infrastructure \(APP-038\)](#) considered several environmental, technical and commercial factors. This included both the proximity to the nearest residential receptors and settlements. The BRAG appraisal (presented in Table 7) therefore balanced the proximity of individual residential properties with proximity to larger clusters of properties, amongst other factors. The proximity to Burn Park Farm is acknowledged by the red rating for the identified site; however, taking into account all factors, on balance the site is considered to be the most appropriate within the OnSS search area. It is noted that necessary mitigation measures have been identified and secured for both construction and operational stages to reduce potentially significant environmental effects as far as practicable. In particular, [F2.2: Outline Code of Construction Practice \(APP-237\)](#) identifies mitigation measures to prevent effects arising from noise, dust, vibration and light pollution.

In respect of impacts on livestock, specific consideration of livestock is not typical in the EIA process. Assessments undertaken for the OnSS in [Volume A3](#) of the Environmental Statement on human and ecological receptors sufficiently assess construction and operational impacts arising from Hornsea Four and secure necessary mitigation measures. The Applicant considers that this mitigation is sufficient to avoid significant effects arising from Hornsea Four.

Flood Risk

The Applicant welcomes the additional information with regards to flood risk in the area surrounding the OnSS. These are in accordance with the findings of [A6.2.2: Onshore Infrastructure Flood Risk Assessment \(APP-098\)](#), which was developed in consultation with the Environment Agency and Lead Local Flood Authority. This is reflected in the Relevant Representation Response provided by the Environment Agency (RR-010), which confirms that they do not have concerns related to the assessment of flood risk at the OnSS.

The Applicant notes that the OnSS would be elevated such that it would not be at risk from any source of flood risk, particularly fluvial or surface water flooding. The Applicant would

also like to reiterate that the Onshore Infrastructure Drainage Strategy (Co19 of [A4.5.2: Commitment Register \(APP-050\)](#)) would include measures to limit discharge rates and attenuate flows to maintain greenfield runoff rates and therefore would not increase flood risk to neighbouring land. The Onshore Infrastructure Drainage Strategy will be developed in consultation with the Environment Agency and Lead Local Flood Authority.

Onshore Ecology

The Applicant has undertaken a full suite of ecological surveys in order to determine the baseline conditions with regard to protected species (e.g. bats, water voles, great crested newt, otter, badger etc.) and habitats within and around the OnSS and onshore ECC. In addition, the Applicant has assessed the potential impact of the proposed works and incorporated appropriate mitigation measures that have been discussed and agreed with Natural England, the Environment Agency, East Riding of Yorkshire Council Biodiversity Officers and the Yorkshire Wildlife Trust. The findings of which are fully assessed and presented in [A3.3: Ecology and Nature Conservation \(APP-027\)](#). Where mitigation measures have been identified, these are presented in [F2.3: Outline Ecological Management Plan \(APP-251\)](#), which also includes the measures that will be undertaken to replace and enhance the OnSS, in accordance with [F2.16: Outline Net Gain Strategy \(APP-251\)](#). The Outline Ecological Management Plan outlines measures to mitigate effects on breeding birds, bats, badgers, otters, water voles, great crested newts. For example, paragraph 4.4.2.7 details a secured 'dark corridor' to mitigate potential effects on bats that utilise the vegetation to the north of the OnSS and temporary compound.

Landscape and Visual Impact Assessment

The effects of the OnSS on visual amenity are fully assessed within the landscape and visual impact assessment (LVIA), presented in [A3.4: Landscape & Visual \(APP-028\)](#). It is acknowledged that, given the scale of the OnSS and the open nature of the landscape, there will be significant effects on views experienced by high sensitivity receptors within a localised area. This includes Mrs and Mrs Taylor and recreational users of local footpaths, bridle paths and cycle routes.

		<p>The Applicant has committed to the implementation of a range of measures to help reduce effects on visual amenity, as follows:</p> <ul style="list-style-type: none">• An indicative landscape plan has been developed (presented in F2.8: Outline Landscape Management Plan (APP-243)), which has been designed in response to the LVIA to reduce landscape and visual effects and to help assimilate the OnSS into the local landscape.• A Landscape Management Plan will be developed in accordance with F2.8: Outline Landscape Management Plan (APP-243). The Landscape Management Plan will include details of mitigation planting at the OnSS site, including the number, location, species, and details of management and maintenance of planting. Landscape mitigation planting will be established as early as reasonably practicable in the construction phase. (Co30, secured by DCO Requirement 8 Provision of landscaping). As shown in Figure 2 of APP-243, landscape planting has been included in the south-west corner of the OnSS site, in proximity to the boundary with Burn Park Farm. This includes landscape bunding (earthworks designed to help mitigate visual impacts).• Detailed design will be developed for the OnSS in accordance with F2.13: Outline Design Plan (APP-248) which will include details regarding design and access. Examples of such detailed design information include (but are not limited to): building heights and form; site layout; external appearance and colours; vehicular and pedestrian access. (Co195, secured by DCO Requirement 7 Detailed design approval onshore). It is considered that the detail provided in respect of the application of colour (in Section 7.3 of APP-248) demonstrate high quality design standards that will assist in mitigating visual impacts on nearby receptors. This will be achieved through the selection of appropriate colours from the surrounding landscape and the application of colour on building facades in a design that incorporates the OnSS and EBI into the surrounding landscape. This is in accordance with NPS EN-1 policy, paragraph 5.9.22 which states that adverse landscape and visual effects may be minimised through the design of colours and materials. <p>F2.13: Outline Design Plan (APP-248) provides the outline approach to embedded design mitigation for the OnSS, which will inform the detailed design, including layout, scale, finished ground levels, external appearance and materials, and hard surfacing. The design 'vision' is</p>
--	--	---

		<p>set out in A4.4.6: Design Vision Statement (APP-048) and provides a visual representation of how project mitigation measures, further enhancement measures, and net gain may interact.</p> <p>Photomontage visualisations have been prepared (A6.4.1: Landscape and Visual Resources: Photography and Photomontages (APP-115)) to illustrate the potential scale and massing of the OnSS, and an indication of maturing landscape planting based on the Outline Landscape Management Plan (APP-243).</p> <p>The LVIA finds that, based on these commitments, the residual effects of the OnSS will largely be reduced to a non-significant level upon establishment of the proposed landscaping, at year 10.</p> <p><i>Agricultural Impact Following Construction</i></p> <p>Following construction, the Applicant has committed to reinstating disturbed agricultural land to pre-existing conditions as far as reasonably practical (Co10, see A4.5.2: Commitments Register (APP-050)). The assessment within the ES (Section 6.11 of A3.6: Land Use and Agriculture (APP-030)) provides further detail on the mitigation to be employed to minimise the impacts of disturbance on the ability of the land to return to its former usage in as short a period as possible. This will be informed by physical and nutrient soil testing (Co61) and storing and managing soils in accordance with DEFRA Construction Code of Practice for Sustainable Use of Soils on Construction Sites (Ref PB1328) or the latest relevant available guidance (Co8). Further details are provided in the Outline Soil Management Plan, which forms Appendix B of F2.2: Outline Code of Construction Practice (APP-237).</p> <p>As set out in the ES (Section 6.11 of A3.6: Land Use and Agriculture (APP-030)), it is considered that appropriate, existing farming practices will be able to resume after a short duration following construction. Exceptions to this, where agriculture will be excluded, will be in small areas above link boxes, each a maximum of 9 m², which may include a manhole cover for access Cables will be installed to a target depth of 1.2 m below the existing surface level of the ground. Cables will not be buried at a depth that will impede future farming operations. Individual variations to this target depth will be agreed with landowners through the heads of terms process.</p>
--	--	--

		<p><i>PRoW Network</i></p> <p>An assessment of permanent impact to Public Rights of Ways (PRoWs) was undertaken as part of the EIA in accordance with agreements with ERYC, as set out in the impact register (A4.5.1: Impacts Register (APP-049)), and no likely significant effect was identified. Permanent diversions and associated signage will be applied to a small number of PRoW (Co79, see A4.5.2: Commitments Register (APP-050))</p> <p>Specific measures to reduce impacts on all users of the PRoW will be agreed with ERYC, as set out in the Outline PRoW Management Plan (which forms Appendix C of F2.2: Code of Construction Practice (APP-237)).</p> <p>Similarly, an assessment of temporary impact during the construction phase was undertaken as part of the EIA in accordance with agreements with ERYC, as set out in the impact register (A4.5.1: Impacts Register (APP-049)), and no likely significant effect was identified.</p> <p>Within the construction phase, there will be both instances of short-term temporary stopping up of a number of PRoW in the vicinity of the OnSS as well as the permanent stopping up (and subsequent permanent diversion post-construction) of Skidby Footpath 16. Due to the complicated network of PRoW surrounding the OnSS, the impact of the stopping up of these routes has been carefully reviewed to ensure no long-term impact to the wider PRoW network. Further details of the PRoW management measures to be undertaken can be found within the PRoW Outline Management Plan which forms appendix C of the Outline CoCP (F2.2: Outline Code of Construction Practice (APP-237)).</p> <p><i>Traffic</i></p> <p>A3.7: Traffic and Transport (APP-031) of the ES contains a comprehensive review of baseline conditions and the assessment of Hornsea Four traffic upon driver delay, severance, pedestrian amenity, accidents and safety and abnormal loads.</p> <p>The outline Construction Traffic Management Plan (oCTMP), (provided as Appendix F of F2.2: Outline Code of Construction Practice (APP-237)), includes a commitment to submit further assessment of construction traffic flows through identified sensitive junctions in advance of construction to determine if there will be significant driver delays. If mitigation measures are</p>
--	--	---

		<p>required these would be agreed with the relevant highway authority to ensure that residual impacts are not significant. This commitment to producing a final CTMP is supported by inclusion of Requirement 18 of the draft Development Consent Order (DCO) (C.1.1: Draft DCO including draft Deemed Marine Licence (DML) (APP-203)).</p> <p>The air quality impact of increased light and heavy goods vehicles on the local road network was assessed using detailed dispersion modelling of vehicle emissions. Impacts were considered at sensitive locations alongside roads which were predicted to experience an increase in traffic movements during construction. The assessment showed that the additional traffic would not give rise to significant air quality impacts at receptors (A4.5.1: Impacts Register (APP-049)).</p>
--	--	--

6 Annex 4 – Full Response to Lockington Parish Council (RR-018)

Annex 4 – Full Response to Lockington Parish Council (RR-018)

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-018 summary</p>		<p><i>Summary of Applicant's Response to RR-018</i></p> <p>The Applicant has had due consideration of Lockington Parish Council's Relevant Representation, and a summary of the key points of response is set out below:</p> <ul style="list-style-type: none"> • Confirmation of the site selection process for the primary logistics compound located east of Lockington, inclusive of rationale for the location and overview of the significant consultation undertaken; • Clarification and responses to comments raised regarding traffic and transport, inclusive of the enforceability of vehicle control measures, vehicle numbers, accidents and road safety and vehicle movements through Lockington village; and • Overview of mitigation measures secured for the construction of Hornsea Four.
<p>RR-018-A</p>	<p>Lockington Parish Council have been involved in correspondence and meetings over the last two years with the Applicant (Orsted Hornsea 4), primarily about the logistics compound which is to be constructed to supply and service the on-shore cable route/works which located on Station Road, Lockington, west of the A164 for a minimum duration of 3 years. The Parish Council are of the view that the Logistics Compound should be located to the east of the A164 and formally object to the proposals, not having been persuaded by the case variously put forward by the Hornsea4 team as to why this is not possible. In summary, the Applicant's case is:</p> <p>1. Highway analysis and advice (from ERYC) is the primary justification for locating the Logistics Compound to the west of the A164 as this enables traffic to turn left off the A164 directly on to Station Road rather than waiting for a gap in traffic to facilitate a right turn if the Compound were located to the east, with potential for queuing of HGVs on the A164 during such manoeuvre. This is all predicated on</p>	<p>The identification of logistics compounds for Hornsea Four was based on the methodology set out in Section 4.3.2 of A4.3.3: Selection and Refinement of Onshore Infrastructure (APP-038). This was informed by technical requirements, landowner feedback and environmental factors. The placement of the primary compound on Station Road provides a central location with logistical advantages for the construction of Hornsea Four. It is adjacent to the onshore ECC and within close proximity to the A164 which is beneficial for access. The logistics compound location was subject to formal consultation under Section 42 of the Planning Act 2008 between 13 August to 23 September 2019. It is noted that whilst some concerns were raised by local stakeholders and subsequently responded to in B1.1.3: Applicant regard to Section 47 Consultation Responses (APP-132), no consultation responses made as part of the formal consultation from nearby residents requested the logistics compound be moved to the east of the A164.</p>

	<p>HGV traffic being controlled with arrival only from the south for the duration of the project.</p> <p>2. Station Road (East) is not as wide as Station Road (West) – the Traffic & Transport Environmental Statement (ES) identified Station Road to the east of the A164 as being too narrow for two vehicles to pass.</p> <p>3. Location of a compound east of the A164 would be contrary to the consultation feedback from landowners/tenants, namely – the land to the north of the Station Road (east of the A164) contains natural and running springs and preferably should be avoided whilst the land to the south of Station Road (east of the A164) is not preferable due to existing and future cattle farming operations.</p>	
RR-018-1	<p>The Parish Council’s view and counterarguments to the above can be summarised as follows:</p> <p>1. Station Road (west) primarily serves the village of Lockington which contains c160 houses, a School, Church and a village hall – although it is used as a through route for non-HGV’s from and to other villages/destinations. Station Road (east) primarily serves Aike which contains c30 houses. Wherever the Compound is located and whatever ‘control measures’ are in place, it will inevitably bring disruption and delays to road users from Lockington and/or Aike – accordingly, logic indicates that it should be located to the east of the A164 where the population and vehicle numbers are significantly lower as this must have less adverse impact on the local communities.</p>	<p>The access strategy for Hornsea Four construction traffic, has been planned to maximise the use of the principal road network and where possible, avoid settlements. All construction traffic is proposed to travel to the Logistics Compound via the A164 from the south, therefore avoiding traffic travelling through Lockington.</p> <p>With regard to the traffic delay concerns raised, during the evidence plan process (Table 7.4 of A3.7: Traffic and Transport (APP-031)) the screening exercise with the ERYC identified this junction had low baseline traffic flows and therefore, had low sensitivity to the proposed increases in traffic. Recognising these baseline conditions, it was agreed that the junction was screened out of detail capacity assessment (section 7.7.4 of A3.7: Traffic and Transport (APP-031)). Therefore, it is implicit that there are no traffic and queuing and delay impacts that would favour the eastern side from the western side.</p>
RR-018-2	<p>2. The enforceability of the vehicle control measures is debateable and will only be applicable to HGV’s. The figures* supplied to the Parish Council by the Hornsea4 team for estimated daily average 2-way construction vehicle movements to a compound west of the A164 total 61 (30 incoming & 30 outgoing) of which 15 would be HGV’s, all travelling from the south. In short, the proposed location of the Compound and traffic safety justification is predicated on 15 HGV’s (i.e., only 7 or 8 HGV’s incoming and outgoing) per day. HGV’s exiting the Compound will still have to turn right (southwards) at the</p>	<p><i>Enforceability of vehicle control measures</i></p> <p>The Applicant has submitted an outline Construction Traffic Management Plan (oCTMP) (as Appendix F of F2.2: Outline Code of Construction Practice (APP-237)). Section 2.3.3 of the oCTMP includes details of proposed measures to control the routes that would be used by HGVs during the construction of Hornsea Four (to those detailed in Figure 2 of the oCTMP). This commitment would ensure no HGV traffic is routed via the village of Lockington. Section 5 of the oCTMP also includes details of measures to monitor the routes that are used by HGVs and details of enforcement action for non-compliance. The outline CTMP forms the basis for a final CTMP, which will be prepared and submitted prior to the commencement of construction of</p>

A164 junction across the traffic when a gap permits – queuing and delays on Station Road are inevitable. (* See Note below regarding the traffic figures). Additionally, based on the figures supplied, there will be an estimated c45 daily non-HGV vehicles (presumably works vans, staff cars, catering supplies, external service vehicles, etc, etc) that will not and (arguably) cannot realistically be controlled in terms timing and/or direction of arrival/departure – adding to potential queuing and delays on Station Road (west). The impact will be roughly the same if the Compound were located east of the A164 but the impact on the local community would be substantially different by virtue of numbers of properties & population in Lockington and Aike respectively. The location of the Compound based primarily on the low level of HGV movements is therefore disproportionate in terms of impact on the local community and traffic flows generally on the A164. Additionally, it is understood that the traffic screening exercise undertaken in conjunction with ERYC recognised the relatively low flows at the A164/Station Road junction – arguably ‘denting’ the traffic/safety rationale for locating the Compound to the west and adding to the disproportionality of its proposed location.

the connection works for approval by the relevant highway authorities. This commitment to producing a final CTMP is secured by inclusion of Requirement 18 of the draft Development Consent Order (DCO) ([C.1.1: Draft DCO including draft Deemed Marine Licence \(DML\) \(APP-203\)](#)).

With regards to comments in relation to non HGV traffic, it can be noted from Table 7.18 of the Traffic and Transport Chapter ([APP-031](#)) that there could be a peak of up to 108 non HGV movements per day travelling via link 43 (Station Road west of the A164) and an average of 51. These non-HGV movements are referred to as ‘light vehicles’. The term ‘light vehicles’ is used to describe a range of vehicles (such as cars, vans, pickups, minibuses, etc.) that do not constitute a HGV (i.e. all vehicles with a gross weight less than 3.5 tonnes). These vehicles would be predominantly associated with the movement of employees and incidental deliveries for Hornsea Four.

The forecast distribution of traffic is outlined in [A6.7.1: Traffic and Transport Technical Report \(APP-125\)](#). This forecast distribution has been informed by worker journey origins and journey times to the logistics compound, to assign traffic demand to the network. On this basis, it is forecast that the majority of the 108 two-way daily light vehicle movements would travel via the most expeditious route, i.e. the A164, thus avoiding Lockington. The only exception to this distribution would be if a journey origin was within the Lockington Parish or immediate locality.

Noting the above, the Applicant would not wish to restrict employee movements via Lockington for genuine reasons, e.g. employees based within the local area. It is therefore not considered proportional to introduce restrictions on light vehicles.

Vehicle numbers

The Applicant would clarify that there have been minor revisions to the forecast traffic movements throughout the consultation phase, these revisions reflect the latest information in relation to project parameters at the time of engagement. Table 7.18 of [A3.7: Traffic and Transport \(APP-031\)](#) provides details of the finalised numbers of peak and average daily vehicle movements via Station Road to the west of the A164 (denoted as link 43). It can be identified from Table 7.18 that the peak period of construction could result in up to 175 additional two-way vehicle movements per day, of which up to 67 two-way would be HGVs

		<p>(i.e. 34 rounded HGV arrivals and 34 departures). Table 7.18 also provides details of average construction flows, equivalent to 66 two-way vehicle movements, of which 15 would be HGVs.</p> <p><i>Accidents and Road Safety</i></p> <p>A3.7: Traffic and Transport (APP-031) includes an assessment of Accidents and Road Safety upon all links forming the traffic and transport study area. It can be identified from Section 7.7.3 of A3.7: Traffic and Transport (APP-031) that there has been only one collision along Station Road west of the A164 (link 43) in the five year period over which Personal Injury Collision (PIC) data has been captured. It is therefore considered that the road safety impacts upon link 43 are unlikely to be exacerbated by the forecast Hornsea Four construction traffic and are therefore not considered to be significant. The Applicant would also clarify that the assessment of accidents and road safety is not predicated upon the average numbers (as mentioned by the Parish Council) but instead utilises the peak numbers.</p> <p><i>Queuing and Delays</i></p> <p>Please refer to the Applicants response to RR-018-2 above.</p>
RR-018-3	3. If the Compound were located on the northern side of Station Road (east) in the field immediately east of the A164, the road is not narrower or too narrow for two vehicles to pass, quite the opposite - see photos below. Looking East towards Aike Looking East towards Aike – the proposed alternative Compound location is on left adjacent to A164 – Station Road is wide(r) along this section. Looking west to Lockington Village	A3.7: Traffic and Transport (APP-031) includes a review of all links of substandard width which would prevent two HGVs from passing. It can be identified from Table 7.19 that both link 42 (Station Road east of the A164) and link 43 (Station Road west of the A164) are identified as being of substandard width. Mitigation measures are therefore proposed for both sections of Station Road to the east and west of the A164.
RR-018-4	4. Following on from the above, it is questionable if a Compound immediately east of the A164 (north of Station Road) is actually affected by drainage issues. There are springs shown on the OS Map, but these are further to the east. Potential drainage arguments for not locating the Compound to the east as suggested should not be accepted unless validated.	The Applicant confirms that suitable consideration of flood risk for the siting of compounds has been undertaken. The Applicant would like to reiterate that it is committed to the provision of appropriate flood risk mitigation measures, which is reflected in Co19, Co184, Co185 and Co191 of A4.5.2: Commitment Register (APP-050) . The Applicant confirms that the Onshore Infrastructure Drainage Strategy will be developed in line with the outline provided in APP-241 and the latest relevant drainage guidance notes in consultation with the Environment Agency, Lead Local Flood Authority and relevant Internal Drainage Board as appropriate.
RR-018-5	5. Additionally, Location of the Logistics Compound east of the A164 as suggested would:	<i>Public footpath</i>

	<ul style="list-style-type: none"> • Not disrupt and give rise to safety issues for users of the public footpath from Lockington Village to the A164 which is (a) well used for users of the Beverley-Driffield bus service, and (b) just being reconstructed by ERYC. • Not require the removal of an entire length of field hedge - environmental & biodiversity considerations. • Be further away from the nearby Bryan Mills Cottages and Bryan Mills Farm and so mitigate potential disturbance and noise. • Equally – if not better – serve the proposed cable route. • Avoid the ‘real-life’ temptation for non-HGV drivers exiting the Compound (if sited to the west) to simply turn left and filter through Lockington village – thus adding to the traffic and safety concerns for Lockington residents. Hornsea4 maintain that “all construction traffic is proposed to travel to the Logistics Compound via the A164 from the south therefore avoiding traffic travelling through Lockington” BUT it is unclear what “construction traffic” means and exactly how this will be controlled in practice. Non-HGV traffic (as mentioned above) will not be limited to ‘contractor’s vehicles’ and will include inevitably include vehicles directly and indirectly associated with the project/construction works and not necessarily under Hornsea4’s control. 	<p>Figure 7.6 provided within A3.7: Traffic and Transport (APP-031) identifies that due to the logistic compound’s location, access would not be taken from the north of Station Road and instead access would only be taken from the south. This access strategy would ensure that no construction traffic would be required to cross over the existing footpath on the northern side of the road.</p> <p>A3.7: Traffic and Transport (APP-031) includes a review of the baseline conditions along Station Road (link 43) and presents an assessment of the changes in traffic as a result of Hornsea Four traffic upon severance and pedestrian amenity. No significant impacts as a result of changes in Hornsea Four construction traffic upon severance or pedestrian amenity are assessed.</p> <p><i>Vehicle movements via Lockington</i></p> <p>Please refer to the Applicants response to RR-018-2 above.</p>
RR-018-B	<p>Summary: The Hornse4 team are of the view that location of the Logistics Compound east of the A164 is sub-optimal and consider “that on balance, positioning the Logistics Compound to the west of the A164 would be safer and result in less delays.” The Parish Council remain unpersuaded by their arguments and consider that the ‘balance’ is too one-sided with disproportionate weight being given to traffic considerations (particularly given the low HGV numbers involved) compared to the 3 years of disruption and delays to residents of Lockington that are inevitable with the proposed location of the Compound west of the A164. Having regard to the above, there is a case for a meaningful reassessment of the proposed location. The Applicant appears intent on locating the Compound west of the A164</p>	<p>A comprehensive assessment of all environmental effects has been undertaken and submitted to support the DCO application. The Applicant has committed to the implementation of mitigation measures where they have been identified, as presented in for example but not limited to the oCoCP and oCTMP (APP-237), which comprise but are not limited to:</p> <ul style="list-style-type: none"> • Restricted core working hours (Section 5.1 of APP-237); • Good housekeeping policies applied to construction areas (Section 5.2 of APP-237); • Site security, screening and fencing (Section 5.3 of APP-237); • Light pollution mitigation (Section 5.4 and detailed specifically in relation to compounds in Section 5.10 of APP-237); • Pollution prevention and emergency planning and procedures Section 5.5 and 5.6 and Appendix D of APP-237; • Site clearance measures (Section 5.9 of APP-237);

but Lockington Parish Council would submit that this does not adequately respect or safeguard the interests of the local community, and an alternative option for the Logistics Compound is available that does not have the same adverse impact. ---- (* Note: These traffic figures were supplied in writing by the Applicant in September 2020; new peak flow figures have recently been supplied following a zoom meeting in July 2021, but these are being queried as they contrast so dramatically with the previous average flow figures. No response to our queries has been received as at the date of this submission. The relevant traffic information may be in the 28 page List of Documents (possibly Volume6 -Annex7) but this does not seem to be readily or freely accessible to the Parish Council – so the latest traffic figures (and those that the ERYC have based their advice upon) remain a mystery. A supplementary subission may be necessary by the Parish Council if and when these figures are made known).

- Soil management measures (Appendix B of [APP-237](#));
- Flood risk mitigation (Section 6.3 of [APP-237](#));
- Ecological and biosecurity mitigation (Section 6.4 and Appendix A of [APP-237](#));
- Public Right of Way management measures (Appendix C of [APP-237](#));
- Traffic and transport control and mitigation measures (Appendix F of [APP-237](#)); and
- Measures construction noise and dust (Section 6.9 and 6.10 of [APP-237](#)).

The Applicant recognises that there will be some disruption for the residents of Lockington but with the package of mitigation in place this is considered to be temporary and not significant.

7 Annex 5 – Full response to Natural England (RR-029)



Hornsea Project Four

Annex 5, Full Response to Natural England (RR-029)

Deadline 1, Date: 8 March 2022

Document Reference: G1.9

Revision: 01

Prepared Faye McGinn, Orsted, March 2022
Checked Hannah Towner-Roethe, March 2022
Accepted Francesca De Vita, Orsted, March 2022
Approved Julian Carolan, Orsted, March 2022

Revision Summary

<i>Rev</i>	<i>Date</i>	<i>Prepared by</i>	<i>Checked by</i>	<i>Approved by</i>
01	08 March 2022	Faye McGinn	Francesca De Vita	Julian Carolan

Revision Change Log

<i>Rev</i>	<i>Page</i>	<i>Section</i>	<i>Description</i>
01	N/A	N/A	Submitted at Deadline 1

Table of Contents

1	Annex 5 – Full Response to Natural England	144
1.2	Relevant Representation and Written Representations	145
1.3	Designated Sites and Species Potentially Affected by this application.....	148
1.4	The Overall Position of Natural England.....	151
1.5	Summary of Key Environmental Concerns: Offshore Ornithology	152
1.6	Summary of Key Environmental Concerns: Compensation.....	160
1.7	Summary of Key Environmental Concerns: Marine Mammals.....	165
1.8	Summary of Key Environmental Concerns: Marine Processes.....	169
1.9	Summary of Key Environmental Concerns: Benthic and intertidal ecology	181
1.10	Summary of Key Environmental Concerns: Fish and shellfish ecology.....	181
1.11	Summary of Key Environmental Concerns: Onshore Ecology	183
1.12	Summary of Key Environmental Concerns: Seascape	183
1.13	Summary of Key Environmental Concerns: Landscape.....	183
1.14	Summary of Overarching Comments on the Application	184
1.15	Summary	187
2	Appendix A - Development Consent Order, Project description and Monitoring plans ..	188
2.1	Comments on C1.1 Draft DCO including Draft DML.....	188
2.2	Comments on: Draft DCO conditions for the Compensation Schedules provided in B2.7 FFC SPA: Gannet and Kittiwake Compensation Plan and B2.8 FFC SPA: Guillemot and Razorbill Compensation Plan.....	194
2.3	Comments on: Volume 4, Chapter 4, Project Description	198
2.4	Comments on: F2.7: Outline Marine Monitoring Plan.....	200
3	Appendix B Offshore Ornithology	203
3.1	Project Parameters.....	203
3.2	Baseline data collection and analysis methodology	203
3.3	Assessment of displacement impacts for EIA and HRA.....	205
3.4	Assessment of Collision impacts for EIA and HRA	209
3.5	Assessment of indirect effects.....	210
3.6	Population modeling approaches	211
3.7	Environmental Impact Assessment (EIA).....	213

3.8	Habitats Regulations Assessment (HRA).....	216
3.9	Portrayal of Natural England/ SNCB advice.....	220
3.10	Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology.....	221
3.11	Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report.....	242
3.12	Detailed Comments: A5.2 Offshore Ornithology Displacement Analysis.....	247
3.13	Detailed comments: A5.3 Offshore Ornithology Collision Risk Modelling.....	249
3.14	Detailed comments: Volume 5.4 Offshore Ornithology Population Viability Analysis...	251
3.15	Detailed comments: A5.5 Offshore Ornithology Migratory Birds Report	254
3.16	Detailed comments: Volume A5.6 Offshore MRSea Report	254
3.17	Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1.....	260
3.18	Detailed Comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis	278
3.19	Detailed Comments: Volume F2.19 Outline Ornithological Monitoring Plan.	285
4	Appendix C - Derogation Case	285
4.1	Advice on proposed compensation measures: Kittiwake and gannet offshore structures 285	
4.2	Advice on proposed compensation measures: Kittiwake onshore structures	289
4.3	Advice On The Proposed Compensation Measures: Kittiwake And Gannet Offshore Nest Structures	290
4.4	Advice on proposed compensation measures: Auks (guillemot and razorbill) and gannet 300	
4.5	Seagrass Restoration.....	323
4.6	Key consenting concerns applicable to all measures.....	325
4.7	Detailed comments: Volume A4, Annex 6.1: Compensation Project Description.....	330
4.8	Detailed comments: Volume A4, Annex 6.4: Compensation Commitments Register	331
4.9	Detailed comments: Volume B2, Chapter 4: Summary Statement	332
4.10	Detailed comments: Volume B2, Chapter 6: Compensation measures for FFC SPA: Overview	332
4.11	Detailed comments: Volume B2, Annex 6.1: Compensation measures of the FFC SPA: Compensation Criteria.....	333
4.12	Detailed comments: Volume B2, Annex 6.2 Compensation measures for FFC SPA Prey Resource Evidence.....	334
4.13	Detailed comments: Volume B2, Chapter 7 FFC SPA: Gannet and Kittiwake Compensation Plan	336

4.14	Detailed comments: Section 5, Draft DCO conditions.....	342
4.15	Detailed comments: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence.....	346
4.16	Detailed comments: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap.....	348
4.17	Detailed comments: Volume B2, Annex 7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence	351
4.18	Detailed comments: Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap.	351
4.19	Detailed comments: Volume B2, Annex 7.5: Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design	352
4.20	Detailed comments: Volume B2, Annex 7.6 Outline Gannet and Kittiwake Compensation Implementation and Monitoring Pan.....	354
4.21	Detailed comments: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan.....	354
4.22	Detailed comments: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence.....	367
4.23	Detailed comments: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap.....	373
4.24	Detailed comments: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence	375
4.25	Detailed comments: : Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap.	379
4.26	Detailed comments: Volume B2, annex 8.7: Outline Gannet, Guillemot and Razorbill Compensation Implementation and Monitoring Plan	382
5	Appendix D – Marine Mammals	382
5.1	Project Parameters.....	382
5.2	Baseline Characteristics.....	382
5.3	Environmental Impact Assessment.....	383
5.4	Habitats Regulation Assessment.....	385
5.5	Mitigation	387
5.6	Post- consent monitoring.....	388
5.7	Detailed comments: Volume A2, Chapter 4: Marine Mammals.....	389
5.8	Detailed comments: Subsea Noise Technical Report Part 1 and 2.....	392
5.9	Detailed comments: Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1 and Part 2).....	393
5.10	Detailed comments: B2.2 Report to Inform Appropriate Assessment Part 1:.....	394

5.11	Detailed comments: B2.2: Report to Inform Appropriate Assessment Part 10: Appendix G: Marine Mammals – Grey seal RIAA information.....	403
5.12	Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 12: Appendix I: Marine Mammals – Bottlenose dolphin RIAA information.....	404
5.13	Detailed comments: F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan.....	405
5.14	Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol.....	407
5.15	Detailed comments: F2.7: Outline Marine Monitoring Plan.....	409
6	Appendix E - Marine Geology, Oceanography and Physical Processes.....	410
6.1	Project Parameters.....	410
6.2	Baseline Characterisation.....	412
6.3	Environmental Impact Assessment.....	413
6.4	Report to inform Habitats Regulations Assessment	420
6.5	Marine Conservation Zones Assessment	421
6.6	Detailed comment: Volume A2.1 Marine Geology, Oceanography and Physical Processes.....	424
6.7	Detailed comments: Volume A5, Annex 1.1: Marine Processes Technical Report.....	454
6.8	Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix A, B, C	457
6.9	Detailed comments: Volume A2, Chapter 11: Infrastructure and Other Users.....	458
6.10	Detailed comments – Volume 4, Annex 4.8: Pro-Rata Annex	458
7	Appendix F -Benthic and Intertidal Ecology.....	459
7.1	Project Parameters.....	459
7.2	Baseline Characterisation.....	460
7.3	Environmental Impact Assessment.....	461
7.4	Report to inform Habitats Regulations Assessment	464
7.5	Marine Conservation Zones Assessment	464
7.6	Mitigation	466
7.7	Post-consent monitoring.....	467
7.8	Detailed comments: Volume A2.2 Benthic and intertidal ecology.....	468
7.9	Detailed comments: Volume A5.2.1 Benthic and intertidal ecology technical report ...	477
7.10	Detailed comments: F2.15: Outline Offshore Cable Installation Plan	478
7.11	Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation):..	479

7.12	Detailed comments: Volume A4.5.3 Offshore Cumulative Effects Appendix A Screening Matrix.....	483
8	Appendix G – Fish and Shellfish Ecology.....	483
8.1	Project Parameters.....	483
8.2	Baseline Characterisation.....	484
8.3	Environmental Impact Assessment.....	486
8.4	Mitigation.....	489
8.5	Post-consent monitoring.....	489
8.6	Detailed comments: Volume A2.3 Fish and Shellfish Ecology.....	489
8.7	Detailed comments – Volume A5.3 Fish and Shellfish Ecology Technical Report:.....	493
9	Appendix H -Onshore Ecology & Landscape, Seascape and Visual Effects.....	493
9.1	Summary of main issues related to onshore ecology	493
9.2	Summary of main issues related to landscape, seascape and visual effects	495
9.3	Detailed comments: A3.6 Land Use and Agriculture	496
9.4	Detailed comments: A4.3 Selection and Refinement of the Onshore Infrastructure	496
9.5	Detailed comments: A4.4.2 Onshore Crossing Schedule	497
9.6	Detailed comments: A4.5.6 Location of Onshore Cumulative Schemes.....	497
9.7	Detailed comments: A6.3.2 Extended Phase 1 Target Note Tables	498
9.8	Detailed comments: A6.3.4 Breeding Bird Survey Report	498
9.9	Detailed comments: F2.6 Outline Onshore Infrastructure Drainage Strategy.....	498

1 Annex 5 – Full Response to Natural England

1.1.1 Legislative and Policy Framework

Reference	Relevant Representation Comment	Applicant's Response
RR-029-1.1	<p>Natural England is a non-departmental public body established under the Natural Environment and Rural Communities Act 2006 ("NERC Act"). Natural England is the statutory advisor to Government on nature conservation in England and promotes the conservation of England's wildlife and natural features.¹ Natural England's remit extends to the territorial sea adjacent to England, up to the 12 nautical mile limit from the coastline.²</p>	Noted.
RR-029-1.2	<p>Natural England is a statutory consultee:</p> <ul style="list-style-type: none"> • in respect of environmental information submitted pursuant to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regs');³ • in respect of plans or projects that are subject to the requirements of the Conservation of Habitats and Species Regulations 2017 as amended (the "Habitats Regulations") which are likely to have a significant effect on European protected sites – that is, sites designated as Special Areas of Conservation ("SACs") and Special Protection Areas ("SPAs") for the purposes of the EU Habitats and Birds Directives;⁴ • in respect of proposals which may hinder the achievement of the conservation objectives of Marine Conservation Zones ("MCZs") which have been designated under the Marine and Coastal Access Act 2009;⁵ • in respect of proposals likely to damage any of the flora, fauna or geological or physiological features for which a Site of Special Scientific Interest ("SSSI") has been notified pursuant to the Wildlife and Countryside Act 1981 (the "1981 Act");⁶ and • in respect of all applications for consent for Nationally Significant Infrastructure Projects which are likely to affect land in England.⁷ 	Noted.
RR-029-1.3	<p>Pursuant to The Conservation of Offshore Marine Habitats and Species Regulations 2017 (the "2017 Regulations"). Under Regulation 28(4) (a) of the 2017 Regulations, where the assessment relates to a European offshore marine site, the competent authority must consult the JNCC (Joint Nature Conservation Committee). Where the assessment relates to a European site (including a European marine site), then the</p>	Noted.

	competent authority must consult Natural England, in accordance with regulation 28(4) (b) of the 2017 Regulations.	
RR-029-1.4	It is also the Government's policy to consult Natural England in respect of sites listed for the purposes of the Convention on Wetlands of International Importance especially as Waterfowl Habitat signed at Ramsar on 2nd January 1971 ("Ramsar sites") as if they were European protected sites. ⁸	Noted.
RR-029-1.5	The Examining Authority should note that pursuant to an authorisation made on the 9th December 2013 by the JNCC under paragraph 17(c) of Schedule 4 to the Natural Environment and Rural Communities Act 2006, Natural England is authorised to exercise the JNCC's functions as a statutory consultee in respect of applications for offshore renewable energy installations in offshore waters (0-200nm) adjacent to England. This application was included in that authorisation and, therefore, Natural England will be providing statutory advice in respect of that delegated authority. However, JNCC retains responsibility as the statutory advisors for European offshore marine sites that are located outside the territorial sea and UK internal waters (i.e. more than 12nm offshore) and continues to provide Natural England advice on the significance of any potential impacts on interest features of those sites.	Noted.
RR-029-1.6	In determining this application, the Secretary of State will be acting as the competent authority for the purposes of the Habitats Regulations and the 2017 Regulations. The Secretary of State is also a section 28G authority with specific duties under the 1981 Wildlife and Countryside Act in respect of SSSI.	Noted.
RR-029-1.7	Further detail on the legislative and policy framework through which Natural England provide advice on proposed plans or projects is included within Appendix I.	Noted.

1.2 Relevant Representation and Written Representations

Reference	Relevant Representation Comment	Applicant's Response
RR-029-2.1	Natural England's advice in these representations is based on information submitted by Ørsted (the Applicant), in support of its application for a Development Consent Order (DCO) in relation to Hornsea Four Offshore Wind Farm (the project). The project refers to the construction and operation of an offshore wind farm of up to 800MW. The export	Noted.

	cable makes landfall east of Fraisthorpe, Yorkshire, and the grid connection is at Creyke Beck, Cottingham, Humberside.	
RR-029-2.2	In the interests of issue resolution Natural England has combined Relevant Representation and Written Representations within this response. This is to provide the detail on all issues as early as possible to allow more time for discussion and resolution.	Noted.
RR-029-2.3	These representations contain a summary of what Natural England considers to be the main nature conservation, landscape and related issues with regards the Development Consent Order (DCO) application, as well as the Deemed Marine Licences (DML) contained therein, and indicate the principal submissions that it wishes to make at this point. If required and appropriate Natural England will develop these points through further Written Representations or in response to Examiner's questions. Natural England may wish to revise our advice or add additional points, particularly if further information about the project becomes available and it reserves the right to bring such matters to the Examining Authority's attention.	Noted.
RR-029-2.4	Natural England has been working closely with the Applicant to provide advice and guidance on the Hornsea 4 Wind Farm since the spring of 2018. Natural England has also been working with the Marine Management Organisation, and the Centre for the Environment, Fisheries and Aquaculture Science to provide coordinated advice in relation to each of our remits. Following the Planning Inspectorate's acceptance of the application on 26th October 2021, Natural England has agreed to attend meetings with the developer with a view to progressing Statements of Common Ground as part of the Examination process and to try and resolve outstanding issues ahead of the examination.	For further details please see F3.4 Statement of Common Ground between Hornsea Project Four and Natural England: Derogation Matter (APP-257) , F3.5: Statement of Common Ground between Hornsea Project Four and Natural England: Onshore Matters (APP-258) submitted at application and G1.13 Statement of Common Ground between Hornsea Project Four and Natural England Other Offshore Matters , and G1.18 Statement of Common Ground between Hornsea Project Four and Natural England Offshore and Intertidal Ornithology submitted at Deadline 1.
RR-029-2.5	Natural England advises that the matters set out in Sections 3 to 6, and the Appendices, will require consideration by the Examining Authority as part of the Examination process unless progress can be made before the Examination commences. The Examining Authority may therefore wish to ensure that the matters set out in these representations are addressed as part of their first set of questions to ensure the provision of additional information early in the Examination process.	Noted.
RR-029-2.6	Please note that Natural England will produce a Risk and Issues log which will incorporate the comments we have made in this representation and track their resolution throughout the examination process. It is anticipated that this will form a core part of our	Noted.

	Written Representations Submission and will reflect any progress in issue resolution following the Relevant Representations.	
RR-029-2.7	<p>These representations provide an overview of Natural England’s advice. They are set out as below:</p> <ul style="list-style-type: none"> • Section 3 identifies the designated sites and natural features for which there may be impact pathways for this application. • Section 4 summarises Natural England’s overall view of the application. • Section 5 sets out the key environmental concerns which Natural England would like the Examining Authority (and ultimately the Secretary of State) to consider • Section 6 highlights over arching comments on the application which we like the Examining Authority to note. 	Noted.
RR-029-2.8	<p>Natural England’s detailed responses, constituting Natural England’s Written Representations, where more detailed explanation of issues has been considered relevant, may be found in the following Appendices:</p> <ul style="list-style-type: none"> • Appendix A Development Consent Order, Project description and Monitoring plans • Appendix B Offshore Ornithology • Appendix C Derogations Case • Appendix D Marine Mammals • Appendix E Marine Geology, Oceanography and Physical Processes • Appendix F Benthic and Intertidal ecology • Appendix G Fish and Shellfish • Appendix H Onshore Ecology, Seascape, Landscape and Visual Effects • Appendix I Legislative and Policy Framework 	Noted.
RR-029-2.9	Throughout our advice, we will be using colour coding to denote the level of potential risk or significance of impact associated with our comments. Full details of this are provided in Table 2.1 below.	Noted.
RR-029-2.10	Within this Section 5 of these Relevant and Written Representations we have assigned a broad risk rating to each topic heading to indicate the level of our concerns overall and have provided a summary of our key areas of concern. Within each of the Appendices to this letter we have provided a summary table, and a table of detailed comments where we have used the colour coding to give an indication of the level of risk associated with each of the points we raise.	Noted.

RR-029-2.11	Natural England are keen to continuously improve our input into Examinations and would therefore welcome any feedback on our approach.	
-------------	--	--

1.3 Designated Sites and Species Potentially Affected by this application

Reference	Relevant Representation Comment	Applicant's Response
RR-029-3.1	The designated sites and interest features included within Tables 3.1 and 3.2 are those which may be affected by the proposed project based on the information provided to date. It should be noted that this list may change if new evidence emerges during the course of the examination. Links have been provided to the citation or conservation objectives of designated sites. We have provided links, rather than hard copies, as these are large and live documents which are updated on a regular basis to incorporate the most up to date evidence. To avoid the potentially out of date or inaccurate documents being referred to during the Examination we recommend that the links are utilised. If the Examining Authority would also like hard documents please let us know at the earliest opportunity.	Noted.

Features for which Outstanding Concerns Remain

RR-029-T3.1-A	Southern North Sea SAC - UK0030395 - Harbour porpoise (<i>Phocoena phocoena</i>)	Noted
RR-029-T3.1-B	Flamborough Head SAC UK0013036 – Reefs Submerged and partially submerged Caves	Noted
RR-029-T3.1-C	The Wash and North Norfolk Coast SAC – UK0017075 - Harbour Seal (<i>Phoca vitulina</i>)	Noted
RR-029-T3.1-D	Humber Estuary SAC – UK0030170 - Grey Seal (<i>Halichoerus grypus</i>), Atlantic Salt meadows, Salicornia and other annuals colonizing mud and sand Sandbanks which are slightly covered by seawater at all times, Mudflats and sandflats not covered by seawater at low tide, Estuaries	Noted
RR-029-T3.1-E	Humber Estuary Ramsar – UK11031 - Grey Seal (<i>Halichoerus grypus</i>) Golden plover (<i>Pluvialis apricaria</i>) Black-tailed godwit (<i>Limosa limosa islandica</i>) Ruff (<i>Calidris pugnax</i>) Shelduck (<i>Tadorna tadorna</i>)	Noted

	<p>Dunlin (<i>Calidris alpina alpina</i>) Knot (<i>Calidris canutus</i>) Redshank (<i>Tringa totanus</i>) Non – breeding waterbird assemblage Atlantic Salt meadows Salicornia and other annuals colonizing mud and sand Sandbanks which are slightly covered by seawater at all times Mudflats and sandflats not covered by seawater at low tide Estuaries</p>	
RR-029-T3.1-F	<p>Humber Estuary SPA – UK9006111 - Habitats that support the classified features including: Intertidal mixed sediment; Intertidal mud; intertidal sand and muddy sand; and Salicornia and other annuals colonising mud and sand.</p>	Noted
RR-029-T3.1-G	<p>Berwickshire and North Northumberland Coast SAC – UK0017072 - Grey Seal (<i>Halichoerus grypus</i>)</p>	Noted
RR-029-T3.1-H	<p>Greater Wash SPA – UK9020329 - Red-throated diver (<i>Gavia stellata</i>) Common scoter (<i>Melanitta nigra</i>) Little gull (<i>Larus minutus</i>)</p>	Noted
RR-029-T3.1-I	<p>Flamborough and Filey Coast SPA - UN9006101 - Gannet (<i>Morus bassanus</i>) Kittiwake (<i>Rissa tridactyla</i>) Guillemot (<i>Uria aalge</i>) Razorbill (<i>Alca torda</i>) Seabird assemblage</p>	Noted
RR-029-T3.1-J	<p>Coquet Island SPA – UK9006031- Seabird assemblage</p>	Noted
RR-029-T3.1-K	<p>Farne Islands SPA – UK9006021 - Seabird assemblage</p>	Noted
RR-029-T3.2-A	<p>Holderness Inshore - UKMCZ0035 - High energy circalittoral rock Intertidal sand and muddy sand Moderate energy circalittoral rick Spurn Head (subtidal) Subtidal coarse sediment Subtidal mixed sediment Subtidal mud</p>	Noted

	Subtidal sand	
RR-029-T3.2-B	Holderness Offshore – UKMCZ0078 - Subtidal coarse sediment Subtidal mixed sediment Subtidal sand Ocean Quahog (<i>Arctica islandica</i>) North Sea glacial tunnel valleys	Noted
RR-029-T3.2-C	River Hull Headwaters SSSI – 1003424 - Lowland fens Lowland mire grassland and rush pasture, Lowland wetland floodplain fen, waterfringe fen, spring/flush fen and raised bog lagg, River supporting habitat, Wet woodland	Noted
RR-029-T3.2-D	Dimlington Cliffs SSSI – 1003488 - Geological Feature (EC - Quaternary of East England)	Noted
RR-029-T3.2-E	Humber Estuary SSSI – 1000783 - Estuary Saline lagoons Sand dunes Geology and geomorphology (Spurn Point) Grey seal	Noted
RR-029-T3.2-F	Flamborough Head SSSI – 1002289 - Reefs Vegetated sea cliffs of the Atlantic and Baltic coasts Submerged or partially submerged sea caves Aggregations of breeding birds	Noted
RR-029-3.2	European Protected Species - An application for a wildlife licence may be required if the application will have impacts on EPS. We advise the applicant to apply for a licence at the earliest opportunity for the following species: <ul style="list-style-type: none"> • Cetaceans - Harbour Porpoise • Amphibians –Great Crested Newt Natural England has adopted standing advice for protected species which includes links to guidance on survey and mitigation.	Noted
RR-029-3.3	Competent Authorities must have regard for the Habitats Regulations, the 1981 Act, Section 40 of the Natural Environmental and Rural Communities (NERC) Act 2006, and the Marine and Coastal Access Act 2009 when discharging any of their functions, including the granting of a DCO/DML and the discharge of associated conditions and plans. The advice provided in this letter is based on the information currently available	Noted.

in support of this application and may be updated on the basis of additional information such as pre-construction surveys.

1.4 The Overall Position of Natural England

Reference	Relevant Representation Comment	Applicant's Response
RR-029-4.1	<p>In relation to SPAs and SACs, the assessment provisions of the Conservation of Habitats and Species Regulations 2017 (and the Offshore Habitat Regulations) require that a competent authority may only agree to a plan or project of this nature after having ascertained, on the basis of an appropriate assessment, that it will not affect the integrity of the site(s). By this it is meant that such a plan or project may be granted authorisation only on the condition that the competent authority is certain, beyond reasonable scientific doubt, that it will not adversely affect the integrity of the site(s) concerned. On the basis of the information submitted, Natural England is not satisfied that it can be excluded beyond reasonable scientific doubt that the project would have an adverse effect alone or in-combination on the integrity of the:</p> <ul style="list-style-type: none"> • Flamborough and Filey Coast SPA • Southern North Sea SAC • Flamborough Head SAC • Humber Estuary SAC/SPA/Ramsar 	Noted. Please see responses below for detailed responses.
RR-029-4.2	<p>In relation to MCZs, the provisions of the Marine and Coastal Access Act 2009 require that the decision-making authority be satisfied that there is no significant risk of hindering the achievement of the conservation objectives of an MCZ. On the basis of the information submitted Natural England has concerns about the following sites:</p> <ul style="list-style-type: none"> • Holderness Inshore MCZ • Holderness Offshore MCZ 	Noted. Please see responses below for detailed responses.
RR-029-4.3	<p>In relation to SSSIs, the provisions of the 1981 Act require that the statutory undertaker take account of Natural England's advice when determining whether or not to permit an activity and/or whether to attach conditions to that permission. On the basis of the</p>	Noted. Please see responses below for detailed responses.

	<p>information provided, Natural England is concerned that the protected features of the following SSSIs may be damaged or destroyed:</p> <ul style="list-style-type: none"> • Dimlington Cliffs SSSI • Flamborough Head SSSI • Humber Estuary SSSI 	
RR-029-4.4	<p>In addition to the lack of certainty in relation to designated sites, Natural England believes that the ES does not provide the competent authority with sufficient information to make a decision in relation to the Environmental Impact Assessment (EIA) Regulations 2017 for the following bird species:</p> <ul style="list-style-type: none"> • Gannet • Kittiwake • Guillemot • Razorbill • Puffin • Herring gull • Great black-backed gull. <p>Natural England also advises that further information in relation to marine geology, oceanography and physical processes needs to be provided before the potential for significant impacts at and EIA scale can be ruled out.</p>	Noted. Please see responses below for detailed responses.

1.5 Summary of Key Environmental Concerns: Offshore Ornithology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.1	<p>Natural England confidence in the baseline</p> <p>Natural England consider the baseline characterisation data collected by digital aerial surveys over a 24-month period to be adequate. However, we have potentially significant concerns about the suitability of the methods used to analyse the baseline characterisation data to produce the density and abundance estimates that underpin both the Environmental Impact Assessment and Habitats Regulations Assessment. These concerns are related to those species for which modelling has been used (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin) in preference</p>	<p>The Applicant has held an additional Ornithology Technical Panel Meeting (17 Feb 2022) to discuss the MRSea comments and options available to resolve these concerns with Natural England.</p> <p>The Applicant is rerunning the MRSea design based abundances using a methodology that addresses Natural England's comments for gannet and intends to produce a Baseline Sensitivity Report which is currently anticipated to be submitted at Deadline 2.</p>

	<p>to the more frequently used design-based estimates. It should be noted that our concerns relate to possible errors in the application of the model, rather than the use of model itself. However, the resulting lack of confidence in the baseline characterisation means that Natural England cannot currently form any conclusions about the significance of predicted impacts presented by the Applicant that are dependent on model-based estimates. Natural England consider the Applicant to have several options available to resolve these concerns and we are keen to work with them towards quickly resolving this issue.</p>	<p>The Baseline Sensitivity Report shall also sign-post readers to the relevant parts of an updated MRSea Report, where the design-based estimates and monthly dot-density maps are presented for the key species alongside model-based estimates and monthly spatial distribution maps.</p>
<p>RR-029-5.2</p>	<p>Position on AEol</p> <p>Whilst we cannot agree with the Applicant's conclusions at this time (see above), we highlight that our current position in recent Examinations for in-combination impacts has been that we are unable to rule out significant adverse impacts at an EIA scale on kittiwake, razorbill, guillemot, gannet and greater black-backed gull due to cumulative collision mortality and/or displacement impacts for all projects up to and including Hornsea 3, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two. This conclusion was made irrespective of whether the Hornsea 4, Dudgeon Extension and Sheringham Shoal Extension Projects (DEP and SEP) are included in the cumulative totals or not. Any further impact to the existing totals from Hornsea 4 would reinforce this conclusion.</p>	<p>After considering the Secretary of State's decision for Norfolk Boreas and the associated Habitats Regulations Assessment (HRA), which follows from the decision made for Hornsea Three, the Applicant has revisited its conclusion of no potential for adverse effects on integrity (AEol) in respect of the black-legged kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and projects. On that basis, the Applicant will present an update to the Report to Inform Appropriate Assessment (RIAA) and its derogation case based on an overall conclusion that there is potential for an AEol on kittiwake at the FFC SPA from Hornsea Four in-combination with other projects. Consequently, to that extent only, compensatory measures for kittiwake will be necessary should the Secretary of State be minded to grant development consent. These changes will be captured in Revision 2 of B2.2. Report to Inform Appropriate Assessment Part 2 and Revision 2 of B2.5: Without Prejudice Derogation Case and subsequently updated upon request from the Examining Authority (ExA). For the avoidance of doubt, the Applicant's position remains that there will be no AEol from Hornsea Four alone on the kittiwake feature and, aside from the overall (in-combination) conclusion on integrity noted above, the Applicant maintains its position in all other respects in regards to its methodology and assessment of the effects on the FFC SPA features. The Applicant also maintains its position of no AEol alone or in-</p>

combination for all other qualifying species or seabird assemblage of the FFC SPA and for all other European sites.

In relation to EIA scale impacts, the Applicant's position remains that no significant adverse impacts arise for all offshore and intertidal ornithology receptors assessed (gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin), from Hornsea Four alone predicted impacts and cumulatively with all current planned and consented projects as detailed in [A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology \(APP-017\)](#).

It is the Applicant's intention following revisions to the baseline, to update cumulative assessments in line with any project changes since application, in order to reduce any uncertainties around the final assessments. This will reduce any uncertainty and allow Natural England to confidently comment on conclusions drawn from the assessment, either regarding the project alone or cumulative impacts.

In the DCO Application the Applicant's proposed without prejudice compensatory measures for gannet and kittiwake were presented together in a single Gannet and Kittiwake Compensation Plan (APP-186). However, as set out in the Applicant's position paper (AS-023), the Applicant is updating the RIAA and its derogation case 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. In light of the Applicant's updated position on kittiwake, it is considered appropriate to separate the compensatory measures for gannet and kittiwake into separate compensation plans (and consequently separate Implementation and Monitoring plans), reflecting that compensatory measures for kittiwake are now considered necessary, whereas for gannet the Applicant remains

		confident there would be no AEol alone or in combination and the compensatory measures for gannet remain “without prejudice” measures.
RR-029-5.3	<p>Position on AEol</p> <p>With respect to HRA impacts, we advised during the Hornsea 3, Norfolk Vanguard, Norfolk Boreas, EA1N and EA2 examinations that it was not possible to rule out an adverse effect on integrity (AEol) of the kittiwake feature of the FFC SPA for collision impacts from in-combination with other plans and projects, for all projects up to and including Hornsea 3, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two, irrespective of whether Hornsea 4, DEP and SEP are included in the totals or not (REP11-02710). Our position on this remains unchanged and we note that it was accepted by the Secretary of State in the Hornsea 3 and Norfolk Boreas decisions. Any additional mortality arising from these proposals would therefore be considered adverse. In essence, this project will be making an already bad situation worse.</p>	<p>The Applicant has considered the Secretary of State’s decision for Norfolk Boreas and the associated Habitats Regulations Assessment (HRA), which follows from the decision made for Hornsea Three. The Applicant considers that, despite its confidence that there is no potential for AEol on kittiwake from Hornsea Four in-combination with other plans and projects as evidenced in its original DCO application, it is not a point that it wishes to pursue during Examination.</p> <p>These changes will be captured in Revision 2 of B2.2. Report to Inform Appropriate Assessment Part 2 and Revision 2 of B2.5: Without Prejudice Derogation Case and subsequently updated upon request from the ExA based on an overall conclusion that there is potential for an AEol on kittiwake at the FFC SPA from Hornsea Four in-combination with other projects.</p>
RR-029-5.4	<p>Natural England also has concerns regarding displacement impacts giving rise to adverse effects on guillemot and razorbill (see below) from Hornsea 4, and regarding in-combination impacts on gannet from collision mortality. These concerns are summarised below and detailed in Annex B.</p>	<p>The Applicant has produced an Auk Displacement and Mortality Evidence Review (G1.47) which is submitted at Deadline 1. The Applicant hopes this will go some way towards easing the concerns of Natural England in relation to displacement impacts.</p> <p>The Applicant maintains its position in regards to its methodology and assessment of the effects on the guillemot, razorbill and gannet FFC SPA features. The Applicant also maintains its position of no AEol alone or in-combination for guillemot, razorbill and gannet FFC SPA features and for all other European sites as detailed in B2.2 Report to Inform Appropriate Assessment Part 1 (APP-167).</p>
RR-029-5.6	<p>Displacement impacts on auks</p> <p>Baseline characterisation data for Hornsea 4 suggests that the array area (plus buffer) is used by considerable numbers of guillemot and razorbill both within and outside the breeding season, and particularly in August and September. This is a key, sensitive period</p>	<p>Please refer to the Applicant’s responses to RR-029-5.7 with regards to the apportionment process outside the breeding season, and particularly in August and September. and RR-029-APDX:B-92 with</p>

	<p>for these two auk species as they head offshore to moult, the males accompanied by dependent chicks, and are flightless for several weeks potentially making them dependent on specific foraging areas. Given the proximity of the array area to the FFC SPA, we consider it likely that a large proportion of the auks present originate from the colony. We are therefore concerned that there is potential for the array area to have functional links with the FFC SPA colony and that displacement of birds from favoured areas could result in a loss of important supporting habitat for a key lifecycle stage, resulting in a range of effects including mortality. This risks undermining the conservation objectives for the site relating to the habitats of the qualifying species as well as the population of the qualifying species.</p>	<p>regards to the consideration of the levels of importance of areas outside the FFC SPA during the breeding and non-breeding season.</p>
<p>RR-029-5.7</p>	<p>We consider that the importance of this area to FFC SPA guillemot and razorbill during August and September has not currently been accounted for and warrants further exploration. We consider the Applicant's current approach is likely to underestimate impacts on these species in August and September and suggest that there could be merit in the application of a bespoke approach to assessments for this period.</p>	<p>The Applicant considered the evidence available to determine the potential risk to guillemot and razorbill during the non-breeding bio-seasons to account for the potential importance of the array area and surrounding waters during the development process. This led to the Applicant reducing the array area to avoid the areas of sea to the south of the array area that appear more important to the FFC SPA owing to the underlying geological and oceanographic features providing more favourable food resources post-breeding for auks. This process, determining and resulting in the array area materially reducing in size, is set out in Section 12.11: Developable Area of B2.5 Volume B, Chapter 5: Without Prejudice Derogation Case (APP-182) and the importance of the area to the south of the array area is visually presented in Section 10.4.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178).</p> <p>The Applicant also took into consideration Natural England's request during the Evidence Plan Process (OFF-ORN-6.12), that for the post-breeding months of August and September, a significant proportion of guillemots found within Hornsea Four are likely to be from the FFC SPA, which meant a bespoke approach to non-breeding season apportionment would be required. The Applicant's solution was to use a weighted apportionment approach for the non-breeding season as detailed in Section 10.4.4 of B2.2: Report to Inform</p>

		<p>Appropriate Assessment (APP-167-APP-178). For the months of August and September, the Applicant assumed based on expert judgment, backed up by tracking studies on guillemot post-breeding dispersal, that 75% of all breeding adult guillemots within Hornsea Four during these months were from the FFC SPA. This is a significantly higher proportion than would be assumed following the standard non-breeding approach, therefore accounting for Natural England’s request during the post breeding months of August and September.</p> <p>The Applicant’s position is that the development work and design refinement which took place prior to application, and then the bespoke approach to apportionment taken through the assessment process considered Natural England’s request to examine the relative importance of the general area. This is further supported through evidence on auk displacement and mortality rates within an updated paper (Auk Displacement and Mortality Evidence Review (G1.47)) to determine the most representative impact levels from Hornsea Four for any season and consider the importance of the wider regional waters in Section 10.4.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). The Applicant has submitted Auk Displacement and Mortality Evidence Review (G1.47) to the ExA at Deadline 1.</p>
RR-029-5.8	<p>Natural England notes that an investigation into the importance of the array area to guillemot and razorbill, the possible impacts of displacement, and likely colony origin of the auks present was previously requested by Natural England during the Evidence Plan Process but was not provided. Natural England request that further consideration is given now to drivers of seasonal variations in the wider spatial distributions of auks, particularly during August and September, to determine the potential importance of this area.</p>	<p>The Applicant is in dialogue with Natural England to further understand this request.</p> <p>As discussed in RR-029-5.7, the Applicant has submitted to examination at Deadline 1 the Auk Displacement and Mortality Evidence Review (G1.47).</p>
RR-029-5.9A	<p>Assessment methodology</p> <p>We note that there are several elements of the assessment methodologies where SNCB advice has not been followed:</p>	Noted.

		The Applicant has provided responses to Natural England’s queries on specific assessment methodologies in RR-029-5.9B to RR-029-5.9G
RR-029-5.9B	<ul style="list-style-type: none"> Natural England require the Applicant to consider all birds (sitting and in flight) for the assessment of auk displacement. By excluding birds in flight, the assessment is performed on a lower number of birds leading to an underestimation of the impacts. This advice has been followed for all other Round 3 projects but has not been included in the Hornsea 4 assessment. 	<p>Following agreement on the baseline data ((post Deadline 2), the Applicant intends to submit updated displacement assessments for auks (including both sitting and flying birds) to the ExA during the examination (at or prior to Deadline 5).</p> <p>It should be noted though, that the Applicant has undertaken revisions to current baseline and displacement analysis of auks to include flying and sitting birds, the results of which show that material changes to the final abundances and therefore the final potential impacts are likely to occur. These will be presented in a revised displacement report once agreement has been reached on the baseline data.</p> <p>Please also refer to the Applicant’s response to RR-029-5.9.</p>
RR-029-5.9C	<ul style="list-style-type: none"> We disagree with the seasonal definitions used by the Applicant for gannet and kittiwake displacement. The Applicant has used the migration-free breeding season, which is a narrower period of time excluding months at the start and end of the ‘full’ breeding season where some birds in a given biogeographic area are engaged in breeding activities, but others are still on or starting migration. We consider that using this reduced breeding season as the basis for apportioning birds to SPA colonies during the breeding season will lead to displacement impacts being underestimated. 	Please refer to the Applicant’s response to RR-029-APDX:B-82.
RR-029-5.9D	<ul style="list-style-type: none"> Assessment outputs are not presented with their respective confidence intervals. Confidence intervals are used to show the range we can be 95% confident the true value falls within (for a 95% confidence interval). As the true value could fall anywhere within this range, confidence intervals show the level of uncertainty associated with an estimate (i.e. the larger the interval is, the more uncertain the true value is and vice versa). By not presenting the confidence interval range, it is not possible to determine the level of certainty that can be placed in the estimates presented, and therefore for SNCBs and 	The Applicant intends to produce an updated MRSea Report, where the design-based estimates and revised model-based estimates will be presented. The Applicant will provide clear signposting to the 95% confidence intervals for Natural England to use for determination of certainty around the data.

	<p>decision makers to understand how much weight should be placed on the predicted impacts that are based on these estimates.</p>	
RR-029-5.9E	<ul style="list-style-type: none"> For the Population Viability Analysis, the Applicant has not presented the Counterfactual of Final Population Size (ratio of the impacted final population size to the unimpacted final population size). This is a metric which can be used in the interpretation of predicted impacts on populations and was included in earlier versions of the assessment. We consider it essential that it is provided as it provides a clear relationship with the magnitude of any impact, making it easier to assess what the population level effects of any impact will be. 	<p>Please refer to the Applicant’s response to RR-029-APDX:B-18 with regards to the presentation and use of the Counterfactual of Population Growth Rate (CPGR) and Counterfactual of Final Population Size (CFPS) outputs from PVA.</p>
RR-029-5.9F	<ul style="list-style-type: none"> The Applicant has used a theoretical generalised stable age structure to apportion impacts to adults from SPA colonies for HRA assessment. This is unlikely to be representative of the actual proportions of adults present within specific areas at different times of year and could lead to over, or more importantly, underestimation of impacts. Where good quality site-specific ageing data is not available, Natural England recommend that the precautionary approach is to assume that all ‘adult type’ birds (i.e. birds that cannot be distinguished from adults, and hence might be adults) are apportioned as adults. 	<p>Please refer to the Applicant’s response to RR-029-APDX:B-44.</p>
RR-029-5.9G	<p>We recommend that assessment outputs are provided taking full consideration of SNCB guidance, as this will result in the appropriate values being available for the Examining Authority and decision-maker to carry out their assessment.</p>	<p>The Applicant is working on the production of an Assessment Sensitivity Report that set out the key parameters highlighted by Natural England. The Applicant currently intends to submit this report to the ExA at Deadline 2 to facilitate understanding on the divergence of Natural England’s requests from the Applicants evidence-based position. If necessary it can be updated and re-submitted at various points during the examination, as discussions evolve..</p>
RR-029-5.10	<p>Indirect effects on seabirds</p> <p>For EIA, the Applicant suggests that if there were no significant impacts identified for potential prey species in their respective assessments then there would be no significant impacts on ornithology receptors. Natural England disagrees with this assumption as the, assessment undertaken in the Fish and Shellfish chapter considers impacts at a regional population level which does not reflect the likely distribution of foraging birds,</p>	<p>Impacts upon habitats and prey are assessed in the inter-related effects section of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>The Applicant is giving further consideration to potential supplementary work on indirect-effects (to be confirmed and</p>

	<p>particularly during the breeding season. Furthermore, it only considers fish and shellfish as receptors, rather than potential sources of impact. Natural England consider that an understanding of the relative importance of the site as a foraging area, and potential for any impacts on prey abundance and distribution is critical in framing the predicted impacts that can be quantified. We suggest that any negative impact on forage fish may have an impact on vulnerable seabirds – particularly kittiwake.</p>	<p>anticipated to be delivered at Deadline 3). The Applicant will also signpost relevant sections of the ES which it is hoped will help clarify and confirm the work has been concluded to date.</p> <p>Please also refer to the Applicant’s response to RR-029-APDX:B-11.</p>
RR-029-5.11	<p>Natural England advise that a summary of the outcomes of the relevant assessments on forage fish abundance and distribution in and around the project area should be provided and discussed in relation to the implications for key seabird species, with a focus on the months of August and September for guillemot and razorbill. This will help clarify whether more localised impacts on prey species could contribute to impacts on seabirds, and if so to what extent.</p>	<p>Please refer to the Applicant’s response to RR-029-5.10.</p>
RR-029-5.12	<p>Portrayal of Natural England/SNCB Advice</p> <p>Whilst we welcome that the Applicant has at times sought to provide analysis that aligns with the advice that Natural England have provided throughout the Evidence Plan process, we are disappointed that this and wider SNCB advice is frequently referred to as “overly precautionary” in comparison to the applicant’s “evidence led” approach. The SNCB approach is no less evidence-led than that of the applicant. It is simply a different interpretation of the same evidence, and one which takes account of the evidence-poor, high-uncertainty environment within which the assessments are carried out, as well as the requirements of the Habitats Regulations. We therefore find this portrayal of our advice to be misleading. Ultimately this is a matter of ecological judgment and given Natural England’s role as the appropriate national conservation body, considerable weight ought to be given to its advice and there should be cogent and compelling reasons for departing from it.</p>	<p>Noted. The Applicant has discussed this with Natural England, and it is not our intention to be antagonistic. We shall consider the terminology used in future, though the use of the term “overly precautionary”, when used, is based on the Applicant’s interpretation of the evidence presented.</p> <p>The Applicant recognises the important role of Natural England and appreciates the time staff have provided, the contribution to workshops and advice on the DCO application.</p>

1.6 Summary of Key Environmental Concerns: Compensation

Reference	Relevant Representation Comment	Applicant’s Response
<i>Advice on the proposed compensation measures</i>		
RR-029-5.13	Kittiwake and gannet offshore structures	Please see Response RR-029-APDX:C-A.

	<p>An offshore Artificial Nesting Structure (ANS), either new or repurposed, is proposed as the primary compensation measure for kittiwake, with seagrass restoration acting as a resilience measure. A comprehensive review of the existing evidence base, further informed by targeted survey effort, has been provided to support the offshore artificial nesting compensation measure. We consider the measure has potential ecological relevance and that it is technically feasible, subject to development of detailed designs. However, we highlight that a specific location or locations has not been identified for the delivery of this measure, which significantly reduces the confidence that the measure is secured.</p>	
RR-029-5.14	<p>Furthermore, it remains unclear if nesting habitat is a limiting factor for the breeding population of kittiwake in the southern North Sea. This is a key uncertainty that needs addressing to have full confidence in the measure. We are further concerned that a commitment has only been made to provide a single structure with a lead in time of 1-2 breeding seasons before first generation (see Paragraph 5.27). We consider this to be very high risk and note that is a substantial reduction in the compensation proposed and accepted by SoS for Hornsea 3</p>	Please see Response RR-029-APDX:C-B.
RR-029-5.15	<p>Natural England considers the provision of an offshore artificial nest structure for gannet to be highly experimental. We are also concerned about the feasibility of a single structure being able to support both kittiwake and gannet colonies if required to deliver compensation for both species. The provision of a gannet colony would require more space than a kittiwake ANS and the provision of a structure optimised for both species may prove challenging.</p>	Please see Response RR-029-APDX:C-I.
RR-029-5.16	<p>Kittiwake onshore structures</p> <p>The Applicant has also included the provision of onshore artificial nesting structures for kittiwake and gannet compensation but note that their preference is to deliver offshore structures. Natural England is not persuaded that further onshore artificial nesting structures are likely to result in sufficient benefits to produce compensation, given the number and location of such structures already proposed by submitted OWF projects. It has not been demonstrated that there is a sufficient pool of nest-limited kittiwake recruits, suitable locations and/or prey availability available to meet and sustain the existing demand for this measure. We therefore recommend that this measure should not be taken forward by the Applicant.</p>	Please see Response RR-029-APDX:C-D.
RR-029-5.17	<p>Auks (guillemot and razorbill) and gannet</p>	Please see Response RR-029-APDX:C-CC.

	<p>The measures proposed for auk compensation are mammalian predator eradication and bycatch reduction. Again, fish habitat (seagrass) restoration is included as a resilience measure. The progression of multiple measures for auk compensation is welcomed, as whilst both measures have theoretical merit, neither of the two measures can be considered adequately secured, due to outstanding uncertainties around feasibility, effectiveness and location. We note, however, that the Applicant does not explicitly commit to undertaking both primary compensation measures and suggests that they have confidence that “each of the measures on their own is robust and deliverable”. This is of concern to Natural England, as based on the evidence available at this time, we do not have confidence that either measure would be able to deliver compensation individually. Each measure currently has critical uncertainties that if not met would render the measure undeliverable.</p>	
RR-029-5.18	<p>We also highlight that if the reasons for AEoI include the effective habitat loss of functionally linked sea areas that have an important role in the life-cycle of FFC SPA auks, as we consider they might do, these measures are not of a nature that would address this aspect of the impact.</p>	Please see Response RR-029-APDX:C-DD.
RR-029-5.19	<p>Bycatch reduction</p> <p>The bycatch reduction measure aims to boost auk and gannet populations by reducing their levels of bycatch from commercial fisheries. A target fishery has been identified as an auk bycatch hotspot, and there is some evidence to suggest this might possibly form a basis for compensatory measures. However, we highlight that whilst delivering compensation via bycatch reduction is theoretically viable, there are several significant uncertainties which we consider to be extremely high risk. In particular, there is currently no proven method to reduce bycatch of auks in gillnet fisheries. The measure currently relies on the success of a single trial for a single method which is yet to happen, and therefore the effectiveness of this measure is unknown. It is also not possible to make an assessment of the scale of measure that might be achievable without an implementation method with quantified success rates, and a quantified assessment of bycatch levels at the target fishery. Evidence from biologically similar species to gannet suggests that bycatch reduction might be possible for this species, however a target fishery and location have not yet been identified. This would need to be addressed in addition to the uncertainties outlined above for the auk species.</p>	Please see Response RR-029-APDX:C-EE and RR-029-APDX:C-FF
RR-029-5.20	<p>Predator eradication</p>	Please see Response RR-029-APDX:C-DDD.

	<p>The predator eradication measure aims to boost auk population growth by removing 100% of invasive mammalian predators (rats) from an island colony(ies). The evidence for predator eradication being effective for auks is limited, but Natural England agree that the measure has theoretical merit. However, a specific location for implementation has not yet been identified, without which the degree of predator interaction and therefore scale of compensation achievable cannot be determined. Nor can the compensation be considered secured prior to the identification of a delivery location with secured land rights. We therefore do not have confidence at this stage that the measure will be deliverable.</p>	
RR-029-5.21	<p>We further note that the Applicant has included predator control as well as eradication for islets where full eradication would not be possible. Natural England do not consider there to be sufficient evidence to demonstrate that predator control rather than eradication would result in sufficient long-term benefit and provide an acceptable compensatory measure.</p>	Please see Response RR-029-APDX:C-EEE.
RR-029-5.22	<p>Seagrass restoration</p> <p>Natural England is of the view that fish habitat (seagrass) restoration cannot be considered compensation, as a link between seagrass restoration and the productivity of the impacted species cannot currently be demonstrated or quantified. We also consider that it cannot be treated as a back-up to account for the high levels of uncertainty in other measures. This is also due to the likely timeframes to implementation, and uncertainty regarding the level of impact on target species. Nevertheless, we welcome and support the measure being retained for resilience/ecosystem enhancement and commend the general approach being taken.</p>	Please see Response RR-029-APDX:C-RRR.
<p><i>Key consenting concerns applicable to all measures</i></p>		
RR-029-5.23	<p>Scale of compensation required</p> <p>Natural England advises the scale of compensation required for all measures cannot currently be determined. Firstly, due to concerns with the offshore ornithology baseline characterisation (see Paragraph 5.1) the final extent of the impacts cannot yet be agreed. Second, a quantified assessment of the level of compensation required to meet the predicted impact will be necessary for each measure, as the scale of the measure required will in part determine whether delivery is feasible. We note that the Applicant has provided some initial assessments, but we do not consider that the current evidence</p>	Please see Response RR-029-APDX:C-SSS.

	base is sufficient in most instances to have confidence in these as potential reductions remain theoretical for most measures.	
RR-029-5.24	Uncertainties with the measures will also need to be reflected in the scale of compensation delivered. We note that none of the measures proposed by the Applicant aim to deliver compensation that directly benefits the site of impact, rather they are aiming to recruit birds to the wider geographic population from which it is assumed that some will recruit to FFC SPA. Natural England consider that like-for-like provision to the metapopulation cannot be assumed and this will therefore need to be reflected in the level of compensation provided. For example, it is Natural England's view that the Applicant should demonstrate that the compensatory measures are of a scale and nature that will provide a level of recruitment into the East Atlantic that has clear potential, in turn, to lead to a sufficient number of adult kittiwakes recruiting to the FFC SPA, as the principal English site in the national site network for this species (indeed the only site in England with this species as a qualifying feature). We acknowledge that it will be impossible to prove that the required number of adult birds has been recruited into the SPA, but we do not consider that that should constrain the scale of the measures. We do not think this could be demonstrated if the measures are only predicted to provide an equivalent number of adult birds to those lost from FFC SPA into the wider population.	Please see Response RR-029-APDX:C-TTT.
RR-029-5.25	We acknowledge that the Applicant has suggested a 1:2 delivery ratio for all measures. However, whilst we welcome the Applicant's commitment to providing compensation above a 1:1 ratio it is unclear how this ratio has been selected. Further discussion will be required to ensure that all aspects of uncertainty have been considered for each measure, noting that the level of uncertainty needing to be factored in will likely differ between measures. Natural England advise that the main focus should be to ensure that the level of compensation secured is sufficient to address the level of impact, as well as the uncertainties around the measures themselves in order to ensure sufficient compensation can be achieved to fully address the losses incurred throughout the lifetime of the project.	Please see Response RR-029-APDX:C-UUU.
RR-029-5.26	The same considerations will need to be given to the auk and gannet compensatory measures if sufficient evidence becomes available to enable delivery levels to be calculated	Please see Reponse RR-029-APDX:C-VVV.
RR-029-5.27	Lead-in times	Please see Response RR-029-APDX:C-WWW.

	As noted above (Paragraph 5.14), the Applicant is proposing minimal lead-in times for the compensation measures, with implementation planned for just 1 or 2 years prior to operation. Natural England are concerned that this does not allow sufficient time for the measures to be delivering prior to impact occurring. European Commission and Defra guidance ¹² states that the measure should be functioning prior to the loss occurring. Should the Applicant wish to continue with these lead-in times it will need to be evidenced that a reduced lead-in time is ecologically viable.	
RR-029-5.28	<p>Strategic compensation – increasing prey availability</p> <p>Natural England maintains that increasing ‘forage fish’ prey availability would be the most ecologically effective method to increase productivity of the target bird populations, acknowledging that this could most effectively be delivered via a Government-led strategic approach at a scale larger than any one wind farm. We highlight that it remains the only measure to directly benefit the impacted SPA and highlight that prey availability measures would also have the additional benefit of addressing the effective habitat loss that could result from auk displacement, by increasing the foraging resource within those areas that remain available</p>	Please see Response RR-029-APDX:C-XXX.
RR-029-5.29	<p>Natural England compensatory measures ‘check list’</p> <p>To assist developers and regulators, Natural England has developed a checklist of aspects that need to be described in detail in compensation submissions, to give confidence that the measures can be secured. This is presented with our detailed comments.</p>	Noted.

1.7 Summary of Key Environmental Concerns: Marine Mammals

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-5.30	<p>Use of Site Integrity Plans</p> <p>Whilst Natural England are in agreement that the project alone will not result in an Adverse Effect on Integrity (AEoI) on the Southern North Sea SAC (SNS SAC), there are various scenarios whereby the underwater noise thresholds for the site would be exceeded on an in-combination basis, and therefore the potential for adverse effect in-combination cannot be excluded due to the uncertainty over concurrent works. This issue is not unique to Hornsea 4 and there is a broad acceptance that in many instances</p>	Noted. Industry wide, each project is required to submit a SIP for approval by the MMO prior to piling in accordance with the conditions of its Marine Licence(s). Each submission will be made once construction and piling programmes are known for that project. Programmes can then be considered by the MMO collectively for all relevant projects and form part of its overall determination of whether mitigation is necessary to avoid adverse effects on the

	<p>it will be possible to mitigate or manage noise levels to avoid AEol closer to the time of construction. However, it is usually not possible to demonstrate this through assessment given the vast number of potential scenarios that would need to be accounted for.</p>	<p>integrity of the SNS SAC and the nature of any such mitigation measures. The Applicant notes that Natural England’s comments are related to industry-wide management and are not project-specific.</p> <p>The Applicant notes that the SIP is a standard document and has been adopted by the Secretary of State in multiple offshore wind DCOs, most recently in the Norfolk Boreas DCO and Norfolk Vanguard DCO decisions. In the Habitats Regulations Assessment for Norfolk Vanguard, the Secretary of State confirmed (at page 96): <i>“The Secretary of State is satisfied that through the SNS SIP, the Applicant will use the most appropriate measures for the Project based on best knowledge, evidence and proven available technology at the time of construction”.</i></p> <p>The SIP process continues to be the most appropriate mechanism for managing in-combination impacts.</p>
RR-029-5.31	<p>The submission of an In-Principle Site Integrity Plan (SIP) offers the opportunity for developers to demonstrate to the ExA/Competent Authority that avoiding AEol will indeed be possible through appropriate management and mitigation but deferring the ultimate determination to the MMO in the pre-construction phase of the project. It is then anticipated that the SIP will be updated/finalised close to the time of construction when the extent of noisy activities within the designated site in any given season is better known and therefore able to be assessed, to enable the MMO to assess the impact of a much-refined worst case scenario and confirm that the applied for works will not result in an AEol on the SNS SAC in-combination with other plans and projects. Whilst this approach carries risk and uncertainty for all parties, it has been accepted as the most pragmatic way forward at this time.</p>	<p>Noted. Please see response to Natural England comment RR-029-5.30.</p>
RR-029-5.32	<p>Natural England have previously advised that a mechanism to manage multiple SIPs over varying timescales needs to be developed and put in place by the Regulators to ensure that the noise thresholds are not exceeded. Whilst we recognise steps have been taken to achieve this with the creation of the Activity Tracker, the current “case by case” approach is not fit for purpose and has already resulted in the in-combination noise levels coming close to exceeding the site thresholds. This is likely to result in difficulties across all industries further down the line, as the next round of offshore windfarms come</p>	<p>Noted. Please see response to Natural England comment RR-029-5.30.</p>

	<p>forward in the southern North Sea. Should potential exceedance of the thresholds occur, a process for dealing with this issue needs to be in place. Until the mechanism by which the SIPs will be managed, monitored and reviewed is further developed, Natural England are unable to advise that this approach is sufficient to address the in-combination impacts described in this Application and therefore it is not possible to be certain that there will be no AEol on the SNS SAC.</p>	
<p>RR-029-5.33</p>	<p>Mitigation commitments</p> <p>As was the case with previous OWF submissions, the Applicant has relied heavily on the SIP process to secure the necessary mitigation measures post-consent to avoid in-combination adverse effect on the SNS SAC. Given the concerns raised above, we strongly recommend that the Applicant considers committing to a range of mitigation measures at this stage, rather than relying on the SIP securing them. If this approach was progressed, the mitigation should be included in principle, to minimise the risk of an adverse effect as far as possible, with the later outcomes of the SIP determining if the mitigation measures can be removed. We consider that mitigation options are available to the Applicant and would be happy to engage further with them on the merits of this approach.</p>	<p>Noted. Please see response to Natural England comment RR-029-5.30.</p> <p>Noted. In relation to the Site Integrity Plan, the Applicant confirms that the specific mitigation measure (or suite of measures) (as outlined in F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246)) that will be implemented during the construction of Hornsea Four will be determined, in consultation with the relevant SNCB, following confirmation of final hammer energies and foundation types, collection of additional survey data (noise or geophysical data), and/or acquisition of noise monitoring data, and/or information on maturation of emerging technologies F2.5: Outline Marine Mammal Mitigation Protocol (APP-240). This additional data and information will allow the noise modelling to be updated to feed into the final SIP and discussions on the appropriate mitigation measure(s). This process includes provision for at-source mitigation, if required, and will ensure that a conclusion of no AEol (with respect to significant disturbance of harbour porpoise in relation to the conservation objectives of the SNS SAC) can be maintained.</p> <p>Both the F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) and F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) finalisation processes include provision for at source mitigation, if required. As such, the Applicant does not consider it necessary to include such commitments at this stage.</p>

		<p>As noted above, in the most recent Norfolk Vanguard Habitats Regulations Assessment the Secretary of State confirmed (at page 96):</p> <p><i>"The Secretary of State is satisfied that through the SNS SIP, the Applicant will use the most appropriate measures for the Project based on best knowledge, evidence and proven available technology at the time of construction".</i></p>
<p>RR-029-5.34</p>	<p>Geophysical surveys</p> <p>We recommend that further commitments are made regarding geophysical surveys should they be included in the DCO under pre-construction works. In particular, we advise that the Applicant must seek sign-off on their geophysical surveys, as this will notify the Regulators to enable them to take them into account in the in-combination assessments for SNS SAC.</p>	<p>The Applicant can confirm that geophysical surveys are not included in the Hornsea Four DCO Application since the precise timing, scope and scale of geophysical surveys associated with Hornsea Four are not known at this stage. The Applicant can confirm that once these details are known, appropriate consideration will be given to these surveys in the context of the MCAA 2009, the Habitats Regulations, current guidance, and best practice. The Applicant considers that this mechanism will ensure that Regulators are provided with accurate details of proposed surveys at the earliest possible opportunity.</p>
<p>RR-029-5.35</p>	<p>Inclusion of Unexploded Ordnance (UXO)</p> <p>Within the Report to Inform Appropriate Assessment (RiAA) the Applicant has undertaken assessments of the potential impacts to designated sites for marine mammals from unexploded ordnance (UXO) clearance activities. While we welcome the work undertaken, we cannot comment on this section or the AEoI conclusions as we do not have the information to underpin the assessment scenario, nor have we seen any of the proposed mitigation documents. We consider it would be more appropriate for this level of detail to be provided as part of the standalone UXO Marine Licence application. We consider it worth noting however that the Applicant's proposed worst case scenario of 5 UXO detonations in a 24 hour period is of major concern for the future UXO marine licence as the threshold would likely be exceeded.</p>	<p>The Applicant can confirm that UXO clearance is not included in the Hornsea Four DCO Application since the number, location and size of any potential UXOs is unknown; however, a high-level assessment is provided on the basis of assumptions about the expected level of risk. A detailed assessment of UXO clearance will be developed for a separate Marine Licence at a later stage (this approach was agreed with the MMO 26 November 2018). This Marine Licence application will also include details of the mitigation proposed for UXO clearance.</p> <p>Once the above details in relation to UXO clearance activities are known, these will be fed into the final SIP to ensure that a conclusion of no AEoI (with respect to significant disturbance of harbour porpoise in relation to the conservation objectives of the SNS SAC) can be maintained.</p>

1.8 Summary of Key Environmental Concerns: Marine Processes

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.36	<p>Coastal Access Ramp</p> <p>The application includes details of a temporary access ramp to be located in the intertidal area during the construction phase of the project. The potential impacts of this have not been assessed for impacts on marine processes or onshore ecology. Although the structure is required for a relatively short period of time (36 months), temporary structures have the potential for significant impacts on coastal processes and nearshore sediment transport particularly when placed at a low point along a rapidly eroding coastline.</p>	<p>Marine Processes</p> <p>It is the Applicant's position that a proportional and robust assessment has been undertaken for all infrastructure with the potential to result in likely significant effects. Information pertaining to the access ramp and of relevance to the marine processes assessment is provided in Section 1.9.2 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) (MDS for Construction Phase) and Section 5.8.3 of F2.2: Outline Code of Construction Practice (APP-237).</p> <p>Located above Mean High Water (defined by Ordnance Survey boundary lines), the temporary access ramp only partially encroaches on the very upper intertidal. Therefore, interactions with the sea are only limited and during the highest tides. As detailed in paragraph 1.9.2.1 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), the ramp is not anticipated to interfere with any of the beach processes including nearshore sediment transport owing to its proposed location (at the drift divide). At the drift divide there is effectively no littoral drift driven by prevailing north-east waves due to sheltering from Flamborough Head and therefore there is no pathway to affect the transport processes. Consequently, there is no likely significant or long-lasting impact anticipated on coastal processes due to the temporary access ramp.</p> <p>The Applicant would like to draw attention to Barmston Head, defended by rock armour, located approximately 1 km downdrift of</p>

the proposed ramp. This structure is a deliberate long-term coastal defence measure limiting erosion of the coast at this location and influencing longshore drift to the south. This feature is helping to stabilise the coast further in this region and has been situated away from the drift divide. It also highlights that this an engineered coastline with precedent for similar structures albeit the existing are much longer term and providing a different function.

Onshore ecology

As presented in [A6.3.1 Extended Phase 1 Habitat Survey Report \(APP-100\)](#) and [A6.3.2 Extended Phase 1 Habitat Survey Target Note Tables \(APP-101\)](#), the Applicant undertook appropriate baseline ecological surveys, which included the landfall location which then informed the requirement for any further species-specific surveys and in turn the findings used to inform the Ecological Impact Assessment presented in [A3.3 Ecology and Nature Conservation \(APP-027\)](#).

As presented on Figure 12 (Sheet 1 of 31) and Figure 13 (Sheet 2 of 31), the key habitats recorded at the landfall location (and which falls partially within the footprint of the proposed access ramp), comprise arable fields, which is of low ecological value. The field boundaries of these arable areas are defined by either species poor hedgerows and/or standing water (ditches). The hedgerow denoted by Target Note (TN)002 (Figure 12 (Sheet 1 of 31) of [A6.3.1 Extended Phase 1 Habitat Survey Report \(APP-100\)](#)) was recorded as a species poor hedgerow with trees and subsequently assessed as providing suitability for commuting and foraging bats. A suite of monthly bat activity transect surveys were undertaken in 2019, as presented in [A6.3.10 Bat Activity Transect Survey Report](#), which included the habitat further west of the landfall area (and primarily due to the absence of suitable habitat for foraging/commuting bats being present along the coastline). The 2019 survey effort recorded Common pipistrelle *Pipistrellus pipistrellus* and Nathusias pipistrelle *Pipistrellus nathusii*, although their activity was concentrated along

		<p>the hedgerows and areas of scrub further south of the transect as opposed to be recorded as using the habitat closer towards the coastline. No features suitable for roosting bats were noted.</p> <p>The ditch (denoted by TN004 on Figure 12 (Sheet 1 of 31) of A6.3.1 Extended Phase 1 Habitat Survey Report (APP-100)) was noted to comprise steep and overgrown banks but was subsequently surveyed for water vole and otter in May and August 2019. No evidence of either species was noted during these surveys, as presented in A3.3 Ecology and Nature Conservation (APP-027). Consequently, no direct or indirect impacts on onshore ecological receptors were predicted to occur within the landfall area and therefore no EclA was required.</p> <p>The Applicant has committed to undertaking pre-construction surveys (which will include the landfall and proposed access ramp location), as presented in F2.3: Outline Ecological Management Plan (APP-238). Should there be any significant changes to baseline conditions observed during this survey effort, these will be communicated to stakeholders alongside an invitation to discuss any adaptations to the current mitigation measures, should they be required.</p>
RR-029-5.37	<p>Consequently, based on the limited information available, Natural England is unable to exclude the potential for significant impacts to a number of receptors, including designated sites such as Flamborough Head SAC, Humber Estuary SAC, SPA, Ramsar and SSSI, Holderness Inshore MCZ and Dimlington Cliffs SSSI. To address this, we wish to see a full and detailed assessment of: the potential impacts of the access ramp on coastal processes and geomorphology and consideration of how any impacts will be managed; assessment of the implications for the Shoreline Management Plan (noting the policy for this area is No Active Intervention), and the effects on marine ecology and protected sites.</p>	<p>The Applicant considers that the assessment of impacts on coastal processes is adequate and proportionate given the likely small scale of the structure and the planned deployment location, both in terms of its position relative to a littoral drift divide and its cross-shore location in the upper intertidal.</p> <p>The Applicant has provided detailed justification in responses to RR-029-APDX:E comments from Natural England, noting that no measurable impacts would be observed at the designated sites such as Flamborough Head SAC, Humber Estuary SAC, SPA, Ramsar and SSSI, Holderness Inshore MCZ and Dimlington Cliffs SSSI as a result of the temporary access ramp.</p> <p>Section 4.9.1.15 of Volume A1, Chapter 4: Project Description (APP-010) states that the actual construction method would take into</p>

		<p>consideration the extent of any subsequent erosion prior to construction commencing. Best practice site management would be the most appropriate way to manage any perceived risks.</p>
<p>RR-029-5.38</p>	<p>Receptors Natural England does not agree that appropriate marine process receptors have been identified for assessment and considers that the “study areas” are too narrow in scope. Consequently, we are unable to agree with a large number of impact assessment conclusions.</p>	<p>The Applicant’s approach represents standard practice which considers source, pathway and receptor relationships. The pathway type helps establish the likely extent (or reach) of an effect. For example, the spread of plumes from sediment disturbance events extending up to the distance of a tidal excursion of a spring tide (for fine material), or changes in wave energy propagation towards the coastline due to blockage type effects due to structures. This approach has been applied to numerous consented offshore wind farm developments, including but not limited to Hornsea Three, Norfolk Vanguard and Norfolk Boreas. In addition, this approach is being applied to numerous pre-application EIAs at the time of writing. Receptors relevant to marine processes which are within reach of a pathway are identified in Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013): Table 1.6 for landfall, Table 1.8 for export cable and Table 1.9 for the offshore array area.</p> <p>Section 1.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides the Applicant’s justification for the definition of the marine processes study area. The study area encapsulates all potential significant effects. The basis of the study area was established during the Scoping Phase and presented to the Evidence Plan Technical Panel. In-line with the approach commonly applied to offshore wind farm EIAs, the study area is established to be sufficiently broad but also relevant, and for the purposes of Hornsea Four extends to the Humber Estuary (to allow consideration of wave-related effects). Focused sub-areas for the array, export cable and landfall are also included which allow for plume-type effects which have the potential to spread at the scale of a spring tidal excursion. The same basis for establishing the study area was described for PEIR.</p>

RR-029-5.39	<p>Although the impacts to designated sites may be subject to separate assessments (i.e. RIAA and MCZ Assessments), they remain marine process receptors and therefore should also be fully considered within the Environmental Statement.</p>	<p>As noted above, this approach applied by the Applicant is considered standard industry practice and has been applied to numerous recently consented offshore wind farm developments. The marine processes assessment provides the source and pathway description for related receptors assessed elsewhere. All potential impacts to designated sites have been assessed in the Environmental Statement.</p>
RR-029-5.40	<p>Maximum Design Scenarios</p> <p>Although we acknowledge that there have been efforts made to refine the Maximum Design Scenarios (MDS) in some cases, Natural England remains concerned that a number of maximum design scenarios are unnecessarily precautionary. Of particular concern to Natural England are the volumes of sandwave levelling and boulder clearance outlined in the draft DCO/dML, which are based on clearance across the full length of the cable corridor, particularly given that there are geophysical data available from a 2021 campaign that should allow these figures to be refined. An additional concern is the proposal to defer a large proportion of the detailed assessment to the post consent phase, notably the Cable Burial Risk Assessment and Scour Assessment. Consequently, the volumes of rock protection outlined in the draft DCO/dML are conservative and estimated based on experience at other projects rather than being informed by the ground conditions within the developable area. From a marine processes perspective, this makes WCS for each receptor difficult to define as a wide range of potential scenarios are possible.</p>	<p>The Applicant acknowledges Natural England's comment and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>
RR-029-5.41	<p>It should also be noted that the project is not intending to decommission rock projection at the end of the operational lifetime of the project. Consequently, the placement of rock protection represents a permanent change to the seabed and the impact of this beyond the operational lifetime of the project should be considered.</p>	<p>It is the Applicant's position that the potential impacts associated with infrastructure remaining in situ during the decommissioning phase of the project has been robustly assessed in the EIA. The effect of infrastructure, including rock protection, left on the seabed is considered to be equivalent to effects during the operational phase. As assessed in Section 1.9.3 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), the assessment considered long-lasting impacts until the physical processes reach an equilibrium, therefore they have not been treated as temporary or reversible in this assessment. As such, the impacts</p>

		<p>will be no worse than those presented within Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). As stated in Volume A1, Chapter 4: Project Description (APP-010), the Applicant confirms that at the end of the operational lifetime of Hornsea Four, it is anticipated that all structures above the seabed (excluding scour protection and cable rock protection) or ground level will be completely removed. The Crown Estate agreement for lease (AFL) for Hornsea Four requires that the project is decommissioned at the end of its lifetime. Additionally, the Applicant highlights that the Energy Act (2004) requires that a decommissioning plan must be submitted to and approved by the Secretary of State for Business, Energy and Industrial Strategy.</p> <p>The Applicant notes that the decommissioning plan and programme will be updated during Hornsea Four's lifespan to take account of changing best practice and new technologies. The approach and methodologies employed at decommissioning will be compliant with the legislation and policy requirements at the time of decommissioning.</p> <p>The Applicant notes that all chapters identify that decommissioning should be agreed at the relevant time with the relevant consultees but a worst case approach is taken. This is considered to be appropriate.</p>
RR-029-5.42	<p>Smithic Bank</p> <p>Smithic Bank is a headland-associated banner type bank which extends south from Flamborough Head by over 12km. Smithic Bank provides shelter for the Holderness coast from wave exposure and acts as a sediment store that feeds the Holderness Coast, Holderness Inshore MCZ and the wider regional sediment transport pathways to areas further afield such as the Humber Estuary. Accordingly, Natural England considers Smithic Bank to be of high environmental value.</p>	<p>The Applicant has provided detailed responses to the concerns raised in related to Natural England's RR-029-APDX:E comments (see RR-029-APDX:E-66).</p> <p>Combined with Flamborough Head, Smithic Bank provides partial shelter from northerly waves to a small section of the Holderness Coast. The bank is (predominately) fed by sediments derived from coastal erosion (source) rather than being a sediment source for the coastline which is in turn recognised as erosional. The Holderness Coast, which is taking the form of a classic log spiral shoreline (Silvester and Hu, 1997) is actively evolving, reaching an equilibrium form under the prevailing wave climate. Wider regional pathways</p>

		<p>from the north may also feed the bank as presented in Figure 19 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), although based on the available evidence, this is considered minor.</p> <p>The environmental value attributed to Smithic Bank is in line with the wider EIA approach giving a medium value. Also, it should be noted that Smithic Bank is not designated as an Annex I habitat.</p>
RR-029-5.43	<p>The Hornsea 4 export cable route crosses the southern part of Smithic Bank. The installation of cables and rock protection (and replenishment) in this area could result in the lowering of Smithic Bank or the alteration of its morphology. Additionally, as the Dogger Bank A& B export cables, which necessitates the placement of a substantial amount of rock protection at each of the 24 cable crossing points. Moreover, the Scotland to England Green Link 2 project has indicated a similar landfall to Hornsea 4 and will potentially cross Smithic Bank. We are concerned that a significant area of cable installation activities and the addition of any cable protection may alter the elevation/profile of the sandbank. Moderate elevation changes to the sandbank could produce significant variations in wave power at the shoreline which will, in turn, modify the shoreline response to storms, and substantially change shoreline morphology.</p>	<p>The Applicant has provided detailed comments on this point in responses to Natural England’s RR-029-APDX:E comments.</p> <p>Figure 43 of the Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides a schematic of the bank profile developed from data spanning the period 1980, 2011 to 2019 which shows high stability of the bank at this location over a 39 year period. Cable burial depths of 2 and 3 m are also shown to indicate that bank lowering is improbable to cable burial depths. Thus the potential requirement for cable protection across Smithic Bank is considered to be low. The Applicant considers that cable installation is unlikely to lead to lowering of the bank profile in this area.</p> <p>Technical review of the MDS in relation to the potential requirements for cable protection across Smithic Bank is currently being undertaken by the Applicant. This will include further consideration of rock protection requirements inshore of the 16 m contour. The outputs from this work will be presented to Natural England and the MMO. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p> <p>The Dogger Bank crossing is a single crossing to cater for multiple cables and following discussions with the MMO, the Applicant has agreed mitigation to move 2.5 km seaward of the commencement of the outer eastern slope of Smithic Bank and into deeper water (20 m). The Applicant understands that the Scotland to England Green Link 2 cable will pass to the north of the offshore ECC, also crossing Smithic Bank and without any requirements for a cable crossing</p>

		<p>(Section 1.12.8.1 of Volume A2, Chapter.1: Marine Geology, Oceanography and Physical Processes (APP-013)).</p> <p>The Applicant considers that the main long-term risk to the coastline is from the potential for increased wave activity resulting from rising sea levels, as a result of climate change, which will provide opportunity for increased wave energy to reach the coast. However, the Hornsea Four development would not have any influence on that effect.</p>
RR-029-5.44	<p>Natural England is concerned that the Hornsea 4 development (alone and in combination) might adversely affect the form and function of Smithic Bank, and, in turn, affect that of other marine process receptors such as the Holderness Coast, Holderness Inshore MCZ, Dimlington Cliffs SSSI, Humber Estuary SAC/SPA/Ramsar/SSSI, Flamborough Head SAC/SSSI. Consequently, we advise that the long-term impacts of (a) cable installation and cable protection across Smithic Bank (including the proposed 25% rock replenishment during the operational phase), and (b) the presence of the HP4/Dogger Bank A&B cable crossing, need to be addressed in terms of the risk of lowering of the sandbank and affecting its associated sediment transport processes. We would also advise that these impacts be considered over the lifetime of the project, also taking into consideration the impacts of climate change.</p>	<p>The Applicant has provided detailed comments on this point in responses to Natural England's RR-029-APDX:E comments.</p> <p>The Applicant does not consider that the Hornsea Four development, alone or with the Dogger A & B cable crossing, will have a detrimental effect upon the form and function of Smithic Bank, nor the designated sites of Holderness Coast, Holderness Inshore MCZ, Dimlington Cliffs SSSI, Humber Estuary SAC/ SPA/ Ramsar/ SSSI, Flamborough Head SAC/ SSSI.</p>
RR-029-5.55	<p>Although we note and welcome the Applicant's efforts to address some of these concerns, through commitments to avoid the placement of rock protection within 350m seaward of MLWS (Co188), and the Commitment to relocate the cable crossing east of the 20m depth contour (Co189), there is insufficient evidence within the ES and supporting Annexes to show that the implementation of these measures would remove the potential for significant impacts on this sensitive receptor. Natural England would expect a commitment to avoid the placement of rock protection on Smithic Bank as a minimum (approximately 16m depth contour), but it would need to be demonstrated that this along with the placement of the cable crossing was sufficient to exclude the potential for impact.</p>	<p>The Applicant has provided detailed comments on this point in responses to Natural England's RR-029-APDX:E comments (see RR-029-APDX:E-63).</p> <p>Smithic Bank profile assessments presented within Figure 43 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), as presented in response to Comment 5.43, indicate that the likelihood for rock protection measures to be required on Smithic Bank are minimal/ low. Technical review of the MDS in relation to the potential requirements for cable protection across Smithic Bank is currently being undertaken by the Applicant. This will include further consideration of rock protection requirements inshore of the 16 m contour. The outputs from this work will be presented to Natural England and the MMO. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of</p>

		Offshore Maximum Design Scenarios which will be submitted at Deadline 3.
RR-029-5.56	<p>Flamborough Front</p> <p>The Flamborough Front is formed where the stratified water from the northern North Sea meets the mixed water from the southern North Sea. The mixing of these two waterbodies leads to an upwelling of nutrients, which in turn leads to increased plankton growth and associated productivity, giving rise to concentrations of forage fish which in turn provide a feeding ground for other species. It is therefore perhaps of no surprise that areas around the front support high densities of seabirds and marine mammals. Consequently, it is vital that the potential impacts of the project alone and in combination with other plans and projects be adequately assessed. Natural England, therefore, considers this receptor to have high environmental value and not medium as indicated in the ES.</p>	<p>The Applicant’s position is that the magnitude of the Flamborough Front has been appropriately determined and acknowledges the relationship of the front giving rise to nutrient-rich water, increased primary production and fisheries providing a feeding ground for birds (English Nature, 2004). This relationship was a material consideration in assign its sensitivity to alterations in physical processes. Given the magnitude of this impact, no measurable indirect impacts on ecology including benthic ecology, birds, mammals or fish are anticipated. It is the Applicant’s position that the magnitude of the potential impact is negligible (see response to RR-029-APDX:E-55 and RR-029-APDX:E-56) and therefore even if the sensitivity were increased if the sensitivity of the feature was considered high then the associated impact according to Table 1.16 would become slight (not significant) rather than neutral (not significant). Therefore, no significant effects in EIA would be predicted.</p> <p>As detailed in paragraph 1.11.2.28 of Volume A2, Chapter.1: Marine Geology, Oceanography and Physical Processes (APP-013), the available evidence to help map the location of the front (from modelling and satellites) suggests the location of this feature is typically further to the south of Hornsea Four by around 11 km (at the closest point in the direction of the flood tide). During the flood tide, turbulent wakes would extend to the south-east from foundations located along the southern boundary of the array, however, at the same time the front would advect over the same scales and the two features would not interact.</p> <p>A marine processes analysis is underway in response to these relevant representations, as discussed with Natural England and the MMO, in order to provide further assurance to the position of Flamborough Front and the potential impacts of Hornsea Four upon this seasonal feature, both in isolation and in-combination with other developments. The scope of this analysis is presented in G1.46</p>

		<p>Marine Processes Supplementary Works Scope of Works which is submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
<p>RR-029-5.57</p>	<p>The foundation structures of the Hornsea 4 array area have the potential to generate turbulent wakes that will contribute to a mixing of the stratified water column. Mixing generated in this way could have a significant impact on the large-scale stratification of the North Sea off the coast of Flamborough Head. The presence of the Hornsea 4 array area, combined with those of Hornsea 2 and Hornsea 1, would occupy a considerable area, hence the potential large-scale impact on the Flamborough Front. Furthermore, the inclusion of Gravity Base Structures, as the MDS for turbine foundation design at Hornsea 4, significantly increases the potential for turbulence effects. Gravity bases of the size and scale proposed have not previously been deployed in the English waters, therefore, we have no evidence base on which to base understanding of their impact on marine processes and their receptors. Natural England therefore advises that the sensitivity of the Flamborough Front should be considered high, until further evidence to the contrary can be provided.</p>	<p>See Applicant’s responses to RR-029-5.56 above.</p> <p>Any increased turbulence resulting from the presence of the Hornsea Four foundation structures would be isolated to the local area of each foundation, dissipating downstream without leading to any larger array scale effects. The Applicant considers it unlikely that these effects will extend to the Flamborough Front (see response to RR-029-5.56 above). Both Hornsea Project Two and Hornsea Project One are similarly remote from the Flamborough Front and are now both installed using monopile foundations. All foundations will lead to some level of local turbulence. Depending on the final design configuration of the GBS foundation (such as cross-section through the water column) this option has the potential to lead to the highest level of turbulence compared to other foundation options. However, in that scenario the scale of turbulence is considered to remain localised in the form of a wake in the lee of each foundation without a larger array scale effect. The measurable distance of any wake is likely to be less than the minimum separation between foundations of 810 m. These effects are unlikely to extend to the Flamborough Front and will remain small compared to feature in its entirety.</p> <p>The magnitude of any impact on the Flamborough Front is considered to be negligible because the influence from any turbulent flow wakes is likely to remain spatially distant (see paragraph 1.11.2.31 of Volume A2, Chapter.1: Marine Geology, Oceanography and Physical Processes (APP-013)). Therefore, even if the sensitivity were increased if the sensitivity of the feature was considered high then the associated impact according to Table 1.16 would become slight (not significant) rather than neutral (not significant). Therefore, no significant effects in EIA would be predicted.</p>

		<p>Although there are presently no OWF-GBS foundations in English Waters, the assessment was informed by the evidence base from comparable projects in comparable settings irrespective of which territorial waters they reside, for example the F3 GBS in the Dutch sector of the North Sea (Bos et al, 2002), and Whitehouse et al (2012) whom presents an evaluation of scour at marine gravity foundations.</p>
RR-029-5.58	<p>Based on the high levels of uncertainty described, Natural England is unable to rule out the potential for significant impacts to the Flamborough Front. Given the front's influence on the wider ecology of the area, potential for significant impacts on the benthic environment, birds, mammals and fish also cannot be excluded and the potential for adverse effect on designated sites such as Flamborough Head SAC Flamborough and Filey Coast SPA, the Southern North Sea SAC cannot be ruled out until further evidence can be provided.</p>	<p>It is the Applicant's position that the Flamborough Front has been robustly and appropriately characterised for the purposes of undertaking an EIA assessment. Therefore, the assessment of significance remains valid on this receptor. As such, the Applicant disagrees that there are high levels of uncertainty associated with this receptor.</p> <p>Existing evidence, presented in Section 3.4.3 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) and Section 1.7.9 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) does not suggest that the Hornsea Four array directly overlaps with the alignment of the front, nor detrimentally effects the temporal behaviour of the feature. The Applicant also considers that any effects attributed to Hornsea Four on the Flamborough Front would be negligible in magnitude. Given the magnitude of this impact, no measurable indirect impacts on ecology including benthic ecology, birds, mammals or fish are anticipated.</p> <p>The Applicant considers that applying the Maximum Design Scenario (MDS) to the marine processes study inherently introduces conservatism into the assessment which sufficiently offsets any residual element of uncertainty.</p> <p>See the Applicant's response to RR-029-APDX:E-I which provides the Applicant's justification as to why there is no potential for adverse effects on designated sites including Flamborough Head SAC Flamborough and Filey Coast SPA, the Southern North Sea SAC.</p>

RR-029-5.59	<p>Natural England would welcome further discussion with the applicant and the members of the Marine Geology, Oceanography and Physical Processes Technical Panel and progression with some of the suggestions previously made within the Evidence Plan process.</p>	<p>The Applicant continues to engage with Natural England through the Statement of Common Ground (SoCG) process in relation to the issues raised in their representation.</p> <p>A marine processes analysis is underway in response to these relevant representations, as discussed with Natural England and the MMO, in order to provide further assurance to the position of Flamborough Front and the potential impacts of Hornsea Four upon this seasonal feature, both in isolation and in-combination with other developments. The scope of this analysis is presented in G1.46 Marine Processes Supplementary Works Scope of Works which is submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
RR-029-5.60	<p>Impacts beyond the operation and decommissioning of the project</p> <p>Within the project description it is indicated that only areas of cable that have become exposed at the time of decommissioning will be removed, and that the majority of cable will remain in situ. Similarly, it is anticipated that joining bays, both onshore (coastal) and offshore will remain in situ and there are no plans for the removal of cable/scour protection. In view of this, Natural England considers that the assessment of impacts on marine processes should extend beyond the operational lifetime of the project in order to determine if and when this infrastructure may become exposed to allow options for long term management and mitigation to be considered. Of particular concern would be the potential impact that may arise in the coastal and nearshore zone. Given the highly dynamic nature of the Holderness coastline it is imperative that the ongoing need for remedial works beyond the lifespan of the project are considered.</p>	<p>The type and scale of impact has been described for materials placed on the seabed. Long-term effects from rock protection materials on the seabed following decommissioning are not expected to be different to those described during the operational phase (i.e. localised and small-scale).</p>
RR-029-5.61	<p>Climate change effects</p> <p>Although climate change effects are explored within section 1.7.11 of the ES chapter, the modelling presented within the chapter is based on present conditions and does not take account of the potential impacts of climate change. As highlighted within the Environmental Statement itself, climate change and more specifically sea level rise, has the potential to impact on marine process receptors, particularly in the nearshore area. For example, an increase in sea level rise could place vertical profile of Smithic Bank</p>	<p>Numerical modelling has been used within the Marine Processes assessment to represent (i) sediment plumes during the construction period; and (ii) hydrodynamics (waves; tides) over the operation and maintenance period.</p> <p>The Applicant does not consider that climate change effects are relevant to the construction phase (a maximum duration of five years and one month). Construction is anticipated to begin in 2024 (see</p>

	<p>lower in the tidal frame which may lead to a reduction in wave sheltering effects, which may in turn lead to increase cliff erosion along the Holderness Coast.</p>	<p>Section 4.7 of Volume A4, Chapter 4 : Project Description (APP-010)). Climate change predictions indicate that offshore waves are not expected to increase over the operation and maintenance period and may indeed reduce (Section 1.7.11.7 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013)). Further, mean sea level variations are predicted to be nominal at the end of the operational period (between 0.15 to 0.22 m). The numerical modelling undertaken in support of Hornsea Four shows that blockage effects on waves do not reach Smithic Bank or the coastline. The numerical modelling is presented in Appendix C of Volume A5, Annex 1.1: (ES) Marine Processes. Technical Report (APP-067).</p>
RR-029-5.62	<p>Natural England advise that to ensure the assessment incorporates the predicted impacts of climate change, modelled predictions should incorporate potential climate change scenarios.</p>	<p>See the Applicant's response to RR-029-5.61.</p>

1.9 Summary of Key Environmental Concerns: Benthic and intertidal ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.63	<p>Natural England is broadly content in relation to Benthic and Intertidal Ecology, subject to several comments being addressed. However, it should be noted that a number of benthic sites have been identified as marine geology, oceanography and physical process receptors, and given the outstanding concerns highlighted above, Natural England would reserve the right to revisit our position as additional evidence emerges.</p>	<p>Noted. The Applicant welcomes further discussion with Natural England on this point as part of the SoCG process.</p>

1.10 Summary of Key Environmental Concerns: Fish and shellfish ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.64	<p>While Natural England defers to the expertise of CEFAS and the NEIFCA in relation to fisheries and focus our advice on concerns in relation to potential impacts to forage fish which are the prey of designated site features.</p>	<p>Noted. Applicant responses to the Marine Management Organisation (MMO) representation (which captures Cefas input) is presented in RR-020-3.6.1 – RR-020-3.6.25.</p>

RR-029-5.65

Impacts to Herring

Natural England has outstanding concerns relating to the impacts on herring spawning as a result of the development of Hornsea 4. There is limited information provided to show the link between piling noise and herring behaviour and no evidence to support the duration of a 'peak' herring spawning season at this site specifically. As a result, Natural England can't confirm the impact piling noise will have on the herring population and does not agree that the commitment to limit piling between 1st September and the 16th Oct will be sufficient.

The assessment of behavioural impacts to fish from underwater noise have been assessed in line with the guidance outlined by Popper et al. (2014) (the only recommended guidance source for underwater noise assessments on fish in the scientific literature (e.g. Popper & Hawkins, 2019). The Popper et al. (2014) recommends that behavioural impacts from underwater noise on fish should be assessed in a qualitative manner, based on the relative proximity of the individual to the sound source. This is the approach which has been presented in section 3.11.1.126 of **Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)**.

The Applicant considers that the assessment undertaken is robust and that further modelling would not alter the outcomes of the assessment. No significant effects were identified.

The Applicant has prepared a separate clarification note (**G1.10 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction**) to provide further analysis and justification of the "peak" spawning period for herring, using the methodology proposed by Cefas as part of the Hornsea Four Evidence Plan process. The aim of this note is to agree the timing of this "peak" spawning period and the associated piling restriction timing. The clarification note is submitted as part of the Applicant's response to Deadline 1.

Following an interrogation of the IHLS data and the available literature to identify the key timings and durations for herring larval development, a back-calculation based on the IHLS survey dates and larval lengths at survey has been undertaken to estimate the start of the "peak" spawning season.

Based on the variable information in the literature regarding larval hatch sizes, the back-calculation indicates, with suitably precautionary assumptions, that the mean start of the "peak" spawning season is between approximately the 5th and 8th of September, with this considered to be a conservative estimate.

Therefore, the Applicant considers it appropriate to conclude that the proposed seasonal restriction for Hornsea Four (1st September –

		16th October) acts to effectively cover the “peak” of the spawning season, with additional conservatism incorporated into the proposed dates beyond that required based on the back-calculations as informed by available literature, and as a result provides a robust mitigation of the potential effects of piling of the HVAC booster station on herring spawning.
--	--	--

1.11 Summary of Key Environmental Concerns: Onshore Ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.66	Natural England is broadly content in relation to Onshore Ecology, subject to several commitments being secured in the DCO. Please See Annex H for further details.	Noted.

1.12 Summary of Key Environmental Concerns: Seascape

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.67	Natural England considers that the development does not have the potential to impact on the special character of the Flamborough Head Heritage Coast (FHHC) and its seascape setting.	The Applicant welcomes agreement on the assessment of seascape.

1.13 Summary of Key Environmental Concerns: Landscape

Reference	Relevant Representation Comment	Applicant's Response
RR-029-5.68	Natural England currently is assessing the Yorkshire Wolds against the criteria for designation as an Area of Outstanding Natural Beauty (AONB). The proposed development is located within the Yorkshire Wolds. Whilst this initial assessment phase does not confer any additional planning protection, it is possible that this could become a material consideration in planning decisions during the determination period. Natural England would be pleased to provide further information in relation to this matter as it becomes available.	RR-029-APDX:H-D

1.14 Summary of Overarching Comments on the Application

Reference	Relevant Representation Comment	Applicant's Response
<i>Defining Project Parameters</i>		
RR-029-6.1	<p>Natural England recognises the need to use a Rochdale Envelope approach to allow flexibility in project design to ensure that changes in available technologies and project economics can be considered post consent. However, Natural England has concerns over the extent to which uncertainty in ground conditions is driving the project extent of the project envelope, and that the Rochdale Envelope approach is resulting in the provision of insufficient baseline information to inform both project design and assessment of impacts.</p>	<p>The Applicant confirms that there are no aspects of the Maximum Design Scenario (MDS), as assessed, to which uncertainty in ground conditions are driving the project envelope, and that the Rochdale Envelope as utilised is justified and assessed by the provision of sufficient baseline data.</p> <p>The Applicant considers that sufficient and proportionate data has been collected on ground conditions and confirms that this data, alongside the Applicant's experience in the construction of offshore wind farms in the UK and Europe, has been used to define the Maximum Design Scenarios which have then been assessed in line with the Rochdale Envelope approach to assessment in order to understand the potential impacts on relevant receptors. This is considered to be appropriate.</p>
RR-029-6.2	<p>The lack of understanding of the ground conditions results in the use of Maximum Design Scenarios (MDSs) that are conservative enough to make up for that lack of understanding and allow for all eventualities. This in turn translates into a vast number of variables. This causes difficulties in Page 23 of 24 assessment, as it is difficult to identify and assess the worst-case scenario for each of the relevant receptors with any certainty. This in turn necessitates precautionary assessments given this uncertainty. That presents challenges when it comes to identifying appropriate mitigation measures.</p>	<p>The assumption that a lack of understanding on ground conditions is resulting in conservative use of the MDS is incorrect. The acquisition of geophysical and geotechnical data and the quality and detail available is driving the refinement of the project envelope. An example of this is that due to detailed offshore data acquisition highlighted the requirement for a two-foundation solution. This example highlights that the MDS was justified by data not its absence.</p> <p>All assessments clearly set out the MDS for each assessment and where significant effects are assessed, mitigation to reduce these to acceptable levels are proposed.</p>

RR-029-6.3	<p>In the absence of detailed information on ground conditions it is also increasingly common for applicants to propose that measures will be developed in various plans which are signed off by the regulator prior to construction, when ground conditions have been established through pre-construction surveys and refined plans are in place. In Natural England’s experience this approach simply ‘stores up problems’ which then become more difficult to resolve within the constraints of the consent, often leading to delays and increased costs.</p>	<p>See Applicant response to Natural England’s comment RR-029-5.40. The Applicant considers that sufficient and proportionate data has been collected on ground conditions (as summarised in Appendix B of Volume A5, Annex 1.1: (ES) Marine Processes. Technical Report (APP-067)) and confirms that this data, alongside the Applicant’s experience in the construction of offshore wind farms in the UK and Europe, has been used to define the Maximum Design Scenarios which have then been assessed in line with the Rochdale Envelope approach to assessment in order to understand the potential impacts on relevant receptors. This is considered to be appropriate. The Applicant notes that refinements have been made where possible (e.g. limitation of the number of GBS used – Co201 Volume A4, Annex 5.2: Commitments Register (APP-050)), whilst still allowing appropriate flexibility in the project design envelope.</p>
RR-029-6.4	<p>It should also be noted that this approach also presents an additional challenge in relation to Habitats Regulations Assessment which, in order to be lawful, needs to be thorough, based on the best available evidence, with no lacunae, and that there needs to be certainty beyond reasonable scientific doubt in its conclusions.¹³ Establishing large MDS due to a lack of understanding of ground conditions can also have a significant bearing on the future plans and projects that will be required to take account of its impacts on a cumulative and in-combination basis.</p>	<p>See Applicant responses to RR-029-6.3 and RR-029-6.4.</p> <p>The Applicant confirms that where uncertainty in baseline condition is identified, it is set out in the baseline consideration for each receptor, in the respective chapter of the Environmental Statement. The MDS for each impact is therein assessed against the project design. For clarification, Worst-Case Scenario (WCS) is not a term used by the Applicant.</p>
RR-029-6.5	<p>Whilst we acknowledge that there will always be an element of uncertainty in ground conditions, Natural England considers it vital that they are assessed as fully as possible, and that this evidence is used to inform project design, the development of Worst-Case Scenarios and the assessment of impacts.</p>	<p>See Applicant responses to RR-029-6.3 and RR-029-6.4.</p> <p>The Applicant confirms that where uncertainty in baseline condition is identified, it is set out in the baseline consideration for each receptor, in the respective chapter of the Environmental Statement. The MDS for each impact is therein assessed against the project design. For clarification, Worst-Case Scenario (WCS) is not a term used by the Applicant.</p>
<p><i>Environmental Impact Assessment Methodology</i></p>		
RR-029-6.6	<p>Matrices are used throughout the ES to support the assessment of the magnitude and significance of impacts. Natural England notes numerous instances where significance has been presented as a range (i.e slight or moderate, moderate or large) and it is nearly always the lower value that has been taken forward. Indeed, there are no ecological impacts that are assessed as significant in EIA terms, either cumulatively or in-combination. In the absence of evidence to support the use of the lower value in a range, Natural England’s view is that the higher value should always be assessed in order to ensure that impacts on features are not incorrectly screened out of further assessment. This is in line with the principles of the Rochdale envelope approach.</p>	<p>The Applicant notes Natural England’s position on impact assessment significance and confirms that in all instances where there are two options that the relevant consultant utilised their professional judgement accordingly using available evidence. Having reviewed the impacts register it is not immediately clear which impacts and in which instances Natural England refer to. The Rochdale envelope approach requires the identification of project parameters liable to give rise to the maximum level of effect. Having identified such maximum parameters, the assessment of significance is a matter of professional judgement. Where effects may fall within</p>

		a range, the Rochdale envelope approach does not require the default selection of the highest value. A default preference for the higher value to be taken in all instances is doesn't give due regard to the evidence or experience of the assessor and would lead to over-estimation of impacts.
RR-029-6.7	In addition, Natural England notes that the assessment methodology, including the terminology used and the matrix to determine the significance of impact have been updated since PEIR. Although we note the Applicant has described how this change was made (ES Volume A1, Chapter 5 para 5.7.8.5), Natural England is concerned that this change in approach and use of new terminology makes the interpretation of impacts confusing and prevents comparison across offshore windfarm projects. For example, Hornsea 3, Norfolk Vanguard, Norfolk Boreas, all use terms such as minor and negligible rather than slight and neutral.	<p>The Applicant notes Natural England's representation.</p> <p>The Applicant presented a DMRB Matrix Justification to Natural England, and all members of the Evidence Plan Steering Group in February 2021, where the reason for and nature of the changes were discussed.</p> <p>The terminology used by Hornsea 3, Norfolk Vanguard, Norfolk Boreas reflects guidance as it was at that time. While the Applicant notes the variation in assessment methodology brought about by the DMRB update, it was beyond the Applicant's control and does not detract from a comparison across Environmental Statements.</p>
RR-029-6.8	The assessments within this ES are impact pathway-led rather than receptor-led. The result of this is that the overall impact to a given receptor as a result of Hornsea 4 is not assessed. A receptor could be subject to a number of impacts that are deemed "not significant" in isolation, and yet the combined effects could have much greater significance. Consequently, it is important that receptor-led assessments are undertaken.	The Applicant confirms that the approach adopted for the Environmental Impact Assessment is a Source-Pathway-Receptor (SPR) approach. As noted in Natural England's response RR-029-APDX:B-R, this is a widely adopted approach to EIA.
RR-029-6.9	<p>We also observe that the definition of magnitude used in the assessment of impacts are very broad with no suitable incremental step between minor and moderate. This has caused concerns throughout the Environmental Statement chapters. The definitions are as follows:</p> <ul style="list-style-type: none"> • Minor is defined as 'Discernible, temporary (throughout project duration) change, over a minority of the receptor, and/or limited but discernible alteration to key characteristics or features of the particular receptors character or distinctiveness. 	<p>The Applicant notes Natural England's representation.</p> <p>A1.5: Environmental Impact Assessment Methodology (APP-011) sets out that the key aspect of the approach is the identification of the likely significant effects (in EIA terms) of Hornsea Four. This assessment of likely significance is supported by a combination of:</p> <ul style="list-style-type: none"> • knowledge acquired by the EIA team on baseline conditions available to date; • definition of the project; • national policy and standards;

	<ul style="list-style-type: none"> • Moderate is defined as 'Considerable, permanent / irreversible changes, over the majority of the receptor, and/or discernible alteration to key characteristics or features of the particular receptors character or distinctiveness. <p>Within these definitions there is no room for a permanent/irreversible change over a small proportion of the site (such as long-term habitat loss from WTG) or a temporary loss or disturbance over a large proportion of the site (such as temporary habitat loss from cable preparation works). We highlight to the Examining Authority that these definitions may result in the underestimation of impacts.</p>	<ul style="list-style-type: none"> • the evidence base and experience of similar projects passing through the consenting system; • topic-specific criteria for impact magnitude, receptor sensitivity to impacts and significance of effect; and • the professional judgement of experts. <p>The approach used for the EIA provides room for all scales and magnitude of impact assessment and does not result in the underestimation of impacts, though it allows the scale of impacts to be set within the correct baseline context.</p>
--	---	---

1.15 Summary

Reference	Relevant Representation Comment	Applicant's Response
RR-029-7.1	Overall, whilst good progress has been made in some areas, Natural England has several significant outstanding concerns with this application. We have already raised the key issues outlined in this response with the Hornsea Four consents team and intend to continue discussions with Ørsted and Evidence Plan Technical Panel members to seek to resolve these outstanding concerns as far as possible ahead of the Examination.	Noted. The Applicant confirms that some issues outlined herein are unexpected and not aligned with our previous discussions and agreements. Notwithstanding, much progress has been made and the Applicant looks forward to our continued engagement on matters preceding and throughout the examination.

2 Appendix A - Development Consent Order, Project description and Monitoring plans

2.1 Comments on C1.1 Draft DCO including Draft DML

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:A-A	The Applicant has not provided an Outline Operations and Maintenance Plan. This plan is essential as it details what maintenance is licenced, which will need additional permissions and what needs a separate marine licence. We consider this to be a standard requirement that is usually linked to the Operations and Maintenance conditions and to the interpretations of maintenance offshore in the DCO/DML.	Please see detailed response to comment RR-029-APDX:A-2 below.
RR-029-APDX:A-B	Unresolved issues associated with the Voluntary Agreement process and the impact of entering the proposed Voluntary Agreement compared to the Compulsorily Acquisition Process	Noted.
RR-029-APDX:A-C	Documents such as the DCO, Project Description and Outline Marine Monitoring Plan are key reference documents that will be referred back to during the post-consent phase and It is likely that we will have further comments to make on the documents included in this Appendix once the current comments are addressed. We therefore consider it important that these documents are kept live during the Examination process with a final version with all updates included made available at the time of consent.	The Applicant notes the comments of Natural England and proposes that should any updates be needed to these documents, that it will submit a schedule of changes and updated documents by the close of examination.
RR-029-APDX:A-D	Natural England's comments on these three documents are likely to evolve as this case progresses through examination. Our comments in this annex should therefore be considered our initial advice and we reserve the right to revise or build on our advice as required.	Noted.
RR-029-APDX:A-1	Point 1 Part 1, Article 2: Natural England does not agree with the definition of Environmental Statement (ES) as it does not allow for any additional evidence to be submitted later and be considered part of this statement.	The Environmental Statement (ES) is a certified document for the purposes of article 38 of the dDCO. As the certification process takes place after the DCO is made, the certification of the ES will include any updates which have taken place prior to the grant of the DCO. If there are any changes to maximum design parameters

	<p>This is important as decisions will take into account not just evidence supplied during the application, but further evidence supplied during the examination. This subsequent information will likely be the information that the Examining Authority (ExA) makes their recommendation on and the Secretary of State makes their determination on. Therefore, when looking at items such as maximum extents, volumes etc these later documents may be the correct ones to use for certain conditions/plans and thus should be reflected in the interpretations. The interpretation should be updated.</p>	<p>then those will either be narrated on the face of the DCO as made, or in the updated ES or outline plans, which are subsequently certified. This ensures that all maximum design parameters are appropriately secured via the final DCO.</p> <p>The Applicant does not propose to amend the definition of Environmental Statement and notes that the definition is consistent with the definition used in DCOs recently made by the Secretary of State, including the Norfolk Boreas DCO and Norfolk Vanguard DCO.</p> <p>No change to the dDCO proposed in response to this comment.</p>
<p>RR-029-APDX:A-2</p>	<p>Point 2 Part 1, Article 2: The definition of maintain does not link to an Outline Operations and Maintenance (O&M) plan. The definition and interpretation of what is permitted under maintain is linked to the ES. We acknowledge that Tables 4.43-4.45 in Volume A4, Chapter 4 Project Description are excellent and do give detailed information on what maintenance is expected, however we consider that the standard approach of using an O&M plan to detail what is licenced and may be undertaken without permission, what needs further permission and what is not licenced and will need further consent significantly reduces the risks of misunderstanding during operation and is an essential point of reference for approvals and consenting during the lifetime of the project. We suggest that the tables used in the Project Description could be turned into the outline O&M plan, or the interpretation could be amended to refer to these tables for offshore to avoid ambiguity (subject to our concerns regarding cable protection over the lifetime of the project, see Point 34). Updates should be reflected in both the interpretations and the deemed Marine License (dML) conditions.</p>	<p>The Applicant is considering this request with the intention of preparing an Outline O&M plan which relates to licensable activities. Once the Outline O&M Plan is prepared, the interpretations and the deemed marine licence conditions will be updated accordingly and the Outline O&M Plan submitted into Examination (currently anticipated for Deadline 2).</p>
<p>RR-029-APDX:A-3</p>	<p>Point 3 Schedule 1, Part 3, Requirements: The maximum volumes of dredge works, such as sandwave clearance, are not provided here. We note that they are given in Schedule 1 Part 1, however, as this section details the maximum design parameters and as dredging is a significant impact and</p>	<p>The Applicant does not consider it necessary to add the maximum volumes of dredge works to Part 3 of Schedule 1. These volumes are already sufficiently secured via Part 1 of Schedule 1 and in the deemed marine licences and duplication within the Requirements is therefore unnecessary. No change to the dDCO proposed in response to this comment.</p>

	<p>an important parameter to enforce, we would have expected it to be provided here. As the figures are provided in the DMLs and the maximums would be enforced by the MMO we do not think this is a major issue in and of itself.</p>	
RR-029-APDX:A-4	<p>Point 4 Schedule 1, Part 3, Requirement 2(2)(c): This requirement gives the minimum blade distance to sea as 42.43m. However, this is based on LAT (lowest astronomical tide). We note that it is normally given as HAT (highest astronomical tide). Using LAT implies a much higher distance between turbine blade and the sea. While in theory neither is incorrect, we consider it important to note that simply changing the metric would not provide any enhanced mitigation. We request that the value in HAT is provided to allow comparison with the gap for other developments.</p>	<p>Orsted use LAT when referring to distances in design in relation to sea level as standard across its portfolio. The minimum blade distance at sea level is: LAT: 42.43m HAT: 37.72m</p> <p>The difference between LAT, HAT and Mean Sea Level, calculated from VORF model data from the UK Hydrographic Office and indicative Project layout is: LAT: 0.00m MSL: 2.43m HAT: 4.71m</p>
RR-029-APDX:A-5	<p>Point 5 Schedule 1, Part 3, Requirement 2(6): This requirement gives the maximum footprint for all turbines. However, there is no limitation on the maximum scope per individual foundation. We would note the same issue with regard to the substation foundations at requirement 3(11) and (12). This issue is repeated in the Deemed Marine licences. We request that the maximum footprint for individual turbine foundations and other marine structures is provided within the DCO and the dMLs</p>	<p>The maximum footprint per individual structure, according to foundation type, is presented in Table 1 of A4.4.8 Pro-rata Annex (APP-046) . This is a certified document in article 38 of the dDCO and is secured for the purposes of these requirements in Requirement 2(7) and 3(14). No change to the dDCO proposed in response to this comment.</p>
RR-029-APDX:A-6	<p>Point 6 Schedule 1, Part 3, Requirement 24: The relevant SNCB should be consulted upon any decommissioning plan and that consultation should be secured within this requirement. We request this requirement is updated to reflect this.</p>	<p>The Applicant does not consider that amendments to the dDCO are necessary in response to this comment as it is a matter for the Secretary of State under the Energy Act 2004 to determine how to consult on any decommissioning plan and with whom. No change to the dDCO proposed in response to this comment.</p>
RR-029-APDX:A-7	<p>Point 7 Schedule 11, Part 2, Condition 4: As noted in Point 34 below (project description), Natural England have concerns regarding the granting of a licence for cable protection deployment across the lifetime of the development.</p>	<p>Please see response to point RR-029-APDX:A-34 below.</p>
RR-029-APDX:A-8	<p>Point 8</p>	<p>Please see responses to comment RR-029-APDX:A-10 below.</p>

	<p>Schedule 11, Part 2, Condition 13(1)(j): This condition secures the use of a Site Integrity Plan so that in combination projects and the project alone do not have an adverse effect on the integrity of the Southern North Sea Special Area of Conservation (SNS SAC). However, recent decisions have reduced our certainty that this condition will adequately address the issues of in combination impacts. This condition is linked to condition 14 which requires the document to be produced no later than 4 months prior to commencement. However, we consider that it should also be restricted to a requirement of no sooner than 6 months prior to commencement.</p>	
<p>RR-029-APDX:A-9</p>	<p>Point 9 Schedule 11, Part 2, Condition 13 (5) and (6): These conditions allow for simultaneous piling of 2 piles to occur, either within the same licensed area or across the array (Schedule 11) and HVAC booster station (Schedule 12) areas. However, there is no restriction on the of number of piles that can be installed in a day. We further note that the Applicant refers to concurrent piling (defined as “two separate foundation locations per 24 hours”; B2.2 RIAA Part 1, 10.3.3.37) in two locations in their RIAA. We are concerned that whilst these conditions restrict the level of simultaneous piling (i.e. no more than 2 piles at the same time), there are no restrictions on the number of piles that can be installed in a day and no restrictions on conducting simultaneous and concurrent piling. This could allow up to 4 piling locations in a 24-hour period which would exceed the maximum design scenario. We request that these conditions are amended to restrict all activities to within a calendar day and that condition 6 is also amended to allow only simultaneous or concurrent piling of 2 piles to occur.</p>	<p>The Applicant notes these comments and has amended the DCO wording to clarify “There will only be a maximum installation of 2 piled foundations within a 24 hour period. It is possible for installation of the two piled foundations to occur concurrently i.e. within a 24 hour period at up to two locations within the HVAC search area or up to two locations within the array. The two piled foundation locations may also be piled simultaneously”.</p>
<p>RR-029-APDX:A-10</p>	<p>Point 10 Schedule 11, Part 2, Condition 14: This condition ensures that for most documentation, plans need to be submitted 4 months in advance to the MMO. Given the significant increase in the size, scope and potential for in combination impacts of offshore windfarm projects we consider that 4 months is now insufficient time, and a 6-month requirement would be more appropriate. We highlight that a 6-month condition was recently agreed for EA1N and EA2. We request the condition be amended to</p>	<p>The Applicant does not agree with the increased size, scope and potential in combination impacts is justification for the earlier submission of documentation. Hornsea Four is of a similar size and scope of many previous Round 3 offshore wind farms with a 4 month requirement. However, the Applicant has considered that an approach to document submission deadlines that is not ‘one size fits all’. Having reviewed the pre-construction submissions, the Applicant proposes the following documents be changed to a 6 month submission requirement:</p>

	<p>reflect a 6-month requirement for pre-construction. However, we would be willing to discuss a more detailed condition that looked to remove the 'one size fits all' approach, allowing for most documents to be 4 months, but key documents to be 6 months.</p>	<p>Outline Marine Written Scheme of Investigation Outline Fisheries Coexistence and Liaison Plan Outline Design Plan Outline Offshore Cable Installation Plan HVAC Booster Station Lighting Plan</p>
<p>RR-029-APDX:A-11</p>	<p>Point 11 Schedule 11, Part 2, Condition 18: This condition does not allow for a stop should the noise of the piling be significantly in excess of the predicted noise levels. Given concerns related to in-combination noise, especially in relation to Marine mammals and the SNS SAC, it is essential that appropriate controls are provided. We request that the following conditions agreed on EA1N and EA2 are included here: Draft DCO Schedule 13 Part 2, condition 2: (2) The undertaker must carry out the surveys approved under sub-paragraph (1), including any further noise monitoring required in writing by the MMO, and provide the agreed reports in the agreed format in accordance with the agreed timetable, unless otherwise agreed in writing with the MMO in consultation with the relevant statutory nature conservation bodies. (3) The results of the initial noise measurements monitored in accordance with sub-paragraph (1) must be provided to the MMO within six weeks of the installation of the first four piled foundations of each piled foundation type. The assessment of this report by the MMO will determine whether any further noise monitoring is required. If, in the opinion of the MMO in consultation with the statutory nature conservation body, the assessment shows statistically significantly different impacts to those assessed in the environmental statement or failures in mitigation, all piling activity must cease until an update to the marine mammal mitigation protocol and further monitoring requirements have been agreed.</p>	<p>The Applicant notes these comments and is undertaking an assessment of the potential inclusion of this condition. Potential updates to the proposed dDCO wording will be provided as soon as practicable.</p>
<p>RR-029-APDX:A-12</p>	<p>Point 12 Schedule 11, Part 2, Condition 18(2)(a): Natural England notes that this condition includes a requirement to monitor the noise generated by the first four piles installed. This requirement is in line with previous</p>	<p>The Applicant considers that monitoring the noise of the first four piles installed is sufficient and as noted by Natural England, is in line with previous requirements imposed by the Secretary of State for similar projects. No change to the dDCO proposed in response to this comment.</p>

	<p>requirements for similar projects. However, Natural England would consider the first four piles to represent the minimum requirement and would welcome discussion on expanding this proposed monitoring to include an agreed selection of the most resistant piles. The most resistant piles are likely to represent the largest noise impacts and could be further used to validate the noise impact predictions of the ES.</p>	
RR-029-APDX:A-13	<p>Point 13 Schedule 11, Part 2, Conditions 17- 19: No monitoring conditions include the requirement to follow the Marine Mammal Monitoring Plan. We consider that adherence to the plan should be secured within the dMLs.</p>	<p>The obligation to monitor in line with the Marine Mammal Monitoring Plan is secured by conditions 17(3), 18(4) and 19(3) of Schedule 11 and 12, which require the Applicant to carry out surveys in line with the plans to be developed in accordance with the outline marine monitoring plan.</p>
RR-029-APDX:A-14	<p>Point 14 Schedule 11, Part 2, Condition 24: Natural England welcome in principle the inclusion of a completion of construction condition, however we note that we may wish to raise issues at a later date following discussion with the MMO to agree industry wide standardisation of the condition.</p>	<p>Noted.</p>
RR-029-APDX:A-15	<p>Point 15 Schedule 12: All issues raised under Schedule 11 also apply to Schedule 12 where similar conditions exist.</p>	<p>Noted.</p>
RR-029-APDX:A-16	<p>Point 16 Schedule 12, Part 2: There are no conditions in this Schedule limiting the maximum hammer energy to be used during piling. Schedule 11 Condition 13(4) should be in repeated in Schedule 12 to restrict the maximum hammer energy to 5,000kj.</p>	<p>The Applicant agrees with the comments from Natural England and has amended the dDCO accordingly. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>
RR-029-APDX:A-17	<p>Point 17 Schedule 12, Part 2, Condition 26(1)(a): This condition refers to the final number of installed turbines. This licence does not cover turbine installation and the condition should therefore refer to the number of substations.</p>	<p>The Applicant agrees with the comments from Natural England and has amended the dDCO accordingly. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>

2.2 Comments on: Draft DCO conditions for the Compensation Schedules provided in B2.7 FFC SPA: Gannet and Kittiwake Compensation Plan and B2.8 FFC SPA: Guillemot and Razorbill Compensation Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:A-18	<p>Point 18</p> <p>General: It would be helpful if future iterations of the compensation DCO conditions could be provided within the draft DCO rather than the compensation plans, as the DCO is expected to be a live document during the Examination</p>	<p>The Applicant has revisited its conclusion of no potential for adverse effects on integrity in respect of kittiwake at the FFC SPA from Hornsea Four in-combination with other plans and projects. The Applicant has therefore updated the draft DCO to include provisions for compensatory measures for kittiwake on this basis.</p> <p>The Applicant maintains its position that there will be no adverse effects on integrity with regards to all other qualifying features of the FFC SPA (including guillemot, razorbill and gannet) and for all other European sites. The derogation case for guillemot, razorbill and gannet therefore remains "without prejudice" and it is not appropriate to include drafting provisions within the form of draft DCO which the Applicant is seeking to have granted.</p>
RR-029-APDX:A-19	<p>Point 19</p> <p>Part 1, Condition 2: "This condition needs to include a requirement to consult the relevant SNCB, as well as all other members of the Hornsea 4 (H4) Offshore Ornithology Engagement Group (OOEG). Please note this condition includes the terms of reference (TOR) that the H4 OOEG will adhere to, as well as details of the requirements upon the members in terms of timetables, meetings etc. Also, the details of the dispute mechanism and what the scope of the discussions of the H4 OOEG is to cover. It is essential that these factors are discussed and ideally agreed with all the members of the H4 OOEG and this is not currently secured within these draft conditions. Throughout the schedule KGIMP and GKIMP are both used for the Gannet and Kittiwake Implementation and Monitoring Plan. For consistency please could this be limited to GKIMP."</p>	<p>The Applicant notes the comments of Natural England in relation to the consistency of use of terms between KGIMP and GKIMP. The Applicant confirms that "GKIMP" was the correct term at submission. The dDCO provisions as they relate to kittiwake have ensured consistency in terminology.</p> <p>In relation to Natural England's request that the dDCO should be amended to include a requirement to consult the relevant SNCB, it is the Applicant's position that there will already be adequate opportunity for consultation, as the Applicant is required to consult with the Offshore Ornithology Engagement Group (OOEG) before submitting the GKIMP to the Secretary of State. In addition, the Secretary of State will consult with the members of the OOEG when considering the GKIMP.</p> <p>In the DCO Application the Applicant's proposed without prejudice compensatory measures for gannet and kittiwake were presented together in a single Gannet and Kittiwake Compensation Plan (APP-186). However, as set out in the Applicant's position paper (AS-023), the Applicant is updating the Report to Inform Appropriate Assessment (RIAA) and its derogation case based on an overall conclusion that</p>

		<p>there is potential for an AEol on kittiwake at the FFC SPA from Hornsea Four in combination with other projects. In light of the Applicant’s updated position on kittiwake, it is considered appropriate to separate the compensatory measures for gannet and kittiwake into separate compensation plans (and consequently separate Implementation and Monitoring plans), reflecting that compensatory measures for kittiwake are now considered necessary, whereas for gannet the Applicant remains confident there would be no AEol alone or in combination and the compensatory measures for gannet remain “without prejudice” measures. Schedules of Changes and updated documents will be provided regarding this at Deadline 2.</p>
RR-029-APDX:A-20	<p>Point 20 Part 1, Condition 2 (e): Natural England disagrees with the Applicant being the Chair of the Steering group. We note that an independent Chair has been appointed for the equivalent steering groups established to deliver Hornsea Three’s compensatory measures. Further, as noted above the details of this condition allow the applicant as chair to define the scope of discussions on several key aspects of mitigation, and this could take place without any requirement for discussion or agreement with the other members of the Hornsea 4 OOEG</p>	<p>Whilst an independent Chair has been appointed as head of the OOEG for Hornsea Project Three, this was not a requirement for that project. The Plan of Work for the OOEG for Hornsea Project Three stated “Hornsea Three shall be the Chair of the OOEG or shall appoint a Chair of the OOEG.” This Plan of Work was approved by the members of the OOEG and the Secretary of State. The Applicant therefore does not consider that any amendments are necessary to Part 1 condition 2(e).</p>
RR-029-APDX:A-21	<p>Point 21 Part 2/3, Condition 3 and 8: If it is conditioned that the GKIMP and GGRIMP must be based on the strategies set out in the gannet and kittiwake compensation plan and the gannet, guillemot and razorbill compensation plans, we advise that a final version of the compensation plans would need to be provided to account for any changes made during the examination process. We note that a commitment is made to this effect in Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap, 4.1.1.1. Condition 3 has a typo in the last line - KGIMP instead of GKIMP. All references to Natural England should be amended to the relevant Statutory Nature Conservation Body (SNCB), for consistency.</p>	<p>The Applicant can confirm that a final version of the these documents will be submitted before the final Deadline to reflect any updates made during Examination. If required, the final document(s) would then be certified for the purposes of article 38 of the DCO.</p> <p>The Applicant has included the compensation drafting as it relates to kittiwake in the dDCO and has amended the reference to Natural England to the relevant Statutory Nature Conservation Body, as requested. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p> <p>As stated above in RR-029-APDX:A-19, updated compensation plans (and consequently separate Implementation and Monitoring plans) for gannet and kittiwake will be submitted at Deadline 2.</p>

RR-029-APDX:A-22	<p>Point 22</p> <p>Part 2, Condition 3(c): Natural England is concerned with the significant reduction in lead in times proposed by the Applicant compared to those agreed for Hornsea 3. We further highlight that the Applicant defines the breeding season as running from 1 April- 31 August in each year. This is inconsistent with the breeding season accepted for Hornsea Three, which was defined as 1 March – 30 September. As with the reduced lead in time, the Applicant must provide evidence to justify this reduced breeding season. Furthermore, we consider that the compensation needs to be delivering and not just implemented prior to impact. Noting the wording for adaptive management at 3 (f) does not capture changes to timelines for the measures, or to the development should the monitoring highlight the measures are not delivering the required compensation.</p>	<p>Both the Applicant and Natural England’s approach to assessing gannet and kittiwake are provided within the RIAA and its associated annex for the project alone. The Applicant’s preferred method to assess bio-seasons with supporting evidence from the site-specific survey data incorporating migrating birds within the FFC SPA.</p> <p>Please also refer to the Applicant’s response to RR-029-APDX:B-2</p> <p>The Applicant has considered Natural England’s comment regarding lead-in timescales for artificial nesting and now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>
RR-029-APDX:A-23	<p>Point 23</p> <p>Part 2, Condition 3(d): We consider this should include monitoring and reporting on the effectiveness of the measures, as has been included for the guillemot and razorbill measures (8(a)(iv)).</p>	<p>The Applicant accepts the proposal from Natural England to include an obligation to monitor and report on the effectiveness of the measures in Part 2, Condition 3(d). Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>
RR-029-APDX:A-24	<p>Point 24</p> <p>Part 2, Condition (e): This condition should not just require a reporting of the consultation. It should require the applicant to detail how the consultation responses have been considered and give information explaining why any recommendations or advice has not been included.</p>	<p>The Applicant considers that the current drafting is sufficient. The Applicant would be required to submit the GKIMP to the Secretary of State for approval, who would consider the responses to consultation and whether the Applicant has sufficiently dealt with any responses under the consultation.</p>
RR-029-APDX:A-25	<p>Point 25</p> <p>Part 2, Condition 3(f): As per point raised above on condition 3; captured within any adaptive measures should be any changes to timescales for both the project and for the compensation proposals.</p>	<p>The Applicant is seeking clarification from Natural England on this comment as it is unclear what changes to the drafting Natural England would like to see.</p>
RR-029-APDX:A-26	<p>Point 26</p> <p>Part 2, Condition 3(i): This condition says it links to 9 (b), but there is no 9 (b). We assume this refers to 8 (b), but it should be corrected and or clarified.</p>	<p>The Applicant confirms this is correct and has updated the drafting accordingly. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>

RR-029-APDX:A-27	<p>Point 27</p> <p>Part 2, Condition 3(g): The reporting here should require the provision of this report to all members of the H4 OoEG. Or to the relevant statutory nature conservation body as a minimum.</p>	<p>The Applicant believes the current drafting is sufficient and notes that this is consistent with the similar obligation under paragraph 3(f) of Part 1 of Schedule 14 to the DCO for Hornsea Project Three.</p>
RR-029-APDX:A-28	<p>Point 28</p> <p>Part 3, Condition 8(a)(iii): As with the lead in times for artificial nest structures, we are concerned that implementation of predator eradication and/or control two years prior to operation of the wind farm does not give sufficient time for the measure to be delivering prior to impact.</p>	<p>The Applicant notes the concerns raised by Natural England regarding lead in times. The Applicant commits to eradication two years prior to operation, although the Applicant will work towards the indicative timescale for delivery and implementation allows for four breeding seasons prior to operation outlined within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197).</p>
RR-029-APDX:A-29	<p>Point 29</p> <p>Part 3, Condition 8 (a)(vi) and (b)(v): Please see comments above on condition 3(f) as the issues raised there also apply to these adaptive management conditions.</p>	<p>The Applicant is seeking clarification from Natural England on this comment as it is unclear what changes to the drafting Natural England would like to see.</p>
RR-029-APDX:A-30	<p>Point 30</p> <p>Part 3, Condition 8 (a)(v) and (b)(iv): Please see comments on condition 3 (e), the issues raised on this condition also applies to these conditions.</p>	<p>The Applicant considers that the current drafting is sufficient. The Applicant would be required to submit the GGRIMP to the Secretary of State for approval, who would consider the responses to consultation and whether the Applicant has sufficiently dealt with any responses under the consultation.</p>
RR-029-APDX:A-31	<p>Point 31</p> <p>Part 3, Condition 8 (a)(vii) and (b)(vi): Please see comments on condition 3 (g), the issues raised on this condition also applies to these conditions.</p>	<p>The Applicant believes the current drafting is sufficient and notes that this is consistent with the similar obligation under paragraph 3(f) of Part 1 of Schedule 14 to the DCO for Hornsea Project Three.</p>
RR-029-APDX:A-32	<p>Point 32</p> <p>Part 4, Condition 12: The single condition for Fish Habitat Enhancement lacks the details as per the other compensatory measures. Key elements such as location, extent, timing, adaptive management, monitoring, reporting etc are not detailed to be included. This seems insufficient should this be required as part of compensatory measures.</p>	<p>B2.8.6 Volume B2, Annex 8.6: Compensation measures for FFCSPA: Fish Habitat Enhancement: Roadmap (APP-199) provides the currently available details on key elements such as location, extent, timing, adaptive management, monitoring, reporting etc.</p> <p>The roadmap will be updated throughout the examination to provide further details and the draft DCO wording shall incorporate those matters required to secure the measure as a resilience measure.</p>
RR-029-APDX:A-33	<p>Point 33</p> <p>General: We further note that none of the current conditions secure the need to produce the target level of compensation each year (on average).</p>	<p>The current drafting is consistent with the position taken by the Secretary of State in respect of Hornsea Project Three, Norfolk Boreas or Norfolk Vanguard. No change to the dDCO proposed in response to this comment.</p>

	<p>It should be noted the concerns regarding this are compounded further by our concerns on the adaptive management conditions and need to be addressed.</p>	
--	--	--

2.3 Comments on: Volume 4, Chapter 4, Project Description

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:A-34	<p>Point 34 Table 4.45: This table allows for cable repair, which includes deployment of cable protection within new areas, for the lifetime of the project. Natural England's joint position with the MMO is that it is not appropriate for a license to be granted allowing cable protection to be deployed throughout the operation and maintenance (O&M) phase of a project (Vanguard REP6-073). This is due to the very large spatial and temporal scale of these licenced works, giving a Rochdale Envelope that is too undefined to appropriately assess. We request that an end date is included and conditioned.</p>	<p>The Applicant proposes limiting the cable repair deployment licensed under the dDCO to 15 years. The dDCO has been updated accordingly.</p>
RR-029-APDX:A-35	<p>Point 35 Table 4.6 and Figure 4.8: Different predicted height of accommodation above sea level. 100m vs 60m</p>	<p>The information presented in Figure 4.8 and Table 4.6 is correct. Figure 4.8 shows the maximum height of the offshore substation as 100m (shown in image) next to an offshore accommodation platform, which is described in the figure subheading as "64m above LAT". This figure is to demonstrate that the offshore accommodation platform would be smaller than the offshore substation structures. Table 4.6 details the maximum design parameters for the offshore accommodation platform, specifically stating that the accommodation platform is 60m above LAT for the main structure height and 64m above LAT when including the ancillary structure height (helideck).</p>
RR-029-APDX:A-36	<p>Point 36 4.8.4.4: As raised previously Natural England queries whether 5000kJ will be sufficient to pile a 15m monopile, when other developments have needed to raise their hammer energies to 5000kJ based on much smaller</p>	<p>The Applicant confirms a maximum hammer energy of 5,000 kJ is currently assumed sufficient to install a 15 m diameter monopile based on the technology available at the time of writing.</p>

	<p>pile diameters. Further evidence would be required to demonstrate the appropriateness of this WCS.</p>	
RR-029-APDX:A-37	<p>Point 37 4.8.5.10: There is currently no mechanism within the DCO/dML by which the overall cable protection ‘allowance’ will reduce should fewer cables be installed. Additionally, this approach presents a range of potential scenarios as to how the cable protection might be deployed. In theory, even if six cables are installed, the full allowance could be deployed along a single cable. The combination of these factors makes a worst case scenario incredibly difficult to determine and assess.</p>	<p>The Applicant will provide as built plans on completion of construction under Schedule 11, Part 2, Condition 24 (3) and Schedule 12, Part 2, Condition 26 (1)(a) to the MMO and relevant statutory nature conservation body. Additionally, Table 2 in document A4.4.8 Pro-rata Annex (APP-046), a certified document under article 38 of the draft DCO, provides pro-rata values for cable protection.</p> <p>Cable protection will be required at cable crossings, as well as areas where cable burial is not possible. Up to 10% of the total cable length (including export, array and interconnector cables and excluding cable crossings) may require protection due to unforeseen ground conditions and tool failure. The 10% value is based on Orsted’s experience and is aligned with other Hornsea Zone developments in non-designated sites. Additionally, Table 4.26 in the A4.4.8 Pro-rata Annex (APP-046) confirms that the maximum design scenario for post-lay length of rock berm at seabed is 500m. The as built plans along with the pro-rata cable protection values and maximum design scenario will enable the MMO and statutory nature conservation body to review the cable protection per cable and to assess a worst case scenario per cable.</p>
RR-029-APDX:A-38	<p>Point 38 4.8.8.5 onwards: There are discrepancies in this section over the width of the clearance corridors. Section 4.8.8.7 for boulder clearance states 40m corridors will be cleared whereas table 4.29 for the total calculations’ states 30m. There is a similar discrepancies relating to section 4.8.8.13 where 30m is stated for sandwave clearance corridors however table 4.30 references 40m. Whilst this will potentially make little difference to impacts, it is important there are no discrepancies within the project description. These errors affect the calculations in table 4.29 & 4.30. When these are checked and confirmed it should be ensured that they translate over to the MDS figures used within the Environmental Statement chapters and the DCO.</p>	<p>Section 4.8.8.7 and Table 4.29: Natural England are correct, this is an error on the part of the Applicant and should state a 30m boulder clearance corridor will be cleared. This has been updated in document A1.4 Project Description submitted at Deadline 1.</p> <p>4.8.8.13 and Table 4.30: this is not an error. For calculation of sandwave clearance area and volume an average corridor width of 30 m has been used. This is a conservative estimation of the total sandwave clearance volume. A clarifying statement to this effect has been copied from Table 3 in A4.4.8 Pro-rata Annex (APP-046) and added below Table 4.30 in the Project Description to remove confusion. This change has been included in A1.4 Project Description submitted at Deadline 1.</p>
RR-029-APDX:A-39	<p>Point 39</p>	<p>The Applicant considers that sufficient data has been collected on ground conditions and confirms that this data, alongside the Applicant’s experience in the</p>

	<p>4.30: "As stated in the marine processes and benthic ES chapter Natural England would like to see estimations of boulder and sandwave clearance scaled down based on geophysical survey data. In light of NPS EN-3, which states "The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment", it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave and boulder clearance. Geophysical data – either project specific or otherwise should be used to refine this assessment to a more realistic area. Natural England note that the applicant has undertaken geophysical survey work in 2021. These data should be used to update the assessment and refine the DCO parameters."</p>	<p>construction of offshore wind farms in the UK and Europe, has been used to define the Maximum Design Scenarios which have then been assessed in line with the Rochdale Envelope approach to assessment in order to understand the potential impacts on relevant receptors. The Applicant notes that refinements have been made where possible (e.g. limitation of the number of GBS used – Co201 Volume A4, Annex 5.2: Commitments Register (APP-050)), whilst still allowing adequate flexibility in the project design envelope. However, in light of the comments from Natural England the Applicant can provide a clarification note clearly describing the evolution of the Maximum Design Scenarios, how these were calculated and how the Applicant intends to review and refine these in the future with the additional insight gained from the most contemporary post-Environmental Statement seabed data.</p>
--	---	--

2.4 Comments on: F2.7: Outline Marine Monitoring Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:A-40	<p>Point 40 General: We query why this document is called an Outline Marine Monitoring Plan (OMMP) rather than an In-Principle Monitoring Plan (IPMP). This is not consistent between projects (other projects refer to them as IPMPs) and could cause unnecessary confusion when referencing documents, e.g. OMMP / OMMMP (Outline Marine Mammal Mitigation Protocol) / OOMP (Outline Ornithological Monitoring Plan).</p>	<p>The Applicant acknowledges the point raised by Natural England but confirms that the terminology Outline Marine Monitoring Plan (OMMP) is preferred at this stage and will be retained for consistency with other outline plans included within the Hornsea Four DCO Application.</p>
RR-029-APDX:A-41	<p>Point 41 General: In Annex A we provide a checklist of the content Natural England consider should be included in an IPMP.</p>	<p>Noted.</p>
RR-029-APDX:A-42	<p>Point 42 3.3.2.1: Regarding Marine Geology, Oceanography, and Physical Processes, the In-principle Monitoring Proposals stated that "...there are considered to be no significant uncertainties in the assessment conclusions and therefore no monitoring requirements specifically related to marine</p>	<p>As presented in Section 3.3.2 of F2.7: Outline Marine Monitoring Plan (APP-242), when taking account of the precautionary approach to assessment, there are considered to be no significant uncertainties in the assessment conclusions and therefore no monitoring requirements specifically related to marine processes have been identified, beyond the standard geophysical surveys. These surveys will inform</p>

	<p>processes have been identified, beyond the standard geophysical surveys...". We disagree with this conclusion and would advise that the Applicant monitors the following:</p> <ul style="list-style-type: none"> • Flamborough Front (e.g. satellite data) • Smithic Bank structure and integrity • Sandwave recovery • Interannual beach profiles • Wave shadow effect downwind of the array • Scour around foundations 	<p>a wide range of engineering elements relevant to the marine processes assessment, including changes in seabed topography and scour around foundations. Where these surveys are being undertaken as part of the standard pre-construction geophysical monitoring campaign, the specification of the surveys will be agreed with the MMO and its advisors during consultation in the post-consent phase.</p> <p>All of the assessments of the potential impacts of Hornsea Four set out in Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) were concluded to be likely to result in effects of negligible or slight adverse significance (not significant in EIA terms). This is, in part, due to the commitments made as described in Volume A4, Annex 5.2: Commitments Register (APP-050) and the present assumptions in the assessment being considered to offer a conservative assessment to offset uncertainties. Therefore, it is the Applicant's position that no additional monitoring is required and are considered disproportionate to the findings of the assessment and uncertainties. Furthermore, bathymetric changes can occur from natural events as well as human activity within the marine environment and any changes observed would not be able to be directly attributed to the presence and activities associated within Hornsea Four. As such, the monitoring would be of no or little value.</p>
<p>RR-029-APDX:A-43</p>	<p>Point 43 3.3.2.2: We note that "No monitoring specific to different potential foundation types is proposed as part of the marine processes monitoring." Given that the interaction between GBS foundations and the seabed have not been widely studied, it is important that the Applicant carries out monitoring of morphological change around a number of GBS WTG foundations.</p>	<p>See Applicant response to Natural England's point RR-029-APDX:A-42 above.</p>
<p>RR-029-APDX:A-44</p>	<p>Point 44 3.4.2.2: "Whilst Natural England appreciates the evidence from the study which has taken place in Belgium on GBS and the site specific assessment based on a combination of an evidence-based approach, expert opinion, and project-specific modelling to evaluate blockage related effects within Hornsea 4, we do not consider this sufficient evidence. The use of GBS is new in UK waters and the impacts on the surrounding environment and recoverability are not fully understood. Therefore we believe it is</p>	<p>See Applicant response to MMO's points RR-020-4.5.6 to 4.5.7.</p>

	important that a robust post construction monitoring program is incorporated into the Hornsea 4 project to examine the impacts of any GBS used."	
RR-029-APDX:A-45	<p>Point 45</p> <p>3.6: This section of the OMMP remains extremely short and lacking on detail. There has been no consideration of the areas of the assessment where assumptions have been made and where the project could contribute to filling knowledge gaps (for example, with regards to operational WTG noise levels, or the assumed distribution of bottlenose dolphin close to the coast). Many of our comments and proposals for additional monitoring for marine mammals made during the Evidence Plan process not been sufficiently addressed by the consultation response and new version of the OMMP. We recommend that the OMMP is kept live during examination so an updated, final version can be provided capturing the results of further discussion.</p>	<p>See Applicant response to Natural England's comments on Appendix D: Main Issues – Post-consent monitoring.(RR-029-APDX:D-T)</p>
RR-029-APDX:A-46	<p>Point 46</p> <p>Table 6: The Applicant has included monitoring undertaken under the Marine Mammal Mitigation Protocol (MMMP) as a monitoring commitment. However, we consider that this monitoring is undertaken for the purposes of mitigation only i.e. it is a pre-piling search. If the data collected are not being used to confirm the results of the ES assessment, then we cannot consider it as EIA-related monitoring.</p>	<p>Noted. This monitoring will be removed from the marine mammals section of the OMMP.</p>
RR-029-APDX:A-47	<p>Point 47</p> <p>Table 6: We are disappointed to see that the applicant has reduced the number of monitored piling locations from 6 to 4, in comparison to an earlier version of the OMMP. We request that a justification is provided for the reduction.</p>	<p>The Applicant notes that the monitoring of six piling locations was presented in error in a previous draft of the OMMP and was corrected to refer to the monitoring of four piling locations in the version of the OMMP submitted as part of the DCO Application.</p>
RR-029-APDX:A-48	<p>Point 48</p> <p>3.6.2.2: We do not consider that the conclusions of the SIP will have bearing on the requirements for monitoring. Monitoring is not only required where an adverse effect is predicted; it should address significant assumptions in the ES and confirm the ES assessments.</p>	<p>Noted.</p>

RR-029-APDX:A-49	<p>Point 49</p> <p>3.6.2.3: The pre- and post-construction digital aerial surveys are not carried out at a scale that is conducive to understanding potential impacts at the population scales of marine mammals. Natural England advise that the applicant undertakes strategic monitoring to understand these population level impacts</p>	Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.
------------------	--	--

3 Appendix B Offshore Ornithology

3.1 Project Parameters

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B -A	Project Description: The project parameters are clearly defined with respect to offshore ornithology.	Noted and captured in the SoCG with Natural England in relation to offshore and intertidal ornithology.
RR-029-APDX:B-B	NE position on Worst Case Scenario: Natural England consider the maximum design scenarios for impacts on offshore and intertidal ornithology receptors to be clearly defined and are representative of the likely Worst Case Scenarios (WCS) to be used in the assessment.	Noted and captured in the SoCG with Natural England in relation to offshore and intertidal ornithology.

3.2 Baseline data collection and analysis methodology

Reference	Relevant Representation Comment	Applicant's Response
-----------	---------------------------------	----------------------

RR-029-APDX:B-C

Main Issues - Baseline data collection and analysis methodology

Analysis of baseline characterisation survey data to derive density and abundance estimates: Natural England consider the baseline characterisation data collected by digital aerial surveys over a 24-month period to be adequate. However, we have potentially significant concerns about the suitability of the methods used to analyse the baseline characterisation data to produce the density and abundance estimates that underpin both the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA). These concerns are related to those species for which modelling has been used (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin) in preference to more frequently used design-based estimates and are set out in our detailed comments.

In its simplest form, design-based methods estimate densities from the number of birds seen in the areas sampled, which can then be used to estimate population density for the entire study area. This approach relies heavily on the survey design providing representative samples across the entire study area. In contrast, model-based approaches use relationships between bird abundance within the surveyed area and suitable variables (e.g. depth or productivity) to predict the densities of birds throughout the study area. Model-based approaches are less dependent on survey design and can result in more precise density and population estimates, but they are dependent on there being an adequate number of bird observations to determine the nature of the relationships with the relevant variables.

Natural England welcome the use of model-based methods. However, we are concerned about possible errors in the modelling approach adopted and continue to request that both design-based and model-based estimates are presented. Whilst MRSea modelling has been used in ornithology assessments before, its use to generate a baseline characterisation for impact assessment purposes is novel and therefore must be appropriately validated.

Our resulting lack of confidence in the treatment of the baseline characterisation data means that Natural England cannot currently form

The Applicant welcomes Natural England's agreement on the adequacy of the 24 months of baseline data.

The Applicant has held an additional Ornithology Technical Panel Meeting (17 Feb 2022) to discuss the MRSea comments and options available to resolve these concerns with Natural England.

The Applicant is rerunning the MRSea design based abundances using a methodology that addresses Natural England's comments for gannet and intends to produce a Baseline Sensitivity Report which is currently anticipated to be submitted at Deadline 2.

The Baseline Sensitivity Report shall also sign-post readers to the relevant parts of an updated MRSea Report, where the design-based estimates and monthly dot-density maps are presented for the key species alongside model-based estimates and monthly spatial distribution maps.

The Applicant considers the MRSea approach to be suitable and appropriate for baseline characterisation and welcomes further discussion with Natural England on the updates detailed above in order to secure agreement on this approach.

	<p>any conclusions about the significance of predicted impacts presented by the Applicant that are dependent on model-based estimates.</p> <p>The comments in the following sections are therefore caveated on the basis that Natural England consider that there are issues with the derivation of the baseline bird density data that underpin these assessments. However, we have provided comments regarding other methodological aspects of the assessment where these are not dependent on baseline survey data.</p> <p>Natural England consider the Applicant to have several options available to resolve these concerns and we are keen to work with them towards quickly resolving this issue.</p> <p>The comments in the following sections are therefore caveated on the basis that Natural England consider that there are issues with the derivation of the baseline bird density data that underpin these assessments. However, we have provided comments regarding other methodological aspects of the assessment where these are not dependent on baseline survey data.</p> <p>Natural England consider the Applicant to have several options available to resolve these concerns and we are keen to work with them towards quickly resolving this issue.</p>	
RR-029-APDX:B-D	<p>Data gaps:</p> <ul style="list-style-type: none"> • The importance of the array area to auks – specifically the colony origin, behaviour and age structure of auks present in the site during August and September. See comments below for further details. • Site-specific age data (including the proportions of birds aged and numbers of adult and sub-adult birds) for focal species to inform the proportions of adults present within specific areas at different times of year for apportioning to colonies. 	<p>Please refer to the Applicant’s responses to RR-029-5.7 with regards to the weighted approach to assessing auks in August and September and the Applicant’s apportionment process.</p> <p>Please also see the Applicant’s response to RR-029-APDX:B-44 with regards to the age</p>

3.3 Assessment of displacement impacts for EIA and HRA

Reference	Relevant Representation Comment	Applicant’s Response
-----------	---------------------------------	----------------------

<p>RR-029-APDX:B-E</p>	<p>Seasonal definitions: Natural England do not agree with the seasonal definitions used for gannet and kittiwake within the assessment based around the migration-free breeding season. The migration-free breeding season is a narrower period of time, which excludes months at the start and end of the 'full' breeding season where some birds in a given biogeographic area are engaged in breeding activities, but others are still on or starting migration.</p> <p>Natural England has consistently advised that for species where breeding birds are predicted to be present in the project area, that the breeding season months follow those presented in Furness (2015) under 'breeding season' and not the 'migration-free breeding season', except where local colony or site-specific information suggests that a different set of months is appropriate for defining colony attendance. This is because during the breeding season, a high apportioning rate will be applied to a colony within the mean-max foraging range due to the high likelihood of encountering a bird from the target colony. If the breeding season is defined more narrowly, a lower apportioning rate will be applied to birds encountered during the excluded months. Using the migration-free breeding season as the basis for breeding season apportioning compared to the full breeding season will therefore result in dilution of impacts.</p> <p>No evidence has been provided to support the use of the migration-free breeding seasons and given the proximity of the project area to Flamborough and Filey Coast SPA (FFC SPA), we consider the likelihood of encountering a bird from FFC SPA during the early and late breeding season months is higher than encountering one from much further away (e.g. Scotland or Norway). We therefore consider that using the migration-free breeding season could lead to displacement impacts being underestimated. Natural England advise that the Applicant provide all relevant values for the assessment based on our recommended seasonal definitions for gannet and kittiwake. These seasons should be carried through the entire EIA and HRA process.</p>	<p>Please refer to the Applicant's responses to RR-029-APDX:B-126 with regards to presentation of Natural England's preferred seasonal definitions for gannet and kittiwake at the HRA Scale .</p> <p>At an EIA scale, the Applicant considers that the migration-free breeding bio-season best represents the distributional and behavioural changes observed from the site-specific data (see Section 3.7 & 3.8 of A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074)). The use of either breeding season at an EIA scale however, will not affect the overall annual impact value assessed, which forms the main focus of EIA scale assessments.</p>
<p>RR-029-APDX:B-F</p>	<p>Consideration of the importance of the area for auks in August and September: During pre-application consultation, Natural England</p>	<p>Please refer to the Applicant's responses to RR-029-5.7 with regards to the weighted approach to assessing auks in August and September and the Applicant's</p>

requested that the Applicant provide additional consideration of the substantially high numbers of auks (specifically guillemot and razorbill) that are found in the project area during August and September. This request reflects Hornsea 4's proximity to the FFC SPA colony and the associated need to understand the potential impacts on it. FFC SPA is the largest seabird colony in England and hosts the largest English populations of razorbill and guillemot, being the only SPA with razorbill as a qualifying feature and one of only two for guillemot. (It also supports England's largest gannet and kittiwake colonies - indeed the only gannetry - and the only SPAs with these species as qualifying features). Accordingly, it is critical that the impacts on SPA qualifying features are fully assessed, including displacement impacts on guillemot.

Whilst the Developable Area Approach undertaken by the Applicant excludes the highest areas of use, high numbers of these species are still recorded in the baseline surveys for the array area during this period. This is a key, sensitive period for guillemot and razorbill which may be in moult, and thus flightless, and are accompanied by dependent chicks. Given the proximity of the Hornsea 4 array to FFC SPA, we consider the high usage at a sensitive period could suggest functional linkages with the SPA colony which warrant further investigation.

Natural England request that further consideration is given to drivers of seasonal variations in the wider spatial distributions of auks, particularly during August and September, to determine the potential importance of this area. This should consider the possible impacts of displacement in relation to the colony origin of birds present (i.e. connectivity with FFC SPA), the proportion of birds present with attendant chicks, foraging activity and the extent and suitability of habitat for auks outside of the array area. This was previously requested by NE during the Evidence Plan process but was not provided.

Consideration should also be given to the merits of applying a bespoke approach to the treatment of auks during August and September to account for the potential importance of the area.

apportionment process. Further evidence on the importance of the wider waters for auks from the FFC SPA are presented in RR-029-APDX:B-92.

RR-029-APDX:B-G	<p>Birds included in assessment: The assessments for guillemot, razorbill and puffin do not include all birds (sitting and flying) in the mean seasonal peak abundance estimates. These values provide an indication of the average maximum numbers of birds that may be subject to displacement impacts and Natural England have consistently advised that they should include both birds sitting on the water and in flight. By excluding birds in flight, the assessment is performed on a lower number of birds leading to an underestimation of the impacts. We do not consider that sufficient justification has been provided to support the Applicant's approach of excluding birds in flight.</p> <p>As per SNCB displacement guidance, and in line with all other Round 3 windfarms, Natural England require the Applicant to consider all birds (sitting and in flight) for the assessment of auk displacement so the full potential impact can be understood.</p>	Please refer to the Applicant's response to RR-029-5.9 with regards to flying and sitting auks for displacement assessments.
RR-029-APDX:B-H	<p>Mean peak abundance estimates: Natural England do not agree with the Applicant's approach to weighting the seasonal mean peak abundance estimate in the non-breeding season for guillemot. This currently involves splitting the non-breeding season into post-breeding, migration-free non-breeding and return migration periods. This weighting approach reduces the annual displacement impacts on guillemot considerably relative to any of the more precautionary alternative approaches (e.g. treating August and September as a separate period entirely or using the mean peak abundance from the entire non-breeding season). We are concerned that this overly conservative approach risks the level of potential displacement being significantly underestimated. Natural England therefore request an alternative approach to deriving seasonal mean peak abundance estimates is applied for guillemot.</p>	Please refer to the Applicant's responses to RR-029-5.7 with regards to the weighted approach to assessing auks in August and September.
RR-029-APDX:B-I	<p>Lack of consideration of confidence intervals: Natural England notes that the Applicant has not included consideration of the confidence intervals (CIs) reflecting variability surrounding the mean peak abundance estimates. Confidence intervals are used to show the range we can be 95% confident the true value falls within (for a 95% confidence interval). As the true value could fall anywhere within this range, confidence intervals show the level of</p>	Please refer to the Applicant's response to RR-029-APDX:B-103 for the reasons why assessments are based on the central estimates both alone and cumulatively / in-combination.

	<p>uncertainty associated with an estimate (i.e. the larger the interval is, the more uncertain the true value is and vice versa). If the confidence interval range is not presented, it is not possible to determine the level of certainty that can be placed in the abundance estimates presented, and therefore for SNCBs and decision makers to understand how much weight should be placed on the predicted impacts that are based on these estimates.</p> <p>Natural England requests that that CIs are presented alongside all mean peak abundance estimates used for assessment of displacement.</p> <p>N.B. This applies to all assessments, not just displacement.</p>	
--	---	--

3.4 Assessment of Collision impacts for EIA and HRA

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-J	<p>Band models used: Natural England notes that the Applicant has provided a range of collision risk modelling (CRM) scenarios using the deterministic Band model to derive values in line with SNCB advice and the stochastic CRM (sCRM) using the Applicant's approach.</p> <p>The Applicant has chosen to use the outputs of Band Option 2 (gannet and kittiwake) and Option 3 (large gulls). The Applicant has presented, but not used, results from Band Option 1 (using site-specific flight height data) in their assessment. This is suggested to be due to Natural England and the RSPB not having sufficient confidence in the flight height data presented and we note that there has been no attempt to address this.</p> <p>Natural England consider the SNCB advice has broadly been followed in tandem with the Applicants own approach. However, it is noted that the Applicant has not considered potential uncertainty around the generic flight height distributions used in both Band Option 2 and Option 3. We also request that outputs using Option 2 continue to be provided for large gulls if CRM is repeated using updated density data.</p>	<p>The Applicant agreed on the most suitable CRM model to use ahead of the application and on the Band Options most appropriate for each species through the Evidence Plan Process (agreement OFF-ORN-2.32 to 2.38 – as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)).</p> <p>Band Option 1 was not used for the purpose of assessments at the request of Natural England and the RSPB within their Section 42 Responses, as they deemed the underlying datasets contributing to the flight heights from the boat-based survey data to be unreliable as detailed in A5.5.3 ES Volume A5 Annex 5.3 Offshore Ornithology Collision Risk Modelling (APP-076).</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-55 with regards to considering potential uncertainty in the form of confidence intervals around the generic flight height distributions used in the collision risk modelling.</p>

RR-029-APDX:B-K	<p>Calculation of density estimates, confidence intervals and standard deviations: Natural England question the approach for deriving mean densities, CIs and standard deviations (SDs) used in the Band CRM or sCRM. These input parameters are fundamental to estimating potential collision impacts and potential variability or uncertainty.</p> <p>It is unclear how the densities of birds in flight and associated CIs were derived from modelled density surfaces for all birds (sitting and flying), with or without subsequent apportioning of unidentified species. Further, Natural England question the use of minimum and maximum plausible CIs (from two surveys in any given month) to then derive a standard deviation. Our preferred approach would be to pool bootstrap samples from the relevant pairs of surveys for each calendar month to derive the mean monthly density, SDs and CIs.</p>	<p>The Applicant worked with the Offshore and Intertidal Ornithology Evidence Plan Technical Panel to develop and agreed the methodology to determine seabird density variation suitable for use in the CRM (agreement OFF-ORN-2.37 – as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)), which was used for assessing all seabirds for collision risk.</p> <p>Please refer to the Applicant’s response to RR-029-APDX:B-55 with regards to considering potential uncertainty in the form of confidence intervals around the generic flight height distributions used in the collision risk modelling.</p>
-----------------	---	---

3.5 Assessment of indirect effects

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:B-L	<p>Prey availability: For EIA, the Applicant suggests that if there were no significant impacts identified for potential prey species in their respective assessments then there would be no significant impacts on ornithology receptors. Natural England disagree with this.</p> <p>The assessments undertaken in the Fish and Shellfish chapter consider impacts at a regional population level and only consider fish and shellfish as receptors, rather than potential sources of impact. NE consider that an understanding of the relative importance of the site as a foraging area, and potential for any impacts on prey abundance and distribution is critical in framing the predicted impacts that can be quantified. Further assessment is therefore needed to understand how more localised impacts on fish and shellfish might influence prey availability for seabirds.</p>	<p>Please refer to the Applicant’s response to RR-029-5.10</p> <p>Forage fish, like key bird species, exhibit varying spatial and temporal patterns of distribution and any localised impacts on fish species are not anticipated to be directly relatable to seabirds as they exhibit resilience to these small-scale fluctuations in prey availability. Redistribution or local declines that could impact specific seabirds at certain times of the year would therefore not be attributable to the construction and/or operation of the Hornsea Four.</p>

	<p>We suggest that any negative impact on forage fish may have an impact on vulnerable seabirds – particularly kittiwake. These pathways should be considered in more detail and conclusions evidenced.</p>	
RR-029-APDX:B-M	<p>Barrier effects: Hornsea 4 has included an assessment of barrier effects but only for fulmar, gannet and kittiwake (though this has not been carried through for consideration in the HRA). There has been no consideration of potential barrier effects on guillemot and razorbill, which as noted above are present in large numbers in the project area in August and September and may have limited flight capability due to being in moult.</p> <p>This is based on the assumption that only “fulmar, gannet and kittiwake may forage on a regular basis out to a distance as far as, or further than the Hornsea Four array area”. NE consider this assumption to be insufficiently evidenced. We note that while adult birds foraging from FFC SPA during the breeding season will typically forage close to the colony, in years of poor food resources they may forage further, and additionally when not constrained to, for example provisioning chicks, they may also forage or use sea areas further from the colony.</p> <p>NE consider that an understanding of the potential for any impacts arising from barrier effects, that may limit access to resources or incur an additional metabolic cost, is critical in framing the predicted impacts that can be quantified. We advise that either more evidence is provided to support the conclusions on the lack of barrier effects for auk species, or the Applicant should consider the potential for barrier effects on auks from Hornsea 4.</p>	<p>The Applicant maintains that an appropriate and proportionate approach has been taken to the scoping in or out of species for barrier effect within the ES Chapter.</p> <p>The Applicant has committed to updating all displacement analysis for auk species to account for both flying and sitting birds (please refer to Applicant’s response to RR-029-5.9). In doing so it is noted that the SNCB joint advice note on displacement (SNCB, 2017) suggests that taking this approach then accounts for any effects due to barrier in the absence of other quantitative means of assessment.</p>

3.6 Population modeling approaches

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:B-N	<p>Consideration of uncertainty and variability in impacts assessed: Population Viability Analysis (PVA) is a tool used to investigate the vulnerability of a population to potential impacts, based on comparisons between projected unimpacted baseline population trajectories and</p>	<p>The Applicant recognises that there is potential for cumulative and in-combination impact values to change throughout the examination process due to other projects moving between their PEIR, final applications and through their examination phases. This means that there is potential for the current PVA modelling results to become</p>

	<p>impacted population trajectories over time. The Applicant has used the Natural England PVA Shiny tool within both EIA and HRA, which we welcome.</p> <p>Natural England note that the applicant has only considered impacts based on single, presumably central, values of collision mortality and mean peak abundance estimates for displacement for the project alone, cumulatively or in-combination when carrying out PVA.</p> <p>Natural England requires that variability and uncertainty in the predicted Hornsea 4 impacts are captured and included in PVA to inform interpretation of the outcomes. We highlight that in evidence-poor contexts with multiple sources of uncertainty (e.g. CRM), exclusive focus on a single or central value carries with it a high risk of 'false precision', whereas a range-based approach allows a more nuanced consideration of a range of plausible values. We therefore advise that PVA modelling should incorporate the upper and lower predicted annual impact estimates for Hornsea 4 in addition to the central values.</p> <p>Variability and uncertainty in estimates should also be taken into account when drawing conclusions about the potential for significant impacts during EIA, and we request that minimum and maximum predicted impacts associated with the project are considered in all assessments.</p>	<p>outdated. It is the Applicant's intention following revisions to the baseline, to rerun PVA modelling using a range of generic impact values, future proofing the modelling as Hornsea Four progresses through examination. Consequently, this will also allow Natural England to consider a range of PVA outputs should they wish to do so.</p>
RR-029-APDX:B-O	<p>Presentation of PVA metrics (counterfactuals): PVAs produce two key metrics which can be used in the interpretation of predicted impacts (project alone, cumulatively or in-combination) on populations: the counterfactual of population growth rate (ratio of the impacted annual growth rate to the unimpacted growth rate) and the counterfactual of final population size (ratio of the impacted final population size to the unimpacted final population size).</p> <p>Both metrics are relatively insensitive to underlying population trends. However, the counterfactual of the population growth rate varies over a limited range, meaning it may be difficult to distinguish between the population level impacts of different magnitudes. In contrast, the counterfactual of final population size provides a clear relationship with the magnitude of any impact, making it easier to assess what the population</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-18 with regards to the presentation and use of the CFGR and CFPS PVA outputs.</p> <p>The counterfactual of final population size (CFPS) was initially presented to Natural England alongside the counterfactual of population growth rate (CPGR). However, the use of CFPS is more sensitive to declining population trends and misspecification of demographic parameters. During the EP Process (EP#14) the Applicant stated their intention to not present CFPS due to these concerns.</p>

	<p>level effects of any impact will be. However, it may be more sensitive to declining, rather than stable/increasing populations trends, and to mis-specification of demographic parameters. Therefore, both metrics should be used in conjunction to assess the population level consequences of impacts.</p> <p>The counterfactual of final population size has not been included in any of the PVA outputs presented for EIA or HRA. However, we note that this was originally included in the Applicant's assessment but has been removed from the final application with insufficient justification. Thus, Natural England request that both the counterfactual of final population size and growth rate are provided to allow a fully informed interpretation of the PVA results relative to background population trends and specific conservation objectives.</p>	
--	--	--

3.7 Environmental Impact Assessment (EIA)

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-P	<p>General comment: The issues and uncertainties raised here and in the preceding sections of this report mean that, at this time, Natural England cannot confidently comment on conclusions drawn from the assessment, either regarding the project alone or cumulative impacts.</p> <p>However, Natural England highlight that our current position in recent Examinations for cumulative impacts has been that we are unable to rule out significant adverse impacts at an EIA scale on kittiwake, razorbill, guillemot, gannet and greater black-backed gull due to cumulative collision mortality and/or displacement impacts for all projects up to and including Hornsea 3, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two. This conclusion is irrespective of whether Hornsea 4, Dudgeon Extension Project and Sheringham Shoal Extension Project ('DEP and SEP') are included in the cumulative totals or not. Any further impact to</p>	<p>Noted.</p> <p>In relation to EIA scale impacts, the Applicant's position remains that no significant adverse impacts arise for all offshore and intertidal ornithology receptors assessed (gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin), from Hornsea Four alone predicted impacts and cumulatively with all current planned and consented projects as detailed in A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>It is the Applicant's intention following revisions to the baseline, to update cumulative assessments in line with any project changes since application, in order to reduce any uncertainties around the final assessments. This will reduce any uncertainty and allow Natural England to confidently comment on conclusions drawn from the assessment, either regarding the project alone or cumulative impacts.</p>

	<p>the existing totals from Hornsea 4 would reinforce this conclusion regarding these species.</p>	
<p>RR-029-APDX:B-Q</p>	<p>Impact pathways: Natural England generally agree with the impact pathways identified and assessed, but do not consider that indirect and barrier effects have been adequately assessed for some relevant receptors (gannet, kittiwake, guillemot, razorbill and puffin).</p>	<p>Noted – the Applicant welcomes NE’s agreement as to the impact pathways identified/assessed.</p> <p>Please refer to the Applicant’s responses to RR-029-5.10 with regards to indirect effects and RR-029-APDX:B-M with regards to barrier effect.</p>
<p>RR-029-APDX:B-R</p>	<p>Methodology for the assessment of significance: The EIA methodology follows the conceptual source-pathway-receptor model and uses a matrix to assess/assign the potential significance of effect based on the sensitivity of the receptor and magnitude of impacts (degree of change). This is a widely adopted method for EIA however, this method is largely subjective and Natural England advise that quantitative assessments of impact, linking predicted impacts to population effects are used where possible – e.g. assessing impacts against baseline mortality rates and then undertaking further PVA modelling if required.</p>	<p>The Applicant does not agree with Natural England that the ‘source-pathway-receptor’ EIA methodology is largely subjective. The ‘source-pathway-receptor’ conceptual model process is used to provide a systematic and auditable approach to understanding the potential for effects to arise, the spatial extents of the effect-receptor interactions, impact pathways, and potential impact significance. The conceptual ‘source-pathway-receptor’ model is effective in the identification of potential effects and the means by which these can manifest themselves on the receiving environment and its sensitive receptors. Following this method for each effect, the assessment identifies receptors within the study area that are sensitive to that effect and implements a systematic approach to understand the impact pathways and the level of impacts on given receptors. The process considers the following which are defined within the assessment criteria:</p> <ul style="list-style-type: none"> • the magnitude of the effect; • the sensitivity of a receptor to the effect; • the probability that an effect-receptor interaction will occur; • the determination and (where possible) qualification of the level of impact on a receptor, considering the probability that the effect-receptor interaction will occur, the spatial and temporal extents of the interaction and the significance of the resulting impact; • the level of certainty at all stages. <p>The Applicant welcomes that Natural England recognise that the EIA methodology follows the methods more widely adopted for other projects. The Applicant followed Natural England’s suggested approach to linking predicted impacts to population effects where possible – e.g. assessing impacts against baseline mortality rates and then undertaking further PVA modelling if impacts reach a</p>

		<p>certain threshold – generally agreed to be over 1% mortality above the relative baseline mortality rate. However, as outlined in the Applicant’s response to RR-029-APDX:B-81, this approach is only taken when impacts assessed for Hornsea Four are considered to be of a material contribution towards the overall impact as a project alone or to the cumulative level value.</p>
<p>RR-029-APDX:B-S</p>	<p>Cumulative Effect Assessment: Natural England agrees with the projects included within the cumulative assessment. It is understood that the values used were ‘mostly’ comprised of data from the final cumulative tables submitted at Deadline 11 for EA1N/EA2 (SPR 2021). However, we note that some of the impact values do not match those currently advised by Natural England and that some of the total impacts presented do not accurately reflect the sum of the constituent projects.</p> <p>It is also noted that herring gull and lesser black-backed gull have not been fully assessed in relation to relevant 1% baseline mortality thresholds. NE advise that even small, predicted impacts at the project alone level should still be considered in the context of a cumulative assessment with other plans and projects where there are concerns around cumulative impacts from multiple OWF. Cumulative annual impacts (including variability and uncertainty) should be assessed against the relevant largest BDMPS 1% baseline mortality threshold to clearly rule out the potential for any significant effects.</p> <p>Natural England requests that the Applicant checks and agrees the project specific impacts and fully considers the cumulative impacts on herring gull and lesser black-backed gull.</p> <p>We also note that the range of predicted Hornsea 4 impacts are not considered in the cumulative assessments. Natural England request that the minimum and maximum cumulative predicted impacts (based on the central values for other projects and the range for Hornsea 4) are provided to allow consideration of uncertainty around estimates and confidence placed in conclusions.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-4 with regards to the approach and methodology to cumulative assessments.</p> <p>Please refer to the Applicant’s responses to RR-029-APDX:B-30, RR-029-APDX:B-36, RR-029-APDX:B-38 and RR-029-APDX:B-106 in relation to all specific instances where Natural England have noted differences from their advised values.</p> <p>Please also refer to the Applicant’s response to RR-029-APDX:B-103 with regards to the use of central estimates to assessed cumulative and in-combination impacts.</p>

3.8 Habitats Regulations Assessment (HRA)

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-T	<p>General comment: Prior to Hornsea 4, Natural England's position has been that the in-combination total of collision mortality across consented plans/projects has already exceeded levels which are considered to be of an Adverse Effect on Integrity to Kittiwake at FFC SPA, and that any additional mortality arising from these proposals would only reinforce this conclusion.</p> <p>We also have concerns regarding in-combination collision impacts for gannet, and as detailed above we are concerned that displacement impacts could give rise to adverse effect on guillemot and razorbill but have not been fully considered within the assessments.</p>	<p>The Applicant acknowledges Natural England's position with regards to kittiwake and has accepted the decision from the SoS that there is the potential for AEol with regard to the kittiwake feature of the FFC SPA (as confirmed in G1.5 Kittiwake AEol Conclusion (AS-023)) in-combination. The Applicant will update the relevant documents (including the RIAA) as part of the Schedule of Change process with regards to this point and will submit to the ExA during the examination.</p> <p>The Applicant maintains its position that there is no potential for an AEol on any other feature or protected site, as demonstrated in the RIAA (B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)).</p>
RR-029-APDX:B-U	<p>LSE Screening: We highlight that the LSE test is a 'coarse filter' used to identify potential effect pathways that require further consideration through Appropriate Assessment.</p> <p>Natural England note that Fulmar were screened out from EIA, and thus HRA, due to low sensitivity to disturbance and displacement because they are often associated with fishing vessels. Natural England do not agree that it can be assumed that construction vessels and activities would have the same behavioural impact as fishing vessels. We also note that fulmar are included in the Applicant's assessment of barrier effects. Natural England considers that a more robust rationale for screening out fulmar at the LSE stage be provided to give confidence in the conclusion of no LSE.</p> <p>Assessment of potential impacts on the seabird assemblage of FFC SPA have not been considered fully. Instead, the Applicant has provided assessments for herring gull and puffin as components of the seabird assemblage feature of FFC SPA. We request that full consideration is given to the potential impacts on the seabird assemblage feature of FFC SPA. We highlight that Hornsea 4 could have impacts on all four qualifying features</p>	<p>In relation to justification for species being screened in / out for assessment, the Applicant sought consultation on the matter with Natural England at EP#3. Agreement was reached between the Applicant and Natural England that disturbance and displacement assessments would be required for gannet, guillemot, razorbill and puffin only (agreement OFF-ORN-2.10 - as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130))).</p> <p>The Applicant would like to point out that Natural England have made an error in their comments on fulmar, as this species was screened out for barrier effect assessment, and therefore is not included within B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). It is also worth noting that fulmar is a component of the seabird assemblage feature and is not a qualifying feature of the FFC SPA.</p> <p>With regards to the assessment of named components of the FFC SPA seabird assemblage, these were undertaken to ensure Natural England could understand that individually these two species were not subject to an LSE.</p>

	<p>of the SPA, which form part of the assemblage, as well as puffin, a component of the seabird assemblage.</p> <p>Natural England also note that razorbill are a component of the seabird assemblage feature of Farne Islands SPA. However, whilst the other auk species trigger an LSE in the breeding season, razorbill do not. Natural England advises that razorbill from the Farne Islands SPA seabird assemblage is screened in, or further evidence provided clarifying why it has not triggered LSE.</p> <p>Furthermore, the Applicant has not considered impacts from Hornsea 4 in the cumulative assessment if the project alone assessment was “negligible”. Natural England disagree with this approach as it could result in potential in-combination impacts being screened out from the assessment, even when certain species may already be close to levels where Adverse Effects on Integrity cannot be ruled out. We advise in-combination impacts should not be ruled out based on low project alone annual impacts and that in-combination impacts, including associated uncertainty, should be tested against the 1% baseline mortality threshold for the relevant population.</p> <p>Natural England advises that herring gull at FFC SPA should be considered in relation to both project alone and in-combination impacts relative to the 1% baseline mortality threshold for the population.</p>	<p>The seabird assemblage feature of the FFC SPA was assessed within the species-specific assessment sections for this designated site throughout B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). However, the Applicant recognises that guidance on assessing assemblage features and the method to assess them has been subject to recent changes. Should further consideration be required in order to demonstrate that this feature is not subject to an AEol alone or in-combination this can be provided to the ExA during the examination at Deadline 2.</p>
RR-029-APDX:B-V	<p>Approach to apportioning impacts to FFC SPA (methodology): For HRA, the overall predicted impacts arising from the project are apportioned to adults from relevant SPAs. Apportioning rates are generally split between breeding, when apportioning can be based on the relative contributions of specific SPAs within foraging range, and where appropriate, the non-breeding seasons, when populations using an area may represent a mix of birds from different SPA populations within a Biologically Defined Minimum Population Scale (Furness, 2015). Both the methods used for apportioning impacts to adults and subsequently apportioning them to relevant SPAs can have a large effect on the final impacts considered within both the project alone and in-combination assessments.</p> <p>Natural England note that the Applicant has provided two approaches to apportioning, their own and one incorporating some, but not all, of our</p>	<p>Please refer to the Applicant’s responses to RR-029-APDX:B-82 with regards to the apportionment approach and to RR-029-5.7 with regards to the approach to assessing auks and the bespoke weighting approach to consider birds within the months of August and September as part of the wider non-breeding bio-season.</p>

advice. We disagree with the Applicant's approach to apportioning adults, based on a theoretical generalised stable age structure, used in both approaches. This is unlikely to be representative of the actual proportions of adults present within specific areas at different times of year. This constitutes a significant source of uncertainty which could lead to over, or more importantly, underestimation of impacts.

Natural England continues to advise that the Applicant should use site-specific survey data to estimate adult apportioning rates. Where good quality site-specific ageing data is not available, then NE recommend that the precautionary approach is to assume that all 'adult type' birds (i.e. birds that cannot be distinguished from adults, and hence might be adults) are apportioned as adults. We also suggest that the apportioning of adult birds should be season-specific to account for any seasonal variations in the use of the site.

Further, Natural England are concerned about the approach to apportioning guillemot to FFC SPA in August and September. Given the proximity of FFC SPA, lack of other large populations nearby and the fact that the birds will be moulting, and therefore flightless, a large proportion of the birds present are still likely to be linked with FFC SPA, rather than other SPAs that are mainly in Scotland, at this time. These issues also apply to razorbill, which have a similar ecology to guillemot. Following requests from Natural England to address this, the Applicant has provided a bespoke approach to apportioning guillemot in the non-breeding season, however we consider that the approach taken is likely to heavily underestimate potential impacts assigned to FFC SPA in August and September. We are also concerned that the impacts on FFC SPA razorbill are not adequately characterised.

Natural England advise that the merits of a more precautionary bespoke approach to apportionment of guillemot to FFC SPA during August and September should be explored. As detailed above, we request additional evidence is provided to determine the importance of the array area for guillemot, razorbill and puffin to inform such an approach (and to help

	<p>determine whether bespoke approaches are warranted for the latter two species).</p>	
<p>RR-029-APDX:B-W</p>	<p>PVA: Natural England broadly agree with the approach to PVA undertaken and demographic parameters detailed. However, the mean productivity estimate of 0.722 (SD 0.210) currently being used for kittiwake is based on a weighted mean from different parts of the SPA for the period 2009-2019 (i.e. Filey plots and Flamborough and Bempton plots). Whilst Natural England initially agreed to this productivity rate during the Evidence Plan process, we noted that productivity data for Filey is only available from 2012 to 2019 and that productivity for the SPA as a whole for 2012-2019 was 0.580 (SD 0.096). As productivity rates for the SPA have declined, the current PVA results may present an optimistic assessment of the impacts on colony growth rates, further reinforcing the conclusion of AEOI in-combination.</p> <p>For any future PVA, Natural England recommend using a productivity rate of 0.580 (SD 0.096) for PVA models for the kittiwake population of FFC SPA. This represents the mean productivity across all plots in Flamborough/Bempton and Filey for the period 2012-2019 which represents the period when productivity plots were covered in both Flamborough/Bempton and Filey areas of the FFC SPA.</p>	<p>The calculation of FFC SPA kittiwake feature productivity was consulted on and agreed upon with Natural England during the Evidence Plan Process (agreement OFF-ORN-6.21 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)). That method was to include 10 years' worth of data to adequately capture inter annual variation in productivity. Natural England's justification for excluding the years of 2009-2012 is due to the absence of Filey plot productivity monitoring for these years, it should be noted that the Filey colony is only a very small proportion of the overall FFC SPA population. By excluding the productivity monitoring data from 2009-2012 for Flamborough and Bempton plots, this reduces confidence in the productivity value by limiting inter annual variation by removing the years with higher productivity rates, which may present an overly pessimistic assessment of impacts, especially considering the colony is considered stable in recent years (Aitken et al. 2017).</p>
<p>RR-029-APDX:B-X</p>	<p>In-combination impacts: Natural England agree with the projects considered for the in-combination assessment.</p> <p>However, some of the in-combination totals provided by the Applicant in the RIAA Part 1 for the PVA modelling, including all projects excluding Hornsea 4, Sheringham Shoal and Dudgeon Extension Projects, do not align with our estimates. Natural England request that the project specific impacts apportioned to FFC and all relevant totals are checked and agreed. Furthermore, Natural England note that the HRA does not currently consider the range of predicted impacts for Hornsea 4 based on variations around the baseline data (collision and displacement), input parameters used in CRM or apportioning values. It would be appropriate if the contribution of Hornsea 4 to in-combination impacts was provided as a range i.e. for totals to be presented using the central values from other</p>	<p>The Applicant welcomes Natural England's agreement with the projects considered for the in-combination assessment and agreed on values for all consented projects (agreement OFF-ORN-6.5 to 6.10 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)). The Applicant undertook considerable consultation on the in-combination totals presented in B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) for all species and projects. The totals for all projects excluding Hornsea 4, Sheringham Shoal and Dudgeon Extension within the PVA modelling match those provided in the main species / designated sites assessments throughout B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178), though numbers included within in-combination tables may be rounded up or down accordingly to present impact values as whole birds.</p>

	<p>projects and the minimum and maximum Hornsea 4 impact values. This would allow consideration of uncertainty in the project level impacts which may influence interpretation of potential impacts and confidence in the in-combination conclusions reached, particularly where sites-features may be close to potential AEOI resulting from offshore wind farm impacts.</p>	<p>The Applicant will continue to keep a watching brief on other projects as they move through their development cycle and review and update our cumulative and in-combination impact values from other plans and projects accordingly and provide appropriate updates to the ExA throughout the examination process.</p> <p>Please refer to the Applicant’s response to RR-029-APDX:B-103 with regards to the use of central estimates for Hornsea Four when considered within cumulative and in-combination assessments.</p>
RR-029-APDX:B-Y	<p>HRA conclusions: The issues and uncertainties raised here and in the preceding sections of this report mean that, at this time, Natural England cannot conclude beyond reasonable scientific doubt to the absence of an adverse effect on the integrity of the SPAs assessed by the Applicant. Please see our advice above regarding FFC SPA kittiwake collision mortality already being at a level where adverse effects on integrity cannot be ruled out, and our concerns around the impacts of displacement on FFC SPA. Natural England will update our advice once the impact levels have been quantified to our satisfaction.</p>	<p>The Applicant notes Natural England’s representation and confirms that we are working towards the resolution of the MRSea baseline data requests as raised. This work will be available for Natural England, and other stakeholders in due course and the subsequent agreement captured within G1.9 SoCC between Hornsea Project Four and Natural England Offshore Ornithology.</p> <p>Upon clarification of the baseline for ornithology it is expected that Natural England confirm their position.</p>

3.9 Portrayal of Natural England/ SNCB advice

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:B-Z	<p>Whilst we welcome that the Applicant has at times sought to provide analysis that aligns with the advice that Natural England have provided throughout the Evidence Plan process, we note that this and wider SNCB advice is frequently referred to as “overly precautionary” in comparison to the applicants “evidence-led” approach. The SNCB approach is no less evidence-led than that of the applicant. It is simply a different interpretation of the same evidence, and one which takes account of the evidence-poor, high-uncertainty environment within which the assessments are carried out, as well as the requirements of the Habitats Regulations. We therefore find this portrayal of our advice to be misleading and are disappointed that the applicant has chosen to reflect it in this way. Ultimately this is a matter of</p>	<p>Please see detailed responses on this matter provided in the Applicant’s comments to Offshore Ornithology Relevant Representations (e.g. Responses RR-029-5.12 and RR-033-J).</p> <p>The Applicant recognises the important role of Natural England and appreciates the time staff have provided, the contribution to workshops and advice on the DCO application.</p>

	<p>ecological judgment and given Natural England’s role as the appropriate national conservation body, considerable weight ought to be given to its advice and there should be cogent and compelling reasons for departing from it.</p>	
--	---	--

3.10 Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:B-1	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 1</p> <p>Section 5.7.2: Model-based methods have been used in preference to design-based methods to generate abundance and density estimates for several species (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin). Due to concerns with the implementation of the modelling approach, Natural England cannot currently agree with the baseline estimates produced for the selected species and any subsequent conclusions drawn from assessments where they have been used. We further note that a justification has not been provided for the use of the model-based approach over design-based estimates. See comments on Volume A5, Annex 5.6 (Point 63) for further details.</p>	<p>The Applicant has held an additional Ornithology Technical Panel Meeting (17 Feb 2022) to discuss the MRSea comments and options available to resolve these concerns with Natural England.</p> <p>The Applicant is rerunning the MRSea design-based abundances using a methodology that addresses Natural England’s comments for gannet and intends to produce a Baseline Sensitivity Report which is currently anticipated to be submitted at Deadline 2.</p> <p>The Baseline Sensitivity Report shall also sign-post readers to the relevant parts of an updated MRSea Report, where the design-based estimates and monthly dot-density maps are presented for the key species alongside model-based estimates and monthly spatial distribution maps.</p>
RR-029-APDX:B-2	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 2</p> <p>Section 5.7.4.1 & Table 5.12, 5.11.2.103, Table 5.38, Table 5.39: Natural England do not agree with the seasonal definitions used for gannet and kittiwake within the assessment based around the migration-free breeding season. Natural England consistently advised during the Evidence Plan process that for species where breeding birds are predicted to be present in the project area, that the breeding season months follow those presented in Furness (2015) under ‘breeding season’ and not the ‘migration-free breeding season’, except where local colony or site-specific information</p>	<p>The Applicant provided supporting evidence within the A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and the B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) to determine the months considered most appropriate for assessing each seabird species for Hornsea Four, which led to different months being considered within B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). However, additional impact levels are provided according to the bio-seasons as requested by Natural England within B2.2, Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177).</p>

	<p>suggests that a different set of months is appropriate for defining colony attendance.</p> <p>No evidence has been provided to support the use of the migration-free breeding seasons and given the proximity of the project area to FFC SPA, we consider the likelihood of encountering a bird from FFC SPA during the early and late breeding season months is higher than encountering one from much further away (e.g. Scotland or Norway). We therefore consider that using the migration-free breeding season could lead to collision and displacement impacts being underestimated.</p> <p>We recommend that the Applicant provide all relevant values for the assessment based on the recommended seasonal definitions for gannet and kittiwake outlined below. These seasons should be carried through the entire EIA and HRA process: Gannet - pre-breeding (Dec-Feb), breeding (March-Sept), post-breeding (Oct-Nov) Kittiwake - pre-breeding (Jan-Feb), breeding (March-Aug), post-breeding (Sept-Dec).</p>	
<p>RR-029-APDX:B-3</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 3</p> <p>Table 5.14 and 5.7.4.4 - 5.7.4.9: Natural England disagrees with the approach taken by the Applicant to calculate regional breeding season populations.</p> <p>It is unclear in Table 5.14 what the population sizes relate to and how they were derived. For example, for gannet the Applicant has taken the population estimate of 248,385 gannets in the UK North Sea and Channel during spring migration (Furness, 2015), and using the stable age structure calculations from Table 5.13 has calculated that 45% of these are juvenile/immature/nonbreeding adult birds. These have then been added to the adult population of gannet at FFC SPA to generate a total regional breeding population of 139,302 birds.</p> <p>There are a number of issues with this approach:</p> <p>1) Furness (2015) estimated that there are 248,385 gannet in the UK North Sea and Channel in spring – of which 66% were estimated to be adults (i.e. only 34% juvenile/immatures). This is because the Biologically Defined Minimum Population Scales (BDMPS), developed to allow assessment of</p>	<p>The Applicant consulted on and agreed the values to be used in Tables 5.14 and in Sections 5.7.4.4 – 5.7.4.9 within A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) with Natural England ahead of the Application through the Evidence Plan Process (EP#10). This was undertaken through the provision of a note to Natural England ahead of that meeting that outlined the proposed methodology for the calculation of demographic rates and population sizes for assessment at the EIA level in the document 1. Dem Rates & Col Cots_HOW04_Issued_20200528. Natural England provided written feedback on these proposed methods within their response note '319443 Ornithology Technical Panel Meeting 10 NE Advice', which agreed with the Applicant's methods.</p> <p>The Applicant considers that Natural England may have mis-interpreted some data within the tables and sections they have highlighted.</p> <p>The Applicant also acknowledges that Natural England have provided their advocated largest BDMPS values, though it is unclear how guillemot and puffin have been calculated and what sources were used to define these values, as they are not</p>

impacts at the EIA scale, are not assumed to represent a stable population of birds where the age class distribution matches a predicted stable age structure, so it is not appropriate to apply proportions from a stable age calculation to this total;

2) During the return autumn migration, it is estimated that 456,299 gannet will be in the UK North Sea and Channel with 53% of these being adult birds. The Applicant selected the spring figure over the autumn figure as they considered this best reflected the numbers of non-breeders present in the following breeding season, however neither reflect the expected pattern of distribution or abundance of birds in the North Sea during the breeding season;

3) The Applicant's calculation of 45% of 248,385 birds being juvenile/immature/non-breeding birds applies to the whole UK North Sea and Channel area, whereas the 26,784 adults which it is combined with only relates to FFC SPA breeding birds, which are likely to be restricted to a much smaller spatial scale. So, when the Applicant adds these two figures together it is not clear over what spatial scale they are intended to apply to. If the number of breeding adult gannets in the North Sea and English Channel are considered during the breeding season it will be much higher than the 26,784 birds attributed to FFC SPA – based on the figures in Furness (2015) there are 221,174 breeding adults in UK North Sea colonies. For EIA assessments Natural England advise calculating the total annual impact for a species; then assessing this against the largest seasonal population (breeding or non-breeding) at the appropriate BDMPS population scale e.g., UK North Sea scale. Given that there is little evidence to support calculations of the number of juveniles, immatures and non-breeding birds that remain in their wintering areas into the breeding season, we advise that regional baseline population sizes for the breeding period can be derived from Furness (2015) by summing the adult and immature population estimates for all colonies that sit within a given regional scale. We advise that values for herring gull and lesser black-backed gull should also be provided so they can be referred to in relation to cumulative assessment (see Point 4). NE advises the following largest BDMPS values should be used,

aligned with other recently consented projects values for the same species as agreed with Natural England.

The Applicant is currently seeking out clarification on the methods employed and the values provided by Natural England on how they have calculated their largest BDMPS values for guillemot and puffin (Clarification will be provided in Deadline 2).

	<p>which are in line with those advised for EA1N/EA2 (REP11-027) and Hornsea Project Two (REP6-017):</p> <table border="0"> <tr> <td style="padding-right: 20px;">Species</td> <td>Largest BDMPS for use in EIA assessments</td> </tr> <tr> <td>Gannet</td> <td>456,298 – Applicant suggests max of 248,385 in table but uses 456,298 in assessment.</td> </tr> <tr> <td>Kittiwake</td> <td>829,937 – Applicant suggests max of 627,816 in table but uses 829,937 in assessment.</td> </tr> <tr> <td>LBBG</td> <td>209,007– no BDMPS presented in Table or considered in ES.</td> </tr> <tr> <td>Herring gull</td> <td>466,511 – no BDMPS presented in Table or considered in ES.</td> </tr> <tr> <td>GBBB</td> <td>91,399 – agreed.</td> </tr> <tr> <td>Guillemot</td> <td>2,045,078 – Applicant uses 1,617,306 (non-breeding BDMPS).</td> </tr> <tr> <td>Razorbill</td> <td>591,874 – agreed.</td> </tr> <tr> <td>Puffin</td> <td>868,689 – Applicant uses 231,957 (non-breeding BDMPS)</td> </tr> </table> <p>Changes made in response to this advice will need to be carried through to all assessments.</p>	Species	Largest BDMPS for use in EIA assessments	Gannet	456,298 – Applicant suggests max of 248,385 in table but uses 456,298 in assessment.	Kittiwake	829,937 – Applicant suggests max of 627,816 in table but uses 829,937 in assessment.	LBBG	209,007– no BDMPS presented in Table or considered in ES.	Herring gull	466,511 – no BDMPS presented in Table or considered in ES.	GBBB	91,399 – agreed.	Guillemot	2,045,078 – Applicant uses 1,617,306 (non-breeding BDMPS).	Razorbill	591,874 – agreed.	Puffin	868,689 – Applicant uses 231,957 (non-breeding BDMPS)	
Species	Largest BDMPS for use in EIA assessments																			
Gannet	456,298 – Applicant suggests max of 248,385 in table but uses 456,298 in assessment.																			
Kittiwake	829,937 – Applicant suggests max of 627,816 in table but uses 829,937 in assessment.																			
LBBG	209,007– no BDMPS presented in Table or considered in ES.																			
Herring gull	466,511 – no BDMPS presented in Table or considered in ES.																			
GBBB	91,399 – agreed.																			
Guillemot	2,045,078 – Applicant uses 1,617,306 (non-breeding BDMPS).																			
Razorbill	591,874 – agreed.																			
Puffin	868,689 – Applicant uses 231,957 (non-breeding BDMPS)																			
RR-029-APDX:B-4	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 4</p> <p>Section 5.7.4.6 – 5.7.4.7, Table 5.14, 5.12.1.11, 5.12.2.56: The Applicant states: “Additional species such as herring gull, lesser black-backed gull and great black-backed gull were recorded in small numbers during the</p>	<p>The Applicant acknowledges Natural England’s comments in relation to projects considering cumulative assessments for large gull species, particularly those closer to the larger breeding colonies along the coast of Suffolk.</p>																		

	<p>breeding season that may be foraging beyond their mean-max ranges to reach the Hornsea Four array area on occasion. However, herring gull and lesser black-backed gull were also recorded in such low abundances and densities within the array area and 4 km buffer in all bio-seasons that they do not form part of the detailed impact assessments in Section 5.11.2, so data with respect to their regional breeding and wider BDMPS populations are not included in Table 5.14.”</p> <p>We note that collisions estimates have been included for both lesser black-backed gull and herring gull but that these are not compared directly with the largest BDMPS populations. Natural England do not agree with the exclusion of herring gull and lesser black-backed gull from full cumulative assessments. We note that for EA1N and EA2, NE could not rule out significant impacts at an EIA scale for herring gull, great black-backed gull and lesser black-backed gull when consideration was given to cumulative impacts, when impacts from Hornsea 4 (PEIR), SEP and DEP were included in the cumulative totals (REP11-027). Thus, NE consider that Herring gull and lesser black-backed gull should be included the cumulative assessments, considering annual impacts against the 1% baseline mortality rates for the largest BDMPS population (see Point 3).</p>	<p>The Applicant provided a detailed approach in A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017). The methodology for evaluation of potential receptors and impacts follows a source-pathway-receptor model, which takes account of the sensitivity of the receptors to sources of effect. Sensitivity of the receptor, conservation value and magnitude of the potential impact were all taken into account when considering receptors for assessment. For species such as herring gull and lesser black-backed gull, which might be considered to have a high conservation value and high sensitivity to potential impacts relating to collision risk, due to the very low numbers being known to reside within the Hornsea Four array area the magnitude of the impact would be negligible regardless of sensitivity and conservation value.</p> <p>The Applicant therefore followed the CIEEM guidelines (CIEEM, 2019) to initially scope out such species so the emphasis of the ES would be on potential “significant effects rather than all ecological effects” as stated in paragraph 1.11 (CIEEM, 2019). However, at the request of Natural England, The Applicant included both species and presented assessments for collision risk for both within A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and A5.5.3 Environmental Statement Volume A5 Annex 5.3 Offshore Ornithology Collision Risk Modelling (APP-076).</p>
<p>RR-029-APDX:B-5</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 5</p> <p>Table 5.16 The Applicant has not considered the decommissioning of offshore structures in the ES. We consider that further justification should be provided to support its exclusion. It is likely that disturbance and displacement would occur from increased vessel traffic during this time.</p>	<p>The Applicant acknowledges Natural England’s comments regarding the level of detail provided for determining potential impacts during the decommissioning phase.</p> <p>The level of potential impacts during the decommissioning phase is widely understood to be less than that determined during the construction phase, as stated in Section 5.11 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>Furthermore, in relation to the Decommissioning phase it was concluded at PIER that no significant adverse effect would arise, with Natural England not providing any concerns to this conclusion within their Section 42 responses. Therefore, in line with CIEEM guidance (CIEEM, 2019) that the emphasis of the ES should be on potential “significant effects rather than all ecological effects” as stated in</p>

		paragraph 1.11 (CIEEM, 2019), the decommissioning phase was justifiably not considered in detail.
RR-029-APDX:B-6	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 6</p> <p>Section 5.10.1.9, 5.12.1.19: The Applicant has not considered impacts from Hornsea 4 in the cumulative assessment if the project alone assessment was “negligible”. NE advise that even small, predicted impacts at the project alone level should still be considered in the context of a cumulative assessment with other plans and projects where there are concerns around cumulative impacts from multiple OWF. Cumulative annual impacts (including variability and uncertainty) should be assessed against the relevant largest BDMPS 1% baseline mortality threshold to clearly rule out the potential for any significant effects.</p>	<p>The Applicant maintains its position that the cumulative effects section is in accordance with EIA requirements and in line with assessments undertaken for other projects recently consented. The methodology is outlined in Section 5.12.1.9 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and states that, where certain impacts assessed for the project alone are not considered in the cumulative Assessment, that is due to one or more of the following factors:</p> <ul style="list-style-type: none"> • The highly localised nature of the impacts (i.e. they occur entirely within the Hornsea Four boundary only); • Management measures in place for Hornsea Four will also be in place on other projects reducing their risk of occurring; and/or • Where the potential significance of the impact from Hornsea Four alone has been assessed as negligible and considered not to contribute in any meaningful way to an existing potential cumulative impact.
RR-029-APDX:B-7	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 7</p> <p>Section 5.11.1: Natural England do not agree with the estimates provided for annual mortality due to displacement during operation calculated using the Applicant’s approach. Consequently, we do not agree with the estimated mortality during construction presented here. See Point 9 & 83 for further details.</p>	<p>A supplementary report (Auk Displacement and Mortality Evidence Review (G1.47)) will be provided at Deadline 1, detailing the justification for the Applicant’s approach of 50% displacement and 1% mortality rate, based on a review of all current empirical evidence of auk displacement from post consent monitoring studies The Applicant would welcome further consultation with Natural England with regards to the scientific approach taken to progress displacement assessments to account for empirical data supporting the potential impact levels appropriate for auks.</p>
RR-029-APDX:B-8	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 8</p> <p>Section 5.11.1.9 and Table 5.23: This section lists several different sources of information on the susceptibility of different seabird species to displacement, but it does not explain how these sources have been used to assess sensitivity to disturbance and displacement during construction in the screening process, or how this assessment and references relate to the assessment in Table 5.26. Please clarify the process used to screen seabirds at risk of disturbance and displacement in Tables 5.23 and 5.26.</p>	<p>The Applicant provided a detailed account of the approach to screen in species for the assessment of both the construction and O&M phases of Hornsea Four as detailed in A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017). The methodology for evaluation of potential receptors and impacts is provided in response to RR-029-APDX:B-R.</p> <p>Following this approach those species determined to be of low and very low sensitivity were screened out, whilst those of medium to high sensitivity were screened in. The exception to this criterion was the addition of gannet screened in for disturbance and displacement at the request of Natural England.</p>

		The species screened in for assessment purposes following the above method were consulted on and agreed with Natural England through the Evidence Plan Process (ETG#3).
RR-029-APDX:B-9	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 9</p> <p>Section 5.11.1.14: The Applicant has only considered a 1% mortality rate for displacement assessments, contrary to SNCB advice that a range of mortality rates between 1 and 10% are considered, to reflect the very limited evidence available on the likely consequences of displacement, including sub-lethal as well as lethal effects. In addition, the Applicant refers to the use of the 1% mortality rate in 'over precautionary'. NE do not consider that sufficient evidence has been provided to justify this statement or the sole use of the 1% mortality rate.</p>	The Applicant can confirm that further evidence in support of the use of 50% displacement and 1% mortality rate based on the empirical review conducted in a supplementary report (G1.47). This is provided to the ExA and Natural England at Deadline 1, the latter of whom the Applicant would welcome further response from with regards to the scientific approach taken to progress displacement assessments to account for empirical data supporting the potential impact levels appropriate for auks.
RR-029-APDX:B-10	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 10</p> <p>Section 5.11.1.15 & 5.11.1.36: Tables have not been provided detailing the construction displacement estimates for gannet or puffin impacts as for the other species (e.g. guillemot). These tables should be provided as per the other species</p>	The Applicant presented displacement matrices for all species within Volume A5 Annex 5.2: Offshore Ornithology Displacement Analysis (APP-075) . Displacement matrices are also presented for all species for the operation and maintenance phase impacts in Section 5.11 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) . However, as the method for assessing construction phase impacts was agreed with Natural England as being half that predicted for the operation and maintenance phase additional matrices were not provided, as a narrative-led approach was drafted for these potential impacts.
RR-029-APDX:B-11	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 11</p> <p>Section 5.11.1.39, 5.11.2.127, 5.11.3.5, 5.11.2.147, 5.11.2.148: The Applicant concludes that if no significant impacts were identified on fish and benthic in their respective assessments, then there would be no significant impacts on ornithology receptors. Natural England disagrees with this assumption. The assessments undertaken in the Fish and Shellfish chapter consider impacts at a regional population level and only consider fish and shellfish as receptors, rather than potential sources of impact.</p> <p>Indirect effects of impacts on habitat and prey on birds may occur at different thresholds than for the receptors themselves. That there are no</p>	

	<p>significant impacts on wider stocks of forage fish does not mean there may not be redistributions or local declines that could impact specific seabirds at certain times of the year.</p> <p>We further note that the fish and shellfish assessment does not appear to consider the data from Langton et al. (2021) and other important sandeel studies, particularly in regard to relationships with seabird productivity (e.g. Furness & Tasker 2000, Frederiksen et al. 2005, Wanless et al. 2005, Daunt et al. 2008). Sprat also receive very little attention but are a key resource for many seabirds at different times of year. Further assessment is therefore needed to understand how more localised impacts on fish and shellfish might influence prey availability for seabirds.</p> <p>Natural England advises that a summary of the outcomes of the relevant assessments on forage fish abundance and distribution in and around the project area should be included and discussed in relation to the implications for key seabird species. This should at least be considered in relation to sandeel, herring and sprat, with a focus on the potentially critical months of August and September for guillemot and razorbill. Consideration should be given to any evidence of foraging behaviour at different times of year and to studies and post-construction monitoring that have investigated changes in prey abundance and distributions to frame the likelihood of negative or positive impacts. An evidenced case for no significant impacts should be put forward.</p>	
<p>RR-029-APDX:B-12</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 12</p> <p>Section 5.11.2.12, 5.12.2.7: The Applicant has used a mortality rate of 1% for gannet in their operation and maintenance displacement assessment. Natural England consider that assessing displacement only at a mortality rate of 1% is not sufficiently evidenced, particularly in the case of Hornsea 4 which is relatively close to the FFC SPA colony. NE advise that for gannet the range of displacement 60-80%, and mortality 1-10% should be considered, noting that we request that the full matrix is presented from 0% to 100% displacement/mortality.</p>	<p>The Applicant welcomes the agreement with Natural England to use a range of between 60-80% displacement for gannet.</p> <p>Displacement matrices for gannet were included within A5.5.2 Environmental Statement Volume A5 Annex 5.2 Offshore Ornithology Displacement Analysis (APP-075), from which any level of displacement and mortality can be viewed.</p> <p>Following advice received from Natural England within the Section 42 Responses, the Applicant undertook further work to gather an increased evidence base in support of the most appropriate displacement and mortality rates for gannet, which are based on their recent report (Gannet Displacement and Mortality Report).</p>

	In line with the other species assessed, please also provide the full annual displacement matrix for gannet within the array area + 2 km buffer.	APEM, 2022b). This report will be submitted to the ExA and Natural England at Deadline 2 and the Applicant welcomes further responses from Natural England on this additional evidence in support of the Applicant's approach.
RR-029-APDX:B-13	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 13</p> <p>Section 5.11.2.13 - 5.11.2.21 & Table 5.27: The annual estimated displacement mortality rate for gannet presented here is calculated using the Applicant's approach which Natural England disagree with (see Point 12). We request that the seasonal and annual estimated mortality calculated using NE's recommended approach (60-80% displacement rate and a range of 1-10% mortality rate) is also provided. The full displacement matrix should also be provided as has been done for auks.</p>	<p>Noted.</p> <p>Please refer to Applicant's response to RR-029-APDX:B-12 for displacement mortality rate for gannet.</p> <p>With regards to the make up of different bio-seasons, the Applicant provided supporting evidence within Section 5.7 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and the B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) to determine the months to be considered most appropriate for assessing each seabird species for Hornsea Four, which led to different months being considered within the B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). However, additional impact levels are provided according to the bio-seasons as requested by Natural England within B2.2, Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177).</p>
RR-029-APDX:B-14	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 14</p> <p>Section 5.11.2.23 & Table 5.28: The Applicant refers to a comprehensive review of post-construction monitoring studies they have undertaken to inform auk displacement and presents a summary of that review. However, the full review has not been seen by Natural England. Until such time as Natural England have been provided with the full review and been able to comment on the evidence provided, we cannot agree with conclusions presented that are based on its contents. Please present the full review for comment by Natural England: APEM (2021, In prep). Review of Auk Disturbance & Displacement, Habituation and potential Mortality Rates to inform Offshore Wind Farm EIAs. APEM Note in preparation.</p>	Additional supporting evidence on auk displacement and mortality rates are contained within an updated report (Auk Displacement and Mortality Report (G1.47)). The Applicant has submitted this report at Deadline 1.
RR-029-APDX:B-15	Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 15	Additional supporting evidence on auk displacement and mortality rates are contained within an updated report (Auk Displacement and Mortality Report (G1.47)). The Applicant has submitted this report at Deadline 1.

	<p>Section 5.11.2.42: The applicant states in relation to guillemot: “However, it should be noted that due to the large expanse of available habitat outside of the array area, the mortality rate due to displacement could be as low as 0% as the increase in density outside of the array area in comparison to the whole of the North Sea would be negligible”.</p> <p>Natural England notes that there has been no assessment of the extent and suitability of habitat for guillemot outside the array plus buffer area, nor of the potential effects of increased densities in this area to evidence this statement. Furthermore, additional evidence previously requested by NE during the Evidence Plan Process to address questions regarding the impacts of displacement on guillemot and razorbill in the Hornsea 4 array area has not been presented. This included a request for information about the potential specific importance of the Hornsea 4 array area to guillemot and razorbill compared to the wider surrounding area. The requested evidence should be provided to support this position. See Point 50 for further discussion on the potential importance of the array area to guillemot.</p>	<p>The Applicant notes Natural England’s comment regarding the extent of suitability of habitat for guillemot and razorbill outside of the Hornsea Four array area and provided results of recent auk mapping studies created by the RSPB for guillemots and razorbills presenting the most important areas for these species from the FFC SPA colony (Section 10.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)). The core area for auk species from the FFC SPA colony are known to be within the mean max foraging area from the colony, which is 60-80 km (Woodward et al., 2019), meaning that Hornsea Four is beyond that distance for both species.</p> <p>Further evidence of the most important areas of sea for auks from the FFC SPA is also provided through the evidence that informed the Developable Area Process (see B2.5 Volume B, Chapter 5: Without Prejudice Derogation Case (APP-182)), that demonstrates the Hornsea Four array area is considerably further north from the most important area for auks, which were determined to be significantly further south.</p>
RR-029-APDX:B-16	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 16</p> <p>Section 5.11.2.44 & Table 5.29: The annual estimated mortality from displacement for guillemot presented here is based on the Applicant’s chosen approach of assessing using 50% displacement, and 1% mortality (we acknowledge that values calculated using NE’s approach are presented in Table 5.29).</p> <p>NE cannot agree with the figures presented using the Applicant’s approach for several reasons: the abundance estimates for the displacement assessment have not included birds in flight as well as birds on the water (see Point 19); NE disagree with the weighted approach to calculating seasonal mean peak abundances for guillemot which may underestimate impacts (see Point 50); and, we have concerns about the method used to derive the model-based abundance estimates (see Point 63). The figures should be recalculated following NE guidance (see Point 50+ for further comments on the displacement analysis).</p>	<p>Responses have been provided above with regards to the following comments as follows;</p> <ul style="list-style-type: none"> • Auk displacement and mortality rates – see response to RR-029-5.7; and • MRSea modelling approach to the baseline – see response to RR-029-5.1. <p>The Applicant welcomes Natural England’s acknowledgement that additional values following their approach are presented in Table 5.29 in Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>With regards to Natural England’s request to consider a bespoke solution to assess guillemot for displacement, the Applicant considers the most appropriate approach is that adopted within the Application documents (Section 5.11.2.44 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017)). This bespoke method was used as it reduces the inflation bias on mean peak population estimates during the wider non-breeding bio-season for guillemot, the contributing data from which has a heavier weighting towards the months of</p>

		<p>August and September over the remaining five months of October to February when significantly fewer guillemots are present. The bespoke approach for this species was taken due to the non-breeding season being assumed to be much wider (August to February) in comparison to other species.</p>
<p>RR-029-APDX:B-17</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 17</p> <p>Section 5.11.2.47: "During the non-breeding bio-season, the weighted mean peak abundance for guillemot is 34,095 individuals within the array area and 2km buffer."</p> <p>This appears to be incorrect. The weighted mean is 17,062 according to Table 5.29 and according to our calculations using the Applicant's approach this should be 14,575. These values should be checked and recalculated, incorporating NE comments on the displacement methodology as a whole.</p>	<p>The Applicant agrees that an error in the text occurred, and the weighted mean peak should be 17,062 (per Table 5.29) and not 34,095. It should be noted that the impact value assessed against (number of birds subject to mortality as a consequence of displacement) is correct.</p> <p>With regards to the latter point, the Applicant is unsure as to how Natural England have derived their value of 14,575, as this does not follow our weighted mean approach methodology</p>
<p>RR-029-APDX:B-18</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 18</p> <p>Section Table 5.30, Table 5.40, Table 5.50, Table 5.61, Table 5.63: We note that no values have been presented in line with the NE approach and the Counterfactuals of Final Population Size (CFPS) have not been provided, against NE advice. NE consider that these should be provided for all PVA results. See Point 60 for further discussion on this point.</p>	<p>Through the consultation process at EP#13, it was the Applicant's understanding that assessment should be focused on the Counterfactual of Population Growth Rate (CPGR).</p> <p>The rationale for using density independent was based on Natural England advice through consultation at EP#6 to 9.</p> <p>The Applicant notes Natural England's change in position on this point and on the use of different PVA methods (inputs and outputs) since the DCO Application for Hornsea Four was submitted.</p> <p>The use of the CPGR were relied upon by Natural England to determine more recent consented projects, including Hornsea Project Three and East Anglia ONE. The Applicant considers there is significant uncertainty relating to the outputs relating to the CFPS, this is because the interpretation of CFPS is a highly subjective output, with no way to validate what such predicted reduction in population size is likely to have on a specified population. Whereas for the CFGR, the predicted reduction in growth</p>

		<p>rate can be cross examined against known population growth rates to provide an informed decision on the likely impact such an effect will have on the colony long term.</p> <p>The Applicant's is currently undertaking further interrogations into the validity of the NE Seabird PVA tool (2019) and suitability of both outputs for assessment, the results of which will be shared with Natural England in a new sensitivity report to be submitted to the ExA during the examination.</p>
RR-029-APDX:B-19	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 19</p> <p>Section 5.11.2.58, 5.11.2.74: The annual estimated mortalities from displacement for razorbill and puffin presented here is based on the Applicant's chosen approach of assessing using 50% displacement, and 1% mortality (we acknowledge that values calculated using NE's approach are presented in Table 5.32).</p> <p>NE cannot agree with the figures presented here for several reasons. The abundance estimates for the displacement assessment have not included birds in flight. SNCB advice is clear that both birds in flight and birds on the water need to be included in abundance estimates. NE also have concerns about the method used to derive the model-based abundance estimates (see Point 63). The figures should be recalculated following NE guidance (see Point 50+ for further comments on the displacement analysis).</p>	<p>Responses have been provided above with regards to these comments as follows;</p> <ul style="list-style-type: none"> • Auk displacement and mortality rates – see response to RR-029-5.7; • Both sitting and flying auks to be considered in displacement analysis – see response to RR-029-5.9; and • MRSea modelling approach to the baseline – see response to RR-029-5.1.
RR-029-APDX:B-20	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 20</p> <p>Section 5,11.2.51, 5.11.2.69, 5.11.2.81: NE welcome the Applicant also providing estimates for a range of displacement and mortality rates following SNCB advice, however due to concerns with the abundance estimates they are based on we cannot agree with the values produced.</p>	<p>The Applicant welcomes Natural England's acknowledgement that a range of displacement and mortality rates have been presented following SNCB advice.</p> <p>With regards to the concerns over the abundance estimates – see response to RR-029-5.1.</p>
RR-029-APDX:B-21	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 21</p>	<p>The Applicant welcomes Natural England's acknowledgement of mitigating potential impacts on seabirds through the Developable Area Approach (DAA). Details of the exact changes in predicted potential impacts for multiple different design</p>

	<p>Section 5.11.2.88: NE welcome the approach to mitigation (increasing minimum swept height and reducing the developable area). However, no supporting information has been provided to demonstrate the relative reductions in potential impacts associated with these measures. We would welcome seeing an indication of the relative reductions in collision impacts and displacement achieved through the application of these measures.</p> <p>We further note that the commitment to incorporating a raised minimum swept height (Table 5.17, Co138) gives the minimum blade distance to sea as 42.43m. However, this is based on LAT (lowest astronomical tide). We note that it is normally given as HAT (highest astronomical tide). Using LAT implies a much higher distance between turbine blade and the sea. While in theory neither is incorrect, we consider it important to note that changing the metric does not provide any enhanced mitigation. We request that the value in HAT is provided to allow comparison with the gap for other developments.</p>	<p>changes were not provided in full to Natural England nor are they included within the application. However, Natural England were fully consulted during the DAA workshops and following each significant change to the design of Hornsea Four new impact assessments were presented to Natural England through the Evidence Plan Process to update them on potential collision risk and displacement mortality rates.</p> <p>One such example was during ETG#11, when the Applicant presented the reduction in abundance for key species due to the implementation of the Developable Area Approach.</p> <p>With regards to Natural England’s query over the use of different metrics used to define the minimum swept area (or air gap), the Applicant would like to clarify that it has not changed the metric of the air gap within the ES. As Natural England have stated in their comment, presenting air gap can be done using either HAT or LAT. As detailed in the collision risk annex (A5.5.3 ES Volume A5 Annex 5.3 Offshore Ornithology Collision Risk Modelling (APP-076)) the air gap is presented and incorporated within the sCRM against HAT, adhering to the model’s guidance document and in line with SNCB advice.</p>
RR-029-APDX:B-22	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 22</p> <p>Section 5.11.2.91: NE request that minimum and maximum collision estimates take into account the variability around flight heights (i.e. the upper and lower 95% confidence intervals around the flight height data) as this parameter can have a greater effect on collision range predictions compared to variability associated with density values.</p>	<p>The Applicant presented central estimates for consideration of Hornsea Four alone and for all projects cumulatively in order to provide a level playing field approach to the assessment process.</p> <p>It is the Applicant’s position that this allows for the most reliable assessment of alone and cumulative assessments to be undertaken which reduces any inherent bias that may result from including minimum and maximum values for individual parameters, model outputs and projects that may then lead to under or over-inflated values being used.</p> <p>Furthermore, a Baseline Sensitivity Report is being prepared for the ExA in order to signpost how individual variations build up across the assessment process and may influence the final outcome of assessments. This will be submitted to the ExA at Deadline 2.</p>

<p>RR-029-APDX:B-23</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 23</p> <p>Section 5.11.2.126- 5.11.2.129: NE advise that the assessments of collision risk for lesser black-backed gull and herring gull should compare annual impacts against the largest BDMPS baseline mortality 1% threshold to clearly rule out the potential of significant impacts alone. See Point 3.</p>	<p>Following advice received from Natural England within their Section 42 Responses, the Applicant undertook further work to gather an increased evidence base in support of the most appropriate displacement and mortality rates for gannet, which are based on APEM’s recent report (Gannet Displacement and Mortality Report. APEM, 2022b). This report will be submitted to the ExA and Natural England during the examination at Deadline 2 and the Applicant welcomes further comment from Natural England on this further evidence which supports the Applicant’s approach.</p> <p>Responses have been provided above with regards to Natural England’s comment on the use of CFPS – see response to RR-029-APDX:B-18.</p>
<p>RR-029-APDX:B-24</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 24</p> <p>Section 5.11.2.137- 5.11.2.141 & Table 5.42: We note that the full range of NE parameters have not been included for the displacement assessment presented here. Further, no values are presented in line with the NE approach in Table 5.42 and the counterfactuals of final population size are not included in the table. Assessments should be presented in line with SNCB guidance.</p>	<p>The Applicant acknowledges Natural England’s wider request to include flying and sitting birds in the assessment of auk displacement, which has been agreed to be completed for guillemots, razorbills and puffins. Once the revised MRSea baseline analysis is completed, a revised displacement annex will be submitted into the examination at Deadline 2.</p> <p>A revised displacement analysis that includes both flying and sitting birds in place of separate displacement and barrier effect assessments would then follow the SNCB guidance (SNCB, 2017) and Natural England’s request.</p>
<p>RR-029-APDX:B-25</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 25</p> <p>Section 5.11.2.151: Hornsea 4 has included an assessment of barrier effects but only for fulmar, gannet and kittiwake. This is based on the assumption that only “fulmar, gannet and kittiwake may forage on a regular basis out to a distance as far as, or further than the Hornsea Four array area”. NE consider this assumption to be insufficiently evidenced and advise that either more evidence is provided to support the conclusions on the lack of barrier effects for auk species, or the Applicant should consider the potential for barrier effects on auks from Hornsea 4.</p> <p>Currently puffin have been screened out based on the mean foraging range, whereas for the other auk species mean max foraging range was</p>	<p>The Applicant acknowledges Natural England’s wider request to include flying and sitting birds in the assessment of auk displacement, which has been agreed to be completed for guillemots, razorbills and puffins. Once the revised MRSea baseline analysis is completed, a revised displacement annex will be submitted into the examination at Deadline 2.</p> <p>A revised displacement analysis that includes both flying and sitting birds in place of separate displacement and barrier effect assessments would then follow the SNCB guidance (SNCB, 2017) and Natural England’s request.</p>

	<p>considered. It is not clear why only mean foraging range has been considered for puffin. NE consider that mean max foraging range plus 1SD should be used for all species, and evidence suggests that areas beyond the array are within this distance for puffin, razorbill and guillemot (Woodward et al., 2019). Further, while adult birds foraging from FFC SPA during the breeding season will typically forage close to the colony, in years of poor food resources they may forage further, and additionally when not constrained to, for example provisioning chicks, they may also forage or use sea areas further from the colony. Additionally, Hornsea Projects One and Two have recorded large numbers of auks, with evidence of east-west and northwest-southeast flight movements recorded in both the breeding and non-breeding seasons.</p> <p>NE consider that an understanding of the potential for any impacts arising from barrier effects, that may limit access to resources or incur an additional metabolic cost, is critical in framing the predicted impacts that can be quantified.</p>	
<p>RR-029-APDX:B-26</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 26</p> <p>Section 5.11.2.154- 5.1.2.155: For gannet, the Applicant assumes that no gannet would be foraging in the areas of Hornsea Projects 1-3 post construction so Hornsea 4 would not be acting as a barrier to access of these areas further east.</p> <p>We highlight that this assumption suggests that a 100% displacement rate is applicable for gannet, compared to the 60-80% that has been used for the displacement assessments and therefore assumes that not all birds are displaced from the area. We consider that insufficient evidence has been provided to justify a conclusion of negligible impact based on this assumption.</p>	<p>The Applicant's approach considered barrier effect would be limited as very few birds would be seeking to forage past Hornsea Three. The Applicant's assessment within Section 5.11 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017), did consider the potential for in-combination barrier effect of the four Hornsea projects from west to east flights. Based on tracking data (Langston et al. 2013), which was relied upon for assessment, there are very few commuting flights of gannets from the FFC SPA to beyond the eastern extent of the four Hornsea projects. Therefore, the potential for a barrier effect on gannet in the breeding season was concluded as limited at most and would not lead to an impact of more than negligible magnitude.</p> <p>The Applicant did not assume a 100% displacement rate for gannet, but relied upon the displacement ranges advised by Natural England of 60-80%. Following the application of a range of 60-80% displacement it is worth noting that by default those birds which would not be displaced would continue to fly through the Hornsea offshore wind farms and would therefore not be subject to a barrier effect (but may be considered in collision risk assessments).</p>

		<p>The Applicant has undertaken further work to gather an increased evidence base in support of the most appropriate displacement and mortality rates for gannet, which are based on their recent report Gannet Displacement and Mortality Report. APEM, 2022b). This report will be submitted to the ExA and Natural England at Deadline 2 and the Applicant welcomes further responses from Natural England on this additional evidence in support of the Applicant’s approach.</p>
RR-029-APDX:B-27	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 27</p> <p>Section 5.11.2.157: In assessing barrier effects for kittiwake, the Applicant has only considered the tracking data from 2017. It is not clear why the wider dataset of tracking evidence from 2010-2018 has not been considered, despite these wider data informing the foraging range calculations in Woodward et al. (2019). We suggest wider tracking data for kittiwake at FFC SPA should be used in drawing conclusions about potential flight pathways in relation to Hornsea 4 and beyond.</p>	<p>The Applicant has considered the full range of tracking data available (from 2010-2018) when assessing the potential for barrier effect as presented in A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>These data sets indicate that there are very few commuting flights across the Hornsea Four array area (and similarly few across the under-construction, consented or proposed Hornsea projects within the former Hornsea Zone).</p>
RR-029-APDX:B-28	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 28</p> <p>Section 5.11.2.164: The Hornsea Four MDS includes 180 WTCs and up to 10 other offshore structures within the array area. Hornsea 4 argues that meeting the minimum regulatory requirements for lighting is “In keeping with the minimum legal requirements, this would minimise the risks of migrating birds becoming attracted to or disorientated by WTCs at night or in poor weather.”</p> <p>NE do not agree that that it can be concluded that meeting the minimum regulatory requirement for offshore lighting is the same as minimising impacts on ornithology receptors. We consider it would be appropriate to consider screening of key species that could be sensitive to impacts of lighting to provide context for this assessment.</p> <p>Further, mitigation measures outlined in the OSPAR guidance are not solely restricted to minimising the emission of light, but also include measures such</p>	<p>As set out at section 5.11.2.164 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017), the Applicant is committed to meet the minimum necessary regulatory requirements, as set out in the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O117 on ‘The Marking of Offshore Wind Farms’ for navigation lighting and by the Civil Aviation Authority in the Air Navigation Orders (CAP 393 and guidance in CAP 764). By definition, it is not possible to do less than the minimum lighting mandated by the relevant regulatory requirements.</p> <p>The Applicant is giving further consideration to lighting requirements and will confirm at Deadline 3.</p>

	<p>as changing the spectrum of light emitted, shielding light, and use of intermittent light including switching lighting off at particular times. We would welcome these elements also being considered in Hornsea 4's designs.</p>	
RR-029-APDX:B-29	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 29</p> <p>Section 5.12.2: NE agree that all relevant offshore wind farm projects have been considered in the cumulative assessment. However, we note that the range of predicted Hornsea 4 impacts are not considered in the cumulative assessments.</p> <p>Natural England request that the minimum and maximum cumulative predicted impacts (based on the central values for other projects and the range for Hornsea 4) are provided to allow consideration of uncertainty around estimates and confidence placed in conclusions.</p>	<p>The Applicant welcomes that Natural England agree that the list of projects within the cumulative assessments are correct.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of a central estimate for all projects assessed cumulatively.</p>
RR-029-APDX:B-30	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 30</p> <p>Table 5.48 & 5.12.2.8: We note that the values in Table 5.48 do not sum to the total estimates in the 'all projects' total. Again, the assessment is also conducted for seasons defined around migration-free breeding rather than overall breeding season as requested by NE. Please ensure a version of the assessment is provided using the NE advised seasonal definitions.</p>	<p>The Applicant can confirm that the cumulative assessment values in Table 5.48 for all other projects, in relation to gannet, are consistent with those agreed for the most recent projects agreed with Natural England and also relied upon by other recently consented projects through PINS.</p> <p>The Applicant has identified the error within Table 5.48 as being the inclusion of East Anglia One twice. This additional entry of East Anglia One abundance did not contribute to the 'all projects' total though, so the end value remains correct.</p> <p>The Applicant can also confirm the cumulative seasonal abundance values used for assessment are consistent with those agreed for all other projects for the breeding season and are not values for the migration-free breeding season. The values for all other projects within each bio-season (including the breeding season) are also those as agreed with Natural England for this project's cumulative assessment and in line with those agreed as appropriate through other recently consented projects through PINS.</p>
RR-029-APDX:B-31	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 31</p>	<p>See above response to comment RR-029-APDX:B-30 in relation to identified error in Table 5.48.</p>

	<p>Section 5.12.2.10 – 5.12.2.13: We note that the values here are incorrect owing to errors in Table 5.48 (see Point 30). We further note that the results for a single mortality rate of 1% are considered in the text. NE request that up to 10% mortality is considered here.</p>	<p>The Applicant notes Natural England’s request to consider up to 10% mortality for gannet from displacement. All data are provided in the displacement matrices to enable assessment of a range of mortality levels within the A5.5.2 ES Volume A5 Annex 5.2 Offshore Ornithology Displacement Analysis (APP-075), Section 5.11 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and Section 10.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). The Applicant has undertaken further work to gather an increased evidence base in support of the most appropriate displacement and mortality rates for gannet, which are based on their recent report Gannet Displacement and Mortality Report. APEM, 2022b). This report will be submitted to the ExA and Natural England at Deadline 2 and the Applicant welcomes further responses from Natural England on this additional evidence in support of the Applicant’s approach.</p>
<p>RR-029-APDX:B-32</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 32</p> <p>Section 5.12.2.18, 5.12.2.32, 5.12.2.46: Hornsea 4 has used the largest non-breeding season population size for guillemot, razorbill and puffin to assess impact against, whereas the largest population size is actually the breeding season for guillemot and puffin.</p> <p>Applicant uses 1,617,306 for the largest BDMPS for guillemot; NE advises the use of 2,045,078 (breeding season). Applicant uses 591,232 for razorbill; NE advises the use of 591,874 (non-breeding). Applicant uses 260,726 for puffin; NE advises the use of 868,689 (breeding).</p>	<p>As detailed above in response to RR-029-APDX:B-3, the Applicant has calculated the breeding bio-season population size via the method presented and agreed through the EP process (agreement OFF-ORN-2.40 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)). For assessment using annual total potential impact levels the Applicant assessed against the largest BDMPS population as a proxy, which was agreed as suitable through the Evidence Plan Process.</p> <p>In relation to the alternate BDMPS populations calculated by Natural England for guillemot and puffin, it is not clear to the Applicant how these have been derived. The Applicant would welcome clarification from Natural England on their derivation, as they deviate from the method agreed through the Evidence Plan Process and also differ from those more widely agreed and used by other recent and current projects, including EA1N, EA2 and Norfolk Boreas.</p> <p>The Applicant can confirm that for razorbill the assessments have been made against the advised value of 591,874 and the value of 591,232 is an error. However, the correct value was used in the calculation to estimate the impact level in the same section, therefore meaning the outcome is correct.</p>

RR-029-APDX:B-33	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 33</p> <p>Section 5.12.2.22, 5.12.2.23: The Applicant states: “the vast majority of the North Sea and English Channel OWFs do not lie within important areas of sea for guillemots and therefore displacement from these areas would not lead to significant reduction in survival”.</p> <p>NE note that the Wakefield et al. (2017) and Cleasby et al. (2018) results (which are based on the same original dataset) used to inform this statement are based on tracking data from guillemots during the late incubation and early chick rearing period of the breeding season only. This data does not include any information on the distributions of birds in August and September, when there are indications of high abundances of guillemot in the Hornsea 4 array area. Furthermore, no data from guillemots tracked at FFC SPA were included in these analyses – the distribution maps around FFC are based on modelled predictions only. The results from Wakefield et al. (2017) and Cleasby et al. (2018) cannot, therefore, be used to draw inference about the potential importance of areas of the North Sea to guillemot outside of the narrow late incubation and early chick rearing period.</p> <p>NE further notes the absence of an additional review of evidence from the Applicant previously requested by NE, that was to investigate the impacts of displacement on guillemot and razorbill from the Hornsea 4 site and the potential importance of this area to these species. See Point 50 for further discussion.</p>	<p>The Applicant undertook a literature review to identify the most appropriate available data to support the assessment process and identify the most important areas of the North Sea for guillemot, during the breeding and non-breeding bio-seasons.</p> <p>The results of this literature review, which are provided in Section 5.11 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017), support the case put forward by the Applicant, as it confirms that most English OWFs are outside of the mean max foraging range (Woodward et al., 2019) for auk species from their breeding colonies.</p> <p>It has also been agreed by Natural England, in their response to other OWF examinations (for example during the Norfolk Boreas examination – Natural England’s comments in relation to the Norfolk Boreas updated ornithological assessment, submitted at Deadline 2 [REP2-035]. PINS Ref REP4-040 that such projects and others considered in their cumulative assessments in the southern North Sea are not considered to be the most important areas for auk species during either the breeding or non-breeding season. As previous project cases support the Applicant’s position that the majority of OWFs in English waters do not reside within areas of highest importance to auk species then this has been assumed to remain the case for the Applicant when considering other projects during cumulative assessments.</p> <p>The Applicant has also further reviewed data from the original AfL plus 4 km buffer to identify the most important areas to auks and through the developable area approach. This identified the area to the south of the AFL to be of greater importance and has therefore been appropriately excluded from the maximum design scenario.</p>
RR-029-APDX:B-34	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 34</p> <p>Section 5.12.2.27, 5.12.2.41, 5.12.2.54, Table 5.55: NE cannot agree with conclusions on the magnitude or significance of displacement impacts at</p>	<p>The Applicant is in consultation with Natural England to determine which aspects of the baseline methodology their concerns relate to.</p> <p>See response to RR-029-5.1 with regards to the baseline and response to RR-029-5.9 for resolving the request to use flying and sitting birds for displacement assessments.</p>

	<p>this time owing to concerns with the underlying assessment data detailed elsewhere in these comments.</p>	
<p>RR-029-APDX:B-35</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 35</p> <p>Section 5.12.2.36, 5.12.2.37: We note that the Applicant’s own baseline characterisation data appears to suggest that the array area (plus buffer) is used by considerable numbers of razorbill both within and outside the breeding season, and particularly in August and September. Additional evidence should be provided on the importance of these areas to razorbill throughout the year. See Point 50.</p>	<p>The Applicant’s detailed baseline characterisation is provided in A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074), which provides the spatial and temporal distribution of razorbill with monthly and bio-season abundance / density estimates as well as spatial maps for each bio-season. Further monthly abundance / density estimates from the 24 months of site-specific surveys and monthly spatial modelled data are presented in the A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074).</p> <p>Additional narrative in relation to the Hornsea Four array area and buffer throughout the seasons are presented within Section 5.11 in the A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and Section 10.4 of the B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178).</p> <p>The evidence cited in the documents above provides evidence in support of the importance of the array area plus buffer, with regards to colony specific, regional and BDMPS populations. The Applicant would welcome further clarification from Natural England on this point and shall continue to engage on this matter.</p>
<p>RR-029-APDX:B-36</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 36</p> <p>Section 5.12.2.58, Table 5.58, 5.12.2.87- 5.12.2.89, Table 5.64, 5.12.2.90-5.12.2.92, Table 5.65: It is unclear whether the collision estimates for Hornsea 4 are central values based on the Applicant’s approach or NE approach. If they follow the Applicant’s approach, values using the NE approach should also be provided (with associated minimum and maximum predictions).</p> <p>NE note that some annual totals have been summed incorrectly from the values presented.</p>	<p>The Applicant can confirm that the central estimates presented within the cumulative collision risk assessment tables are central values based on the Applicant’s approach to assessment. This allows for Hornsea Four to be included in a level-playing field assessment, whereby it is adjudged and assessed in a similar manner to other project’s agreed values for the sake of aligning the cumulative assessment process. The Applicant’s interpretation of Natural England’s preferred parameters are presented within A5.5.3 ES Volume A5 Annex 5.3 Offshore Ornithology Collision Risk Modelling (APP-076), with associated minimum and maximum predictions.</p> <p>As advised by Natural England (EP#12 & 13) the Applicant kept up to date with the latest cumulative impact numbers based on the ongoing updates for East Anglia One North / East Anglia Two OWFs through their joint examination. The collision mortality</p>

	<p>NE further note some discrepancies between the Applicant's impact values and those that NE advise: for EA3 the Applicant has given 41.8 whilst NE advise 4; for Moray West the Applicant has given 12 whilst NE advise 13.</p>	<p>rate of 41.8 gannets for East Anglia Three is derived from the Deadline 11 update (Add in ref), which was the most up to date value for the Applicant to consider during the drafting stages of Section 5.12 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p> <p>For Moray West the Applicant agrees that the annual value presented in Table 5.65 should have been 13 not 12. However, this was a presentational error and that the calculation of the total cumulative collision impact for gannet used an annual total of 13 for Moray West.</p>
<p>RR-029-APDX:B-37</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 37</p> <p>Section 5.12.2.69, Table 5.60: NE note some discrepancies between the Applicant's impact values and those that NE advise: for Rampion the Applicant has used 0 whilst NE advise 121.5; for EA3 the Applicant has given 92.3 whilst NE advise 112.7. See also Point 36.</p>	<p>Ahead of the application the Applicant considered that the kittiwake collision mortality rate associated with Rampion should be excluded. This is due to Rampion OWF being situated within the Western Waters and English Channel BDMPS (Furness, 2015), so therefore sits within a different BDMPS to that being assessed against for Hornsea Four's cumulative assessment for this species.</p> <p>However, it should be noted that despite the value in the table being presented as zero, the total cumulative collision risk of 4,009 per annum includes the 121.5 value attributed to Rampion. The Applicant would welcome further consideration by NE of these kittiwake data being removed from the cumulative collision risk totals in future calculations of risk at the North Sea BDMPS level for the reasons set out above.</p> <p>As advised by Natural England (EP#12 & 13) the Applicant kept up to date with the latest cumulative impact numbers based on the ongoing updates for East Anglia One North / East Anglia Two OWFs through their joint examination. The collision mortality rate of 92.3 for East Anglia Three is derived from the Deadline 11 update (SPR, 2021), which was the most up to date value for the Applicant to consider during the drafting stages of Section 5.12 of A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017).</p>
<p>RR-029-APDX:B-38</p>	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 38</p>	<p>The Applicant welcomes Natural England's suggested correction and can confirm that there is an error in the table and that for subsequent cumulative assessments the value of 39 for this species will be used.</p>

	<p>Section 2.12.2.79 & Table 5.62: NE note some discrepancies between the Applicant's impact values and those that NE advise: for EA3 the Applicant has given 34.4 whilst NE advise 39. It appears that the Applicant has used the non-breeding collisions alone. See also Point 36.</p>	
RR-029-APDX:B-39	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 39</p> <p>Section 5.12.2.93- 5.12.2.101 & Table 5.66: We note that, as with the other assessments for gannet, a worst-case scenario including 10% mortality for 60% and 80% displacement has not been included. These scenarios should be provided. Counterfactuals of final population size are also not included in the table and should be provided.</p>	<p>The Applicant has undertaken further work to gather an increased evidence base in support of the most appropriate displacement and mortality rates for gannet, which are based on their recent report Gannet Displacement and Mortality Report. APEM, 2022b). This report will be submitted to the ExA and Natural England at Deadline 2 and the Applicant welcomes further responses from Natural England on this additional evidence in support of the Applicant's approach..</p> <p>With regards to the comment on the use of the CFPS please see response to RR-029-APDX:B-18.</p>
RR-029-APDX:B-40	<p>Detailed comments: Volume A2, Chapter 5: Offshore & Intertidal Ornithology. Point 40</p> <p>Section 5.15: NE cannot comment on the current summary due to concerns relating to baseline data and elements of the assessment approach (e.g. seasonality, calculation of mean-peak values, range of assessment values for displacement, lack of consideration of worstcase predictions, lack of consideration of variability and uncertainty in predicted impacts, lack of full cumulative assessment for some species and lack of counterfactuals of final population size being presented).</p>	<p>Please see the Applicant's detailed responses above to the concerns listed.</p>

3.11 Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-41	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 41</p> <p>Section 3.4.2: NE note that it is implied that design-based estimates have been estimated for all species and that additional modelling was</p>	<p>The Applicant can confirm that MRSea estimates have been used in preference to the design-based methods where sufficient data has allowed models to be fitted (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin).</p>

	<p>undertaken where possible as a supplementary approach. However, MRSea estimates have been used in preference to the design-based methods where sufficient data has allowed models to be fitted (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin).</p> <p>Despite several requests by NE during the Evidence Plan process, no comparison has been presented between either the raw data, design-based estimates and the MRSea modelled estimates and associated estimates of precision (coefficients of variation (CV)). To provide the requisite confidence in the outputs, the use of MRSea needs to be justified and validated through these comparisons. An overview of the model approach, particularly inclusion of temporal trends and flexibility in relation to distributions, is also not provided.</p> <p>Whilst NE remains supportive of using MRSea to produce estimates, the current description and justification for the approach provided here and in Volume A5, Annex 5.6 do not allow appraisal of the relative merits or risks associated with the MRSea approach. We therefore cannot currently have confidence in the density and abundance estimates produced by this method. Please refer to comments on Volume A5, Annex 5.6 Offshore Ornithology MRSea Report (Point 63) for more detail.</p>	<p>The Applicant has held an additional Ornithology Technical Panel Meeting to discuss the MRSea comments and options available to resolve these concerns with Natural England.</p> <p>The Applicant is in the process of consultation with Natural England to determine, beyond doubt, which aspects of the MRSea methodology Natural England's concerns relate to. Upon confirmation, of their concerns the Applicant intends to produce a Baseline Sensitivity Report setting out the implications, if any, for the changes to the baseline characterisation upon implementation of any necessary changes to the modelling approach these concerns, which is currently anticipated to be submitted to the ExA at Deadline 2.</p> <p>Please see RR-029-5.1 for presentation of a comparison between raw data and design-based estimates</p>
RR-029-APDX:B-42	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 42</p> <p>Section 3.4.4.5 & 3.4.5.4: We note that the corrected abundance and density estimates do not include confidence intervals (CI) in these tables and therefore the level of uncertainty associated with these estimates is not available for consideration. Please provide CIs for the estimates in Appendix B and include a description of how they were derived.</p>	<p>The Applicant is in consultation with Natural England to determine, beyond doubt, which aspects of the baseline methodology their concerns relate to, so agreement can be reached on baseline suitability. Please also see Applicant's response to RR-029-5.1.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.</p>
RR-029-APDX:B-43	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 43</p> <p>Section 3.4.6.3- 3.4.6.5: NE agree that inflation bias may occur based on mean peak population estimates for the non-breeding season for guillemot. However, we strongly disagree with the Applicant's weighted approach</p>	<p>The Applicant welcomes Natural England's agreement that the current assessment of guillemot during the non-breeding season using a mean peak would lead to an inflation bias.</p> <p>The Applicant considers the most appropriate approach is that adopted within the Application documents, as this reduces the inflation bias on mean peak population</p>

	<p>adopted to estimate seasonal mean peak abundance estimates for guillemot. We do not agree that “The outcome of such a process provides a more accurate estimate of guillemot usage, temporally and spatially, across the wider non-breeding bio-season to enable a more robust baseline for use in impact assessments for Hornsea Four.” NE considers that the weighted approach to calculating seasonal mean peak abundance for guillemot underestimates the potential impacts during a potential period of increased sensitivity, and does not account for the high numbers of guillemot present in the array area in August and September. See Point 50.</p>	<p>during the non-breeding bio-season which has heavier weightings towards the months of August and September over the remaining five months of October to February. Please also see response to RR-029-APDX:B-16.</p>
<p>RR-029-APDX:B-44</p>	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 44</p> <p>Section 3.4.9.2: No details are provided here or in Appendix D in relation to potential issues with ageing different species. Natural England highlights the importance of site-specific ageing data in relation to apportioning for HRA and request a full breakdown of relevant data for the project area, including any relevant boat-based survey data which may have higher proportions of aged individuals, for use in SPA apportioning. Details on the limitations of the age classification approach and the percentages of all birds of each species that were aged should also be provided.</p> <p>Note that NE advise that where good quality site-specific ageing data is not available, we recommend that the precautionary approach is to assume that all ‘adult type’ birds (i.e. birds that cannot be distinguished from adults, and hence might be adults) are apportioned as adults. We also suggest that the apportioning of adult birds should be season-specific to account for any seasonal variations in the use of the site.</p>	<p>The Applicant has provided the breakdown of site-specific aged data for all species where available on a monthly basis within Appendix D of Volume A5, Annex 5.1: Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074).</p> <p>The age apportionment process relied upon values from the BDMPS to understand the age breakdown of the species of interest. This is due to many seabird species (including kittiwake, guillemot and razorbill) having the same plumage after six months as they do when adults, therefore creating a bias in any data sets, regardless of being boat-based or aerial digital-based. Therefore, survey data sets may make mis-leading assumptions when considering all birds in ‘adult’ plumage to be breeding birds, as many may be immature individuals or adults taking a sabbatical.</p> <p>As is well documented, many seabird species are long-lived and do not breed for the first time until their fourth or fifth year, therefore a considerable amount of ‘adult plumage’ birds are not breeding adult birds. To ensure a robust assessment the age breakdown used within the Applicant used scientifically researched data from the wider BDMPS, as these rely on a larger data set and are considered to be more reliable to inform the baseline and assessment process.</p> <p>The Applicant agrees with Natural England that apportionment should be bio-season specific to account for any seasonal variations in the use of the site and have provided as such within the assessments for each species.</p>

<p>RR-029-APDX:B-45</p>	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 45</p> <p>Section 3.5.2.1 & Figures 4 to 21: Bar graphs do not provide CIs associated with the abundance estimates. CIs in relation to all abundance or density estimates should be provided.</p> <p>Also, the Applicant states: "For gannet, guillemot, razorbill and puffin, additional abundance estimates are provided for the Hornsea Four array area plus a 2 km buffer (Appendix A: Abundance Estimates and Behaviour Information (not subject to Apportionment / Correction) of all bird species from Site-Specific Surveys (including unidentified birds)), as these data are determined appropriate for assessing displacement."</p> <p>This suggests that abundance estimates without any corrections are suitable for assessing displacement. NE disagree with this and advise that corrected data should be used for the assessment. Clarification is needed on whether data from Appendix A (uncorrected) or B (corrected) was used for the assessment of displacement for these species.</p>	<p>The Applicant acknowledges that CIs are not provided in the bar graphs. The Applicant did, however, provide the CIs within Appendix A of A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074), prior to apportionment of any unidentified species group and the application of a correction for availability bias.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.</p> <p>Both uncorrected and corrected data have been included within Appendices within A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074) to demonstrate any changes to these data. The Applicant outlines the approach to the displacement assessment in A5.5.2 ES Volume A5 Annex 5.2 Offshore Ornithology Displacement Analysis (APP-075), which is in agreement with Natural England that all data used within the displacement matrices and impact assessments of these species relies upon apportioned and corrected data only.</p> <p>The Applicant provided additional data prior to apportionment and correction for availability bias for completeness only.</p>
<p>RR-029-APDX:B-46</p>	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 46</p> <p>Section 3.5.2.1, 3.6.3.1, 3.7.3.1, 3.8.3.1, 3.9.3.1, 3.10.3.1, 3.11.3.1, 3.12.3.1, Figures 4 to 21: NE note that all seasonal maps provide identical distributions (scaled by changes in abundance) for each species. This suggests that the underlying distributions of birds do not change across seasons, which is implausible. This is a result of the modelling approach and as such, breaking down the maps to illustrate seasonal or individual survey distributions is of little benefit for assessing changes in distributions of birds. We note that the same conclusions are also reached about distributions across all seasons due to the inherent limitations of the modelling approach.</p>	<p>Please refer to the Applicant's response to RR-029-5.1</p>

	<p>NE considers that it would be more appropriate to provide modelled spatial distribution surfaces for the Afl, and include either plots of coefficients of variation of percentile-based confidence intervals generated from bootstrap samples to characterise spatial uncertainty.</p> <p>The Applicant should provide maps including the entire Afl and showing CIs associated with predicted spatial distributions for each species overlaid with raw data observations.</p>	
RR-029-APDX:B-47	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report. Point 47</p> <p>Table 7 & Table 8: NE note that no values are provided based on the 'full' breeding season, against NE advice (see Point 2). The applicant should provide relevant values for the full breeding seasons as per NE advice.</p>	<p>The Applicant provided a full breakdown of seasonal data within A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074), with the full season splits as detailed in Furness (2015) and in line with the suggested seasons as interpreted from the fluctuations in abundance from the site-specific data. Presentation of the baseline characterisation following this method provides the reader with the most reliable information to determine seabird spatial and temporal distribution within the sites on an annual and seasonal basis. Within A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017) and B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) the bio-seasons considered for assessment purposes were based on the standard seasons in line with other recent OWF project's impact assessments.</p>
RR-029-APDX:B-48	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report Point 48</p> <p>Appendix A: NE note that CIs should be provided for density estimates that are derived from the density surfaces using a different method to the abundance estimates. NE also note that coefficients of variation (CVs) are provided for design-based estimates but not for the model-based estimates. Both issues should be rectified.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.</p>
RR-029-APDX:B-49	<p>Detailed comments: Volume A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report Point 49</p> <p>Appendix B: We note that no CIs are provided. These data should ultimately be used for the assessments and therefore detail pertaining to CIs is key to the assessment process.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.</p>

3.12 Detailed Comments: A5.2 Offshore Ornithology Displacement Analysis

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-50	<p>Detailed comments: Volume A5.2 Offshore Ornithology Displacement Analysis - Point 50</p> <p>Section 1.4.1.2, 1.4.4.2: "In order to reduce this bias for guillemot and provide more representative, yet still precautionary, abundance and density estimates for the non-breeding bio-season, a weighted-mean approach has been used for the displacement matrices".</p> <p>NE do not agree that the Applicant's weighted mean peak abundance estimation method is more representative or more precautionary. The Applicant's approach uses specific apportioning values for the period August-September and a standard nonbreeding apportioning approach for October to February. These values are then weighted according to the number of months represented and an overall apportioning value applied for the non-breeding season. We consider that this approach is likely to heavily underestimate potential impacts assigned to FFC SPA in August and September, when high abundances have been noted in the array plus 2km buffer. Furthermore, guillemot may be particularly vulnerable to impacts during these months as they head offshore to moult, the males accompanied by dependent chicks, and are flightless for several weeks potentially making them dependent on specific foraging areas.</p> <p>Given the proximity of the array area to FFC SPA, lack of other large populations nearby and the fact that the birds will be moulting, and therefore flightless, we consider it likely that a large proportion of the birds will originate from FFC SPA, rather than other SPAs that are mainly in Scotland, at this time. We are therefore concerned that there is potential for the array area to have functional links with the FFC SPA colony and that displacement of birds from favoured areas could result in a loss of important supporting habitat for a key lifecycle stage, resulting in a range of effects including mortality. We therefore consider that the potential importance of</p>	<p>The Applicant welcomes Natural England's position to undertake a bespoke method to assess auk displacement, particularly during the post-breeding months where inflation bias occurs. The Applicant considers the most appropriate approach is that adopted within Section 5.11 in the A2.5 Environmental Statement Volume A2 Chapter 5 Offshore and Intertidal Ornithology (APP-017), as this reduces the inflation bias on mean peak population during the non-breeding bio-season (which creates heavier weightings towards the months of August and September over the remaining five months of October to February). By weighting the data in this manner the Applicant does not consider that any final impacts are not represented as a higher proportion of birds are attributed to the FFC SPA during the months of August and September.</p> <p>Please also refer to the Applicant's response to RR-029-5.7 and RR-029-5.6.</p>

	<p>this area to guillemot during August and September has not currently been accounted for in the Applicant's approach and warrants further exploration, as there could be merit in the application of a bespoke approach for this period.</p> <p>Natural England notes that an investigation into the importance of the array area to guillemot and razorbill, the possible impacts of displacement, and likely colony origin of the auks present was previously requested by NE during the Evidence Plan Process but was not provided. Natural England request that further consideration is given now to drivers of seasonal variations in the wider spatial distributions of auks, particularly during August and September, to determine the potential importance of this area.</p>	
RR-029-APDX:B-51	<p>Detailed comments: Volume A5.2 Offshore Ornithology Displacement Analysis - Point 51</p> <p>Section 1.4.4.2: "Baseline survey data from Hornsea Four suggest that this post-breeding dispersal occurs within two of these seven months (AugSep), with birds quickly passing out of the area as they migrate"</p> <p>While the baseline data does appear to show that this peak in numbers reduces over time, it does not support the statement that birds are 'passing quickly out of the area as they migrate'. High abundances of guillemot are recorded as late as November (2017). Furthermore, the baseline data appears to show large aggregations of birds during August to September. See Point 50 for further discussion on this.</p>	Please refer to the Applicant's response to RR-029-APDX:B-47.
RR-029-APDX:B-52	<p>Detailed comments: Volume A5.2 Offshore Ornithology Displacement Analysis - Point 52</p> <p>Section 1.6 & Table 1: NE note that for gannet, the seasons assessed do not follow NE advice and instead of using, or also presenting, the 'full' breeding season, only the migration-free breeding season is used. An assessment of gannet should be provided using the NE seasonal definitions as discussed in Point 2.</p>	Please refer to the Applicant's response to RR-029-5.9.
RR-029-APDX:B-53	<p>Detailed comments: Volume A5.2 Offshore Ornithology Displacement Analysis - Point 53</p>	Please refer to the Applicant's response to RR-029-5.9.

	<p>Section 1.6.1.3: "For displacement analysis, gannets recorded as either sitting or flying were included, whilst for guillemot, razorbill and puffin only sitting birds were included, given the species foraging behaviours."</p> <p>SNCB advice is that all birds, regardless of behaviour (i.e. including both sitting and flying birds) should be included when calculating abundance estimates for all species. Birds in flight are using the area and may be subject to displacement impacts. Abundance estimates should be recalculated for all three auk species (guillemot, razorbill, and puffin) to include birds in flight. Abundance estimates for auk species also need to include species apportionment for unidentified auks and corrections for availability bias. See Point 19.</p>	
RR-029-APDX:B-54	<p>Detailed comments: Volume A5.2 Offshore Ornithology Displacement Analysis - Point 54</p> <p>Tables 3 to 26: We recommend that updated displacement matrices are provided in line with the SNCB advice detailed in these comments. We request that matrices are also presented of the upper and lower confidence intervals as calculated for the abundance estimates, so that the full range of effect scenarios can be understood. Displacement matrices for annual impacts (all seasons summed) should also be presented, for all species.</p>	Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.

3.13 Detailed comments: A5.3 Offshore Ornithology Collision Risk Modelling

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-55	<p>Detailed comments: Volume A5.3 Offshore Ornithology Collision Risk Modelling- Point 55</p> <p>Section 2.2.6.3 & Table 1: NE note that the applicant has not included the 95% CIs from the Johnston et al. (2014) maximum likelihood flight height distributions. It is necessary for these to be provided to inform our understanding of uncertainty surrounding estimates.</p>	<p>The Applicant does not agree with the use of 95% CI maximum likelihood flight height distributions. A further, more detailed response will be provided in an assessment sensitivity report on this topic to the ExA during the examination.</p> <p>The Applicant's view, which is reflected in the approach taken by other experts undertaking collision risk modelling for OWFs, is that the use of 95% CIs around generic flight heights are unsuitable for assessment. This is due to the Johnston et al. (2014) datasets being comprised from an extensive number of studies, therefore the Applicant has confidence that the maximum likelihood values for each species are a</p>

		<p>reflective value of a species average flight behaviour. Conversely due to the numerous studies included, if assessments use the 95% CIs these values are likely to be affected by outlying uncharacteristic flight behaviours (many in relation to studies from OWFs that are either onshore or in nearshore environments that are very different in nature to Hornsea Four).</p> <p>Therefore, when assessing uncertainty relating to the collision risk assessment the Applicant relies on variation in seabird density estimates and input parameters where uncertainty remain (for instance in the nocturnal activity rates or avoidance rates) and not the generic flight height values.</p>
RR-029-APDX:B-56	<p>Detailed comments: Volume A5.3 Offshore Ornithology Collision Risk Modelling- Point 56</p> <p>Section 2.2.7: Natural England question the approach for deriving mean densities, CIs and standard deviations (SDs) for used in the Band CRM or sCRM collision risk modelling. These parameters are fundamental to estimating potential collision impacts and potential variability or uncertainty.</p> <p>It is currently unclear how the densities of birds in flight and associated CIs were derived estimated for birds in flight from modelled density surfaces derived for all birds (sitting and flying), with or without subsequent apportioning of unidentified species. Further, Natural England question the do not advise the use of minimum and maximum plausible CIs (from two surveys in any given month) to then derive a standard deviation. It is our interpretation that the Applicant's approach (maximum upper confidence interval - minimum lower confidence interval densities/4) currently produces a Standard Error and that this does not directly relate to the mean of the two densities.</p> <p>The Applicant should clarify how densities and associated CIs were estimated for birds in flight from modelled density surfaces based on all birds and following any apportioning of unidentified species.</p> <p>Natural England consider a more appropriate approach would be to combine the relevant bootstrapped sample estimates of birds in flight, either from modelled density surfaces or design-based estimates, for the</p>	<p>The Applicant agreed the method to estimate seabird density variation to be used within the sCRM with Natural England through the Evidence Plan Process (agreement OFF-ORN-2.37 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130))), which was followed to predict collision risk variation. The Applicant disagrees with Natural England's suggestion that the Applicant calculated a 'standard error' (which describes the variation between two or more populations). The approach taken by the Applicant, which was developed and agreed with Natural England, treats both months as contributing to a single population with an upper and lower CI estimated as the maximum upper CI and minimum lower CI, and therefore we estimated the standard deviation of that single (pooled) population.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates being the basis for assessment.</p>

	<p>two months. This would provide a single overall distribution for the two surveys from which the mean, Standard Deviations and CIs could be derived. We would welcome discussion regarding this option with the Applicant.</p>	
RR-029-APDX:B-57	<p>Detailed comments: Volume A5.3 Offshore Ornithology Collision Risk Modelling- Point 57</p> <p>Appendix A: Whilst NE appreciates alternate impact scenarios are presented by the Applicant, we advise that any further analysis and assessment includes the applied use of outputs presented and based on SNCB guidance and not exclusively only the Applicant’s modelled impacts. NE consider the range of outputs presented (i.e., the difference between the Applicant’s results and those results derived using SNCB guidance) to be potentially significant. For example, the mean predicted annual collisions for kittiwake presented by the Applicant are 93.27, whereas those modelled using SNCB guidance are 106.69 (with Band Model Option 2 applied in both instances). Such variances may be significant, particularly in relation to the in-combination assessment. Therefore, whilst the Applicant may wish to present in the assessment results based on their own modelling, the assessment should also include an interpretation of the results derived using the advised SNCB guidance. The variance in modelled impacts cannot be considered ‘insignificant’ or ‘negligible’ and should therefore be assessed and presented consistently throughout all stages of the assessment. NE request that the modelled impacts and results of the CRM, as presented in Appendix A are used in all subsequent analysis and assessment of impacts, i.e., PVA modelling and in-combination assessment based on SNCB advice.</p>	<p>The Applicant intends to submit an Assessment Sensitivity Report at various points during the examination which presents the Applicant’s and Natural England’s positions on assessment methodologies and outcomes. This will be submitted after the MRSea baseline data has been clarified.</p>

3.14 Detailed comments: Volume 5.4 Offshore Ornithology Population Viability Analysis

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:B-58	<p>Detailed comments: Volume A5.4 Offshore Ornithology Population Viability Analysis.- Point 58</p> <p>Section 1.2.1.3, 3.1.1.2: Natural England acknowledge the inclusion of PVA models for great black-backed gull. However, lesser black-backed gull and</p>	<p>See Applicant’s response to RR-029-APDX:B-6.</p>

	<p>herring gull have been excluded from full assessment using PVA for EIA impacts on the basis that "potential impacts from Hornsea Four determined to be negligible and of no material contribution to any cumulative effects for these species".</p> <p>Even if project alone predicted collisions for a species are small, these should still be added to the cumulative/in-combination total and an assessment made at this level. NE advise that PVA modelling is undertaken for species where the project alone or cumulative/in-combination level impact reaches 1% of baseline mortality for the population. See Points 4&6.</p>	
RR-029-APDX:B-59	<p>Detailed comments: Volume A5.4 Offshore Ornithology Population Viability Analysis.- Point 59</p> <p>Section 2.2.1.5: NE note there is no reference to the use of a 'burn in' period or justification for why one has not been included. NE consider that a 'burn in' period should be used, or a justification for why one has not been used provided.</p>	<p>The Applicant consulted with Natural England prior to running PVAs for all species and agreed (agreement OFF-ORN-2.28, 2.30 & 2.42 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)) on all the input parameters and preferred methods of running their model (NE Seabird PVA Tool, 2019). In relation to 'burn in' this was not requested at that time when consulting with Natural England, as we understood there to be some model issues when applying it and no agreement on the most suitable use of it for specific species.</p> <p>Furthermore, Natural England's guidance document for the model (NE, 2019) states 'burn in' as future work in relation to the model, which provided uncertainty to the Applicant as to the suitability of its inclusion within their model.</p> <p>However, should Natural England now have formal advice on the use of 'burn in' rates for different species for running their PVA tool the Applicant would welcome further clarification on this matter.</p>
RR-029-APDX:B-60	<p>Detailed comments: Volume A5.4 Offshore Ornithology Population Viability Analysis.- Point 60</p> <p>Section 2.2.1.8, 4.1.1.1, Tables 10 - 21: The Applicant states: "Although both the counterfactual of population size and population growth rate are presented within this report, the Applicant considers that the counterfactual of population growth rate only should be used for interpreting the predicted impacts."</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-18.</p>

	<p>NE note that counterfactual of final population size (CFPS) has not been presented in the report as stated, despite having been present in earlier versions seen by NE. This is against NE advice to continue to provide both growth rate and population size metrics.</p> <p>Whilst Natural England appreciate that both metrics have limitations, both are required to fully inform the interpretation of outcomes relative to underlying background population trends. Further, NE refer to Cook & Robinson (2016) who suggest: "It is necessary to consider the trade-off between a criterion offering a more unambiguous assessment of the population level effect (CIUn) [this is final pop size], and one which is less sensitive to uncertainty surrounding population trend and has a more consistent relationship with impacts of increasing magnitude (CIUl) [this is growth rate], potentially aiding an understanding of the consequences of over or underestimating the magnitude of any impact."</p>	
<p>RR-029-APDX:B-61</p>	<p>Detailed comments: Volume A5.4 Offshore Ornithology Population Viability Analysis.- Point 61</p> <p>Table 2: NE note that the BDMPS population sizes presented here are consistent with those in the ES, with the exception of puffin, which is given as 260,726 compared to 231,957 in the ES chapter (Table 5.12). NE do not consider either of these to be the appropriate value to use. As discussed in relation to the ES, the largest BDMPS population size in any season for all species should be used (see Point 3).</p> <p>Furthermore, no data are included in the Survival rate column, rather the table indicates a "National pre-formulated" rate used. Clarity is needed on the specific survival rates used, including survival rates for the different age classes used.</p> <p>Productivity rates are presented, and NE agree with the values used for EIA, however we note that there is a discrepancy between the value presented in Table 2 for kittiwake and the value that appears in the equivalent logfile from the PVA run in Appendix A.</p> <p>Table 2 cites the east coast rate of 0.819 for kittiwake which we agree is the most appropriate rate for the cumulative BDMPS scale PVA. The matching logfile in Appendix A indicates that 0.69 (pg 57) was used which is</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-3 with regards to the values used to determine BDMPS values.</p> <p>In relation to the puffin population value, this was an error and will be amended accordingly for any future PVA modelling.</p> <p>With regards to the survival rates used by the Applicant within the NE Seabird PVA tool (2019), these are based on the pre-formulated national rates derived from the literature review conducted by Horswill & Robinson (2015), as agreed with Natural England to be the most suitable for assessment through the Evidence Plan Process (OFF-ORN-2.42).</p> <p>At the request of and in agreement with Natural England through the Evidence Plan Process, each individual value was not presented upfront, as the log files for all PVA runs were included within Appendix A of the A5.5.4 ES Volume A5 Annex 5.4 Offshore Ornithology Population Viability Analysis (APP-077), which present exact values for all ages classes.</p>

	the most appropriate rate for the biogeographic scale assessment. The productivity rate used should be checked and the PVA re-run as required.	The Applicant can confirm that the productivity rate used within the cumulative BDMPS assessment is an error, the correct value should be 0.819. The Applicant will review and re-run if required.
RR-029-APDX:B-62	Detailed comments: Volume A5.4 Offshore Ornithology Population Viability Analysis.- Point 62 Section Table 4, Table 10 & Table 11: Following the displacement assessment, we note that the PVA was not carried out using a worst-case scenario of 80% displacement and 10% morality for gannet as per NE advice. We advise that this is provided, and the results considered in relation to combined collision and displacement impact scenarios.	Please refer to the Applicant's response to RR-029-APDX:B-12.

3.15 Detailed comments: A5.5 Offshore Ornithology Migratory Birds Report

Reference	Relevant Representation Comment	Applicant's Response
	No specific comment	Noted.

3.16 Detailed comments: Volume A5.6 Offshore MRSea Report

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-63	Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 63 General: In principle, NE welcome the use of modelling-based approaches to density and abundance estimation, and for the examination of trends in spatial distributions, however these values underpin much of the EIA and RIAA and it is therefore important that there is confidence in the modelling approach. We note that NE have previously commented on an initial version of this report provided 29/10/2020 (Evidence plan references: Off-ORN-1.20, 1.21, 1.22, 1.23 and 1.24). The results of the analysis have been updated to reflect the latest reduction in the developable area, however the underlying models appear to produce very similar distributions as those presented in	Please refer to the Applicant's response to RR-029-5.1.

the last version of the report provided to NE (albeit clipped to a smaller area). Thus, it is understood that all survey data for the Afl area were used to model density surfaces. The revised density and population estimates for the wind farm footprint (and buffers) described in the application have been derived from cells within the relevant areas.

Despite these updates and requests from NE during the Evidence Plan process, there has been no comparison of the modelled outputs with design-based methods or raw data to provide a sense check of the outputs or justification for the chosen approach. Further, based on the outputs provided in this document, and A5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report, we have concerns in relation to the performance of the model and the outputs in relation to individual survey estimates and associated confidence intervals.

Our current position is that at the present time, it is not possible to have confidence in the abundance and density estimates produced via this method. Further justification is required for confidence in the current approach.

We provide below an overview below of what we consider to be necessary for the Applicant to provide the requisite confidence in the outputs and/or alternative approaches should the modelling no longer be used. These are expanded on further in the remaining comments on this document.

- Provide a full justification for the use of the model-based method over the design-based methods. This should include comparisons of modelled spatial distributions with raw data or KDE derived surfaces. Density and population estimates should be compared between model- and design-based methods and there should be discussion in relation to the precision of the methods (CVs).
- Provide a more detailed methodology fully describing the different aspects of the modelling and associated diagnostics in relation to performance (i.e. model validation) including a summary and rationale for the modelling approach (i.e. a single model per species which appears to assume spatial relationships are constant over the 24 month period).

	<ul style="list-style-type: none"> •Define how population and density estimates were derived (apparently using different approaches) from the modelled surfaces. Confirm it is correct that densities scaled to the relevant area will not produce the same populations and would have different CIs. •Provide a description of how populations and densities were apportioned to different behaviours •Indicate how CIs and CVs (SD/mean or SE/mean) were estimated using model-based approaches for total populations, densities, apportioned behaviours and corrected apportioned behaviours. •As an alternative, the Applicant could revert to the use of design-based estimates throughout and presentation of spatial distribution maps (e.g. using KDE) for individual surveys and averaged surfaces for respective bio-seasons. 	
RR-029-APDX:B-64	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 64</p> <p>Section 1.1.1.4, Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7: During pre-application consultation, NE advised (Evidence plan reference: OFF-ORN-1.20) that further narrative was needed in relation to the model testing and performance to provide justification and reassurance for use over design-based estimates. Currently no justification for why the model-based estimates have replaced the design-based estimates of abundance has been provided.</p> <p>We are grateful for the additional commentary and presentation of some limited model diagnostics (as per Evidence plan reference: OFF-ORN-1.20). Specifically, the addition of VIF values (consideration of collinearity) and p-values to indicate the significance of selected model variables. However, there does not appear to have been an attempt to compare the model-based approach with design-based estimates, or provide CVs associated with estimates.</p> <p>Further, the approach to model selection is unclear and typical diagnostic plots for MRSea (including comparisons of fitted vs observed values, cumulative residual plots, mean-variance relationship, spatial residuals, ACF plots and Runs Tests results to assess autocorrelation) are not provided</p>	Please refer to the Applicant's response to RR-029-5.1.

	<p>for the models. There is no clear discussion about the performance of the models within the results sections. As detailed in Point 63, this information needs to be provided to justify the approach taken.</p>	
RR-029-APDX:B-65	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 65</p> <p>Section 2.2.1.1: This suggests 95% CIs were produced for each grid cell, but maps illustrating these are not presented within the report. Please provide maps with associated 95% CIs for reference.</p>	Please refer to the Applicant's response to RR-029-5.1.
RR-029-APDX:B-66	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 66</p> <p>Section 2.3.1.1: Based on the described approach, survey number, or bio-season, is being included within models as a factor. Examining the maps of spatial distributions produced, the models therefore appear to be describing a single 'global' spatial density distribution, based on relationships with the included covariates across the entire 24 surveys, which is scaled according to survey or bio-season. The pooling of all data across all years and bio-seasons appears inappropriate, as currently there is the assumption that the underlying form of the relationships with the available covariates remain consistent over time and space.</p> <p>This is unsuitable for examining trends in spatial distributions between bio-seasons and surveys and could have a significant effect on the associated survey-specific density and population estimates (and CIs). This brings in to question the suitability of the estimates and confidence intervals for the assessment process. It needs to be demonstrated that the current modelling approach is appropriate and likely to produce representative density and population estimates for individual surveys.</p> <p>A comparison of outputs against design-based estimates would enable evaluation of relative temporal and spatial (raw observation data or heat maps derived from KDE) trends between the two methods. This would allow a sense-check of the results and consideration of where significant differences might occur.</p> <p>The Applicant should consider the possibility of using individual survey-specific models for each species (as per modelling of the AfL presented by</p>	Please refer to the Applicant's response to RR-029-5.1.

	<p>the Applicant during the evidence plan process in 2019) where there is sufficient data, and use design-based where there is not. Alternatively consider producing models for separate bio-seasons. If data are pooled for bio-season then flexibility should also be incorporated (possible interaction with survey or month) to describe variations in the surfaces between surveys.</p> <p>Given possible time constraints, an alternative would be to revert to the use of design-based estimates throughout and presentation of spatial distribution maps (e.g. using KDE) for individual surveys and averaged surfaces for respective bio-seasons. Whilst it is acknowledged that the design-based method would result in the clipping of data to the relevant project areas, spatial distribution maps should make use of all available data.</p>	
RR-029-APDX:B-67	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 67</p> <p>Section 2.3.1.5 and 2.3.1.6: It remains unclear how density and abundance estimates were derived for different behaviours (sitting/flying) and only total density and abundance estimates are presented within this report.</p> <p>Based on discussion with the Applicant during the Evidence Plan Process, it would appear the results for all birds were apportioned according to the raw count data for each behaviour. However, it remains unclear whether apportioning ratios were determined from individual surveys or across the whole survey programme. If this is the case, clarity is needed on how the CIs associated with the estimates for different behaviours were derived. Detailed clarification should be provided on the methods undertaken here. This should include a table providing the apportioning values used for each behaviour and a description of how the data were treated to derive appropriate CIs.</p>	Please refer to the Applicant's response to RR-029-5.1.
RR-029-APDX:B-68	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 68</p> <p>Section 2.3.1.6: We note that density is calculated as a mean from all the cells within a specific area, but that the population was derived by summing the predicted numbers of birds in the relevant cells. It appears that upper</p>	Please refer to the Applicant's response to RR-029-5.1.

and lower confidence intervals (CIs) for the population estimates were derived from the CIs for individual cells based on the bootstrap approach, whilst it is unclear how CIs for the densities have been derived. Confirmation is needed on whether they are based on the distribution of mean density values from the mean density surface.

It is also unclear how part cells (where clipped) were considered. For example, were part cells assumed to be in the area of interest or not, or was an adjustment made based on the proportion of the cell included?

Further, we note that these two approaches do not produce interchangeable metrics of abundance. Thus, the mean density multiplied by the relevant area would not produce the same population estimate as derived from summing the numbers in each cell.

CIs are also not provided for density estimates throughout this document and the Baseline characterisation. These may have been calculated from the distribution of densities or perhaps as an average of the upper and lower CIs across the cells. This is of relevance when considering densities of birds in flight for CRM. Within the CRM Appendix (Volume A5.5.3) the CIs around density estimates for birds in flight are referred to, but not presented. These values are also further used to provide an estimate of SD, though it is unclear whether this is what is actually being produced.

We request that clarification is provided over how part cells were treated in relation to density and abundance estimates. Further detail on how estimates and associated CIs were derived is also needed.

We suggest consideration of using a single method to derive both density and population estimates. For example, producing the density estimates with CIs and then multiplying by the relevant area to get to populations. Alternatively, the population estimates and CIs could be used to get to densities. All values should be reported in associated tables with the associated CIs.

NE consider the best approach for deriving mean abundance, subsequent density estimates and their associated CIs for the different fractions of the population and applied corrections would be to apply any apportioning and corrections to the bootstrapped surfaces (model-based), or density

	<p>estimates (from design-based methods) prior to summing the relevant populations estimates across the relevant cells within the mean distribution, and then deriving the CIs based on the distribution of the data within the bootstrap sample.</p> <p>We note that this method should also be used to provide an overall mean from two months of data and the associated SDs and CIs. For example, the bootstrapped estimates for April in two years could be combined to provide an overall sample of bootstrapped estimates which should then be used to derive the mean surface (model-based) or density estimate (for design-based) and associated CIs.</p>	
RR-029-APDX:B-69	<p>Detailed comments: Volume A5.6 Offshore Ornithology MRSea Report - Point 69</p> <p>Section 3.1.3, 3.2.3 3.3.3, 3.4.3 3.5.3, 3.6.3 3.7.3: No CVs are provided alongside model estimates and CIs are not included for density estimates. Please provide CVs alongside all estimates to provide an indication of relative precision and CIs associated with all density estimates.</p>	Please refer to the Applicant's response to RR-029-5.1.

3.17 Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-70	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 70</p> <p>General comment: Lack of confidence in the baseline characterisation means that Natural England cannot currently form any conclusions about the significance of predicted impacts presented by the Applicant that are dependent on model-based estimates. Thus, the comments in the following sections are caveated on the basis that NE consider that there are issues with the derivation of the baseline bird density data that underpin assessments. However, we have provided comments regarding other methodological aspects of the assessment below where these are not dependent on baseline survey data.</p>	<p>Please refer to the Applicant's response to RR-029-5.1 with regards to the comments on the baseline data / MRSea modelling.</p> <p>The Applicant acknowledges Natural England's position with regards to kittiwake and has accepted the decision from the SoS that there is an in-combination AEoI with regard to the kittiwake feature of the FFC SPA. The Applicant is in the process of updating the Application documents (including the RIAA (B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178))) with regards to this point, submitted at Deadline 1.</p>

	<p>Notwithstanding this, with respect to HRA impacts we advised during the Hornsea 3, Norfolk Vanguard, Norfolk Boreas, EA1N and EA2 examinations that it was not possible to rule out AEol of the kittiwake feature of the FFC SPA for collision impacts from incombination with other plans and projects, for all projects up to and including Hornsea 3, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two, irrespective of whether Hornsea 4, Dudgeon Extension Project and Sheringham Shoal Extension Project ('DEP and SEP') were included in the totals or not. Our position on this remains unchanged and we note that it was accepted by the Secretary of State in the Hornsea 3 and Norfolk Boreas decisions. Any additional mortality arising from these proposals would therefore be considered adverse. We also have concerns regarding displacement impacts giving rise to adverse effects on guillemot and razorbill (see below) from Hornsea 4, and regarding in-combination impacts on gannet from collision mortality.</p>	<p>With regards to the additional comments Natural England raised for other species, these comments are dealt with in the more detailed responses by the Applicant below.</p>
<p>RR-029-APDX:B-71</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 71 General comment: NE notes that sources of variability and uncertainty have not been considered in relation to any of the impacts carried through the HRA assessments. NE require this information on precision to allow judgement about what reliance can be placed on the estimates and to allow incorporation of variability into the range of impacts assessed. NE request that the Applicant includes predicted impacts with associated upper and lower estimates for consideration during the assessment and any associated PVA.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of a central estimate for all projects assessed cumulatively.</p>
<p>RR-029-APDX:B-72</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 72 General comment: There is no clear presentation of the data used to derive the displacement impacts for the Appropriate Assessment (AA). For example, the Applicant has not presented information to show the peak abundance for each season, or the mean of the peak abundances across the survey years. Further, displacement matrices that use the upper and lower 95% confidence limits for the abundance estimates are not presented. These should be provided.</p>	<p>Following a proportionate approach to HRA, the Applicant has not presented repetitious matrices in order to reduce the scale of the document.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of a central estimates being the focus of assessments.</p> <p>The Applicant has provided displacement matrices for the key sites and species within Section 10.4 and 11.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) for the operational and maintenance phase, whilst all baseline</p>

		<p>data are presented within A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074).</p> <p>The derivation of apportioned populations to undertake the impacts underpinning the RIAA are presented within B2.2 Report to Inform Appropriate Assessment Part 11: Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177) for key sites and species, rather than in the RIAA (B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)) in order to reduce the amount of content within the RIAA itself.</p>
RR-029-APDX:B-73	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 73</p> <p>General comment: It is currently unclear what baseline mortality rates have been used in the RIAA. It is understood that these are based on adult rates rather than the weighted approach, but clarity should be provided on this.</p>	<p>As stated in B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178), the Applicant undertook all assessments within the RIAA using the adult survival rates from Horswill & Robinson (2015) as agreed with Natural England and these values were used when calculating baseline mortalities of colonies assessed within the RIAA.</p>
RR-029-APDX:B-74	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 74</p> <p>Section 1.4.1.4 & 1.4.1.5 & Table 1 (Pg 51): The Applicant argues, based on EA1N and EA2 examinations and NE advice, that impacts from Hornsea 3 will be compensated for and that the contribution from Hornsea 3 can therefore be discounted in this assessment. Natural England acknowledges this approach but wishes to highlight that the detailed compensation proposals have not yet been presented to the Secretary of State for consideration and consultation, and until they are approved, implemented and delivering it is not guaranteed that Hornsea 3's impact will be zero. Irrespective of this, NE consider kittiwake to have reached a point of adverse effect in-combination irrespective of the treatment of Hornsea 3's contribution.</p>	<p>The Applicant has followed the advice given by Natural England in relation to exclusion of Hornsea Three FFC SPA predicted kittiwake impacts within assessments, following the consent decision and recommendation from the SoS. This was to include a value of zero for Hornsea Three.</p>
RR-029-APDX:B-75	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 75</p> <p>Table 1 (Pg 27): NE continue to request that the 'full' breeding seasons are used for the assessment of impacts on gannet and kittiwake, rather than 'migration-free breeding' seasons. We note that there appears to have been some limited effort to do this in Volume B2 Chapter 2 RIAA part 1.1, where</p>	<p>Both the Applicant and Natural England's approach to assessing gannet and kittiwake are provided within the B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) and B2.2, Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177). The Applicant's preferred method to assess bio-seasons with supporting</p>

	<p>footnotes appear to this effect in several of the tables. However, there is no clear explanation of when and where different seasonal definitions have been applied for different assessments. We further note that DCO applications for Norfolk Boreas, EA1N and EA2 presented both the migration free and 'full' breeding season for gannet and kittiwake for HRA for the FFC SPA assessment. See Point 2.</p>	<p>evidence from the site-specific survey data incorporating migrating birds within the FFC SPA.</p> <p>Please also refer to the Applicant's response to RR-029-APDX:B-2.</p> <p>The Applicant intends to submit an Assessment Sensitivity Report at various points during the examination which presents the Applicant's and Natural England's positions on assessment methodologies and outcomes. This will be submitted after the MRSea baseline data has been clarified.</p>
RR-029-APDX:B-76	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 76</p> <p>Table 1 (Pg 27): The Applicant states: "Consideration of barrier effects on seabirds has been completed in the assessment of all relevant species / designated sites included in this RIAA (Section 10.4.4)."</p> <p>NE note that this does not include consideration of barrier effects for auks during August and September, which could be in moult (and therefore flightless) with dependent chicks at this time. Barrier effects at this time may influence adult and chick fitness prior to over wintering and thus survival rates, and could also impact productivity in the following year. NE requests that the assessment considers the potential for barrier effects during August and September for guillemot and razorbill. See Point 25.</p>	<p>The Applicant followed SNCB guidance (SNCB, 2017) which considers displacement of auks within the post breeding dispersal / non-breeding season. The Applicant also followed the same guidance which specifies barrier effect only considers birds in flight which are migrating or regularly foraging between nesting and foraging sites, where an object is between the two.</p> <p>The SNCBs guidance (SNCB, 2017) does not provide specific recommendations on the treatment/assessment of barrier effects, as it recognises that there is no method that allows for quantitative distinction between displacement and barrier effects. Due to this limitation the guidance suggests that both flying and sitting birds are included within displacement analysis to account for both displacement and barrier effects.</p> <p>A revised displacement analysis is to be provided which includes both flying and sitting birds in place of separate displacement and barrier effect assessments in line with SNCB guidance (SNCB, 2017) and Natural England's request.</p> <p>Please also refer to the Applicant's response to RR-029-5.9.</p>
RR-029-APDX:B-77	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 77</p> <p>Table 1 (Pg 34): NE disagrees with the Applicant's statement that: "All abundance and density data (with upper and lower 95% confidence interval values) are provided within Volume A5, Annex 5.1: Offshore and Intertidal Ornithology Baseline Characterisation Report, but not within separate</p>	<p>The Applicant is in the process of consultation with Natural England to determine, beyond doubt, which aspects of the MRSea methodology Natural England's concerns relate to. Upon confirmation, of their concerns the Applicant intends to produce a Baseline Sensitivity Report setting out the implications, if any, for the changes to the baseline characterisation upon implementation of any necessary changes to the modelling approach these concerns, which is currently anticipated to be submitted</p>

	<p>displacement matrices or the assessments of displacement, as sufficient precaution is included within the assessment process.”</p> <p>NE note that model-based density data used in CRM are not provided with 95% CIs in Volume A5, Annex 5.1. Corrected and apportioned population data are also not provided with associated CIs despite these values underpinning displacement assessments. These should be provided in due course.</p>	<p>to the ExA at Deadline 2. This will include clear presentation of 95% CI for MRSea corrected and apportioned population data.</p>
<p>RR-029-APDX:B-78</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 78</p> <p>Table 1 (Pg 36): The applicant states: “With respect to offshore ornithology, however, where Hornsea Four contributes a level of effect considered to be de minimis to overall in-combination totals these potential effects are not assessed in detail, as is standard practice. This decision-making, providing transparency on the process of considering qualifying features alone and in combination, is presented in Section 10.4 and Section 11.4.”</p> <p>NE disagree with this approach and consider that even where levels of effect are considered low, consideration should be given to potential in-combination impacts, particularly where a feature of an SPA is likely to be close to a threshold for AEol.</p>	<p>Please see Applicant’s responses to RR-029-APDX:B-81.</p>
<p>RR-029-APDX:B-79</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 79</p> <p>Table 1 pg 50, 10.4.3.44, 10.4.3.56, 10.4.4.65, 10.4.4.99: In response to the NE issue raised 19/10/2020: “Natural England requested that the following is incorporated into apportionment for the FFC SPA; wider extended breeding bio-season of March to August is considered and a range of apportionment values for postbreeding season up to 100% apportionment, excluding the use of a 10% sabbatical rate. Natural England also stated that they disagree with juveniles not being considered. As there is significant disagreement on the apportionment approach Natural England suggest that two apportionment methods are presented.”</p> <p>In response, the Applicant states: “The Applicant disagrees with this approach suggested by Natural England for the assessment of the features of the FFC SPA. The reason for not taking forward this proposed</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-44 with regards to the age structure for auks.</p> <p>Please refer to the Applicant’s response to RR-029-5.7 with regards to apportioning impacts to FFC for guillemot in August and September.</p>

	<p>apportionment is that it does not follow an evidence-led approach and the methodology does not align with other recent consented projects considering designated features from the same SPA.”</p> <p>NE continue to disagree with apportioning based on the stable age structure (Furness 2015). NE have previously requested additional information on the age structure of the guillemot and razorbill using the site, which has not been provided. NE continue to request additional information on the age structure of guillemot and razorbill using the site and on the potential importance of the site to these two species, which has not yet been provided. In the absence of this information and any evidence to suggest otherwise, NE advise that all adult-type birds are assumed to be adults.</p> <p>NE have not agreed the new approach provided for guillemot and, based on scrutiny of the methods used, advise that a more appropriate precautionary approach to apportioning impacts to FFC for guillemot in August and September will be required. Also, pending a review of the baseline characterisation data, in which we currently have very low confidence, it may also be necessary to apply a similar bespoke approach to apportioning razorbill in August and September.</p>	
<p>RR-029-APDX:B-80</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 80</p> <p>Table 4, 10.4.3.1: Razorbill is a component of the seabird assemblage feature of Farne Islands SPA. However, whilst the other auk species trigger an LSE in the breeding season, razorbill does not. This component of the assemblage should be screened in, or clarification should be provided regarding why razorbill (as a component of the seabird assemblage) has not triggered LSE.</p>	<p>The Applicant will provide clarification as to why razorbill from the Farne Islands SPA was not screened into assessment.</p>
<p>RR-029-APDX:B-81</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 81</p> <p>Section 8.2.4.6: As detailed elsewhere, NE advise that even non-significant levels of predicted mortality at a Project alone level should be added to the in-combination totals for a species. See Point 6.</p>	<p>The Applicant undertook HRA screening alone for offshore ornithology taking a very precautionary approach in response to discussion during the Evidence Plan Process (agreement OFF-ORN-5.1 to 5.9 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130))), with that level of precaution being taken into account within the subsequent in-combination assessment. In order to understand this process a summary of features and designated sites considered for each potential impact pathway that are</p>

		<p>assessed or not assessed in detail in-combination are provided in Section 11.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178).</p> <p>Therefore, for clarity and in response to the precautionary screening undertaken for offshore ornithology alone, the subsequent assessment in-combination in Section 11.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) is focused on those designated sites and species for which there is potential for a material contribution from Hornsea Four alone (as confirmed in the assessment alone in Section 10.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)). Where an effect from Hornsea Four alone was determined to be trivial and inconsequential that would be well within the error margins of the assessment (as confirmed in the assessment alone in Section 10.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)), such features and designated sites are not assessed further as there is no potential for any contribution for an in-combination effect to occur.</p>
RR-029-APDX:B-82	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 82</p> <p>Section 10.4: It is unclear in this section what seasonal definitions have been employed for the assessment for gannet and kittiwake. However, based on the Applicant's comments during consultation and the lack of consideration of the 'full' breeding seasons throughout the ES, it is concluded that the seasons for these two species revolve around the migration-free breeding periods presented by Furness (2015) and therefore do not follow NE advice. NE note that there has been some consideration of the 'full' breeding season in Volume B2 Chapter 2 RIAA Part 11. However, this is not clearly sign-posted and is contrary to all other information throughout the assessment, hindering interpretation</p>	<p>The Applicant's preferred method to assess gannet and kittiwake and the compilation of relevant bio-seasons for both species is supported from evidence from the site-specific survey data. These data provide evidence that substantial proportions of birds outside of the migration-free breeding season pass through the Hornsea Four array area. Full details of the Applicant's approach to apportionment for both kittiwake and gannet are presented in B2.2 Report to Inform Appropriate Assessment Part 11: Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177).</p> <p>The Applicant also presents an approach following what is considered to be Natural England's approach to apportionment and assessing gannet and kittiwake within the B2.2 Report to Inform Appropriate Assessment Part 11: Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177).</p>
RR-029-APDX:B-83	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 83</p>	<p>The Applicant's interpretation from discussions with Natural England through the Evidence Plan Process was to consider displacement impacts at half the level during the construction phase in comparison to the operational phase. As this is a novel</p>

	<p>Section 10.4.3.10, 10.4.3.42, 10.4.3.49, 10.4.3.54, 10.4.3.58, 10.4.3.61, 10.4.3.68, 10.4.3.94, 10.4.3.114, 10.4.3.75, 10.4.3.86, 10.4.3.104, 10.4.3.123: The method used for assessing displacement impacts during the construction phase is unclear for all species. The methods state that, for construction, the displacement rate is halved, and displacement is calculated based on this lower range, along with a 1% mortality rate for all species. There are no displacement matrices or calculations presented for these.</p> <p>It was agreed during the Evidence Plan Process that for assessing the potential displacement impacts on gannets and auks during the construction phase of Hornsea 4, the impact level to be used would be half that of the operational phase assessments. The Applicant has set out an approach whereby the standard range of displacement rates appears to be halved and then a 1% mortality rate applied. This is not what was agreed. NE advise that the displacement impacts during construction are calculated as 50% of the operational impact level (which should include the full range of displacement rates (from 30 to 70% for auks and from 60 to 80% for gannet) and mortality rates (1 to 10% for all species). These values should then be presented as a range for the predicted impacts during the construction phase.</p> <p>Please also see comments relating to concerns about displacement assessment during operation and original abundance estimates, which will need to be addressed before displacement impacts can be halved for construction.</p>	<p>method provided outside of any official guidance, the Applicant sought to apply the requested reduction to the Applicant's preferred maximum displacement rate, whilst keeping the Applicant's 1% mortality rate, despite construction impacts being both spatially and temporally limited.</p> <p>As the construction displacement assessments are directly related to the same data as the operational phase the Applicant did not provide additional displacement matrices in order to provide a proportionate assessment, though they are presented in full in Section 10.4 of B.2.2: Report to Inform Appropriate Assessment (APP-167-APP-178).</p> <p>Please refer to the Applicant's response to RR-029-5.1 with regards to the baseline data and use of MRSea.</p> <p>Please refer to the Applicant's responses to RR-029-5.7 with regards to the displacement assessment during the operational phase.</p>
RR-029-APDX:B-84	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 84</p> <p>Section 10.4.3.10, 10.4.3.11, 10.4.3.42: NE advise that mortality rates between 1 and 10% should be used to assess displacement impacts during operation. The temporal/spatial limitations of construction impacts are considered in the agreed approach to assess construction impacts by halving the impacts during operation (see Point 83). Only assessing against a mortality rate of 1% reduces these impact predictions by far more than the agreed half. We disagree that this approach is "overly precautionary".</p>	<p>Please refer to the Applicant's responses to RR-029-5.7 with regards to the auk displacement and mortality rates and RR-029-APDX:B-12 with regards to gannet displacement and mortality rates.</p>

RR-029-APDX:B-85	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 85</p> <p>Section 10.4.3.11, 10.4.3.39-10.4.3.50: Note that NE are concerned that the weighted mean approach used to calculate seasonal mean peak abundance estimates under-estimates impacts on guillemot in August and September. Please see detailed comments on Volume A5, Annex 5.2.</p>	<p>Please refer to the Applicant's responses to RR-029-5.7 with regards to the weighted mean approach.</p>
RR-029-APDX:B-86	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 86</p> <p>Section 10.4.3.17, 10.4.3.25: As definitive mortality rates for red throated divers and common scoter are unknown, NE advise a range of figures for mortality rates of between 1% and 10% are considered for assessments (for impacts from array, construction and cable laying vessels). Assessing at 1% mortality is not sufficiently precautionary.</p>	<p>The approach for the assessment of red-throated divers and common scoters from the Greater Wash SPA was agreed with Natural England (agreement OFF-ORN-2.15 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130)) as these species are only potentially present within a small section of the ECC, where cable laying vessels maybe temporarily located. As such the Applicant considers that sufficient precaution is provided when considering such a small proportion of the population is impacted for a limited period of time and that the extent of any effect is mostly outside of the SPA. Further support for the Applicant's approach to assessment of common scoter and red-throated diver within the ECC will be provided in a supplementary report submitted at deadline 2.</p>
RR-029-APDX:B-87	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 87</p> <p>Section 10.4.3.30, 10.4.3.32, 10.4.3.34, 10.4.4.9: NE do not consider that assessing at 1% mortality for gannet displacement is sufficiently precautionary. As definitive mortality rates for Gannet are unknown, NE advise a range of figures for mortality rates of between 1% and 10% are considered for assessments (for impacts from array, construction and cable laying vessels).</p> <p>NE also note that the presented assessment is based on seasonal definitions which do not align with SNCB advice.</p>	<p>Please refer to the Applicant's responses to RR-029-APDX:B-12 with regards to gannet displacement and mortality rates.</p> <p>Please refer to the Applicant's responses to RR-029-APDX:B-82 with regards to apportionment methodology.</p>
RR-029-APDX:B-88	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 88</p> <p>Section 10.4.3.44, 10.4.3.56, 10.4.4.65, 10.4.4.99: "On the basis of 56% of all the birds predicted to be displaced being breeding adult birds from the FFC SPA". NE note that the proportion of adult guillemots and razorbills used in HRA apportioning (from Furness 2015) is 60% (Volume B2 Chapter 2 RIAA Part 11).</p>	<p>Noted. The Applicant is reviewing all apportionment assumptions and evidence as part of a new Baseline Sensitivity Report, which is currently anticipated to be submitted to the ExA at Deadline 2.</p>

RR-029-APDX:B-89	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 89</p> <p>Section 10.4.3.46: NE do not agree with the 13% weighted apportioning value used here or the current weighting approach assigned as the NE worst case scenario. NE advise that the merits of a bespoke approach to apportionment for guillemot to FFC SPA in August and September should be investigated. (See comments on Volume B2 Chapter 2 RIAA Part 11).</p>	Please see the Applicant's response to RR-029-5.7 with regards to the apportionment process.
RR-029-APDX:B-90	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 90</p> <p>Section 10.4.4.16, 10.4.4.28, 10.4.4.44, 10.4.4.51, 10.4.4.53, 10.4.4.60, 10.4.4.72, 10.4.4.75, 10.4.4.154, 10.4.4.175, 10.4.4.177: NE do not support the use of a single displacement rate or mortality rate, and do not consider that the evidence justifies a 50% displacement rate and 1% mortality rate being defined as precautionary. NE advise that, for auk species, assessment should include a range of displacement rates between 30 and 70% and a range of mortality rates between 1 and 10%. These values should then be presented, as a range, for the predicted impacts.</p>	Please refer to the Applicant's responses to RR-029-5.7 with regards to auk displacement and mortality rates.
RR-029-APDX:B-91	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 91</p> <p>Section 10.4.4.48, 10.4.4.61, 10.4.4.69, 10.4.4.98, 10.4.4.99, 10.4.4.128, 10.4.4.129: Due to the high degree of uncertainty surrounding sabbatical rates (i.e adults that are part of the breeding population but do not participate in breeding activities in some years), NE have not agreed to their use within impact assessments. If the Applicant can provide robust evidence for site-specific sabbatical rates, including seasonal variations then this could be considered when undertaking PVA modelling. However, where there is significant uncertainty around sabbatical rates the precautionary approach is to assume no adults within the site are on sabbaticals.</p> <p>Thus, NE suggest the Applicant should supply evidence demonstrating: a) the proportion of birds that take sabbaticals; b) whether the population estimates at an SPA exclude sabbaticals; and, c) whether sabbaticals return to the sea area around the colony. This should inform if/how sabbaticals are best incorporated in a PVA.</p>	In line with the guidance from SNH on apportionment methods (SNH, 2018) for the breeding season, this includes for the provision of sabbatical rates. The sabbatical rates used by the Applicant are based on those agreed by SNH and Marine Scotland Science (the Scottish consenting body) for three recently consented OWFs within the Forth and Tay, which had similar species and SPA assessments to consider. Further evidence in relation to sabbatical rates will be provided within the assessment sensitivity report the Applicant intends to submit during examination.

RR-029-APDX:B-92	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 92</p> <p>Section 10.4.4.57, 10.4.4.92, 11.4.3.42, 11.4.3.67: NE suggest that the proximity of the project area to FFC SPA and the high densities of guillemot and razorbill that appear to be present in August and September, could indicate functional linkages with the SPA colony that warrant consideration of SPA conservation objectives beyond population abundance i.e. in relation to supporting habitats.</p>	<p>Noted. RR-029-5.6The Applicant provided an extensive assessment considering both guillemot and razorbill from the FFC SPA and where the most important areas of sea were for foraging both within the breeding and post-breeding dispersal periods. The narrative supporting this and figures presenting available data on their distribution within the region of interest are presented for guillemot in Sections 10.4.4.82 through to 10.4.4.91 and for razorbill in Sections 10.4.4.110 through to 10.4.4.119 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). These sections demonstrate the most important areas of sea for this species are more distant from the Hornsea Four array area and in particular are closer to the FFC SPA colony during the breeding period and to a considerable distance to the south of the array area during the post-breeding period.</p> <p>The Applicant is currently considering what further evidence may be required to be submitted in response to Natural England's indication of areas of the North Sea that may have functional linkages or be supporting habitats to the FFC SPA. This will be submitted to the ExA at Deadline 5.</p>
RR-029-APDX:B-93	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 93</p> <p>Section 10.4.4.67: NE considers that the Applicant needs to provide further evidence to support their position of 25% of guillemot being from colonies other than FFC SPA. NE recognise that the Applicant has considered a case where 100% of birds are attributable to FFC SPA for the NE worst-case scenario, but we do not agree with other aspects of the 'NE approach' which have not been agreed with the Applicant.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-82 with regards to the apportionment process.</p>
RR-029-APDX:B-94	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 94</p> <p>Section 10.4.4.68: NE do not agree with the reduction in the estimated proportion of adult guillemot in the array area in August and September from a generalised stable age structure. NE request further evidence be provided on the site-specific age structure of guillemot using the site. In the absence of this information and any evidence to suggest otherwise, NE advise that all adult-type birds are assumed to be adults.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-44 with regards to age structure.</p>

RR-029-APDX:B-95	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 95</p> <p>Section 10.4.4.71: NE do not agree with the current approach to calculating seasonal mean peak abundance for guillemot, or for apportionment of guillemot in August and September to FFC SPA. See Point 50.</p>	<p>Please refer to the Applicant’s response to RR-029-5.7 with regards to the weighting of seasonal abundances and RR-029-APDX:B-82 with regards to the apportionment process.</p>
RR-029-APDX:B-96	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 96</p> <p>Table 15 & 17: NE note that counterfactuals of population size have not been provided. See Point 60.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-18 with regards to use of CFPS from PVA.</p>
RR-029-APDX:B-97	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 97</p> <p>Section 10.4.4.82, 10.4.4.83, 10.4.4.84, 10.4.4.88, 10.4.4.89, 10.4.4.114-10.4.4.118, 10.4.4.377, 10.4.4.378: We note that the Applicant concludes that the Flamborough Front is not of particular relevance to the Hornsea Project 4 area, however they have provided very little evidence to substantiate this. NE do not agree that the DAA can be shown to completely avoid the Front. Given that the Front is not fixed, it is entirely possible that the position may coincide with the project area at different times of year and that this may strongly influence bird distributions.</p> <p>NE note that the DAA likely excluded an area of high productivity for sandeels (Langton et al. 2021) which are likely to be a key resource at this time of year as birds are preparing for winter and are with dependent chicks. However, we note that Volume A5, Annex 3.1 (pg 56) states that “sandeel habitats, and therefore potential spawning habitats, are present within the Hornsea Four array area, coinciding with the sandy areas throughout the centre of the array area.” The Fish and Shellfish ES chapter (A2.3) also states that “The Hornsea Four offshore section of the proposed ECC and the array area are located within areas classified as ‘preferred’ potential sandeel spawning and nursery habitats (Figure 3.5)”.</p> <p>We therefore welcome the exclusion of the areas of high use during the DAA which are likely to reflect good sandeel foraging habitat, but do not consider that sufficient evidence has been provided to rule out connectivity between the front, project and seabirds using the area. NE require further</p>	<p>The Applicant welcomes Natural England’s acknowledgement that the area of sea to the south of the Hornsea Four array area removed from the original AfL is beneficial to sandeels.</p> <p>Please see the Applicant’s response to RR-029-APDX:B-92 with regards to the Flamborough Front.</p>

evidence to be able to rule out the potential importance of both the Flamborough Front and wider prey availability issues in the immediate vicinity of the project on the success of birds at FFC SPA.

NE also do not agree that sufficient information has been provided to draw robust conclusions regarding the importance of the Hornsea 4 array area for auk species. We highlight that the baseline characterisation data for Hornsea 4 continues to identify high densities and abundances of auks, within the array and 2 km buffer during August and September even with the revised DAA. As noted elsewhere, guillemot and razorbill may be particularly vulnerable to impacts at this time of year and the location of the array within an area where there is sandeel habitat that may be influenced by the Flamborough Front, suggests the area is potentially an important foraging area for these species. Thus, the potential effects of displacement and possible barrier effects may result in greater impacts due to heightened sensitivity. We note that no attempt has been made to consider barrier effects for these species during August and September.

NE have previously requested evidence to consider the importance of the array area for these species year-round, not just during the breeding season. This has not been presented. The evidence the Applicant currently uses to conclude the lack of importance of the area relates entirely to the late incubation and early chick rearing periods of the breeding season, and therefore cannot be used to draw conclusions on the importance of the site in August and September. Given that, according to the Applicant, this period includes "the time periods where guillemots are most sensitive to disturbance and displacement effects", we do not agree that the use of the upper ranges of the displacement and mortality rates can be discounted as "overly precautionary". Without further evidence and consideration, we also cannot agree that that there is no potential for impacts on auks due to barrier effects. We consider that further exploration of the importance of this area and potential for barrier effects is necessary, particularly given the close proximity of the array area to the FFC SPA colony. See Point 50 for further details on the evidence needed.

<p>RR-029-APDX:B-98</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 98</p> <p>Section 10.4.4.100, 10.4.4.104, 10.4.4.106, 10.4.4.109: It is stated that “the proportion of the BDMPS populations from FFC SPA during migratory bio-season of 3.38% and during the winter bio-season of 2.74% was agreed as appropriate by Natural England during the Norfolk Boreas examination (Natural England 2020) and for this project through the EP process (OFF-ORN-6.13 B1.1.1 Evidence Plan).”</p> <p>However, at this time, NE also advised that a bespoke approach for apportioning ‘auks’ in the months immediately following the breeding season may be required (Evidence Plan reference: OFF-ORN-6.12).</p> <p>This is because the apportionment approach followed for Norfolk Boreas is not appropriate for Hornsea 4, due to the proximity of Hornsea 4 to the breeding colony at FFC SPA, and the high abundances of razorbill in August and September. NE have previously expressed concerns about these peaks in abundance and requested additional evidence on the age structure of the birds using the site and on the potential importance of the site to razorbill. This has not been provided. Consequently, given these apparent peaks in density and abundance of razorbill in August and September, and following inspection of any revised density and abundance estimates for razorbill, the merits of a bespoke approach to apportionment in August and September for razorbill should be investigated.</p>	<p>Please refer to the Applicant’s response to RR-029-5.7 with regards to the weighting of seasonal abundances and RR-029-APDX:B-82 with regards to the apportionment process.</p>
<p>RR-029-APDX:B-99</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 99</p> <p>Section 10.4.4.124, 10.4.4.145, 10.4.4.164, 10.4.4.165, 10.4.4.185, 10.4.4.186: NE do not support the use of a single displacement rate, and do not consider that the evidence justifies a 50% displacement rate being defined as precautionary. NE advise that, for Puffin, assessment should include a range of displacement rates between 30 and 70% and a range of mortality rates between 1 and 10%. These values should then be presented, as a range, for the predicted impacts.</p>	<p>Please refer to the Applicant’s response to RR-029-5.7 with regards to auk displacement and mortality rates.</p>

RR-029-APDX:B-100	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 100</p> <p>Section 10.4.4.232, 10.4.4.234: It is unclear what breeding season is being assessed throughout but based on evidence elsewhere we assume that it is the non-migratory breeding season for which the results are reported rather than the 'full' breeding season. We request that results for both approaches are presented. Further, we note that the Applicant did submit age data for gannet previously, but this has now been removed without justification.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-82 with regards to the apportionment process (and make up of seasons for the assessment of Hornsea Four alone).</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-44 with regards to age structure.</p>
RR-029-APDX:B-101	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 101</p> <p>Section 10.2.2.236, 10.2.2.237: NE do not agree that sabbaticals should be considered during apportioning of gannet impacts to SPAs. We acknowledge that the Applicant has taken this into consideration for the NE approach to apportioning, however we do not agree with the adult apportioning rate applied on our behalf and consider that site-specific data should be used instead.</p> <p>Further, NE note that in a previous draft iteration of the document, the Applicant had provided site-specific information on the adult apportioning for gannet which suggested a much higher rate than that currently considered. Ageing data for gannet from relevant surveys should be used instead of the generalised stable age-structure throughout the apportioning.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-91 with regards to the use of sabbaticals and apportionment.</p>
RR-029-APDX:B-102	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 102</p> <p>Section 10.4.4.374, 10.4.4.377: NE note that this suggests that barrier effects are only considered for operations and maintenance (O&M) whilst 10.4.4.377 suggests construction is considered.</p> <p>Further, NE note that barrier effects have only been considered for guillemot, razorbill and puffin – not for gannet, which are also assessed for displacement, or kittiwake. This is at odds with the EIA assessment which only examined barrier effects in relation to fulmar, gannet and kittiwake. NE notes that barrier effects could begin during construction, in line with displacement, and should therefore be considered. Include consideration of</p>	<p>The HRA Screening (B2.2, Appendix A: Habitat Regulations Assessment Screening Report (APP-168)) informed the process followed to underpin the assessments. The species taken through for barrier effect within B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178) were agreed with Natural England as guillemot, razorbill and puffin from the FFC SPA only.</p>

	barrier effects for gannet and kittiwake or provide justification for how they have been screened out.	
RR-029-APDX:B-103	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 103</p> <p>Section 11.4: NE agree that all relevant offshore wind farm projects have been considered for the in-combination assessment. However, we note that the range of predicted Hornsea 4 impacts are not considered in the assessments.</p> <p>Natural England request that the minimum and maximum in-combination predicted impacts (based on the central values for other projects and the range for Hornsea 4) are provided to allow consideration of uncertainty around estimates and confidence placed in conclusions.</p>	<p>The Applicant welcomes Natural England’s agreement that all relevant OWFs are included within the in-combination totals.</p> <p>The Applicant presented central estimates for consideration of all projects in order to provide a level playing field approach to assessing in-combination impacts. It is the Applicant’s position that this allows for the most reliable assessment of cumulative and in-combination assessments to be undertaken which reduces any inherent bias that may result from including minimum and maximum values for an individual project that may then lead to under or over-inflated values being used.</p>
RR-029-APDX:B-104	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 104</p> <p>Section 11.4.3.3 – 11.4.3.6 & Table 39: NE consider that an in-combination assessment for red-throated diver and common scoter should be undertaken despite the alone assessment concluding the potential for no material contribution to baseline mortality. If the predicted impacts do not exceed 1% baseline mortality thresholds within the displacement mortality range considered by NE for the species, then they do not need to be considered further.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-81 with regards to the methods regarding in-combination assessment for ornithology.</p>
RR-029-APDX:B-105	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 105</p> <p>Section 11.4.3.42, 11.4.3.67: NE also suggest that the proximity of the project area to FFC SPA, and high densities of guillemot and possibly razorbill that appear to be present in August and September, could indicate functional linkages with the SPA colony that warrant consideration of SPA conservation objectives beyond population abundance i.e. in relation to supporting habitats.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-92 with regards to this point.</p>
RR-029-APDX:B-106	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 106</p> <p>Table 44: NE note that some of the totals in Table 4 appear to have small summing errors (presumably rounding related).</p>	<p>Noted. The Applicant provided values in the in-combination table rounded up or down to the nearest whole number. The true values may include a number of decimal places, not provided in this table (or others) to make it clearer.</p>

		The Applicant intends to continue to review all in-combination values included within the assessment and should any revisions be required for different reasons then these will be considered and re-submitted to the ExA during the examination.															
RR-029-APDX:B-107	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 107</p> <p>Section 11.4.3.54, 11.4.3.57, 11.4.3.59, 11.4.3.78, 11.4.3.81, 11.4.3.83, 11.4.3.106, 11.4.3.109, 11.4.3.111: NE notes that only the Applicant's 'evidence-led' approach to apportioning is applied to the NE range of displacement and mortality rates. This does not represent our advice for the assessment, and we note that NE disagree with the weighted approach to apportioning guillemot to FFC SPA. Furthermore, NE do not support the use of the stable age structure method for estimating adult proportions or the exclusion of sabbaticals (see Point 91).</p>	<p>Please refer to the Applicant's responses to the following with regards to;</p> <ul style="list-style-type: none"> • RR-029-APDX:B-82 with regards to apportionment; • RR-029-5.7 with regards to the weighted mean approach; • RR-029-APDX:B-44 with regards to the age structure; and • RR-029-APDX:B-91 with regards to sabbaticals. 															
RR-029-APDX:B-108	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 108</p> <p>Table 48: NE note that some of the totals in Table 48 appear to have small summing errors (presumably rounding related).</p>	Please refer to the Applicant's response to RR-029-APDX:B-106 with regards to this point.															
RR-029-APDX:B-109	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 109</p> <p>Section 11.4.3.93,-11.4.3.111, Table 52: NE note that some of the totals in Table 52 appear to have small summing errors (presumably rounding related).</p> <p>The estimates of the percentage of baseline mortality discussed in the text for puffin in-combination impacts at FFC appear to be incorrect in several places, for example: Given the baseline mortality of 336 adults (mean pop of 3759 latest sea counts), 1% = 3.36 individuals.</p> <table border="1"> <thead> <tr> <th>Impact</th> <th>Applicant estimate</th> <th>NE estimate</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>0.84</td> <td>0.893</td> </tr> <tr> <td>5</td> <td>1.39</td> <td>1.488</td> </tr> <tr> <td>10</td> <td>2.85</td> <td>2.976</td> </tr> <tr> <td>73</td> <td>21.55</td> <td>21.73</td> </tr> </tbody> </table> <p>These estimates need to be reviewed.</p>	Impact	Applicant estimate	NE estimate	3	0.84	0.893	5	1.39	1.488	10	2.85	2.976	73	21.55	21.73	Please refer to the Applicant's response to RR-029-APDX:B-106 with regards to this point.
Impact	Applicant estimate	NE estimate															
3	0.84	0.893															
5	1.39	1.488															
10	2.85	2.976															
73	21.55	21.73															

RR-029-APDX:B-110	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 110</p> <p>Section 11.4.3.123, 11.4.3.124, Table 55: NE note that where the Applicant has suggested 'de minimis' contribution to any increase in baseline mortality (typically less than 1 individual), they rule out in-combination assessments as impacts are 'insufficient to result in a material contribution to any incombination effect'. As noted in Point 4, Natural England disagrees with this approach and considers that herring gull should be screened in for cumulative assessments.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-81 with regards to Applicant's methodology for considering in-combination effects.</p>
RR-029-APDX:B-111	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 111</p> <p>Table 56: NE note that some of the totals in Table 56 appear to have small summing errors (presumably rounding related).</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-106 with regards to this point.</p>
RR-029-APDX:B-112	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 112</p> <p>Section 11.4.3.159: NE cannot recreate the estimate of 1.11% baseline natural mortality given an impact of 289 birds relative to a baseline mortality of 15,048 for kittiwake. We have 1.92%. The calculations should be checked throughout this section.</p>	<p>The Applicant welcomes Natural England's comment and can confirm that the total number of collisions used in the calculation should be 227 breeding adults as stated earlier in the same paragraph and not 289 that is referred to later in the same paragraph.</p> <p>The Applicant intends to review all in-combination values, including those for Hornsea Four, included within the assessment and should any revisions be required then these will be considered and re-submitted to the ExA at the earliest point during the examination (currently anticipated to be Deadline 3).</p>
RR-029-APDX:B-113	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1- Point 113</p> <p>Section 13 & Table 62 alone & Table 63: NE cannot present a view on the summary for offshore ornithology and conclusions in relation to Adverse Effects due to concerns relating to the baseline data used, elements of the assessment methodology and the assessment not being presented in line with SNCB advice.</p>	<p>Noted – the concerns raised are addressed as applicable elsewhere in this response.</p>

3.18 Detailed Comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-114	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 114</p> <p>General comment: NE note that the impacts being included in this chapter and carried through PVA may be subject to change based on potential modification of the baseline characterisation approach and NE advice.</p> <p>NE note that, despite our requests and their previous inclusion in draft versions of the chapter, the counterfactuals of final population size are not included throughout this Chapter. NE consider it important that this information is presented to allow full consideration of all available diagnostic metrics in light of known population trends.</p>	<p>Please refer to the Applicant's response to RR-029-5.1 with regards to the baseline.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-18 with regards to the presentation and use of CPGR and CFPS from PVA.</p>
RR-029-APDX:B-115	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 115</p> <p>Section 1.2.1.3: NE note that, in line with the RIAA Part 1, herring gull at FFC SPA have been excluded from PVA modelling without clearly ruling out in-combination LSE (i.e. 1% baseline natural mortality). Please confirm that in-combination collision impacts on herring gull do not exceed 1% baseline mortality of the FFC population.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to methodology and approach to in-combination assessments.</p>
RR-029-APDX:B-116	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 116</p> <p>Section 2.2.1: NE note there is no reference to the use of a 'burn-in' period or justification for why one has not been included despite advice from NE to apply one. NE recommend the use of a burn-in period to ensure that the age structure is stable when starting to run the main PVA calculations – the burn-in period is used to estimate the equilibrium age structure.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-59 with regards to exclusion of a 'burn in' rates in the PVAs.</p>

RR-029-APDX:B-117	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 117</p> <p>Section 2.2.1.8: See Point 60 for Natural England’s rationale on the inclusion of the population size counterfactual.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-18 with regards to the presentation and use of CFGR and CFPR from PVA.</p>
RR-029-APDX:B-118	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 118</p> <p>Section 2.2.2.2 & Table 1: Natural England agrees with the mean and SD values for productivity used in the PVA models for gannet, razorbill and guillemot for FFC SPA.</p> <p>For kittiwake, Hornsea 4 has used a mean productivity value of 0.722 (SD 0.210). This has been calculated for the period 2009- 2019 and includes data from the Filey Plots. The mean value represents a weighted mean, with the weighting according to the proportion of the total population present in Flamborough Head and Bempton Cliffs SPA versus Filey (0.88 cf 0.12). It is not clear why some of the plot sites have been combined and an aggregated mean calculated whereas others are kept separate. For example, Filey plot data are presented as combined data across all the Filey plot sites whereas the Flamborough and Bempton plot data are presented as a mix of combined plot sites (e.g. Grandstand sites are aggregated) and individual plot sites (e.g. Jubilee Far). All the plot sites are designed to include around 50 nest sites and so are of equivalent size.</p> <p>Natural England advise using a productivity rate of 0.580 (SD 0.096) for PVA models for the kittiwake population of FFC SPA. This represents the mean productivity across all plots in Flamborough/Bempton and Filey for the period 2012-2019 which represents the period when productivity plots were covered in both Flamborough/Bempton and Filey areas of the FFC SPA.</p> <p>However, during the Evidence Plan process Natural England initially agreed to the use of a kittiwake productivity rate of 0.722 +/- 0.210 (2009-2017) in the PVA, whilst noting during the period used to calculate the rate used in the assessment, productivity at FFC SPA has consistently and significantly declined, with the last three breeding seasons (2017-19) having productivity</p>	<p>Please see Applicants response to RR-029-APDX:B-W in relation to FFC SPA kittiwake productivity.</p> <p>The Applicant is currently reviewing a number of different elements used throughout the assessment process and should PVAs be required to be re-run then comments relating to different input parameters will also be reconsidered.</p>

	<p>rates of approx. 0.55 (and 0.532 if taken over the last 4 years 2016-2019) (lloyd et al. 2019).</p> <p>The results of the current kittiwake PVA may therefore present an optimistic picture of impact on colony growth rates, which would reinforce the conclusion of AEOL in-combination. Should the PVA modelling need to be rerun for kittiwake, Natural England advise using 0.580 (0.096) as the productivity value for kittiwake.</p>	
RR-029-APDX:B-119	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 119</p> <p>Section 3.2.1.2: NE requests that displacement impacts on gannet also be assessed against a 1-10% range of mortality rates.</p>	Please refer to the Applicant’s response to RR-029-APDX:B-12 with regards to gannet displacement and mortality rates.
RR-029-APDX:B-120	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 120</p> <p>Section 4.2.1.1: NE strongly disagree with the use of adult apportioning based on stable age structure data. The Applicant states:</p> <p>“These data are presented in Furness (2015) and are considered to provide a more accurate representation of population age structure than site-based data, since only a small proportion of individuals for each species could be positively aged within the latter. Furness (2015) draws upon a wide number of data sources gathered across multiple years in order to model population age structure, thus reducing the potential for any bias associated with the snapshot nature of site-based surveys.”</p> <p>NE disagree with this approach as it is unlikely that a stable age structure, generalised across multiple years and sea areas, is likely to be representative of the Hornsea 4 area. Instead, we advise that where site-specific ageing data, for species that can be clearly aged as adults or sub-adults, such as gannet, is available from either relevant digital aerial survey (DAS) or boat-based surveys, these should be used. We note that this was the case for gannet in a previous iteration of this report that NE reviewed, but this information has now been excluded from the RIAA.</p>	Please refer to the Applicants response to RR-029-APDX:B-82 with regards to apportionment and RR-029-APDX:B-44 with regards to age structure.

	<p>Where good quality site-specific ageing data is not available, then NE recommend that the precautionary approach is to assume that all 'adult type' birds (i.e. birds that cannot be distinguished from adults, and hence might be adults) are apportioned as adults. We also suggest that the proportions of adults present should be season-specific to account for any seasonal variations in the use of the site. Tables illustrating the proportions of key species surveyed that were aged by month and the associated proportions that were adults should be provided. This should consider DAS data and the same boat-based survey data used to derive the proportions of birds at collision height used in sCRM Band Option 1.</p>	
<p>RR-029-APDX:B-121</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 121</p> <p>Section 4.2.1.2, Table 2: NE have not endorsed the use of sabbatical rates to exclude sabbatical birds from impact assessment. Any non-breeding adults present are likely to form part of the breeding population the previous and/or following year. They can therefore not be excluded from consideration as they form part of the adult breeding population. Considering this, NE requests further justification and evidence to support the use of sabbatical apportioning at Hornsea 4.</p>	<p>Please refer to the Applicants response to RR-029-APDX:B-82 with regards to apportionment and RR-029-APDX:B-91 with regards to sabbaticals.</p>
<p>RR-029-APDX:B-122</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 122</p> <p>Table 2: Please see comment on section 4.2.1.1 above. NE note that in previous iterations of the RIAA seen by NE, the Applicant presented site-specific age data for gannet which has seemingly been removed in favour of a more general approach. This suggested that 92.2% of birds across all months of the year were adults. The current approach to apportioning uses the stable age structure approach Furness (2015) which results in a much lower proportion of birds being assigned as adults.</p> <p>No discussion is presented in relation to the ageing data previously considered. A justification for the use of a generic adult apportioning value</p>	<p>Please refer to the Applicants response to RR-029-APDX:B-44 with regards to age structure.</p>

	<p>for gannet which was previously based on site-specific data should be provided.</p>	
RR-029-APDX:B-123	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 123</p> <p>Section 4.2.2.3, 4.2.2.7, Table 3: NE note the Applicant's consideration of a weighted approach to apportioning for guillemot. However, NE do not agree with this approach, as we consider it to significantly underestimate the potential impacts to guillemot at FFC SPA during August and September. See Point 50.</p> <p>Furthermore, NE do not agree with the application of the stable age structure method for estimating adult proportions. NE previously requested additional information on the age structure of the guillemot using the site, which has not been provided. In the absence of this information and any evidence to suggest otherwise, NE advise that all adult-type birds are assumed to be adults.</p>	<p>Please refer to the Applicants response to RR-029-APDX:B-82 with regards to apportionment and RR-029-APDX:B-44 with regards to age structure.</p>
RR-029-APDX:B-124	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 124</p> <p>Section 4.2.2.4: "To account for this likely greater proportion of juveniles than the rest of year, the proportion of adult birds was reduced to 50% of guillemots recorded."</p> <p>As discussed in Point 120, NE do not agree with the use of the stable age structure approach or the justification for the reduction in adults given the available evidence. Age structures should be calculated from the baseline survey data.</p> <p>It is not clear to what extent juvenile birds (which are considerably smaller than adult birds) were able to be detected during baseline surveys. If the aggregations of guillemot and razorbill recorded in August and September are made up of adult moulting birds, it is indeed possible that there is a greater proportion of adults than is given by the stable age structure. In addition, if the sexes of birds are present in significantly different proportions (e.g. more males with attendant chicks), there may be disproportionate</p>	<p>Please refer to the Applicants response to RR-029-APDX:B-44 with regards to age structure.</p>

	<p>impacts on the numbers of breeding pairs at the colony. Additional evidence requested to resolve some of these issues has not been presented.</p>	
<p>RR-029-APDX:B-125</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 125</p> <p>Section 4.3.1.2, Table 5: NE do not agree that the approach presented here should be called the "Natural England WCS method", as we disagree with two crucial aspects of it:</p> <ul style="list-style-type: none"> -NE do not support the use of the stable age structure approach and request site-specific ageing data is detailed and used to inform adult apportioning. In the absence of site-specific data, all adult-type birds should be assumed to be adults. -NE do not support the use of the weighted approach, which we believe will misrepresent impacts in August-September and October-February. 	<p>Please refer to the Applicants response to RR-029-5.7 with regards to the weighting approach and RR-029-APDX:B-44 with regards to age structure.</p>
<p>RR-029-APDX:B-126</p>	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 126</p> <p>Section 5.2.2.1, 5.2.2.2, Table 7 & Table 8: We note that the Applicant includes a footnote to Table 7 which appears to suggest that the NE advised seasons for gannet were considered in relation to the project collision risk numbers based on the NE approach. This appears to be the first time it is mentioned in any of the submitted documents.</p> <p>Further, the Applicant appears to have only considered a single collision mortality estimate for the Applicant's and the NE scenarios for the project, but it is not clear what these are based on in this section (e.g. Applicant's approach central values and NE upper CIs). Clarification is needed on whether the numbers are based on the NE advised seasons and whether this was the case solely for CRM in this document.</p>	<p>The Applicant consulted on all the data presented within the gannet in-combination values for other projects and gained agreement on these totals before the application. These values are in line with their advice received through the Evidence Plan Process (agreement OFF-ORN-6.8, 6.9 & 6.10 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130))).</p> <p>The Applicant also consulted on Natural England's position with regards to their preferred make-up of bio-seasons and which months to include. The table notes in Table 7 and Table 8 of B2.2 Report to Inform Appropriate Assessment Part 11: Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177) are in line with their advice received through the Evidence Plan Process (agreement OFF-ORN-6.8, 6.9 & 6.10 as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan (APP-130))).</p> <p>To clarify, the values attributed to Natural England's approach is based on the mean collision estimates presented in Appendix A of A5.5.3 ES Volume A5 Annex 5.3</p>

		<p>Offshore Ornithology Collision Risk Modelling (APP-076), using the full breeding bio-season months for gannet and kittiwake as specified in the table notes in Table 7 and Table 8.</p>
RR-029-APDX:B-127	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 127</p> <p>Section 5.2.3.1 -5.2.3.2 & Table 9-12: NE note that values up to Hornsea 3 are not included in the table. It is also unclear what seasonal definitions have been adopted for the NE approach.</p> <p>Further, the Applicant appears to have only considered a single impact estimate for the Applicant's and the NE scenarios for the project, but it is not clear what these are based on in this section (e.g. Applicant's approach central values and NE upper CIs). NE advises that the upper and lower confidence intervals should be presented and considered in relation to the potential impacts modelled to illustrate the underlying uncertainty.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-126 with regards to the consultation process and seasonal monthly make-up.</p> <p>The values up to Hornsea Three are presented as a single value according to the values agreed with Natural England through recent examinations for other OWF projects and are provided in detail with the respective in-combination sections within the RIAA (B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)) for each species of interest. In order to reduce repetition and the provide a more concise data set within B2.2, Appendix H: Offshore Ornithology Flamborough and Filey Coast (FFC) Special Protection Area (SPA) Population Viability Analysis (APP-177) projects up to Hornsea Three were summed.</p> <p>Please refer to the Applicant's response to RR-029-APDX:B-103 with regards to the use of central estimates in in-combination tables.</p>
RR-029-APDX:B-128	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 128</p> <p>Table 12: NE cannot reproduce the in-combination estimates up to Hornsea Project Three based on the Applicant's values provided in the RIAA chapter for each project. This indicates some checking is required.</p>	<p>Noted.</p> <p>The values within Table 12 are consistent with those used for the in-combination assessment within the Section 11.4 of B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178). The Applicant is currently reviewing a number of different elements used throughout the assessment process and should any material errors be identified then PVAs can be re-run.</p>
RR-029-APDX:B-129	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 129</p> <p>Section 6.2.1.1, 6.2.2.1, Table 13, Table 14: NE again note that, despite a footnote appearing for Table 14, it has not been made clear what seasonal definitions have been used for gannet and kittiwake for the NE approach. Please clarify what seasonal definitions have been used for which assessment and ensure that NE advice is followed for the NE approach throughout the assessment process.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-126.</p>

RR-029-APDX:B-130	<p>Detailed comments: Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 11: Offshore Ornithology FFC SPA Population Viability Analysis- Point 130</p> <p>Section 6.3.1.1, 6.3.2.1, Table 15, Table 16: In contrast to gannet above, there is no footnote for kittiwake to suggest that the NE advice on seasonality has been followed.</p>	<p>The footnote for Table 15 is at the foot of the page and not the foot of the table.</p> <p>Please also refer to the Applicant's response to RR-029-APDX:B-126.</p>
-------------------	---	---

3.19 Detailed Comments: Volume F2.19 Outline Ornithological Monitoring Plan.

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:B-131	<p>Detailed comments: Volume F2.19 Outline Ornithological Monitoring Plan.- Point 130</p> <p>General: We welcome the inclusion of the overarching monitoring approach for the Hornsea Zone and the initial outlines of monitoring objectives. We consider that these will likely need expanding upon to provide a robust monitoring framework. We note that comments raised in Appendix A, Annex A in relation to the Outline Marine Monitoring Plan also apply to the OOMP.</p>	Noted.

4 Appendix C - Derogation Case

4.1 Advice on proposed compensation measures: Kittiwake and gannet offshore structures

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-A	<p>Compensation - Advice on the proposed compensation measures Kittiwake and gannet offshore structures</p> <p>Offshore Artificial Nesting Structures (ANS), either new or repurposed, are proposed as the primary compensation measure for kittiwake, with seagrass restoration acting as a resilience measure. A review of the existing evidence base, further informed by targeted survey effort, has been provided to support the offshore artificial nesting compensation measure. We consider the measure has potential ecological relevance and that it is</p>	<p>The Applicant welcomes that Natural England consider offshore nesting structures have ecological relevance and are technically feasible for kittiwake. The Applicant is currently progressing structure design and refining the site selection stage of the measure.</p> <p>The Applicant submitted further site selection information in November 2021 to Natural England and requested advice on a short-list of three locations for a new artificial nesting structure. Further engagement on the locations has been undertaken</p>

	<p>technically feasible, subject to development of detailed designs. However, we highlight that a specific location or locations has not been identified for the delivery of this measure, which significantly reduces the confidence that the measure is secured.</p>	<p>with other key stakeholders. The Applicant is pleased Natural England agree that the search areas appear appropriate and agrees with the order of preference for the short-listed locations (and the other stakeholders consulted) (Site Selection Memo - Natural England Response 171221). Site investigations have commenced with a geophysical survey undertaken in January 2022 with initial results expected in April 2022. The Applicant has held discussions with Natural England on the preferred locations for a new and repurposed structure to increase their confidence in securing the measure.</p>
<p>RR-O29-APDX:C-B</p>	<p>Compensation - Advice on the proposed compensation measures Kittiwake and gannet offshore structures</p> <p>Furthermore, it remains unclear if nesting habitat is a limiting factor for the breeding population of kittiwake in the southern North Sea. This is a key uncertainty that needs addressing to have full confidence in the measure. We are further concerned that a commitment has only been made to provide a single structure with a lead in time of 1-2 breeding seasons before first generation. We consider this to be very high risk and note that is a substantial reduction in the compensation proposed and accepted by SoS for Hornsea Project 3, where four structures capable of providing the calculated number of nests were deemed necessary to provide appropriate resilience, with a four-year lead in. We do not consider that this approach would allow for the compensation to be delivered prior to impact occurring, and it would significantly limit resilience in the measure over the lifetime of the project. It should also be noted that the measure aims to recruit kittiwake to the wider East Atlantic population which FFC SPA sits within, rather than directly benefit the impacted site.</p>	<p>As presented within the Applicant's B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189) and B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187), there is a large body of evidence which exists to support the measure if delivered both onshore or offshore.</p> <p>Within the aforementioned documents, the Applicant presents evidence indicating that nesting habitat is likely to be a limiting factor in the southern North Sea. For example, birds have attempted to nest on the ground at Minsmere in Suffolk (indicating a lack of alternative nesting sites). Furthermore, there is clearly a lack of suitable natural nesting habitat for kittiwake as many birds have previously, or currently, choose to nest inland on roofs, light fittings, lamp posts and other sub-optimal nesting habitat. As the species is a colonial nester, this is clear evidence that suitable nesting habitat is highly limited.</p> <p>The Applicant is aware that both Hornsea Three, Norfolk Boreas and Norfolk Vanguard OWF were granted consent on the basis that an onshore artificial nesting structure would be delivered to provide additional nesting capacity as natural nesting habitat for kittiwake is limited.</p> <p>In an offshore context, Section 3.2 of the B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187) report determined from the evidence base that while offshore populations of kittiwake are increasing, it is highly likely that they are restricted by the availability of appropriate nesting habitat at some locations. The Evidence Report concluded that colony size and</p>

productivity rates at many offshore sites will increase if suitable additional nesting spaces are provided, with specially designed offshore sites potentially being able to provide a vital refuge to buffer against declining coastal populations. It is also imperative to add that all current offshore nesting locations are not designed for optimal kittiwake nesting habitat, with many locations due to be decommission over the lifetime of the Hornsea Four project.

As the Applicant is the first developer to propose the provision of additional offshore nesting habitat, to gather the evidence and has made significant headway to secure such compensation, the Applicant is confident that the evidence base supports the proposed compensation measure, that it will be effective and can be delivered.

The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation that the Applicant is aiming for is illustrated in [B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap \(APP-188\)](#).

The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England's comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.

The evidence demonstrates that the provision of adequate nesting space can be delivered on either one new or repurposed artificial nesting structure and is presented in support of each of the compensation measures:

- [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);**

Compensation proposed by the Applicant is proportionate to the scale of the impact for Hornsea Four.

The Applicant is confident that the required compensation population can be readily delivered at both a new and repurposed offshore structure with the use of optimal kittiwake nesting habitat design and measures (such as decoys and play back of kittiwake calls) to encourage colonisation and recruitment.

The Applicant has proposed the provision of additional artificial nesting opportunities for kittiwakes within the specified search zones 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 as part of the east Atlantic breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud *et al.*, 2016), with the proposed compensation measures to be undertaken within this populations breeding and migratory range.

The Applicant recognises the importance of supporting prey resource in ensuring the long-term sustainability of the UK's kittiwake, guillemot and razorbill populations. As it has been established that it is not possible for the Applicant to directly manage key fish stocks, the Applicant has committed to providing evidence which may inform future UK Government management of relevant fisheries. The Applicant is engaging with UK Government on a strategic basis to ensure any evidence gathering has the right objectives and outputs. The Applicant is also leading a strategic offshore wind industry collaboration with the ambition to deliver compensation on a strategic basis in advance of project need, which is also supporting consideration of prey availability. The Applicant's specific commitment to contribute towards prey resource research is set out in the Application (**B2.6 Compensation measures for FFC SPA: Overview (APP-185)**).

RR-029-APDX:C-C	<p>Compensation - Advice on the proposed compensation measures Kittiwake and gannet offshore structures</p> <p>Natural England considers the provision of an offshore artificial nest structure for gannet to be highly experimental. We are also concerned about the feasibility of a single structure being able to support both kittiwake and gannet colonies if required to deliver compensation for both species.</p>	<p>The Applicant has presented an overview of the evidence supporting an offshore artificial nesting structure to support breeding gannet within B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187). Both gannet and kittiwake are breeding features of multiple Special Protection Areas within the National Site Network (including FFC SPA) where they nest in close proximity to each other. At Bempton cliffs (which is a component of FFC SPA) gannet and kittiwake cohabit and can nest less than a meter away from each other.</p> <p>Offshore structures will be designed to provide adequate design and room to support the required compensation populations of both species. The site selection process and design of the artificial nesting structure is currently being progressed for both species and will demonstrate breeding capacity. Additional considerations will also be determined by an adaptive management process which will allow additional nesting capacity to be added to the structure if required and deemed necessary by monitoring.</p>
-----------------	--	---

4.2 Advice on proposed compensation measures: Kittiwake onshore structures

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-D	<p>Kittiwake onshore structures</p> <p>The Applicant has also included the provision of onshore artificial nesting structures for kittiwake and gannet compensation, but we note that their preference is to deliver offshore structures. Natural England is not persuaded that further onshore artificial nesting structures are likely to result in sufficient benefits to produce compensation, given the number and location of such structures already proposed by submitted OWF projects. It has not been demonstrated that there is a sufficient pool of nest-limited kittiwake recruits, suitable locations and/or prey availability available to meet and sustain the existing demand for this measure. We therefore recommend that this measure should not be taken forward by the Applicant.</p>	<p>Within the Applicant's compensation plan for kittiwake and gannet, offshore structures (repurposed or new) are preferred over onshore artificial nesting structures (see B2.7 RP Volume B2 Chapter 7 FFC SPA Gannet and Kittiwake Compensation Plan (APP-186)). However, as presented within the Applicant's B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189), there is a body of evidence which exists to support the measure if delivered onshore. The Applicant is aware that Hornsea Three, Norfolk Boreas and Norfolk Vanguard OWFs were granted consent on the basis that an onshore artificial nesting structure would be delivered to provide additional nesting capacity as natural nesting location for kittiwake is limited and will provide the compensation necessary.</p> <p>The Applicant will continue to focus priority on delivering additional nesting capacity offshore as either a repurposed (preference) or new nesting structure. A significant</p>

		<p>body of evidence has been provided within the Applicant's 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) in support of an artificial offshore and onshore nesting structure. Therefore, the Applicant is confident compensation for kittiwake can be delivered through all proposed routes.</p>
--	--	--

4.3 Advice On The Proposed Compensation Measures: Kittiwake And Gannet Offshore Nest Structures

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-E	<p>Overall confidence in the measure</p> <p>The measure has merit and is technically feasible for kittiwake, though is highly experimental for gannet. As well as specified and secured locations, a quantified assessment of the scale of the measure and evidence that nest availability is a limiting factor will need to be provided to have suitable confidence in the measure.</p> <p>We are also concerned about the feasibility of a single structure being able to support both kittiwake and gannet colonies, and consider it highly unlikely that the provision of a suitable space on top of a kittiwake ANS will be successful.</p> <p>We recommend that on the basis of the evidence available, onshore structure(s) are not taken forward.</p>	<p>The Applicant has presented an overview of the evidence supporting an offshore artificial nesting structure to support breeding gannet within B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187). Both gannet and kittiwake are breeding features of multiple Special Protection Areas within the National Site Network (including FFC SPA) where they nest in proximity to each other.</p> <p>Offshore structures will be designed to provide adequate room to support the required compensation populations of both species (noting that at Bempton cliffs (which is part of the FFC SPA) gannet and kittiwake cohabit and can nest less than a meter away from each other). The site selection process and design of the artificial nesting structure is currently being progressed for both species and will demonstrate breeding capacity. Additional considerations will also be determined by an adaptive management process which will allow additional nesting capacity to be added to the structure if required and deemed necessary by monitoring.</p> <p>The Applicant's preference is for an offshore repurposed artificial nesting structure, however we are working strategically to develop the onshore site selection and design, in case an onshore artificial nesting structure is deemed necessary by the Secretary of State.</p>
RR-029-APDX:C-F	<p>Kittiwake offshore structures</p> <p>Theoretical merit to deliver compensation</p>	<p>Compensation by any means or at a single developer level for kittiwake cannot currently be delivered directly to FFC SPA.</p>

	<p>Natural England considers that the measure has the potential to increase the number of recruits into the wider kittiwake population, although the scale of benefit to the impacted site will be indirect and is likely to be unquantifiable.</p>	<p>The Applicant has proposed the provision of additional artificial nesting opportunities for kittiwakes within specified search zones 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 as part of the east Atlantic breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud <i>et al.</i>, 2016), with the proposed compensation measures will be undertaken within this populations breeding and migratory range.</p> <p>There is currently no viable technology available which can determine where kittiwake originating from one location initially recruit. This therefore means any impact will be unquantifiable at the SPA of impact.</p>
RR-029-APDX:C-G	<p>Gannet offshore structures</p> <p>Theoretical merit to deliver compensation</p> <p>Natural England considers the provision of an offshore artificial nest structure for gannet to be highly experimental. There are no species specific case studies where the approach has been successful, although we accept that this may be, in part, due to a lack of effort.</p>	<p>Within the B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187) the Applicant present evidence in support of offshore nesting structures as compensation for gannet. While evidence of northern gannet nesting on offshore structures is not currently known to exist, this is largely due to the specific nesting requirements of the species. Offshore platforms do not currently support the required nesting space or features required for gannets. As detailed within the B2.7 FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186), a detailed design process would be undertaken to provide optimal nesting habitat for the species. Evidence of the species nesting on anthropogenic structures does exist in a European context and is presented within the aforementioned evidence report along with closely related gannet species from the Southern Hemisphere.</p>
RR-029-APDX:C-H	<p>Kittiwake offshore structures</p> <p>Technical feasibility</p> <p>Logistics will be challenging offshore but viable options are likely to be available for providing new structures and/or repurposing existing ones.</p>	<p>The Applicant is extremely experienced in working in the offshore environment due to the scale of their offshore wind portfolio in the UK and beyond to date. The Applicant is therefore well prepared to deal with logistical challenges presented by working in the offshore environment.</p>
RR-029-APDX:C-I	<p>Gannet offshore structures</p> <p>Technical feasibility</p>	<p>As set out in B2.7.5 Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design Report (APP-191) and B2.7.1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence Report (APP-187) the applicant</p>

	<p>The Applicant suggests that, if required, the kittiwake ANS will be adapted to also provide a landscaped area suitable for breeding gannet. The provision of a gannet colony requires more space than a kittiwake ANS and the provision of a structure optimised for both species may prove challenging, although a reasonable compromise might be possible.</p> <p>Attempts to re-establish extirpated Northern gannet colonies using decoys and acoustic attraction techniques have previously failed. It is not clear that a suitable site would be colonised.</p>	<p>has detailed the design features and the supporting ecological evidence that has been considered with regards to the provision of gannet nesting space on an artificial structure.</p> <p>From measurement between adjacent nest centres at multiple UK colonies, northern gannet nests each occupy an 80 cm diameter (hexagonal) space, which is highly consistent between colonies (Nelson 2010). The Applicant is therefore confident that adequate space for the required number of gannet nests is available on the roof of the artificial nesting structure. The Applicant is currently refining the design for the artificial nesting structure and is ensuring that gannet requirements are given through consideration.</p>
<p>RR-029-APDX:C-J</p>	<p>Kittiwake offshore structures Agreed compensation level Due to concerns with the baseline characterisation (see Appendix B) it is not currently possible to agree impact levels and therefore compensation levels.</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU.</p>
<p>RR-029-APDX:C-K</p>	<p>Gannet offshore structures Agreed compensation level Due to concerns with the baseline characterisation (see Appendix B) it is not currently possible to agree impact levels and therefore compensation levels.</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU</p>
<p>RR-029-APDX:C-L</p>	<p>Kittiwake offshore structures Scale/extent of measure The proposals are for a single artificial nest structure (ANS), with a repurposed structure being the Applicant's preference over a new structure. NE currently consider it unlikely that a single structure would be sufficient due to outstanding uncertainties with the measure. A 1:2 compensation ratio has been suggested by the Applicant, however no justification has been provided for this.</p>	<p>The evidence demonstrates that the provision of adequate nesting space can be delivered on either one new or repurposed artificial nesting structure and is presented in support of each of the compensation measures:</p> <ul style="list-style-type: none"> • 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); <p>Please see the response above to the previous comments regarding ratios above in response RR-029-APDX:C-UUU.</p>

RR-029-APDX:C-M	<p>Gannet offshore structures</p> <p>Scale/extent of measure</p> <p>The proposals are for a single artificial nest structure (ANS), with a repurposed structure being the Applicant's preference over a new structure. NE currently consider it unlikely that a single structure would be sufficient due to outstanding uncertainties with the measure.</p> <p>A 1:2 compensation ratio has been suggested by the Applicant, however no justification has been provided for this.</p>	<p>Please see the response above to the previous comments regarding ratios above in response RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-N	<p>Kittiwake offshore structures</p> <p>Timing: Deliverable before impact</p> <p>The Applicant states that a new structure would be in place for a minimum of 2 breeding seasons prior to operation of any turbine, while a repurposed structure (with an existing kittiwake colony) would be in place for 1 breeding season prior to operation.</p> <p>Kittiwake do not breed until they are 4+ years old, and therefore breeding recruits will not enter the biogeographic population until that point. These lead-in times are consequently very short, especially considering the plan to provide a single structure.</p> <p>Colony establishment would be occurring in the early years of operation, and until the target population/productivity is met a mortality debt will accumulate. Therefore, although the measure will be in place it is highly unlikely to be delivering compensation at the scale required before impacts occur.</p>	<p>The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation illustrated in B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188) allows for four breeding seasons prior to operation.</p> <p>The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England's comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p>
RR-029-APDX:C-O	<p>Gannet offshore structures</p> <p>Timing: Deliverable before impact</p> <p>As for kittiwake.</p>	<p>Please refer to the Applicant's response RR-029-APDX:C-N above regarding offshore artificial nesting structure timescales.</p>
RR-029-APDX:C-P	<p>Kittiwake offshore structures</p> <p>Location of measure</p> <p>The final location remains undetermined, however a comprehensive spatial mapping exercise considering agreed search criteria has been undertaken and revealed areas of high suitability.</p> <p>However, we have some concerns that the identified area of highest ecological opportunity has been biased to include structures identified as</p>	<p>The area highest ecological opportunity was refined using the results of the heatmapping process (ie. Areas of green were sought) however the process was influenced by other important factors including:</p> <ul style="list-style-type: none"> Review of platforms nesting survey results to identify where birds are already nesting in the Southern North Sea to maximise colonisation potential. The results of the Summer 2021 surveys were provided at Application submission (see B2.7.1 Compensation measures for FFC SPA:

suitable for repurposing, and the actual identified area of highest ecological opportunity has been ruled out with inadequate justification (see comment on section 2.2.4.2, Vol B2 Annex 7.5).

Offshore Artificial Nesting: Ecological Evidence (APP-187) however in general there is limited data to demonstrate colonisation of existing platforms towards the north of the study area with stronger data associated with Flamborough front.

- Seeking further advice from ornithological specialists on ecological suitability of proposed locations; and
- Taking into account existing and future windfarms in terms of distance and orientation given stakeholder feedback that placing a platform where a windfarm would be situated directly in the potential transit routes between the structure and Flamborough and Filey SPA should be avoided.

The Applicant has ensured Natural England have been consulted on this process. A memo with further site selection information was provided in November 2021 requesting advice on a short-list of three locations for a new artificial nesting structure and discussions have been held with Natural England on the preferred locations for a new and repurposed structure to increase their confidence in securing the measure. Engagement has also been undertaken with other key stakeholders regarding these site selection options for a new structure. This includes meeting with the Maritime and Coastguard Agency (MCA) and Trinity House (18th January 2022), the Marine Management Organisation (13.01.2022) and the National Federation of Fishermen's Organisations (NFFO) (22nd November 2021). All stakeholders have been in agreement with the order of preference of the potential location options and raised no concerns over the site selection process. Due to the extremely low numbers of birds that have colonised platforms in the area to the north of the proposed Hornsea Four windfarm, this area has not been included further, as discussed with Natural England in the Workshop held on 3rd February 2022.

Following the submission of the Application the site selection for a new offshore nesting structure has been refined and an update on this is provided in the Applicant's response to Deadline 1 at [G1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement](#).

		<p>In relation to a repurposed structure (which is the Applicant’s preferred method of providing artificial nesting as compensation), highly feasible options have been identified with existing kittiwake colonies, where there is scope to provide additional nesting, and in suitable locations. Consideration has also been given to suitable timeframes for decommissioning and penchant by platform owners or operators to collaborate in repurposing. Hornsea Four is currently progressing discussions with owners and operators of platforms within the North Norfolk Sandbanks and Saturn Reef (NNSSR) SAC. The Applicant is in the process of securing memorandums of understanding with operators to allow specific platforms and locations to be discussed and shared with stakeholders.</p>
<p>RR-029-APDX:C-Q</p>	<p>Gannet offshore structures Location of measure The spatial mapping exercise to identify suitable areas is refined and considered for kittiwake only. It is not clear that similar areas would necessarily be defined for gannet. It is likely that the provision of a separate structure in a specifically identified location would increase the chances of occupation.</p>	<p>The Applicant has presented an overview of the evidence supporting an offshore artificial nesting structure to support breeding gannet within B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187). Both gannet and kittiwake are breeding features of multiple Special Protection Areas within the National Site Network (including FFC SPA) where they nest in close proximity to each other. At Bempton cliffs (which is a component of FFC SPA) gannet and kittiwake cohabit and can nest less than a meter away from each other.</p> <p>Offshore structures will be designed to provide adequate design and room to support the required compensation populations of both species. The site selection process and design of the artificial nesting structure is currently being progressed for both species and will demonstrate breeding capacity. Additional considerations will also be determined by an adaptive management process which will allow additional nesting capacity to be added to the structure if required and deemed necessary by monitoring.</p>
<p>RR-029-APDX:C-R</p>	<p>Kittiwake offshore structures Long term implementation We are concerned that the provision of a single structure does not build in resilience over the lifetime of the project. Adaptive management will also be more difficult offshore. Remote monitoring may be possible, but data quality will need to be evidenced.</p>	<p>The evidence demonstrates that the provision of adequate nesting space can be delivered on either one new or repurposed artificial nesting structure and is presented in support of each of the compensation measures:</p> <ul style="list-style-type: none"> • 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);

		<p>An adaptive management plan would be produced and outlined in the GKRIMP in consultation with OOEG, which would list a set of options to ensure the long-term resilience of the measure. Adaptive management will be an iterative post construction process which combines management measures and subsequent monitoring with the aim of improving effectiveness of the measure, whilst also updating knowledge and improving decision making over time. Adaptive management will be an important component of the compensation measure and will be used as a method to address unforeseen issues or deviations from expected outcomes of the compensation (i.e., colonisation rate of structure, productivity rates and population trends which occur in year four Such measures might include:</p> <ul style="list-style-type: none"> • Provision of additional nesting sites via extension of structure if capacity is exceeded; • Additional protection from elements; • Enhanced predator deterrent; • Provision of nesting material, such as soil and dry vegetation; and • Enhanced recruitment support – kittiwake calls, decoys etc. <p>The Applicant recognises the potential issues associated with monitoring the structure in the offshore environment. However, a number of potential monitoring methods already exist which will be refined and discussed with the OOEG following consent. Such examples include:</p> <ul style="list-style-type: none"> • Boat; • Drone; • Aircraft; and • Remote camera. <p>The Applicant is therefore confident that compensation measures will exist long-term and will implement an adaptive management plan and monitoring approach which will collect high quality data.</p>
RR-029-APDX:C-S	Gannet offshore structures Long term implementation As for kittiwake.	Please refer to the Applicant’s response above regarding offshore artificial nesting structure timescales (RR-029-APDX:C-N).

<p>RR-029-APDX:C-T</p>	<p>Kittiwake offshore structures</p> <p>Success criteria/Ability to prove additionally</p> <p>As nest availability has not been proven to be a limiting factor there remains a high level of uncertainty regarding additionality.</p> <p>Additionality will depend on whether new or repurposed structures are being used. If existing colonies (i.e. decommissioned structures) are being maintained additionality must be carefully considered, as should possible consolidation of small colonies across numerous existing structures onto a new structure that may prove to be more attractive to nesting birds. Maintaining a colony with no productivity increase or relocating existing breeding birds would not deliver compensation.</p> <p>Monitoring efforts are likely to need to be wider in scope than just the artificial structure, and the current understanding of existing offshore colonies and their productivity will need to be built on to fully evidence the additional benefit of a new or repurposed structure. This will be challenging offshore.</p> <p>Both apparently occupied nests (AONs) and productivity should be considered in success criteria.</p>	<p>Please see the Applicant's responses above (RR-029-APDX:C-B and RR-029-APDX:C-F) in relation to the evidence base supporting the limited nesting space available to kittiwake and therefore the case of compensation offering additionality.</p> <p>Success criteria will be agreed in discussion with the OOEG. However, it will be based on productivity of the colony. Productivity rates and occupancy at the structure will vary between years in response to site-specific, regional, and national factors. Therefore, measurement of productivity on an annual or bi-annual basis, will be a key parameter to be used in calculating whether the structure delivers what equates to the required compensation population of birds per annum over the lifetime of the Hornsea Four (currently estimated expected to be 35 years), to the existing wider breeding population.</p> <p>A model will, with each successive year, be populated from the on-going monitoring of the structure, with year specific data on colony size and productivity to monitor progress and future requirements of the structure in delivery of this compensation measure to provide additional birds annually over Hornsea Four's lifetime to the wider breeding population.</p> <p>This future projection of the number nests required will be modelled so as to ensure the productivity is achieved to that which was targeted for the current and past years.</p> <p>Orsted's success criteria is therefore based on an ongoing review process which will identify aspects required to deliver compensation of the required population of kittiwakes per year, whilst also discharging accrued debt/surplus in productivity as monitored.</p> <p>The scale of monitoring will be determined post consent and in consultation with OOEG members. A number of potential monitoring methods already exist, the suitability of which will be discussed with the OOEG following consent. Such examples include:</p> <ul style="list-style-type: none"> • Boat;
------------------------	---	--

		<ul style="list-style-type: none"> • Drone; • Aircraft; and • Remote camera.
RR-029-APDX:C-U	Gannet offshore structures Success criteria/Ability to prove additionally As for kittiwake.	Please see RR-029-APDX:C-T above which will also be appropriate for gannet.
RR-029-APDX:C-V	Kittiwake offshore structures Suitable as sole measure for target species Though see notes on long-term implementation below.	Please see responses RR-029-APDX:C-F and RR-029-APDX:C-R regarding the merit and long term implementation of kittiwake offshore structures.
RR-029-APDX:C-W	Gannet offshore structures Suitable as sole measure for target species See Key uncertainties below.	Please see RR-029-APDX:C-Z; RR-029-APDX:C-Y; and RR-029-APDX:C-BB regarding gannet offshore structures.
RR-029-APDX:C-X	Kittiwake offshore structures – key uncertainties Nest availability limitation If nest availability cannot be demonstrated to be a limiting factor, new colonies will need to have increased productivity to deliver additionality. A greater compensation ratio will also be expected if this remains uncertain.	<p>As presented within the Applicant’s B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187), there is a large body of evidence which exists to support the measure.</p> <p>The Surveys undertaken in Summer 2021 (see the Applicant’s B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)) showed that a number of platforms were thought to be approaching full capacity in terms of nesting space for kittiwake. Furthermore, a large number of oil and gas platforms in the Southern North Sea are scheduled for decommissioning within the next few years.</p> <p>Within the aforementioned document, the Applicant presents evidence indicating that nesting habitat is likely to be a limiting factor in the southern North Sea. For example, birds have attempted to nest on the ground at Minsmere in Suffolk (indicating a lack of alternative nesting sites). Furthermore, there is clearly a lack of suitable natural nesting habitat for kittiwake as many birds have previously, or currently, choose to nest inland on roofs, light fittings, lamp posts and other sub-optimal nesting habitat. As the species is a colonial nester, this is clear evidence that suitable nesting habitat is highly limited and therefore supports the measure if a new or repurposed structure is delivered.</p>

		<p>However, the Applicant acknowledges the need to consider uncertainty and to provide SNCBs with added confidence and have suggested providing a 1:2 ratio for overall compensation per species.</p>
RR-029-APDX:C-Y	<p>Gannet offshore structures – key uncertainties Nest availability limitation As for kittiwake.</p>	<p>Please see the Applicant’s responses to RR-029-APDX:C-Z; RR-029-APDX:C-Y; and RR-029-APDX:C-BB regarding gannet offshore structures.</p>
RR-029-APDX:C-Z	<p>Gannet offshore structures – key uncertainties The use of ANS by Gannet The provision of an ANS for gannet is considered experimental, and unlikely to be sufficient as a lone measure. It is highly uncertain that a structure would be colonised. Further, the addition of suitable nesting habitat to a structure that has been located very specifically according to the ecological needs of kittiwakes may reduce the chance of success.</p>	<p>The Applicant has presented an overview of the evidence supporting an offshore artificial nesting structure to support breeding gannet within B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187). Both gannet and kittiwake are breeding features of multiple Special Protection Areas within the National Site Network (including FFC SPA) where they nest in close proximity to each other. At Bempton cliffs (which is a component of FFC SPA) gannet and kittiwake cohabit and can nest less than a meter away from each other.</p> <p>Offshore structures will be designed to provide adequate design and room to support the required compensation populations of both species. The site selection process and design of the artificial nesting structure is currently being progressed for both species and will demonstrate breeding capacity. Additional considerations will also be determined by an adaptive management process which will allow additional nesting capacity to be added to the structure if required and deemed necessary by monitoring.</p>
RR-029-APDX:C-AA	<p>Kittiwake offshore structures – key uncertainties The retention of onshore ANS as a ‘back up’ The evidence provided for onshore artificial structures is comprehensive, largely reflecting the significant amount of work undertaken by Hornsea 3 to progress this measure. However, Natural England is not persuaded that further onshore artificial nesting structures are likely to result in sufficient benefits to produce compensation, given the number and location of such structures already proposed by submitted OWF projects.</p> <p>Furthermore, NE would not have confidence in a single structure onshore being adequate to provide compensation as the sole measure for kittiwake, not least because four structures were deemed necessary to provide</p>	<p>Within the Applicant’s compensation plan for kittiwake and gannet, offshore structures (repurposed or new) are preferred over onshore artificial nesting structures (see B2.7 RP Volume B2 Chapter 7 FFC SPA Gannet and Kittiwake Compensation Plan (APP-187)). However, as presented within the Applicant’s B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189), there is a body of evidence which exists to support the measure if delivered onshore. The Applicant is aware that Hornsea Three, Norfolk Boreas and Norfolk Vanguard OWFs were granted consent on that basis that an onshore artificial nesting structure would be delivered to provide additional nesting capacity as natural nesting location for kittiwake is limited and will provide the compensation necessary.</p>

	<p>appropriate resilience for HOW3. We are also concerned about the increasing concentration of developers attempting to compensate in the Lowestoft area.</p>	<p>The Applicant will continue to focus priority on delivering additional nesting capacity offshore at either a repurposed (preference) or new nesting structure. A significant body of evidence has been provided within the Applicant's 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) in support of an artificial offshore and onshore nesting structure. Therefore, the Applicant is confident compensation for kittiwake can be delivered.</p>
RR-029-APDX:C-BB	<p>Gannet offshore structures – key uncertainties The retention of onshore ANS as a 'back up' There is little evidence to suggest that onshore ANS will be any more likely to attract nesting gannet than offshore ANS.</p>	<p>Within the Applicant's compensation plan for kittiwake and gannet, offshore structures (repurposed or new) are preferred over onshore artificial nesting structures (see B2.7 RP Volume B2 Chapter 7 FFC SPA Gannet and Kittiwake Compensation Plan (APP-187)). However, as presented within the Applicant's B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189), there is a body of evidence which exists to support the measure if delivered onshore..</p> <p>The Applicant will continue to focus priority on delivering additional nesting capacity offshore at either a repurposed (preference) or new nesting structure. A significant body of evidence has been provided within the Applicant's 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) in support of an artificial offshore and onshore nesting structure. Therefore, the Applicant is confident compensation for gannet can be delivered through all proposed routes.</p>

4.4 Advice on proposed compensation measures: Auks (guillemot and razorbill) and gannet

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-CC	<p>Auks (guillemot and razorbill) and gannet The measures proposed for auk compensation are mammalian predator eradication and bycatch reduction. Again, fish habitat (seagrass) restoration is included as a resilience measure. The progression of multiple measures for auk compensation is welcomed, as whilst both measures have theoretical</p>	<p>The Applicant is committed to delivering all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). Although, the Applicant is confident that each of the measures on their own are robust and deliverable for both</p>

merit, neither of the two measures can be considered adequately secured, due to outstanding uncertainties around feasibility, effectiveness and location. We note, however, that the Applicant does not explicitly commit to undertaking both primary compensation measures and suggests that they have confidence that “each of the measures on their own is robust and deliverable”. This is of concern to Natural England, as based on the evidence available at this time, we do not have confidence that either measure would be able to deliver compensation individually. Each measure currently has critical uncertainties that if not met would render the measure undeliverable.

Furthermore, Natural England highlights that bycatch reduction appears likely to be more effective for guillemot than razorbill. Equally, evidence indicates that razorbill are more likely to benefit from invasive mammal eradication than guillemot. This gives further weight to progressing both measures in the event that the Secretary of State seeks compensation. Nevertheless, whilst progressing multiple possible measures helps to spread the risk around one of those measures not being deliverable, it does not overcome them.

guillemot and razorbill, the inclusion of a package of measures provides stakeholders with additional comfort on the level of compensation that can be provided.

The Applicant is providing overall compensation at a ratio of 1:2 (1:1 for bycatch and 1:1 for predator eradication with the ratio of impact:compensation), thereby increasing the resilience and likelihood of success. Please note that where the Applicant has stated a ratio of 1:2 (impact:compensation) this format follows the approach taken in recent projects notably East Anglia ONE North and East Anglia TWO OWFs. Some literature and previous projects (including related Natural England advice) have presented ratios accordingly as compensation:impact (e.g. 2:1) and therefore the 1:2 ratio should be taken as meaning the same as the 2:1 ratio in this context, this is applicable throughout the response. Additionally, the bycatch reduction technology selection phase and predator eradication implementation studies are currently being undertaken. This will provide further evidence to support the Applicants compensation ratios. Below outlines further information for each measure.

Fish Habitat Enhancement

Fish habitat enhancement through seagrass restoration will provide resilience to the bycatch reduction and predator eradication compensation measures. Research will be undertaken this summer on prey abundance and prey connectivity to demonstrate the efficacy of the resilience measure.

Predator Eradication

The Applicant considers that predator eradication as an individual compensation measure would successfully deliver compensation for both guillemot and razorbill. **B2.8.3. Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)** provides evidence that guillemot and razorbill both benefit from predator eradication through population increase, re-colonisation and increase in productivity levels. For example, Table 1 in **Section 6.2** presents the increase in guillemot and razorbill numbers from an eradication project on Lundy Island.

Bycatch

		<p>The Applicant considers that bycatch reduction as an individual compensation measure would successfully deliver compensation for both guillemot and razorbill. Both species have previously been identified as vulnerable to bycatch in static gillnets (Northridge <i>et al.</i>, 2020). Additionally, the bycatch risk “hotspot” locations for guillemot and razorbill are within the same areas during the same time of year (see Section 7 in B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)). Thereby the Applicant considers installing bycatch reduction technology within these locations, specifically in gear during January and February, will provide compensation for both guillemot and razorbill.</p> <p>The Applicant notes the bycatch rate is higher for guillemot than razorbill, however the number of individuals required for razorbill compensation are far lower than those for guillemot (1.5 vs 35 individuals – Applicant values). Therefore, the Applicant considers that despite the lower bycatch rate, razorbill can be compensated in full via bycatch reduction technologies alone.</p>
RR-029-APDX:C-DD	<p>Auks (guillemot and razorbill) and gannet</p> <p>We also highlight that if the reasons for AEol include the effective habitat loss of functionally linked sea areas that have an important role in the life cycle of FFC SPA auks, as we consider they might do, bycatch and island mammal eradication measures are not of a nature that would address this aspect of the impact.</p>	<p>Compensation measures compensate the total, species-specific impact determined by the Secretary of State (SoS) to be an AEol. The Applicant has therefore designed a suite of compensation measures for guillemot and razorbill to compensate for both species at the required scale of impact.</p> <p>In addition, the Applicant has made a commitment to contribute towards prey resource research (B2.6 Compensation measures for FFC SPA: Overview (APP-183)).</p> <p>The Applicant will contribute to a fund (£100,000 per year for 5 years) to support evidence gathering to inform Government-led management of key fish stocks, in accordance with research gaps identified by the Offshore Wind Strategic Monitoring and Research Forum (OWSMRF) (see B2.10 Without Prejudice Derogation Funding Statement (APP-202) and B2.6.2 Appendix A Ørsted’s Strategic Compensation Approach (APP-185)).</p>
RR-029-APDX:C-EE	<p>Bycatch reduction</p> <p>The bycatch reduction measure aims to boost auk and gannet populations by reducing their levels of bycatch from commercial fisheries. A target fishery has been identified as an auk bycatch hotspot, and there is some</p>	<p>The Applicant acknowledges the concerns raised by Natural England regarding the uncertainties around success of a bycatch reduction technique. To address these uncertainties, the Applicant entered a bycatch reduction technology selection phase during November 2021, focusing on the use of LEB within an active gillnet fishery</p>

evidence to suggest this might possibly form a basis for compensatory measures, though we are unable to provide more definitive advice in the absence of i) agreed impact levels for Hornsea 4, ii) more robust bycatch estimates for target locations and iii) trial findings demonstrating the extent of (if any) bycatch reduction. We highlight that whilst delivering compensation via bycatch reduction is theoretically viable, there are several significant uncertainties which we consider to be extremely high risk. In particular, there is currently no proven method to reduce bycatch of auks in gillnet fisheries. The measure currently relies on the success of a single trial for a single method which is yet to happen, and therefore the effectiveness of this measure is unknown. It is also not possible to make an assessment of the scale of measure that might be achievable without an implementation method with quantified success rates, and a quantified assessment of bycatch levels at the target fishery.

within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB within the same fisheries which bycatch reduction has been evidenced to be highest risk for guillemot and razorbill (within the English Channel) (see bycatch risk mapping in [Section 7 of B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence \(APP-194\)](#)). The Applicant notes previous agreement of the target fishery and location by Natural England and RSPB during Hornsea Compensation Workshop (Hornsea Four Compensation Evidence Workshop 28th May 2021 Minutes of Meeting).

The Applicant is undertaking the LEB selection phase with two companies:

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

Through collaborating with two companies which have both undertaken successful studies within fisheries science, the Applicant is confident with the progress of the testing of the LEB and that the measures required for a successful study have been undertaken. The Applicant has secured 10 fishers to take part in the technology selection phase, with all boats being fitted with a dual camera monitoring system to determine seabird bycatch when fishing with control and experimental nets (i.e. with the LEB deterrent attached). The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. Additionally, the Applicant will consider use of the LEB during the 2022/ 2023 winter season (subject to review of the data from the first season) should it be deemed beneficial to further support the study outcomes or implementation will commence. The preliminary findings of the bycatch reduction technology selection phase indicate

		<p>that the LEB has a positive impact on reducing bycatch of large auks. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase. Due to contractual restrictions, the results of the bycatch reduction selection phase can only be disclosed as percentage reductions in bycatch i.e. not specific numbers of birds, without consent from the participating fishers. However, a similar trial is running simultaneously under RSPB management which will likely have results published following analysis. without such restrictions.</p> <p>The Applicant notes that as the bycatch reduction selection phase is being undertaken within the target fishery, the findings will quantify the level of bycatch reduction achieved through using the LEB, and can therefore directly indicate the scale of deployment that the Applicant would be required to deliver to fulfil compensation.</p>
RR-029-APDX:C-FF	<p>Bycatch Reduction – Gannet</p> <p>Evidence from biologically similar species to gannet suggests that bycatch reduction might be possible for this species, however a target fishery and location have not yet been identified. This would need to be addressed in addition to the uncertainties outlined above for the auk species.</p>	<p>The Applicant is currently undertaking further in-depth analysis regarding gannet and bycatch within the UK. The findings of this analysis will aid in identifying the target fishery and location. Initial analysis shows that most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. Further analysis is currently ongoing into foreign vessels operating in UK waters. The Applicant is committed to contacting the relevant fisheries, both UK and foreign fisheries.</p> <p>The Applicant is also currently undertaking further analysis into gannet bycatch reduction through a bycatch reduction technique review presented in the Applicant’s submission to Deadline I at G1.42: Compensation measures for FFC SPA: Gannet Bycatch Reduction Ecological Evidence. As more studies have been completed regarding longline bycatch, there is confidence regarding the success of bycatch reduction techniques. The Hookpod has been identified as a successful bycatch reduction technique in longline fisheries, with studies estimating a 95% reduction in seabirds bycaught. The Applicant is therefore confident that mitigation technology for gannet is available .</p>
RR-029-APDX:C-GG	<p>Overall confidence in the measure</p> <p>Whilst delivering compensation via bycatch reduction is theoretically viable, there is currently no proven method to reduce bycatch of auks and hence deliver the compensation. The measure relies on a single trial of a</p>	<p>The Applicant notes Natural England’s concerns regarding the success of the bycatch reduction technique and the testing which will be used to provide information regarding success. The Applicant entered a bycatch reduction technology selection phase during November 2021, focusing on the use of LEB within an active gillnet</p>

	<p>single method which could fail. We also cannot make any assessment of the scale of measure that might be achievable without an implementation method with quantified success rates, and a quantified assessment of bycatch levels at the target fishery. Whilst there seems more likely to be successful bycatch reduction measures available for gannet, limited information is presented on the proposed approach to this measure.</p>	<p>fishery within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB, specific to guillemot and razorbill bycatch within a commercial gillnet setting.</p> <p>The Applicant has secured 10 fishers to take part in the of the technology selection phase, with all boats being fitted with a dual camera monitoring system to determine seabird bycatch when fishing with control and experimental nets (i.e. with the LEB deterrent attached). The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. If deemed beneficial to further support the study outcomes from the first year, a second year of technology selection or implementation will commence. There will be a minimum of 6 months data collection in total from the bycatch reduction technology selection phase. However, preliminary findings from bycatch reduction selection phase to date indicate that the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p> <p>The findings from the bycatch reduction selection phase will allow the Applicant to scale up the deployment required to fulfil the compensation requirement. Moreover, as the bycatch reduction selection phase is focused within the target fishery, the scale of bycatch will be directly comparable. Due to contractual restrictions, the results of the bycatch reduction selection phase can only be disclosed as percentage reductions in bycatch i.e. not specific numbers of birds, without consent from the participating fishers. However, a similar study is running simultaneously under RSPB management without such restrictions with the results therefore likely to be published. The Applicant is currently undertaking further in-depth analysis to provide further evidence for gannet, a report on which will be provided into the Examination once complete.</p>
RR-029-APDX:C-HH	<p>Auks bycatch mitigation Theoretical merit to deliver compensation</p>	<p>The Applicant acknowledges Natural England’s comment on the merit of the auk compensation proposed. A reduction in mortality would be undertaken in areas which form part of the wider biogeographic population of guillemot and razorbill as</p>

	<p>We agree that reducing levels of auk bycatch could provide compensation for auk species, although the benefits are likely to be felt at the wider biogeographic level rather than the impacted site.</p>	<p>part of the east Atlantic breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016).</p>
RR-029-APDX:C-II	<p>Gannet bycatch mitigation Theoretical merit to deliver compensation We agree that reducing levels of gannet bycatch could potentially provide compensation, although the benefits are likely to be felt at the wider biogeographic level rather than the impacted site.</p>	<p>The Applicant acknowledges Natural England’s comment on the merit of the gannet compensation proposed and welcomes Natural England’s comment that reducing levels of gannet bycatch could potentially provide compensation. Initial analysis shows that most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. The Applicant is currently undertaking a more in-depth analysis (discussed below) regarding gannet bycatch within the UK. The findings of this analysis will aid in identifying the target fishery and location and will be presented at Deadline 1. The location of the measure will compensate there population which includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016), as is undertaken within this populations breeding and migratory range.</p>
RR-029-APDX:C-JJ	<p>Auks bycatch mitigation Technical feasibility There is currently no proven method for large auk bycatch reduction in the identified fisheries. If the ‘looming eyes buoy’ trial is unsuccessful there will be no mechanism to deliver this measure. Furthermore, it is unlikely that a single trial will provide sufficient evidence of effectiveness and/or scale.</p>	<p>The Applicant notes concerns regarding the success of the bycatch reduction technique and the testing which will be used to provide information regarding success. The Applicant entered a bycatch reduction technology selection phase during November 2021. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB, specific to guillemot and razorbill bycatch within a commercial gillnet setting. The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. If deemed beneficial to further support the study outcomes from the first year, a second year of technology selection will be undertaken by the Applicant or implementation will commence. There will be a minimum of 6 months data collection in total. However, preliminary findings from the bycatch reduction selection phase indicate that the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p>
RR-029-APDX:C-KK	<p>Gannet bycatch mitigation Technical feasibility There is relevant evidence from biologically similar species to suggest that bycatch reduction is possible.</p>	<p>The Applicant welcomes Natural England’s comment on the technical feasibility of the gannet compensation proposed that there is relevant evidence from biologically similar species to suggest that bycatch reduction is possible.</p>

RR-029-APDX:C-LL	<p>Auks bycatch mitigation Agreed compensation level Due to concerns with the baseline characterisation (see Appendix B) it is not currently possible to agree impact levels and therefore compensation levels.</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-MM	<p>Gannet bycatch mitigation Agreed compensation level As for auks.</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-NN	<p>Auks bycatch mitigation Scale/extent of measure A range of potential deployment scales have been suggested, however, the methods of quantifying these are not clear. The level of bycatch reduction that may be possible cannot yet been determined so the scale of the measure cannot be properly calculated.</p> <p>As direct benefits to the impacted site are unlikely, this is likely to have implications for the benefit: impact ratio.</p>	<p>The Applicant entered a bycatch reduction technology selection phase during November 2021, focusing on the use of LEB within an active gillnet fishery within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB within the same fisheries which bycatch reduction has been evidenced to be highest risk for guillemot and razorbill. Therefore, will aid in the identification of relevant information required to calculate scale such as the bycatch rate in the relevant target fishery of each species, and the rate of bycatch reduction from LEBs as discussed within B2.8 FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan (APP-193). The preliminary findings of the bycatch reduction technology selection phase indicate that the LEB has a positive impact on reducing bycatch of large auks. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p> <p>A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA which have been provided to Natural England and discussed during the workshop held on 3rd February 2022. The Applicant has committed for an overall compensation ratio of 1:2 (1:1 for predator eradication and 1:1 for bycatch reduction).</p>
RR-029-APDX:C-OO	<p>Gannet bycatch mitigation Scale/extent of measure</p>	<p>Initial analysis shows that most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. Further analysis is currently ongoing into foreign vessels operating in UK waters. The Applicant is committed to contacting</p>

	<p>Existing levels of bycatch, target fisheries and a proposed method to reduce it need to be further clarified before scale can be considered.</p>	<p>the relevant fisheries, both UK and foreign fisheries. The Applicant is currently undertaking a more in-depth analysis regarding gannet and bycatch within the UK which will be presented at Deadline 1 (G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence).</p> <p>The Applicant is also currently undertaking further analysis into gannet bycatch reduction through a bycatch reduction technique review. As a large number of studies have been completed regarding longline bycatch, there is a high level confidence regarding the success of bycatch reduction techniques. The Hookpod has been identified as a successful bycatch reduction technique in longline fisheries, with studies estimating a 95% reduction in seabirds bycaught. Bycatch reduction using the method is species independent as it removes the hook from access to most seabird species (including gannet based on foraging ecology), therefore removing the bycatch risk. The Applicant is therefore very confident that mitigation technology for gannet is available. The findings of this analysis will be presented at Deadline 1 (G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence).</p>
<p>RR-029-APDX:C-PP</p>	<p>Auks bycatch mitigation Timing: Deliverable before impact If a successful method was identified reduction could be achieved quickly.</p> <p>Compensation would arise as a direct population effect, i.e., breeding adult birds can be retained in the population, thus compensating on a like for like basis. Further surveys/trials are likely needed to prove the method and quantify impact though.</p>	<p>The Applicant welcomes Natural England's comment on the timing of the auk compensation proposed. If deemed beneficial to further support the study outcomes from the first year, a second year of bycatch technology selection phase will take place over the winter of 2022/23 or implementation will commence. There will be a minimum of 6 months data collection in total. However, preliminary findings from the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p>
<p>RR-029-APDX:C-QQ</p>	<p>Gannet bycatch mitigation Timing: Deliverable before impact As for auks.</p>	<p>The Applicant acknowledges Natural England's comment on the timing of the gannet compensation proposed.</p>
<p>RR-029-APDX:C-RR</p>	<p>Auks bycatch mitigation Location of measure We agree with the reasoning for the identified locations.</p> <p>However, a bycatch reduction method needs to prove effective for the fishery in that location for us to have certainty.</p>	<p>The Applicant welcomes Natural England's comment on the location of the auk compensation proposed. The bycatch reduction selection phase is currently being undertaken in the agreed target fishery therefore will aid in proving effectiveness in the location.</p>

RR-029-APDX:C-SS	<p>Gannet bycatch mitigation Location of measure Further work is required to identify a target location and fishery.</p>	<p>Gannet were found by Northridge et al., (2020) to be vulnerable to bycatch from longline fisheries. Initial analysis shows that most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. Further analysis is currently ongoing into foreign vessels operating in UK waters. The Applicant is committed to contacting the relevant fisheries, both UK and foreign fisheries. Furthermore, the Applicant is currently undertaking a more in-depth analysis regarding gannet and bycatch within the UK. The findings of this analysis will aid in identifying the target fishery and location and will be presented at Deadline 1 (G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence).</p>
RR-029-APDX:C-TT	<p>Auks bycatch mitigation Longer term implementation Fisheries are highly dynamic in terms of gear use/focal species. This could alter bycatch levels, require new fisheries to be identified and/or require new reduction methods to be developed.</p>	<p>The Applicant acknowledges that fisheries are dynamic, however, due to the size of the UK fishing fleet, it is highly likely that if fishing practices change (although as noted below the Applicant is not aware of any planned industry level roll out of bycatch reduction techniques), there will be enough vessels to provide compensation at a different location (due to the size of compensation required). Moreover, bycatch is gaining further research, therefore it is likely that bycatch reduction techniques will also develop in the wider literature during the operation of Hornsea Four. The more research within this area increases the likelihood of identifying additional successful bycatch reduction techniques that could be deployed if required.</p> <p>In addition to this, the Applicant has agreed to provide a suite of measures at a ratio of 1:2 (1:1 for predator eradication and 1:1 for bycatch reduction), thereby aiding in resilience.</p> <p>Specific adaptive management will be discussed and secured through the OOEG.</p>
RR-029-APDX:C-UU	<p>Gannet bycatch mitigation Longer term implementation As for auks.</p>	<p>The Applicant refers to the response in the comment above.</p>
RR-029-APDX:C-VV	<p>Auks bycatch mitigation Success criteria/Ability to prove additionality If bycatch reduction can be achieved, then success criteria are relatively straightforward to define. However, the question of additionality may</p>	<p>The Applicant agrees that defining success criteria relating to bycatch as compensation will be relatively straightforward as it links to relieving direct mortality of individual birds. The Applicant is not aware of any planned industry level roll out of bycatch reduction initiative. The Applicant is already well underway in testing the most likely bycatch reduction method (bycatch reduction selection</p>

	<p>become pertinent if other bycatch reduction initiatives are rolled out at the industry level.</p>	<p>phase) and will, if required, be able to deploy the technique rapidly to reduce bycatch at the level deemed suitable to compensate for the species-specific impact. As there are no plans currently in place to reduce bycatch at an industry level, and thus additionality is not considered to be a potential issue by the Applicant.</p>
<p>RR-029-APDX:C-WW</p>	<p>Gannet bycatch mitigation Success criteria/Ability to prove additionality As for auks</p>	<p>The Applicant agrees that defining success criteria relating to bycatch as compensation will be relatively straightforward as it links to relieving direct mortality of individual birds. The Applicant is not aware of any planned industry level roll out of bycatch reduction initiative as technology to reduce species specific bycatch is still being tested. The Applicant is already well underway in testing the most likely bycatch reduction method (bycatch reduction selection phase) for other species and will, if required, be able to undertake a technique selection phase to reduce bycatch for gannet (information provided into the Examination as soon as it is complete). As there are no plans currently in place to reduce bycatch at an industry level, and thus additionality is not considered to be a potential issue by the Applicant.</p>
<p>RR-029-APDX:C-XX</p>	<p>Auks bycatch mitigation Suitable as sole measure for target species Given the lack of mechanism we cannot be confident that this measure will be able to deliver effective compensation. Should a mechanism be proven effective, the evidence suggests that this measure could deliver for guillemot, but it is not as clear that compensation could be delivered for razorbill. The longevity of the measure is also uncertain. We consider the measure would need to be taken forward as a package</p>	<p>The Applicant considers that bycatch reduction as an individual compensation measure would successfully deliver compensation for both guillemot and razorbill. Both species have previously been identified as vulnerable to bycatch in static gillnets (Northridge <i>et al.</i>, 2020). Additionally, the bycatch risk “hotspot” locations for guillemot and razorbill are within the same areas during the same time of year (see Section 7 in B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)). Thereby the Applicant considers installing bycatch reduction technology within these locations, specifically in gear during January and February, will provide compensation for both guillemot and razorbill. The Applicant notes the bycatch rate is higher for guillemot than razorbill, however the number of individuals required for razorbill compensation are far lower than those for guillemot (1.5 vs 35 individuals – Applicant values). Therefore, the Applicant considers that despite the lower bycatch rate, razorbill can be compensated in full via bycatch reduction technologies alone.</p>

		<p>Regarding longevity of the measure, the Applicant acknowledges that fisheries are dynamic, however, due to the size of the UK fishing fleet, it is highly unlikely that there will not be enough vessels to provide compensation at a different location (due to the size of compensation required). Additionally, bycatch is gaining further research, therefore it is likely that bycatch reduction techniques will also develop in the wider literature during the operation of Hornsea Four. The more research within this area increases the likelihood of identifying additional bycatch reduction techniques that could be deployed if required.</p> <p>Nevertheless, the Applicant will deliver both bycatch and predator eradication as a suite of measures, thereby increasing resilience. Specific adaptive management will be discussed and secured through the OOEG.</p>
RR-029-APDX:C-YY	<p>Gannet bycatch mitigation Suitable as sole measure for target species Existing bycatch levels may be relatively low. It is unclear if sufficient reductions can be achieved in order to deliver compensation.</p>	<p>The Applicant is currently undertaking further analysis into the level of gannet bycatch within UK waters, including identifying areas of highest bycatch risk. The document containing this information will be provided into the Examination at Deadline 1, G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence. As bycatch reduction provides direct adults back into the biogeographic region, only 24 to 26 gannet need to be reduced from bycatch (based on a 1:2 ratio of 11.77 - 12.85 gannet). Due to the high success rates of bycatch reduction techniques (Hookpod = ~95% reduction), the Applicant believes gannet can be successfully compensated for with bycatch reduction. Artificial nesting structure for gannet is also proposed by the Applicant to act as a package of measures for the species.</p>
RR-029-APDX:C-ZZ	<p>Auks bycatch mitigation – key uncertainties Target fishery We agree with the current selection but note that the existing levels of bycatch will need to be fully quantified, with consideration given to interannual variation. Crucially, a bycatch reduction mechanism needs to prove effective within the identified fishery and sufficient fishers will need to implement the measure over a long term period.</p>	<p>The Applicant entered a bycatch reduction technology selection phase during November 2021. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB, specific to guillemot and razorbill bycatch within a commercial gillnet setting. The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. If deemed beneficial to further support the study outcomes from the first year, a second year of technology selection will be undertaken by the Applicant or implementation will commence. As the selection phase is being undertaken in the target fishery, this will allow for bycatch to be quantified.</p>

		<p>The Applicant acknowledges that the measure is required for the lifespan of Hornsea Four operation, however, due to the size of the UK fishing fleet, it is highly likely there will be a sufficient number of vessels to provide compensation even if needed at a different location (due to the size of compensation required). Additionally, bycatch is gaining further research, therefore it is likely that bycatch reduction techniques will also develop in the wider literature during the operation of Hornsea Four. The more research within this area increases the likelihood of identifying additional bycatch reduction techniques that could be deployed if required. Specific adaptive management will be discussed and secured through the OOEG.</p> <p>Additionally, the Applicant will deliver both bycatch and predator eradication as a suite of measures, thereby increasing resilience..</p>
RR-029-APDX:C-AAA	<p>Gannet bycatch mitigation – key uncertainties Target fishery A target fishery has not been identified</p>	<p>Initial analysis shows that most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. Further analysis is currently ongoing into foreign vessels operating in UK waters. The Applicant is committed to contacting the relevant fisheries, both UK and foreign fisheries. The Applicant is currently undertaking a more in-depth analysis regarding gannet and bycatch within the UK. The findings of this analysis will aid in identifying the target fishery and location and will be presented at Deadline 1 (G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence).</p>
RR-029-APDX:C-BBB	<p>Auks bycatch mitigation – key uncertainties Target species Evidence suggests reducing bycatch levels for guillemot could deliver compensation, but this is somewhat less certain for razorbill, which are bycaught in much lower numbers. Bycatch levels at the target fishery and likely numbers of ‘saved’ birds need to be accurately quantified for each species.</p>	<p>The Applicant notes the bycatch rate is higher for guillemot than razorbill, however the number of individuals required for razorbill compensation are far lower than those for guillemot (1.5 vs 35 individuals – Applicant values). Therefore, the Applicant considers that despite the lower bycatch rate, razorbill can be compensated in full via bycatch reduction technologies.</p> <p>It is important to note that the Applicant will deliver both bycatch and predator eradication as part of a suite of measures for guillemot and razorbill. Evidence suggests that razorbill may benefit to a greater degree from predator eradication and guillemot, but the level will be sufficient to compensate for both species.</p>
RR-029-APDX:C-CCC	<p>Gannet bycatch mitigation – key uncertainties Target species</p>	<p>The Applicant is currently researching further into gannet bycatch to determine the high-risk locations. A preliminary analysis has identified longlining to be occurring at</p>

	<p>There is some evidence to suggest that reducing bycatch may be a relevant measure for gannet, though perhaps not in English waters.</p>	<p>high levels within Scottish waters and off the southwest coast of the UK. Further analysis is currently being undertaken to identify fishing effort in UK waters from foreign fleet.</p> <p>The vast majority of gannets breeding in the North Sea migrate south through the English Channel following the breeding season (Wright et al 2012). Tracking data (Furness et al., 2018) shows interactions with the waters around the south west of England during this outward journey. Additionally, evidence (Furness et al., 2018) also suggests gannets nesting on the east coast undertake a clockwise migration; first migrating south through the English Channel then returning past the west of Cornwall, around the north of Scotland before heading south to return to North Sea breeding colonies (including FFC SPA).</p> <p>It is therefore initially thought that implementing bycatch within this route (due to limited bycatch risk within the North Sea), will aid in compensating for gannet from FFC SPA as well as the wider geographic population.</p>
<p>RR-029-APDX:C- DDD</p>	<p>Predator eradication</p> <p>The predator eradication measure aims to boost auk population growth by removing 100% of invasive mammalian predators (rats) from an island colony(ies). The evidence for predator eradication being effective for auks is limited, but Natural England agree that the measure has theoretical merit. However, a specific location for implementation has not yet been identified, without which the degree of predator interaction and therefore scale of compensation achievable cannot be determined, nor can the compensation be considered secured prior to the identification of a delivery location with secured land rights. We therefore do not have confidence at this stage that the measure will be deliverable.</p>	<p>The Applicant welcomes Natural England’s agreement that predator eradication has merit as a compensation measure for auks.</p> <p>Evidence that predator eradication is effective for any seabird species is generally limited due to a number of factors, including but not limited to the scale of resources required to monitor post eradication success and the sensitivity of species to disturbance from subsequent monitoring. The Applicant has provided a detailed review of predator eradication projects in the UK which have benefited guillemot and razorbill, within the Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196).</p> <p>Based upon this review of literature, predator eradication and associated biosecurity offer the opportunity to benefit guillemot and razorbill. Pre- and post-monitoring reports from the case studies presented within the aforementioned report (noting that the aims of previous eradication projects often were not targeted at guillemot and razorbill) have shown that the eradication of mammalian predators has benefited both of these species through increases in productivity, nesting populations and recolonisation/ colonisation of new areas previously occupied by invasive</p>

		<p>species. Predator eradication in appropriate locations is a feasible and evidenced measure which can be delivered as compensation for guillemot and razorbill.</p> <p>The Applicant presented within their B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan (APP-193) a shortlist of potential islands suitable for an eradication programme. The Applicant’s Revision 2 of B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap presents further site selection work which has identified the islands within the Bailiwick of Guernsey (including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands)) as highly suitable for predator eradication to provide sufficient compensation for guillemot and razorbill. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including but not limited to: Herm, Jethou and Sark). The refined locations have been discussed in detail during the workshop held on 14th February 2022. The preliminary results of the island habitat suitability analysis will be submitted at Deadline 1 (see G1.33 Predator Eradication Island Suitability Assessment: Bailiwick of Guernsey).</p> <p>Short-listed islands and islets are owned by the States of Guernsey and the States of Alderney (both part of the Bailiwick of Guernsey). Furthermore, the Applicant’s B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four. Alderney Wildlife Trust have approval to undertake predator eradication from States of Alderney (States of Alderney responded to the Hornsea Four consultation supporting the investigations and future compensation measures efforts (presented within the Applicant’s B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)).</p>
RR-O29-APDX:C-EEE	<p>Predator eradication</p> <p>We further note that the Applicant has included predator control as well as eradication for islets where full eradication would not be possible. Natural</p>	<p>Predator control was suggested by the Applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure.</p>

	<p>England do not consider there to be sufficient evidence to demonstrate that predator control rather than eradication would result in sufficient long term benefit and provide an acceptable compensatory measure.</p>	<p>Islands where control was being considered were small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago. Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly at this stage, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029-APDX:C-FFF</p>	<p>Predator eradication (guillemot and razorbill)</p> <p>Overall confidence in the measure</p> <p>Whilst delivering compensation via predator eradication is theoretically possible, a location for implementation has not been identified and it cannot be guaranteed that a location will be found. We therefore cannot have certainty that the measure will be deliverable or make any assessment of the scale of measure that might be achievable.</p>	<p>The Applicant presented within their B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan (APP-193) a shortlist of potential islands suitable for an eradication programme. The Applicant's Revision 2 of B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap presents further site selection work which has identified the islands within the Bailiwick of Guernsey (including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) as highly suitable for predator eradication to provide sufficient compensation for guillemot and razorbill. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands)). The refined locations have been discussed in detail during the workshop held on 14th February 2022. The preliminary results of the island suitability analysis will be submitted at Deadline 1 (G1.33 Predator Eradication Island Suitability Assessment: Bailiwick of Guernsey).</p> <p>Short-listed islands and islets are owned by the States of Guernsey and the States of Alderney (both part of the Bailiwick of Guernsey). Furthermore, the Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four. Alderney Wildlife Trust have approval to undertake predator eradication from</p>

		<p>States of Alderney (States of Alderney responded to the Hornsea Four consultation supporting the investigations and future compensation measures efforts (presented within the Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)).</p>
<p>RR-029-APDX:C-GGG</p>	<p>Predator eradication (guillemot and razorbill) Theoretical merit to deliver compensation Removing predators could allow for colonisation of new areas or reduce predation pressure on existing colonies, and thus increase both breeding populations and productivity of seabirds. However, evidence of it being effective for guillemot and razorbill is limited. These species have not been the target beneficiary for previous predator eradications.</p> <p>The benefits are likely to be felt at the wider biogeographic level rather than at the impacted site.</p>	<p>The Applicant has provided a detailed review of predator eradication projects in the UK which have benefited guillemot and razorbill within the B2.8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196).</p> <p>Based upon this review of literature, predator eradication and associated biosecurity offer the opportunity to benefit guillemot and razorbill within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands).Pre- and post-monitoring reports from the case studies presented within the aforementioned report (noting that the aims of previous eradication projects often were not targeted at guillemot and razorbill) have shown that the eradication of mammalian predators has benefited both of these species through increases in productivity, nesting populations and recolonisation/ colonisation of new areas previously occupied by invasive species. Predator eradication in appropriate locations is therefore a feasible and evidenced measure which can be delivered as compensation for guillemot and razorbill.</p> <p>Nevertheless, the Applicant will deliver to a suite of measures for compensation. Bycatch is included within compensation which can provide compensation for guillemot, thereby increasing the resilience of the measures.</p>
<p>RR-029-APDX:C-HHH</p>	<p>Predator eradication (guillemot and razorbill) Technical feasibility Proven techniques exist for the eradication of rats on islands, and ongoing biosecurity measures can maintain rat free status. However, eradication programs are challenging and can be prone to delays and other issues arising from unforeseen circumstances.</p>	<p>The Applicant welcomes Natural England's comment that proven techniques exist for the eradication of rats on islands, and ongoing biosecurity measures can maintain rat free status. The Applicant is aware of the potential challenges that can arise associated with predator eradication and has undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)). The Applicant has already undertaken site visits to the Isles of Scilly and Guernsey (including Herm and Sark) (August 2021) and is working with the Alderney Wildlife Trust identify at an early stage to identify potential issues and solutions which would increase the success of a potential eradication.</p>

		<p>The Applicant has furthermore employed international eradication and island restoration experts to undertake a detailed implementation study (as described within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets.</p> <p>The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that they have undertaken, or have secured plans to undertake, actions to ensure the success of the measure.</p>
RR-029-APDX:C-III	<p>Predator eradication (guillemot and razorbill)</p> <p>Agreed compensation level</p> <p>Due to concerns with the baseline characterisation (see Appendix B) it is not currently possible to agree impact levels and therefore compensation levels.</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-JJJ	<p>Predator eradication (guillemot and razorbill)</p> <p>Scale/extent of measure</p> <p>Currently undetermined. This cannot be assessed without a location. As direct benefits to the impacted site are unlikely, this is likely to have implications for the benefit: impact ratio.</p>	<p>The Applicant is now only considered full island eradications. Predator control was suggested by the Applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p>

	<p>It is noted that only predator control (rather than eradication) will be possible at some short-listed sites. We do not consider predator control to offer sufficiently evidenced benefits, especially considering that even the benefits arising from eradication are highly uncertain for the target seabird species.</p>	<p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029-APDX:C-KKK</p>	<p>Predator eradication (guillemot and razorbill) Timing: Deliverable before impact Eradication might take longer than the 2 years allocated and eradication is also not the measure of success. The compensation will not be delivering until the required number of chicks are being produced and have reached age of first breeding (i.e. recruited into the breeding population). We do not consider implementation before impact to be analogous to delivering compensation before impact.</p>	<p>Predator eradication measures could be initiated relatively quickly once the site implementation assessments as part of the ground truthing process are complete and following DCO consent award. However, the length of eradication process would be dependent on the population of target species and size of island. Based on previous examples explored in the Guillemot and Razorbill Predator Eradication Evidence Report (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)), island eradication usually takes place over a period of up to two years, but it is anticipated that benefits to guillemot and razorbill populations would be evident the first breeding season following the eradication start (due to a reduction in the number of predators present). Following the implementation studies a more accurate timeframe would be determined by the predator eradication specialists. Productivity monitoring for guillemot and/ or razorbill would be evaluated over a number of breeding seasons and will be detailed in the GRIMP. Hence this measure would be implemented prior to the project impact (displacement from an operational turbine array) arising. Please see further information regarding lead in times in response RR-029-APDX:C-WWW.</p>
<p>RR-029-APDX:C-LLL</p>	<p>Predator eradication (guillemot and razorbill) Location of measure A precise location is yet to be determined. We note that of the short-listed sites, some will not allow for complete eradication. Furthermore, Rathlin Island is shortlisted but already has a funded eradication program in the early stages. It cannot be guaranteed that a suitable location will be identified.</p>	<p>The Applicant presented within their B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan (APP-193) a shortlist of potential islands suitable for an eradication programme. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external international eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including but not limited to: Herm, Jethou and Sark)</p>

		<p>Furthermore, the Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four.</p> <p><u>Predator control</u></p> <p>Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p> <p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p> <p><u>Rathlin Island</u></p> <p>Since the submission of these documents, it has been publicly announced that Rathlin Island has secured funding. Therefore, Rathlin Island will no longer be considered as part of the shortlist by the Applicant.</p>
RR-029-APDX:C- MMM	<p>Predator eradication (guillemot and razorbill)</p> <p>Long term implementation</p> <p>Biosecurity plans have been included and are acknowledged as being essential to the measure's long-term success.</p> <p>We note that adaptive management focusses on eradication failure rather than the colony(ies) subsequently not reaching required growth levels. It</p>	<p>The Applicant acknowledges Natural England's comment. The Applicant will focus on providing adaptive management relative to the eradication as this will reduce predation pressure and increase safe nesting space for breeding guillemot and razorbill. Adaptive management will also consider how colonisation can be increased, such as the use of decoys and playback. Furthermore, other predator management, such as that of corvids, will also be included within adaptive management plans and will be discussed with the OoEG following it's conception</p>

	<p>must be considered that even if eradication is successful, adaptive management may still be required if compensation is not delivered.</p>	<p>post-consent. The suite of compensation measures for guillemot and razorbill are flexible and scalable and can be adjusted between the packages to ensure sufficient compensation is delivered.</p>
RR-029-APDX:C-NNN	<p>Predator eradication (guillemot and razorbill) Success criteria/Ability to prove additionality Increased productivity of the target colonies will be an essential measure of success. Proving additionality raises similar questions as have been considered for kittiwake ANS. It will be very difficult to ascertain if any breeding birds are additional or have simply moved. Wider monitoring may provide some insight.</p>	<p>The scale of monitoring will determined post consent and in consultation with OoEG members. A number of potential monitoring methods already exist which will be refined and discussed with the OoEG following consent. Such examples include:</p> <ul style="list-style-type: none"> • Boat; • Drone; • Aircraft; and • Remote camera. <p>Furthermore, the Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) sets out the implementation studies to be undertaken and presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four.</p> <p>The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external international eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including, but not limited to: Herm, Jethou and Sark). These studies will determine the rat pressure on the species and conduct a colony census in 2022 on the islands of the Bailiwick of Guernsey to aid the evidence regarding additionality. Following advice from Natural England (Workshop held 3rd August 2021) we are also undertaking nesting habitat suitability analysis to consider the opportunities for expansion in the absence of rats.</p>
RR-029-APDX:C-OOO	<p>Predator eradication (guillemot and razorbill) Suitable as sole measure for target species Based on the evidence available, this measure would need to be taken forward as a package for several reasons:</p> <ul style="list-style-type: none"> • If a suitable location is not found this measure will be undeliverable • There is limited evidence of population level effects for the target species 	<p>The Applicant presented within their B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan (APP-193) a shortlist of potential islands suitable for an eradication programme. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external international eradication experts to undertake an implementation study for a potential island eradication on multiple</p>

- The potential extent of this measure is currently unknown, and as currently proposed the scale will not be decided until the post-consent phase
- The proposed locations for the measures are remote from the impacted colony.

islands within the Guernsey Bailiwick (including but not limited to: Herm, Jethou and Sark).

Furthermore, the Applicant's [B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap \(APP-197\)](#) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four.

The Applicant considers that predator eradication has the potential to be used as a compensation measure for both guillemot and razorbill. [B2.8.3. Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence \(APP-196\)](#) provides evidence that guillemot and razorbill both benefit from predator eradication through population increase, re-colonisation and increase in productivity levels. For example, Table 1 in [Section 6.2](#) presents the increase in guillemot and razorbill numbers from an eradication project on Lundy Island.

Nevertheless, the Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). Additionally, the Applicant is committed to providing overall compensation at a ratio of 1:2 (1:1 for predator eradication and 1:1 for bycatch reduction), thereby increasing the resilience and likelihood of success.

The evidence presented within the [B2.8. FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan \(APP-193\)](#) and supporting annexes demonstrates that the proposed measures are capable of more than compensating for the estimated impact of Hornsea Four wind farm on the qualifying gannet, guillemot and razorbill (as determined by the Secretary of State). The Applicant acknowledges that whilst the predator eradication measure proposed cannot be undertaken within the FFC SPA, the birds that the compensation measure will generate will assimilate into the biogeographic population of guillemot and the biogeographic population of razorbill and thereby ensure the coherence of the national site network in the UK is maintained. Further information to support this is provided in [\(B2.8.1: Compensation](#)

<p>RR-029-APDX:C-PPP</p>	<p>Predator eradication (guillemot and razorbill) – Key uncertainties Location It remains unclear whether there are any islands where rats are a limiting or deterring factor for nesting guillemot and razorbill, this needs urgent investigation. Although initial efforts have been made, landowner and community support will also be required.</p>	<p>measures for FFC SPA: Bycatch Reduction: Ecological Evidence: Appendix A (APP-194)).</p> <p>The Applicant has undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)). The Applicant’s B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four. States of Alderney and States of Guernsey are the landowners of the islands/islets where the rat eradication would be undertaken and permission has already been granted to Alderney Wildlife Trust to undertake predator eradication.</p> <p>The Applicant has already undertaken site visits to the Isles of Scilly and Guernsey (including Herm and Sark) (August 2021) and is working with the Alderney Wildlife Trust identify at an early stage to identify potential issues and solutions which would increase the success of a potential eradication.</p> <p>The Applicant has furthermore employed international eradication and island restoration experts to undertake a detailed implementation study (as described within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and
--------------------------	---	---

		<ul style="list-style-type: none"> Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that they have undertaken, or have secured plans to undertake, actions to ensure the success of the measure, despite the inherent challenges presented by island predator eradication.</p>
RR-029-APDX:C-QQQ	<p>Predator eradication (guillemot and razorbill) – Key uncertainties</p> <p>Population level effects</p> <p>Evidence for eradication having population level effects for the target species is limited.</p>	<p>The Applicant has presented a detailed account of evidence supporting the removal of invasive predators and the positive benefits, including increased populations of guillemot and razorbill, within the B2.8.3 RP Volume B2 Annex 8.3 Compensation measures for FFC SPA Predator Eradication: Ecological Evidence (APP-196) report. For example, Table 1 in Section 6.2 presents the increase in guillemot and razorbill numbers from an eradication project on Lundy Island. Habitat suitability analysis using information from site visits and the implementation studies is being undertaken to provided even greater evidence.</p>

4.5 Seagrass Restoration

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-RRR	<p>Seagrass restoration</p> <p>Natural England is of the view that fish habitat (seagrass) restoration cannot be considered compensation, as a link between seagrass restoration and the productivity of the impacted species cannot currently be demonstrated or quantified. We also consider that it cannot be treated as a backup to account for the high levels of uncertainty in other measures. This is also due to the likely timeframes to implementation, and uncertainty regarding the level of impact on target species. Nevertheless, we welcome and support the measure being retained for resilience/ecosystem enhancement and commend the general approach being taken.</p> <p>As we do not consider the measure to be compensation, we have not commented on the documents further, however we would be happy to engage with the Applicant on their methods at a later stage.</p>	<p>The Applicant welcomes Natural England's support of this resilience measure, however, recognises Natural England's concerns regarding uncertainty in relation to the level of impact on the target species. The fish habitat enhancement (seagrass restoration) is a resilience measure and will be used to support the full suite of proposed compensation measures for the target seabirds species (if required by the Secretary of State), kittiwake, guillemot, razorbill and gannet. Additionally, it is important to note that the Applicant will commit to deliver seagrass restoration, if any seabird species requires compensation.</p> <p>Seagrass meadows are likely to have an indirect effect on pelagic birds by acting as a nursery habitat for their prey items. The Applicant acknowledges that there is limited direct evidence connecting relevant seabird species with seagrass. However, linkages exist between the diet of seabird species and forage fish species (comprising</p>

sandeel, herring and sprat) and how individual fish species utilise seagrass. Furthermore, the Applicant recognises the current limited data and literature sources available to support the direct link between target seabird species and seagrass habitats in coastal waters and the North Sea. However, the Applicant seeks to resolve the highlighted evidence gaps by conducting targeted research, including fish surveys, to determine migrations to and from seagrass meadows to the wider North Sea using stable isotope analyses which will be undertaken in the Humber Estuary and the North Sea. The aim of this research will help to determine connectivity between juvenile forage fish species associated with seagrass meadows in the Humber Estuary and their potential distribution into the wider North Sea region following maturation. Such studies are being conducted by the University of Hull in conjunction with the pilot restoration project currently underway by the Yorkshire Wildlife Trust. Moreover, the University of Hull were commissioned to provide a detailed programme of research across the restoration site, with the report due in Q1 2022. In addition, the Applicant has contracted Ocean Ecology Limited and Project Seagrass to carry out a site implementation study including the Humber Estuary. Such research will also provide important baseline data contributing to knowledge gaps for the ecosystem role that UK seagrass meadows provide.

To date the Applicant has undertaken pilot seagrass restoration in association with the Yorkshire Wildlife Trust, within initial planting of 2 ha of seagrass (*Zostera noltii*) seeds within the Humber Estuary which commenced in Q4 2021. An additional 2 ha will be planted in 2022 as part of this pilot. Monitoring of the pilot study is being undertaken by the Yorkshire Wildlife Trust and the University of Hull. The success of the pilot study shall inform the large-scale delivery of a larger seagrass restoration project. The large-scale seagrass restoration will incorporate preparatory work and supporting research surveys and studies to inform project development.

4.6 Key consenting concerns applicable to all measures

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-SSS	<p>Scale of compensation required</p> <p>Natural England advises the scale of compensation required for all measures cannot currently be determined. Firstly, due to concerns with the offshore ornithology baseline characterisation (see Appendix B) the final extent of the impacts cannot yet be agreed. Second, a quantified assessment of the level of compensation required to meet the predicted impact will be necessary for each measure, as the scale of the measure required will in part determine whether delivery is feasible. We note that the Applicant has provided some initial assessments, but we do not consider that the current evidence base is sufficient in most instances to have confidence in these as potential reductions remain theoretical for most measures.</p>	<p>The Applicant is confident that the proposed measures will sufficiently compensate for the required species for Hornsea Four. A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA, which was submitted to Natural England in 2021 and updated following their advice to include all behaviours.</p> <p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B.</p>
RR-029-APDX:C-TTT	<p>Scale of compensation required</p> <p>Uncertainties with the measures will also need to be reflected in the scale of compensation delivered. We note that none of the measures proposed by the Applicant aim to deliver compensation that directly benefits the site of impact, rather they are aiming to recruit birds to the wider geographic population from which it is assumed that some will recruit to FFC SPA. Natural England consider that like-for-like provision to the metapopulation cannot be assumed and this will therefore need to be reflected in the level of compensation provided. For example, it is NE's view that the Applicant should demonstrate that the compensatory measures are of a scale and nature that will provide a level of recruitment into the East Atlantic that has clear potential, in turn, to lead to a sufficient number of adult kittiwakes recruiting to the FFC SPA, as the principal English site in the national site network for this species (indeed the only site in England with this species as a qualifying feature). We acknowledge that it will be impossible to prove that the required number of adult birds has been recruited into the SPA, but we do not consider that that should constrain the scale of the measures. We do not think this could be demonstrated if the measures are only predicted</p>	<p>The Applicant is providing overall compensation at a ratio of 1:2 for each relevant species, thereby providing double the number of individuals to the wider biogeographic population than required for compensation.</p> <p>The Applicant has taken the approach, in accordance with relevant guidance, of designing compensatory measures which benefit the SPA features at risk of being adversely affected as directly as possible. As part of the Applicant's consultation process, it has been acknowledged that it is not possible to deliver compensation for the required species for Hornsea Four directly to the FFC SPA, as direct measures are understood to comprise support for wider seabird prey resource (fisheries management) which may only be led by Government. The Applicant's parent company, Ørsted, is leading a developer collaboration to understand routes to delivery for more strategic ecological measures, and has made a commitment to contribute towards prey resource research to inform Government management (B2.6 Compensation measures for FFC SPA: Overview (APP-183)). In accordance with relevant guidance, the Applicant has proposed the provision of additional artificial nesting opportunities for kittiwakes within the specified search zones, away from the FFC SPA (as additional habitat within the SPA would not benefit the</p>

	<p>to provide an equivalent number of adult birds to those lost from FFC SPA into the wider population.</p>	<p>colony), 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 as part of the east Atlantic breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016), with the proposed compensation measures will be undertaken within this populations breeding and migratory range.</p>
<p>RR-029-APDX:C- UUU</p>	<p>Scale of compensation required We acknowledge that the Applicant has suggested a 1:2 delivery ratio for all measures. However, whilst we welcome the Applicant’s commitment to providing compensation above a 1:1 ratio it is unclear how this ratio has been selected. Further discussion will be required to ensure that all aspects of uncertainty have been considered for each measure, noting that the level of uncertainty needing to be factored in will likely differ between measures. NE advise that the main focus should be to ensure that the level of compensation secured is sufficient to address the level of impact, as well as the uncertainties around the measures themselves in order to ensure sufficient compensation can be achieved to fully address the losses incurred throughout the lifetime of the project.</p>	<p>(impact: compensation) and this follows the Article 6.4 guidance (EC, 2018). The Applicant has committed to a 1:2 ratio for all measures to provide the confidence to SNCBs that the suite of measures will deliver the required compensation. Advice from our ornithological specialists on the required compensation is a 1:1 ratio (based upon a precautionary assessment, ecological evidence and feasibility of delivery of the measure) and we are confident we can deliver the suite of measures. A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: G1.41 Calculation Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA which has been provided to Natural England. However, in-line with the guidance, the Applicant has applied a 1:2 ratio for all relevant species.</p> <p>Natural England in advice to Hornsea Three (18 August 2020) explained that “compensatory measures in the UK have typically included multipliers with respect to the predicted impacts e.g. ratios of 2:1, 3:1, in order to account for any uncertainty regarding the likely effectiveness of those measures”. A review for Defra of compensation found that for most commercial developments or coastal flood defence a 2:1 ratio (compensation: impact) is applied with compensation for coastal squeeze a 1:1 ratio (Defra, 2016) This is also reflected in the report for Welsh Government in 2020 on mitigation and compensation (ABPmer, 2020). The draft Defra guidance on best practice for developing compensation measures states that for marine protected areas ratios of 1:1 are only likely to be acceptable in exceptional circumstances and in agreement with the SNCBs and therefore measures should be delivered at a ratio higher than 1:1. (Defra, 2021a). In response to this consultation Defra found a high level of respondents strongly feel a ratio higher than</p>

1:1 is necessary, and this should be based on clear and robust evidence and linked to certainty of measure to deliver (Defra, 2021b).

The Applicant is confident the ecological evidence reports demonstrates the ecological efficacy of the measures to be confident that a 1:2 ratio will provide more than sufficient compensation for the predicted mortality:

- **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);**
- **B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194);**
- **B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196); and**
- **B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198).**

Through the Compensation Overview, Compensation Plans and Roadmaps:

- **B.2. 6: Compensation measures for FFC SPA: Overview (APP-183);**
- **B.2.7: FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186); and**
- **B.2.8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan (APP-193);**
- **B2.7.2 Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188);**
- **B2.7.4 Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap (APP-190);**
- **B2.8.2 Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap (APP-195);**
- **B2.8.4 Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197); and**
- **B2.8.6 Volume B2, Annex 8.6: Compensation measures for FFCSPA: Fish Habitat Enhancement: Roadmap (APP-199).**

		<p>the Applicant has shown ‘the measures at a 1:2 ratio can be secured and delivered, the robust approach provides confidence that a 1:2 ratio will provide adequate compensation for the predicted mortality.</p> <p>Further updates on the implementation study progress and the Applicant’s progress on securing agreements with relevant local stakeholders in support of the compensation measures were presented to Natural England at the workshops held on 3rd and 14th February 2022. Preliminary findings from the implementation studies are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase and initial findings in the predator eradication being even more promising than expected at this stage. The Applicant has continued to strengthen relationships with key stakeholders to support implementation for all compensation measures. The Derogation Funding Statement (B.2.10: Without Prejudice Derogation Funding Statement (APP-2021)) clearly sets out the Applicants commitment, demonstrates the financial security of the measures and the considerable financial costing allocated to the compensation, which is such a large financial commitment to compensation for a single project.</p> <p>The Applicant has demonstrated through the package of compensation measures the compensation is viable, effective and can be readily secured and delivered. The suite of compensation measures include a commitment of a 1:2 ratio. Natural England, ExA and the Secretary of State can have high confidence that the suite of compensation measures are sufficient to provide the compensation required throughout the lifetime of the project.</p>
RR-029-APDX:C-VVV	<p>Scale of compensation required</p> <p>The same considerations will need to be given to the auk and gannet compensatory measures if sufficient evidence becomes available to enable delivery levels to be calculated.</p>	<p>The Applicant’s response for guillemot and razorbill is reflected in the response regarding compensation ratios above in RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-WWW	<p>Lead- in times</p> <p>As noted in the above summary tables, the Applicant is proposing minimal lead-in times for the compensation measures, with implementation planned for just 1 or 2 years prior to operation. Natural England are concerned that this does not allow sufficient time for the measures to be delivering prior to</p>	<p>The Applicant has considered Natural England’s feedback regarding lead-in timescales for artificial nesting and now makes a commitment to implement the nesting structure 3 breeding seasons ahead of operation of the windfarm. The DCO and compensation roadmaps will be updated accordingly to reflect this.</p>

	<p>impact occurring. European Commission and Defra guidance¹ states that the measure should be functioning prior to the loss occurring. Should the Applicant wish to continue with these lead-in times it will need to be evidenced that a reduced lead-in time is ecologically viable.</p>	<p>The Applicant notes that the risks for lead in times are not associated with bycatch reduction. As bycatch reduction directly reduces mortality, the compensation is effective from the deployment date of these techniques.</p> <p>The European Commission guidance (2018) states that “timing the compensatory measures calls for a case-by-case approach” (see Section 5.5.6). The suite of compensation measures for guillemot and razorbill are flexible and scalable and can be adjusted between the packages to ensure sufficient compensation is delivered. The applicant has discussed with Natural England during the Workshop held on 14th February 2022 the concept of mortality debt and surplus. Natural England also suggested evidencing that mortality debt can be recouped, given that the delivery for predator eradication prior to operation. Natural England stated during the Workshop that there is recognition that the suite of compensation measures and commitment to provide both bycatch and predator eradication is a strong feature of the Hornsea Four compensation packages as it provides flexibility. In addition, the predator eradication effects will be evident from the first breeding season following eradication.</p>
<p>RR-029-APDX:C-XXX</p>	<p>Strategic compensation - increasing prey availability</p> <p>Natural England maintains that increasing ‘forage fish’ prey availability would be the most ecologically effective method to increase productivity of the target bird populations, acknowledging that this could most effectively be delivered via a Government-led strategic approach at a scale larger than any one wind farm. We highlight that it remains the only measure to directly benefit the impacted SPA and highlight that prey availability measures would also have the additional benefit of addressing the effective habitat loss that could result from auk displacement, by increasing the foraging resource within those areas that remain available.</p>	<p>The Applicant welcomes Natural England’s acknowledgement that increasing prey availability would be most effectively delivered via a Government-led strategic approach at a scale larger than any one wind farm. All measures identified within the prey resource evidence report (B2.6.2 Compensation measures for FFC SPA: Prey Resource Evidence (APP-185)) have a high level of technical difficulty and most have a measure of political challenge associated with them. All measures would need significant support from Defra, MMO, JNCC, Natural England and in some cases the Danish Government, as well as significant engagement and interaction with the Danish sandeel fishing industry. The Applicant’s parent company, Ørsted, is currently leading an offshore wind developer collaboration to take forward more strategic ecological compensation options, and is engaging with UK Government stakeholders. In order to inform Government-led management of seabird prey resource, the Applicant has made a commitment to contribute towards prey resource research (B2.6 Compensation measures for FFC SPA: Overview (APP-183)).</p>

RR-029-APDX:C-YYY	<p>Natural England compensatory measures 'check list'</p> <p>To assist developers and regulators, Natural England has developed a checklist of aspects that need to be described in detail in compensation submissions, to give confidence that the measures can be secured (see Annex A).</p>	<p>The Applicant acknowledges and welcomes the criteria checklist developed by Natural England.</p>
RR-029-APDX:C-ZZZ	<p>Ongoing resource requirement</p> <p>We note that a steering group has been proposed by the Applicant for the post-consent period to enable details of the compensation proposals to be finalised. Whilst Natural England acknowledges the need for a steering group, it is required at least in part because the proposals have not been sufficiently refined prior to submission. We highlight that discussion on compensation proposals did not begin in earnest until over two years into the Evidence Plan Process, despite Natural England advising that consideration should be given to compensatory measures at the earliest opportunity.</p>	<p>The Applicant welcomes Natural England's acknowledgement of the need for a steering group. The Applicant appreciates the advice from Natural England throughout the stakeholder engagement and evidence process for compensation and attending workshops specifically on compensation measures since early summer 2020 (including attendance at seven workshops during the pre-application and two workshops following DCO submission).</p>

4.7 Detailed comments: Volume A4, Annex 6.1: Compensation Project Description

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-1	<p>Point 1</p> <p>We welcome the suggestion that 4 years has been factored into the timelines to enable structure colonisation prior to wind farm operation, however we note that this contradicts the timelines provided in other documents which state that structures will only be in place for 1 or 2 breeding seasons before wind farm operation. See Point 12 for further discussion.</p>	<p>The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation illustrated in B2.7.2:</p> <p>Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188) allows for four breeding seasons prior to operation. The timing of implementation of an artificial nesting structure as set out in Table 1 is provisional as the timeframe for consent award, reaching final investment decision (FID) and Contracts for Difference Allocation Round Five, have not yet been set. The programme has been carefully considered to ensure timely delivery of the compensation measure.</p> <p>The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's</p>

		<p>concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England’s comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML to be submitted at Deadline 1.</p>
RR-029-APDX:C-2	<p>Point 2 We note that the Applicant is aiming to maintain the coherence of the SPA network by recruiting kittiwake to the wider East Atlantic population. Natural England emphasises that the SPA network comprises of sites rather than a wider population, and notes that FFC is the only English site with kittiwake as a qualifying feature in its own right. It is NE’s view that this would increase the scale of compensation required, as to maintain the number of breeding adults recruited to the FFC SPA population would require a larger number to be recruited to the wider East Atlantic population. See Point 3.</p>	<p>The establishment of breeding colonies at the artificial structure would produce young that would become part of the wider biogeographic population of kittiwake as part of the east Atlantic breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016), with the proposed compensation measures will be undertaken within this populations breeding and migratory range. The SPA network is not a closed system, with birds from the biogeographic population forming the pool of birds which feeds into SPA populations. There is currently no viable technology available which can determine where kittiwake originating from one location initially recruit and therefore the proportion on new young produced by the structure which recruit to FFC SPA cannot be quantified.</p> <p>The Applicant is undertaking compensation measure for kittiwake at a 1:2 ratio to provide the confidence to SNCBs that the suite of measures will deliver the required compensation..</p>

4.8 Detailed comments: Volume A4, Annex 6.4: Compensation Commitments Register

Reference	Relevant Representation Comment	Applicant’s Response
	No specific comment	Noted.

4.9 Detailed comments: Volume B2, Chapter 4: Summary Statement

Reference	Relevant Representation Comment	Applicant's Response
	No specific comment	Noted.

4.10 Detailed comments: Volume B2, Chapter 6: Compensation measures for FFC SPA: Overview

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-3	<p>Point 3</p> <p>Table 2 presents the Applicant's position on the predicted impact for each species and the population required per annum to compensate for that impact level. Due to concerns with the baseline characterisation modelling used for these species (see Appendix B) and them being based on the Applicant's approach rather than SNCB parameters, Natural England cannot agree with the predicted impact levels presented.</p> <p>We also do not consider that it is currently possible to determine the scale of compensation required. The current evidence base is insufficient to have confidence in values presented as potential reductions remain theoretical. Irrespective of this, calculations have not been provided to support the Applicant's values. For agreement on compensation levels to be reached, a quantified assessment of the level of compensation required to meet the predicted impact will need to be presented for each measure, demonstrating that all demographic parameters and associated uncertainties have been accounted for. It is important to highlight that the delivery requirement of any compensation measure is to provide X additional breeding adult birds per annum and not X chicks per annum. Calculations therefore need to determine how many breeding pairs and/or what increase in productivity is necessary to produce enough</p>	<p>In relation to concerns raised relating to the ornithology baseline characterisation please see detailed responses on this matter provided in the Applicant's comments to Offshore Ornithology Relevant Representations, including RR-029-5.1 and RR-029-5.9B and compensation ratios above in response RR-029-APDX:C-UUU.</p> <p>The Applicant has provided an updated calculation document in support of the population required to compensate for potential impact to gannet, kittiwake, guillemot and razorbill. A detailed account is provided within: G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA which has been reviewed by Natural England and discussed during Workshops held 3rd and 14th February 2022.</p> <p>Applicant has committed for an overall compensation ratio of 1:2 (see response above regarding ratios).</p>

chicks per annum to result in X additional adult kittiwake recruiting to the East Atlantic population per annum.

Furthermore, the scale of compensation required is yet to be determined. The current approach of the KCP is to recruit kittiwake to the East Atlantic population rather than the FFC SPA population, however the calculations for kittiwake needed are based on recruitment/appportioning to FFC SPA. To be confident of maintaining the number of breeding adults recruited to the FFC SPA population will require a larger number to be recruited to the wider East Atlantic population (see Point 2). The proportion of birds produced that are (all other things being equal) likely to be recruited into the FFC SPA from the wider East Atlantic population therefore needs to be factored into the calculations. The same considerations will also need to be given to the auk compensatory measures if evidence becomes available to calculate delivery levels, as these also do not aim to compensate at the site of impact.

We welcome that the Applicant has suggested providing compensation at greater than a 1:1 ratio, however it is not clear how or why a compensation ratio of 1:2 has been selected. As we do not think it is currently possible to determine the scale of compensation achievable with the current measures due to outstanding uncertainties, further discussion will be needed on this topic. More generally, Natural England highlights that ratios are only one way of addressing the uncertainty associated with measuring success, and considers that well-designed and located measures based on agreed targets may be a surer way to achieve success than the application of crude ratios.

4.11 Detailed comments: Volume B2, Annex 6.1: Compensation measures of the FFC SPA: Compensation Criteria

Reference	Relevant Representation Comment	Applicant's Response
	No specific comment	Noted.

4.12 Detailed comments: Volume B2, Annex 6.2 Compensation measures for FFC SPA Prey Resource Evidence

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-029-APDX:C-4</p>	<p>Point 4 - Document Used: Volume B2, Annex 6.2: Compensation measures for FFC SPA Prey Resource Evidence. General.</p> <p>This document is an updated and expanded version of the equivalent document² submitted as part of Hornsea 3's derogations case. Natural England's advice³ given during the Hornsea 3 statutory consultation on prey availability remains unchanged. We maintain that increasing prey availability would be the most effective method to increase productivity of the target bird populations. We highlight that it remains the only measure to benefit the site of impact, and prey availability measures also have the additional benefit of addressing the effective habitat loss that could result from auk displacement, by increasing the foraging resource within those areas that remain available.</p> <p>Natural England acknowledges that such measures (sustainable management of forage fish fisheries) could most effectively be delivered via a Government-led strategic approach at a scale larger than any one wind farm, as is concluded by the Applicant in the report. There are increasingly few options available for compensation delivery at a project alone level, and fewer still that can demonstrably benefit the site of impact.</p>	<p>The Applicant acknowledges that a number of the measures proposed under the heading "Incentives/ disincentives for certain activities" relate to the management of prey resource (such as creation of fishery exclusion zones or purchase of sandeel and/or sprat quotas). As described in B2.6 Compensation measures for FFC SPA: Overview (APP-183), it is not currently possible for an individual offshore wind developer, or group of developers, to enact proportionate fisheries management measures that can be secured to deliver meaningful compensation on this theme.</p> <p>All measures identified within the prey resource report (B2.6.2 Compensation measures for FFC SPA: Prey Resource Evidence (APP-185)) have high level of technical difficulty and most have a measure of political challenge associated with them. All measures, apart from a commercial agreement, would need significant support from Defra, MMO, JNCC, Natural England and in some cases the Danish Government, as well as significant engagement and interaction with the Danish sandeel fishing industry. The Applicant's parent company, Ørsted, is currently leading an offshore wind developer collaboration to take forward more strategic ecological compensation options, and is engaging with UK Government stakeholders. In order to inform Government-led management of seabird prey resource, the Applicant has made a commitment to contribute towards prey resource research (B2.6 Compensation measures for FFC SPA: Overview (APP-183)).</p> <p>The Applicant welcomes Natural England's comment that Natural England acknowledges that such measures (sustainable management of forage fish fisheries) could most effectively be delivered via a Government-led strategic approach at a scale larger than any one wind farm, as is concluded by the Applicant in the report.</p>
<p>RR-029-APDX:C-5</p>	<p>Point 5 - Document Used: Volume B2, Annex 6.2: Compensation measures for FFC SPA Prey Resource Evidence. 2.7.2.6.</p> <p>The report questions whether the science-led approach could be secured within the relevant timeframes as it is likely to take between 3-5 years to have full traction. We consider that this should be compared with the</p>	<p>The Applicant has estimated the timeframes required for delivery of a science-led approach to fisheries management, however, in contrast to the timescale for delivering artificial nesting structures, the timing of initiation, implementation and monitoring of a prey resource measure is not within the Applicant's means to secure. As context, in 2021, Defra and Marine Scotland issued a "call for evidence on future management of Sandeels and Norway Pout", acknowledging that urgent action is required to protect stocks and the wider ecosystem</p>

	<p>timeframe that may be required to achieve sufficient colonisation of offshore nest structures, which is likely to also be 3-5 years.</p>	<p>(including kittiwakes). The summary of responses for this consultation is due in March 2022, and next steps for Government may include further management measures. However, the Applicant is not currently in a position to rely on this process.</p> <p>The Applicant will contribute to a fund (£100,000 per year for 5 years) to support evidence gathering to inform Government-led management of key fish stocks, in accordance with research gaps identified by the Offshore Wind Strategic Monitoring and Research Forum (OWSMRF) (see B2.10 Without Prejudice Derogation Funding Statement (APP-202) and B2.6.2 Appendix A Ørsted's Strategic Compensation Approach (APP-185)). The Applicant will work in close collaboration with Hornsea Project Three to build upon the growing evidence base so as to maximise the benefits of the evidence gathering programme.</p> <p>Ørsted is currently leading a collaboration of offshore wind operators and developers to promote a strategic approach to the delivery and securing of compensation, including supporting the delivery of more strategic measures such as prey resource management. The collaboration is currently hosted under the Offshore Wind Industry Council's Developer Group and is working in close collaboration with UK Governments.</p>
<p>RR-029-APDX:C-6</p>	<p>Point 6 - Document Used: Volume B2, Annex 6.2: Compensation measures for FFC SPA Prey Resource Evidence. Appendix A, Section 5.</p> <p>We welcome the Applicant's commitment to fund research into a science-led, ecosystem-based assessment to inform fisheries management and quota allocation, though we query whether this should be secured within the DCO.</p>	<p>The Applicant is pleased that Natural England welcomes the commitment to fund research into a science-led, ecosystem-based assessment to inform fisheries management and quota allocation. The Applicant is willing to make a legal commitment outside of the DCO to manage, fund and deliver the research projects identified. A commitment to fund research would be flexible to the route chosen by UK government to manage the fishery and would also provide valuable information regardless in relation to understanding the status of the relates species and what may change under different future climate scenarios.</p>
<p>RR-029-APDX:C-7</p>	<p>Point 7 - Document Used: Volume B2, Annex 6.2: Compensation measures for FFC SPA Prey Resource Evidence. Appendix A, Section 7.</p> <p>Natural England welcomes and supports the Applicant's efforts to collaboratively engage with offshore wind developers to promote a strategic approach to compensation securement and delivery. We also welcome the Applicant's acknowledgement that outputs from a strategic scheme could be factored into the adoption and design of future adaptive management.</p>	<p>The Applicant welcomes the support from Natural England regarding Ørsted's strategic approach to compensation.</p>

4.13 Detailed comments: Volume B2, Chapter 7 FFC SPA: Gannet and Kittiwake Compensation Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-8	<p>Point 8 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 1.4.1.2.</p> <p>We note that a steering group has been proposed by the Applicant for the post-consent period to enable details of the compensation proposals to be finalised. Whilst Natural England acknowledges the need for a steering group, it is because the proposals have not been sufficiently refined pre-submission. We note that the Applicant could have been further ahead in addressing uncertainties and securing the measures had they focussed on developing compensation proposals earlier in the Evidence Plan Process, as advised by NE. Whilst some post-consent discussions are beneficial, we do not consider reliance on post-consent steering groups to agree important aspects of the measures to be a sustainable approach to compensation design and delivery and maintain that robust measures should be developed "up front" as part of the pre-application process.</p>	<p>The Applicant welcomes Natural England's acknowledgement of the need for a steering group. The Applicant appreciates the advice from Natural England throughout the stakeholder engagement and evidence process for compensation and attending workshops specifically on compensation measures since early summer 2020 (including attendance at seven workshops during the pre-application and two workshops following DCO submission).</p> <p>The Applicant has demonstrated through the package of compensation measures the compensation is viable, effective and can be secured and delivered.</p>
RR-029-APDX:C-9	<p>Point 9 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 1.4.1.3.</p> <p>Natural England disagrees with the Applicant being the Chair of the Steering group. We note that an independent Chair has been appointed for the equivalent steering groups established to deliver Hornsea 3's compensation. Further, the details of the associated DCO condition (see Points 14&15) allow the Applicant as Chair to define the scope of discussions on several key aspects of mitigation and this is without any requirement for discussion or agreement with the other members of the H4 OOEG. Natural England consider that an independent chair should be appointed to any steering group formed. N.B. This also applies to 1.4.1.3 in Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan.</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.</p>

RR-029-
APDX:C-10

Point 10 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 3.1.1.2.

Natural England consider the provision of a single structure to be a high-risk approach, both in terms of initial failure and ongoing resilience over the lifetime of the project (~35 years). The risk of relying on a single structure is compounded by the proposed lead-in time of two full breeding seasons to achieve colonisation for new structures, and only one full breeding season for repurposed structures (see Point 12).

Furthermore, depending on the scale of compensation that is to be provided (which is yet to be agreed), the offshore colony created (or expanded) may need to be amongst the largest currently known. The Applicant suggests that 526-608 pairs would be required to produce 95 adult kittiwakes/annum (in a 1:1 ratio). The largest offshore colony currently identified is at Draugen, Norway with 674 apparently occupied nests (AON) in 2019, the second largest being an unidentified/confidential structure surveyed by the Applicant which held 409 AON in 2021 (see Table 1 in Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence). Most offshore colonies appear to be significantly smaller than this, making it unlikely that a single structure would be able to deliver the compensation (noting that requirements may differ depending on whether new or repurposed structures are used and that it is suggested the structure might also accommodate a gannet colony). It is also unlikely that a target equivalent to a 1:1 compensation ratio would be supported by Natural England at this time (see Points 3&12) given the number of uncertainties relating to artificial nest structures.

We note four onshore structures capable of providing the calculated number of nests were deemed necessary to provide appropriate resilience for Hornsea 3, as reflected in the SoS's decision. We do not consider that it is currently possible to commit to a fixed number of structures that it will be necessary to provide, however we strongly advise that one will be

In an offshore context, [Section 3.2](#) of the [B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence \(APP-187\)](#) report determined from the evidence base that while offshore populations of kittiwake are increasing, it is highly likely that they are restricted by the availability of appropriate nesting habitat at some locations. The Evidence Report concluded that colony size and productivity rates at many offshore sites could increase if suitable additional nesting spaces are provided, with specially designed offshore sites potentially being able provide a vital refuge to buffer against declining coastal populations. It is also imperative to add that all current offshore nesting locations are not designed for optimal kittiwake nesting habitat, with many locations due to be decommission over the lifetime of the Hornsea Four project.

The [B.2.6: Compensation measures for FFC SPA: Overview \(APP-183\)](#) report sets out the compensation level required for kittiwake in Table 2. Based upon the effect on 21.22 breeding adult individuals the population required to compensate is 56.7 breeding adults on a 1:1 ratio, however the Applicant has confirmed that the effect will be compensated at a 1:2 ratio providing 113 nesting pairs to compensate for the adverse effect to provide SNCBs with further confidence. The [B.2.7.5: Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design \(APP-191\)](#) report describes how the artificial nesting compensation measure is flexible and scalable and the [B.2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap \(APP-188\)](#) describes how a colony of over 500 pairs of kittiwake could easily be supported by an artificial nesting structure from the initial design.

The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England's comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.

insufficient. We advise that a commitment should therefore be made to provide more than one structure in more than one location, with the final number dependent on the scale of compensation required.

Offshore structures will be designed to provide adequate design and room to support the required compensation populations of both species. The site selection process and design of the artificial nesting structure is currently being progressed for both species and will demonstrate breeding capacity. An adaptive management plan would also be produced and outlined in consultation with OOEG, which would list a set of options to ensure the long-term resilience of the measure. Adaptive management will be an iterative post construction process which combines management measures and subsequent monitoring with the aim of improving effectiveness of the measure, whilst also updating knowledge and improving decision making over time. Adaptive management will be an important component of the compensation measure and will be used as a method to address unforeseen issues or deviations from expected outcomes of the compensation (i.e., colonisation rate of structure, productivity rates and population trends which occur in year four). Such measures might include:

- Provision of additional nesting sites via extension of structure if capacity is exceeded;
- Additional protection from elements;
- Enhanced predator deterrent;
- Provision of nesting material, such as soil and dry vegetation; and
- Enhanced recruitment support – kittiwake calls, decoys etc.

All factors will be undertaken to ensure long-term efficiency of the compensation measure for the lifetime of the Hornsea Four Project. In relation to the compensation population size, the Applicant has provided an updated calculation document in support of the population required to compensate for potential impact to gannet, kittiwake, guillemot and razorbill. A detailed account is provided within: Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA.

Compensation proposed by the Applicant is proportionate to the scale of the impact for Hornsea Four.

As the Applicant is the first developer to propose the provision of additional offshore nesting habitat, gather evidence and has made significant headway to secure such compensation,

		the Applicant is confident that the evidence base supports the proposed compensation measure.
RR-029-APDX:C-11	<p>Point 11 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 3.1.2.1.</p> <p>Natural England welcomes the Applicant's preference to deliver offshore over onshore artificial nest structures (ANS), however we consider that this should be strengthened to a commitment to provide offshore ANS only (see Point 41).</p>	<p>The Applicant's preference is for an offshore repurposed artificial nesting structure, however we are working strategically to develop the onshore site selection and design, in case an onshore artificial nesting structure is deemed necessary by the Secretary of State.</p>
RR-029-APDX:C-12	<p>Point 12 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 3.1.2.2 & 3.1.2.3.</p> <p>The timescale for implementation of the compensatory measure is very short, allowing only 1 or 2 breeding seasons for structure colonisation prior to wind farm operation. We do not believe there is sufficient evidence to support this approach, noting that our advice on Hornsea 3 and Norfolk Boreas was that 3 to 5 years would be necessary, and this was accepted by the SoS.</p> <p>We highlight that data from offshore colonies is patchy and inconsistently collected (as detailed in 'Volume B2 Annex 7. 1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence') and initial colonisation and growth are often unrecorded. Whilst we agree that a well sited offshore ANS is likely to be colonised, the approach is experimental, and the likely speed of colonisation cannot be predicted with any certainty. In the case of a repurposed structure, we do not consider that simply retaining the existing birds at the structure would qualify as compensation - an increase in colony productivity would be required to demonstrate additionality. There again remains considerable uncertainty around the likely colonisation speed, resulting level of increase in productivity and added capacity that could be achieved. Should the Applicant wish to continue with these lead-in times it must be evidenced that a reduced lead-in time is ecologically viable.</p>	<p>The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation illustrated in B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188) allows for four breeding seasons prior to operation. The timing of implementation of an artificial nesting structure as set out in Table 1 is provisional as the timeframe for consent award, reaching final investment decision (FID) and Contracts for Difference Allocation Round Five, have not yet been set. The programme has been carefully considered to ensure timely delivery of the compensation measure.</p> <p>The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England's comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.</p> <p>As mentioned above, a period of three-breeding seasons is now committed to for both new and repurposed structures, to allow kittiwake to establish and provide young into the biogeographic population. The Applicant's B2.7.1 PR Volume B2 Annex 7.1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence (APP-187) report presents evidence which highlights the advantages of an offshore structure, including increased productivity when compared to onshore colonies. Bird breeding at offshore</p>

	<p>We note that European Commission and Defra guidance⁴ states that compensatory measures should be functioning prior to the loss occurring. NE's interpretation of this would be that to be considered 'functioning' or 'delivering', the compensation measure should be providing adult birds and/or productivity at the required level before any impact occurs and that there should be sufficient lead-in time factored in to enable this. If this is not the case, we would expect accumulated mortality debt to be quantified within the submission.</p> <p>It should also be noted that a mortality debt scenario is highly likely even if the ANS is colonised, as the productivity of the colony may not be sufficient. It is expected that, especially for a new ANS, initial colonisation would involve small numbers of birds. This 'lead-in' must be accounted for when calculating an estimated population requirement of the ANS (to aid design in terms of nest space requirement).</p> <p>A fully evidenced justification needs to be provided to demonstrate that the required colony size/growth is achievable prior to wind farm operation for the reduced lead in time and/or an adaptive management plan to account for mortality debt needs to be presented. We again highlight that this is a significant reduction from the precedent of four full breeding seasons set by Hornsea 3.</p>	<p>structures also have 360-degree access to prey, reduced competition from other species and reduced predation risk (due to lack of large gull species and corvids breeding offshore).</p> <p>The kittiwake population on the structure will be given due consideration within each monitoring years' success criteria calculations to ensure the require compensation population is met at the end of the operation lifetime of the Project.</p> <p>An adaptive management plan will be developed and discussed with OOEG members following consent. Adaptive management measures will ensure compensation success by mitigating unforeseen issues. Likely adaptive measures will include:</p> <ul style="list-style-type: none"> • Extension of structure to facilitate further nesting spaces which will include the provision of additional nesting sites if capacity is exceeded; • Additional protection from elements; • Enhanced predator deterrent/ management; • Provision of nesting material, such as soil and dry vegetation; and • Enhanced recruitment support – kittiwake calls, decoys etc. <p>The Applicant is confident that the structure will be successful in compensating for the Hornsea Four impacts for kittiwake and has added security in success as a result of providing a detailed adaptive management plan following consent.</p> <p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.</p>
<p>RR-029-APDX:C-13</p>	<p>13 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. 3.2.4.8</p> <p>We note that the area of highest ecological opportunity that has been identified does not appear to have been defined, strictly, by the heatmapping process. Rather, an area of potentially better ecological opportunity has been disregarded for unconvincing reasons (discussed further in Point 45). We do acknowledge that the site selection process is still in a relatively early phase.</p>	<p>The area of highest ecological opportunity was refined using the results of the heatmapping process (ie. areas of green were sought) however the process was influenced by other important factors including:</p> <ul style="list-style-type: none"> • Review of platforms nesting survey results to identify where birds are already nesting in Southern North Sea to maximise colonisation potential. The results of the Summer 2021 surveys were provided at Application submission (see B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological evidence) however in general there is limited data to demonstrate colonisation of existing platforms towards the north of the study area with stronger data associated with Flamborough front.

- Seeking further advice from ornithological specialists on ecological suitability of proposed locations; and
- Taking into account existing and future windfarms in terms of distance and orientation given stakeholder feedback that placing a platform where a windfarm would be situated directly in the path between the structure and Flamborough and Filey SPA should be avoided.

The Applicant has ensured Natural England have been consulted on this process. A memo with further site selection information was provided in November 2021 requesting advice on a short-list of three locations for a new artificial nesting structure and discussions have been held with Natural England on the preferred locations for a new and repurposed structure to increase their confidence in securing the measure. Engagement has also been undertaken with other key stakeholders regarding these site selection options for a new structure. All stakeholders have been in agreement with the order of preference of options and preferred location. The area to the north has not been included primarily due to the extremely low numbers of birds that have colonised platforms towards this area as discussed with Natural England in the Workshop held on 3rd February 2022.

In relation to a repurposed structure (which is the Applicant's preferred method of providing artificial nesting as compensation), highly feasible options have been identified with existing kittiwake colonies, where there is scope to provide additional nesting, and in suitable locations. Consideration has also been given to suitable timeframes for decommissioning and penchant by platform owners or operators to collaborate in repurposing. Hornsea Four is currently progressing discussions with owners and operators of platforms that are within the North Norfolk Sandbanks and Saturn Reef (NNSRR) SAC. The Applicant is in the process of securing memorandums of understanding with the operators to allow specific platforms and locations to be discussed and shared with stakeholders.

Following the submission of the Application the site selection for a new offshore nesting structure has been refined and an update on this is provided in [G1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement](#).

4.14 Detailed comments: Section 5, Draft DCO conditions

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-14	<p>14 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 1 Condition 2</p> <p>This condition needs to include a requirement to consult the relevant SNCB, as well as all other members of the Hornsea 4 (H4) Offshore Ornithology Engagement Group (OOEG). Please note this condition includes the terms of reference (TOR) that the H4 OOEG will adhere to, as well as details of the requirements upon the members in terms of timetables, meetings etc. Also, the details of the dispute mechanism and what the scope of the discussions of the H4 OOEG is to cover. It is essential that these factors are discussed and ideally agreed with all the members of the H4 OOEG and this is not currently secured within these draft conditions.</p> <p>Throughout the schedule KGIMP and GKIMP are both used for the Gannet and Kittiwake Implementation and Monitoring Plan. For consistency please could this be limited to GKIMP.</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations in response RR-029-APDX:A-19.</p>
RR-029-APDX:C-15	<p>15 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 1 Condition 2 (e)</p> <p>For the reasons set out in Point 9, Natural England disagrees with the Applicant being the Chair of the Steering group.</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations RR-029-APDX:A-20.</p>
RR-029-APDX:C-16	<p>16 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2/3 Condition 3 and 8</p> <p>If it is conditioned that the GKIMP and GGRIMP must be based on the strategies set out in the gannet and kittiwake compensation plan and the gannet, guillemot and razorbill compensation plans, we advise that a final</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.</p>

	<p>version of the compensation plans would need to be provided to account for any changes made during the examination process. We note that a commitment is made to this effect in Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap, 4.1.1.1.</p> <p>Condition 3 has a typo in the last line, KGIMP instead of GKIMP.</p> <p>All references to Natural England should be amended to the relevant Statutory Nature Conservation Body, for consistency.</p>	
<p>RR-029- APDX:C-17</p>	<p>17 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3(c)</p> <p>As detailed in Point 12, Natural England is concerned with the significant reduction in lead in times proposed by the Applicant. We further highlight that the Applicant defines the breeding season as running from 1 April- 31 August in each year. This is inconsistent with the breeding season accepted for Hornsea 3's compensatory measures, which was defined as 1 March – 30 September. As with the reduced lead in time, the Applicant must provide evidence to justify this reduced breeding season, particularly regarding March, which is likely to be a time when kittiwakes are prospecting for nest sites. Furthermore, we consider that the compensation needs to be delivering and not just implemented prior to impact. Noting the wording for adaptive management at 3 (f) does not capture changes to timelines for the measures, or to the development should the monitoring highlight the measures are not delivering the required compensation.</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.</p>
<p>RR-029- APDX:C-18</p>	<p>18 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3(d)</p>	<p>Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.</p>

	<p>We consider this should include monitoring and reporting on the effectiveness of the measures, as has been included for the guillemot and razorbill measures (8(a)(iv)).</p>	
RR-029-APDX:C-19	<p>19 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3(e)</p> <p>This condition should not just require a reporting of the consultation. It should require the Applicant to detail how the consultation responses have been considered and give information explaining why any recommendations or advice has not been included.</p>	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-20	<p>20 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3 (f)</p> <p>As per point raised above on condition 3; captured within any adaptive measures should be any changes to timescales for both the project and for the compensation proposals.</p>	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-21	<p>21 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3(i)</p> <p>This condition says it links to 9 (b), but there is no 9 (b). We assume this refers to 8 (b), but it should be corrected and or clarified.</p>	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-22	<p>22 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 2 Condition 3(g)</p> <p>The reporting here should require the provision of this report to all members of the H4 OoEG. Or to the relevant statutory nature conservation body as a minimum.</p>	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-23	<p>23 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 3 Condition 8(a)(iii)</p> <p>As with the lead in times for artificial nest structures, we are concerned that implementation of predator eradication and/or control two years prior to operation of the wind farm does not give sufficient time for the</p>	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.

	measure to be delivering prior to impact. We do not consider predator control to offer sufficiently evidenced benefits as a compensation measure. See Points 48&50.	
RR-029-APDX:C-24	24 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 3 Condition 8 (a)(vi) and (b)(v) Please see comments above on condition 3(f) as the issues raised there also apply to these adaptive management conditions.	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-25	25 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 3 Condition 8 (a)(v) and (b)(iv) Please see comments on condition 3 (e), the issues raised on this condition also applies to these conditions.	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-26	26 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 3 Condition 8 (a)(vii) and (b)(vi) Please see comments on condition 3 (g), the issues raised on this condition also applies to these conditions.	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-27	27 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. Part 4 Condition 12 The single condition for Fish Habitat Enhancement lacks the details as per the other compensatory measures. Key elements such as location, extent, timing, adaptive management, monitoring, reporting etc are not detailed to be included. This seems insufficient should this be required as part of compensatory measures.	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.
RR-029-APDX:C-28	28 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. General We further note that none of the current conditions secure the need to produce the target level of compensation each year (on average). It should be noted that concerns regarding this are compounded further by	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.

	our concerns on the adaptive management conditions and should be addressed.	
RR-029-APDX:C-29	29 - Document Used: Volume B2, Chapter 7: FFC SPA: Gannet and Kittiwake Compensation Plan. Section 5, Draft DCO conditions. General It would be helpful if future iterations of the DCO conditions could be provided within the draft DCO as this is expected to be a live document during the Examination.	Please see detailed responses on this matter provided in the Applicant's response to Appendix A DCO Relevant Representations.

4.15 Detailed comments: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-30	30 - Document used: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence. 3.1.2.2. Determining the reasons for existing structures being colonised versus not colonised may be key to ensuring the success or failure of the measure, and also improving our understanding of the extent to which offshore nest site availability is currently a limiting factor to kittiwake. We welcome the acknowledgement of this in Section 3.3.2 but are concerned that the Applicant has concluded that further investigations are beyond the scope and timescales of the project (3.3.2.2). We would welcome further discussion with the Applicant on this matter as it is not clear if all avenues of investigation detailed by the Applicant have been ruled out.	The Applicant acknowledges this comment and welcomes further discussion. The Applicant has sought to ascertain further platform information from operators (i.e.. historical deterrent use) and has had varying levels of response (noting this is a sensitive topic for platform operators) and aims to submit further information on this to the Examination as soon as possible. Furthermore, the Applicant is committing to further survey work on nesting seabirds in the Summer of 2022 following the same methods which Natural England have praised (please see Natural England's below Relevant Representation).
RR-029-APDX:C-31	31 - Document used: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence. 3.3.3. Natural England agrees with the Applicant that, "Incorporating design features which are likely to improve breeding success, would enhance the chance of the artificial nest structure contributing to additionality." As such, in addition to careful consideration of the existing structures that have proven attractive to breeding kittiwakes, it should also be considered that these structures can (probably) be further enhanced once the normal constraints of building e.g. an oil or gas platform can be disregarded.	The Applicant welcomes this advice and confirms it is in agreement that existing structures offer opportunities for further enhancement to provide additional nesting space where appropriate. The Applicant appreciates the advice regarding design for new or repurposed structures.

	<p>The materials (or surface detailing) used to construct ledges could also be considered if building or adapting an offshore structure. Textured or grippy surfaces might be more conducive to stable nest building.</p>	
<p>RR-029-APDX:C-32</p>	<p>32 - Document used: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence. 4.2.1.1. Table 5. We note that Northern gannet have not maintained colonies at artificial structures. Evidence from Australasian gannet is encouraging but there may be unknown site-and species-specific factors.</p> <p>There is also evidence of failed attempts to re-establish extirpated colonies (of both Northern and Australasian gannet) e.g., in Canada (referenced in Sawyer & Fogle, 2013)⁵, Maine⁶and New Zealand⁷. These projects unsuccessfully used decoys and acoustic attraction methods to attempt to attract gannets. Consideration of sites where the creation of artificial colonies, or the re-establishment of extirpated colonies has failed is important evidence when considering the likely efficacy of the measure and designing a proposal.</p> <p>Overall, we consider that there is insufficient evidence to suggest that the creation of an artificial colony for Northern gannet would prove successful. Creation of ANS for Northern gannet should be considered experimental and high risk.</p>	<p>The evidence presented by the Applicant demonstrates that compensation can be delivered for gannet on either one new or one repurposed artificial nesting structure and is presented in support of each of the compensation measures: B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187).</p> <p><i>This report has reviewed the evidence of gannet nesting on artificial structures and the feasibility of establishing new gannet colonies. The numerous examples of Australasian and Northern Gannet colonising artificial structures (supports, jetties, boats, platforms) provides evidence, and suggests that gannet do not have a clear preference for natural habitat colonies. Furthermore, a recolonisation attempt at Young Nick’s Head deployed decoys and playback in 2008 and had two eggs reported in the 2010 breeding season, 11 chicks fledged in the 2011 breeding season and 28 chicks fledged in the 2012 breeding season (Sayer & Fogle 2013). This provides promising evidence that such techniques are viable in increasing colonisation chances at an artificial offshore nesting structure provided as compensation. It is also important to incorporate the lack of available nesting habitat for gannet offshore as offshore structures are unlikely to be suitable habitat for nesting gannet due to their specific design. A specially designed structure for gannet would, as presented for kittiwake, allow assess 360-degree access to prey, reduced competition from other species and reduced predation risk (due to lack of large gull species and corvids breeding offshore). As a result, there is a high likelihood that gannet productivity would be higher offshore. Therefore, the provision of optimal potential nesting habitat offshore will deliver compensation for gannet.</i></p>
<p>RR-029-APDX:C-33</p>	<p>33 - Document used: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence. 4.4.1.1. Natural England disagree agree with the use of the word ‘colonisation’ regarding Northern gannet nesting in Mediterranean harbours. These nesting attempts appear to be isolated incidents involving very small numbers of birds and have not persisted. Further, we do not agree that gannets do not have a clear preference for natural habitat colonies. We</p>	<p>The Applicant acknowledges the relatively small number of nesting birds in the Mediterranean, however the reference to colonisation still stands. Colonisation is defined as the spreading of species into a new habitat. A lack of suitable habitat has prevented gannet increasing in the Mediterranean example. Numerous examples are presented within both the onshore and offshore ecological evidence reports (B2.7.3 RP Volume B2 Annex 7.3 Compensation measures for FFC SPA Onshore Artificial Nesting Ecological Evidence (APP-189) report and B2.7.1 RP Volume B2 Annex 7.1 Compensation measures for FFC SPA</p>

	consider the relevance and significance of the evidence presented has been overstated.	Offshore Artificial Nesting Ecological Evidence (APP-187) report) which document gannet nesting outside of natural habitat.
RR-029-APDX:C-34	<p>34 - Document used: Volume B2, Annex 7.1: Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence. Appendix A, B, C, D, E, F.</p> <p>No specific comments. The Applicant should be commended for undertaking the work herein. The survey work undertaken used appropriate methods and generated very useful data.</p>	The Applicant welcomes Natural England's comment commending the Applicant for the work undertaken.

4.16 Detailed comments: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-35	<p>35 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 2.1.1.2.</p> <p>The analysis presented in 'B2.7.1.1 Population modelling of black-legged kittiwake on the English east coast to identify the population of first-time breeders available to recruit to new colonies' is welcomed, but the limitations described therein must be fully acknowledged. We consider there to be limited evidence on the pool of available recruits in the relevant meta population and consider the analysis presented in this report to be speculative and uncertain.</p> <p>Furthermore, the report states that "Works here do not establish whether nests are a limiting factor for the extant colonies but seek to estimate the flux of recruits from natal colonies who would nest elsewhere. These may be currently non-breeding individuals that would benefit from additional nesting, or those who would have bred regardless. In the latter case, breeders at new nesting platforms would be interpreted as a redistribution of extant breeding birds, rather than additional" (1.2.1.1). If nest limitation cannot be demonstrated, it will be essential to predict and subsequently to prove that 'additional' productivity compared to extant colonies has been achieved when assessing metrics of success for this measure.</p>	Please refer to responses RR-029-APDX:C-B and RR-029-APDX:C-F regarding the sufficiency of recruits and the Applicant presents evidence that nesting habitat is likely to be a limiting factor in the southern North Sea.

RR-029- APDX:C-36	<p>36 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 3.1.1.1.</p> <p>The Applicant states, "The potential collision mortality effect from Hornsea 4 for the project alone is predicted to be 21 individuals." It should be noted that this collision mortality estimate—which we do not agree with -relates only to the apportioned impact on breeding birds from FFC SPA and therefore may not be appropriate to use if the Applicant is aiming to compensate at a network level.</p>	<p>The Applicant is confident that the predicted impacts and compensation proposed is appropriate. As agreed by the SoS for the recent decision for Norfolk Boreas, the implementation of an artificial nest structure by the project would provide net benefit to the national site network. This in turn could then lead to kittiwakes being recruited into the FFC SPA and therefore compensation is satisfactory at the apportioned impact on breeding birds from FFC SPA scale rather than at a wider scale.</p>
RR-029- APDX:C-37	<p>37 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 3.1.1.2.</p> <p>We note the Applicant's preference for a repurposed structure and agree that repurposing an offshore structure or structures has some clear benefits over a new installation. However, it is important to consider the various possibilities in the context of compensation. If a structure currently holds a kittiwake colony and is scheduled for decommissioning, then it must be considered likely that those birds would be displaced to breed at another location rather than being lost from the breeding population altogether. This will particularly be the case if it cannot be determined why existing uncolonised offshore structures are uncolonised (i.e. that nest availability is a limiting factor, see Points 30&35). It is therefore difficult to envisage direct compensation being delivered simply by retaining a structure/colony: this is more akin to 'avoided habitat loss'. However, if a repurposed structure could be significantly improved e.g. through installation of additional nesting ledges, leading to colony growth and/or increased productivity compared to the baseline, this could clearly be quantified and defined as compensation. This would require a robust population baseline for the colony using the existing structure(s). Further discussion and/or evidence is needed on the merits of a novel versus repurposed structure.</p>	<p>The Applicant acknowledge Natural England's support of a repurposed offshore structure as a compensation measure of kittiwake. A repurposed structure will be developed into an artificial nesting structure which will be specifically designed to support a kittiwake breeding colony by providing optimally designed nesting habitat. Current offshore colonies are on structures not designed for nesting kittiwake, and on many, are dissuaded from nesting. Furthermore, there is no certainty that once a structure supporting a kittiwake colony has been decommissioned, those birds will be able to breed at a different location. Therefore, the specifically designed artificial nesting structure proposed as compensation by the Applicant will offer significantly improved nesting habitat compared to what is currently available. The Applicant is confident that based on this and the evidence base provided within (B2.7.3 RP Volume B2 Annex 7.3 Compensation measures for FFC SPA Onshore Artificial Nesting Ecological Evidence (APP-189) report and B2.7.1 RP Volume B2 Annex 7.1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological (APP-187) report) the measure will deliver compensation at the required level.</p>
RR-029- APDX:C-38	<p>38 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 5.1.1.1 Table 1</p> <p>We note that at present there is no clear commitment to a timeframe for implementation and/or delivery of the compensation measure in relation</p>	<p>The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation illustrated in B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188) allows for four breeding seasons prior to operation). The timing of implementation of an</p>

	<p>to the operation of the windfarm. It is suggested here that there would be 4-5 years between compensation implementation and wind farm operation. This is also reflected in the Compensation Project Description (Point 1). However elsewhere in the documents the Applicant commits to only allow one or two breeding seasons for compensation implementation prior to operation (Point 12).</p> <p>Clarity is needed on the Applicant's intended timescale for implementation and delivery of the compensatory measures. An agreed timescale is essential to help determine the overall likelihood of success and ensure that uncertainty is accounted for by allowing time for adaptive management within reasonable timescales.</p>	<p>artificial nesting structure as set out in Table 1 is provisional as the timeframe for consent award, reaching final investment decision (FID) and Contracts for Difference Allocation Round Five, have not yet been set. The programme has been carefully considered to ensure timely delivery of the compensation measure.</p> <p>The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England's concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England's comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML to be submitted at Deadline 1.</p>
<p>RR-029-APDX:C-39</p>	<p>39 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 8.1.1.4.</p> <p>We note that a 5km buffer between the ANS and offshore wind farms has been proposed. We would welcome further discussion on the most appropriate buffer to use, and how the collision risk for the ANS would be affected by this.</p>	<p>A 5km buffer around offshore windfarms (in planning, consent or built) was applied during the heatmapping process as advised during consultation on the site selection of a new offshore nesting structure with The Crown Estate.</p> <p>The Applicant has considered the location of existing and future wind farms in the consideration of new and repurposed structure site selection and sought advice ornithological specialists on ecological suitability of proposed locations. The Applicant has held discussions have been held with Natural England on the preferred locations for a new and repurposed structure, in addition to other key stakeholders. All stakeholders have been in agreement with the order of preference of options and preferred location.</p>
<p>RR-029-APDX:C-40</p>	<p>40 - Document Used: Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap. 10.1.1.4.</p> <p>The platforms of interest to the Applicant are those with an existing colony of kittiwake that are due for decommissioning. See Point 37 for considerations on this point.</p>	<p>The Applicant refers Natural England to the response addressed in RR-029-APDX:C-37.</p>

4.17 Detailed comments: Volume B2, Annex 7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-41	<p>41 - Document Used: Volume B2, Annex 7.3: Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence. General</p> <p>Natural England has no specific comments on this document but note that comments relating to gannet on document 'Volume B2 Annex 7. 1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence' also apply here (see Points 32&33).</p> <p>Broadly, we urge caution against considering the use of onshore ANS as a compensatory measure for kittiwake. Natural England cannot be confident that there is a sufficient pool of nest-limited kittiwake recruits, suitable locations and/or prey availability available to meet and sustain the existing high demand for this measure. We consider that further demand beyond that already submitted to BEIS could have a detrimental effect on the delivery of other compensation schemes of this nature. We strongly advise that the Applicant makes a clear commitment to the provision of offshore ANS for kittiwake.</p>	<p>Within the Applicant's compensation plan for kittiwake and gannet, offshore structures (repurposed or new) are preferred over onshore artificial nesting structures (see B2.7 RP Volume B2 Chapter 7 FFC SPA Gannet and Kittiwake Compensation Plan (APP-187)). However, as presented within the Applicant's B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence (APP-189), there is a body of evidence which exists to support the measure if delivered onshore. The Applicant is aware that Hornsea Three, Norfolk Boreas and Norfolk Vanguard OWFs were granted consent on the basis that an onshore artificial nesting structure would be delivered to provide additional nesting capacity as natural nesting location for kittiwake is limited and will provide the compensation necessary.</p> <p>The Applicant will continue to focus priority on delivering additional nesting capacity offshore at either a repurposed (preference) or new nesting structure. A significant body of evidence has been provided within the Applicant's 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) report in support of an artificial offshore and onshore nesting structure. Therefore, the Applicant is confident compensation for kittiwake can be delivered through all proposed routes.</p>

4.18 Detailed comments: Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap.

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-42	<p>42 - Document Used: Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap. 2.2.1.1</p> <p>The Applicant states, "The potential collision mortality effect from Hornsea 4 for the project alone is predicted to be 21 individuals." It should be noted that this collision mortality estimate—which we do not agree</p>	<p>As agreed by the SoS for the recent decision for Norfolk Boreas, the implementation of an artificial nest structure by the project would provide net benefit to the national site network. This is in turn could then lead to kittiwakes being recruited into the FFC SPA and therefore compensation is satisfactory at the apportioned impact on breeding birds from FFC SPA scale rather than at a wider scale.</p>

	with -relates only to the apportioned impact on breeding birds from FFC SPA and would not be appropriate to use if the Applicant is aiming to compensate at a wider biogeographic level.	
RR-029-APDX:C-43	43 - Document Used: Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap. Table 1 See Point 38	Please see detailed response on this matter provided in the Applicant's response to Response RR-029-APDX:C-38.
RR-029-APDX:C-44	44 - Document Used: Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap. 6.1.1.1 The likelihood of success of onshore ANS is restricted by the demand from existing projects which are already proposing this measure in the same broad geographic region. Our experience of the land identification and acquisition process for Hornsea 3 (which is still ongoing) suggests that suitable sites are rare.	<p>The Applicant is cognisant of compensation measures for kittiwake being delivered by other projects. However, the Applicant notes that not all other developers have secured locations for their compensation. The Applicant is able to draw on knowledge gained from Hornsea Project Three, who have been successful in purchasing land for the purpose of artificial nesting structures and is therefore in a strong position to progress locations if an onshore nesting structure is progressed.</p> <p>The Applicant is closely following Hornsea Three's progress on site selection. In addition, the search zone for Hornsea Four onshore nesting is wider than that of Hornsea Three extending further North to allow more flexibility and choice in the search for suitable land and the Applicant has received expressions of interest from a number of landowners.</p>

4.19 Detailed comments: Volume B2, Annex 7.5: Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-45	45 - Document used: Volume B2, Annex 7.5: Compensation measures for FFC SPA: Artificial Nesting: Site Selection and Design. 2.2.4.2. It is not clear how has the black line boundary delineating the 140km x 70km area of highest ecological opportunity been defined. Figure 2 suggests that the most promising area (dark green squares) is to the immediate NW of Hornsea 4, however this has been ruled out for two reasons: 1. The position of the area in relation to the Hornsea 4 windfarm and FFC SPA (i.e., birds may have to transit through the windfarm) 2. Very few birds were shown to be nesting on platforms in this area	<p>The area of highest ecological opportunity was refined using the results of the heatmapping process (i.e. areas scored green were sought in the site selection process) however the process was influenced by other important factors including:</p> <ul style="list-style-type: none"> Review of platforms nesting survey results to identify where birds are already nesting in the Southern North Sea to maximise colonisation potential. The results of the Summer 2021 surveys were provided at Application submission (see B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187)) however in general there is limited data to demonstrate colonisation of existing platforms towards the north of the study area with stronger data associated with Flamborough front.

With respect to point 1, we assume it is being suggested that Hornsea 4 would lie within the predicted flight path of foraging birds from an ANS in the dark green area. We note that potential transits through windfarms are presumably also a possible issue for an ANS sited within the black line boundary.

Regarding the lack of breeding kittiwakes detected in the area, we note that there appear to be far fewer structures than within the black line boundary, thus reducing the chance that a structure suitable for colonisation is currently present. We recommend that further evidence gathering and analysis is required to confirm the suitability of structures (e.g., presence of suitable ledges, lack of deterrents or disturbance, etc) for breeding kittiwake before using this to discount the area.

The presence of multiple pre-existing kittiwake colonies within the black line boundary (Figure 3) highlights the problem of proving additionality (i.e., it might be expected that a purpose-built structure could simply redistribute kittiwake to a more optimal structure, and this will not necessarily result in any overall increase in productivity).

Clarity is needed on the selection criteria for the black line boundary and the discounting of the area that appears to be 'most suitable' according to the heat mapping exercise.

- Seeking further advice from ornithological specialists on ecological suitability of proposed locations; and
- Taking into account existing and future windfarms in terms of distance and orientation, given stakeholder feedback that placing a platform where a windfarm would be situated directly in the potential transit routes between the structure and Flamborough and Filey SPA should be avoided.

The Applicant has ensured Natural England have been consulted on the site selection process. A memo with further site selection information was provided in November 2021 requesting advice on a short-list of three locations for a new artificial nesting structure and discussions have been held with Natural England on the preferred locations for a new and repurposed structure to increase their confidence in securing the measure. Engagement has also been undertaken with other key stakeholders regarding these site selection options for a new structure. All stakeholders have been in agreement with the order of preference of options and preferred location. The area to the north has not been included primarily due to the extremely low numbers of birds that have colonised platforms towards this area, as discussed with Natural England in the Workshop held on 3rd February 2022.

The Applicant has sought further advice regarding the specific attributes of the platforms including deterrents in the selection of a repurposed structure and included in the consideration of locations for a new structure.

Following the submission of the Application the site selection for a new offshore nesting structure has been refined and an update on this is provided in G1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement.

A repurposed structure will be developed into an artificial nesting structure which will be specifically designed to support a kittiwake breeding colony by providing optimally designed nesting habitat. Current offshore colonies are on structures not designed for nesting kittiwake, and on many, are dissuaded from nesting. Furthermore, there is no certainty that once a structure supporting a kittiwake colony has been decommissioned, those birds will be able to breed at a different location. Therefore, the specifically designed artificial nesting structure proposed as compensation by the Applicant will offer significantly improved nesting habitat compared to what is currently available. The Applicant is confident that

		<p>based on this and the evidence base provided within (B2.7.3 RP Volume B2 Annex 7.3 Compensation measures for FFC SPA Onshore Artificial Nesting Ecological Evidence (APP-189) report and B2.7.1 RP Volume B2 Annex 7.1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological (APP-187) report) the measure will deliver compensation at the required level.</p>
--	--	---

4.20 Detailed comments: Volume B2, Annex 7.6 Outline Gannet and Kittiwake Compensation Implementation and Monitoring Plan

Reference	Relevant Representation Comment	Applicant's Response
	No specific comments	Noted.

4.21 Detailed comments: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-46	<p>46 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.1.1.6.</p> <p>It is stated that, "the bycatch measure can be scaled from the compensation of 70 breeding individuals to ~267 breeding individuals by increasing the number of vessels from 7-30 respectively." While it is accepted that methods are scalable, it is not clear from this or Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence how this precise calculation has been derived.</p> <p>We request that full details of this calculation are provided. Further, as there is no proven method of reducing bycatch of auks in gillnet fisheries, we consider that any quantification or even estimation of bycatch reduction is necessarily highly speculative.</p>	<p>The Applicant determined bycatch reduction estimates from fishermen questionnaires provided to active gillnet fishermen along the south coast. Based on feedback from the stakeholder workshops, bycatch rates were averaged across fishermen. Potential bycatch reduction was then based on a proxy (in the absence of auk specific bycatch reduction rates) presented by Rouxel et al (2021). In order to provide a clear and transparent representation of how the level of compensation has been calculated for Hornsea Four, the following document G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA has been produced and shared with SNCBs. This report provides the calculation method and evidence behind the input parameters used and was discussed with Natural England during the workshop held on 3rd February. G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA will be submitted to the Examination at Deadline 1.</p> <p>Following the bycatch reduction technology selection phase, an accurate bycatch reduction rate can be applied to bycatch estimates. This will consequently allow the number of vessels to be determined. 10 vessels were secured for the bycatch reduction technology selection phase within two months showing how rapidly fishers could be secured by the project.</p>

		Furthermore, no permits or MMO or IFCA licences are required for bycatch mitigation delivery, only fisher agreements are needed.
RR-029- APDX:C-47	<p>47 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.1.1.7</p> <p>We disagree with the statement: "All compensation measures are feasible and can be secured while providing flexibility and scalability." Whilst each measure is theoretically feasible, each has a critical uncertainty that could render the measure undeliverable. There is currently no proven method for reducing bycatch for the target species and it is not guaranteed that a suitable location for predator eradication will be identified. Until these uncertainties are resolved it will not be possible to determine what scale of compensation is achievable.</p>	<p><u>Bycatch</u></p> <p>The Applicant is currently undertaking the bycatch reduction selection phase to identify the success rate of the LEB. This phase includes the trialling of the LEB in the target commercial fishery thereby presenting transferable results on whether the technology reduces bycatch of the target species in the target fishery. The preliminary results are positive as discussed at the Workshop held with Natural England on 3rd February 2022, and the Applicant will provide updates to SNCBs once appropriate analysis has been undertaken following the completion of the bycatch technology selection stage (anticipated for the Examination Deadline 5). Once result have been collected, the scale of implementation can be determined. The Applicant was able to secure 10 vessels to partake within the bycatch reduction technology selection phase within a very short space of time. Additionally, a number of other vessels are already expressing interest in participating in future trials or long-term implementation of the measure. Such implementation would be secured via contracts between the Applicant and the fishermen with the support of a specialist fisheries consultancy. This would be organised following the bycatch reduction technology selection phase.</p> <p><u>Predator eradication</u></p> <p>The Applicant presented within their B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan (APP-193) a shortlist of potential islands suitable for an eradication programme. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including but not limited to: Herm, Jethou and Sark).</p> <p>Furthermore, the Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four.</p>
RR-029- APDX:C-48	48 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.1.1.9	The Applicant notes that the risks for lead in times are not associated with bycatch reduction. As bycatch reduction directly reduces mortality, the compensation is effective

	<p>Natural England is concerned that measures might not be implemented until just one year prior to operation of any wind turbine generator. If compensation measures are implemented this close to operation it is highly likely that impact will occur prior to the measure delivering, resulting in the accumulation of mortality debt. This is exacerbated by the fact that displacement impacts may also occur for auks during the construction phase.</p> <p>Timelines for implementation should take full consideration of the uncertainty in the proposed measures and the risks to timely delivery of compensation.</p>	<p>from the deployment date of these techniques. This will allow for bycatch as compensation to be achieved from commencement of Hornsea Four.</p> <p>The Applicant acknowledges the concerns raised by Natural England regarding potential risks with lead in times for predator eradication. The Applicant has committed to delivering the compensation measure at least two breeding seasons before operation. It is anticipated that benefits to guillemot and razorbill will occur from the first breeding season following eradication and biosecurity measures. The suite of compensation measures for guillemot and razorbill are flexible and scalable and can be adjusted between the packages to ensure sufficient compensation is delivered.</p>
<p>RR-029- APDX:C-49</p>	<p>49 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.3.1.1 & 1.3.1.2</p> <p>Natural England welcomes that a package of measures for auks has been developed, however we are concerned that it is suggested that only one measure might be progressed and that "The Applicant is confident that each of the measures on their own is robust and deliverable". Whilst both measures have theoretical merit, there remains significant uncertainty in terms of their deliverability and quantifiable benefits and based on the evidence available at this time, Natural England do not have confidence that either measure would be able to deliver compensation individually. We therefore consider that the Applicant should commit to progressing both of the main compensatory measures for auks.</p> <p>Furthermore, impact values are yet to be agreed and we are unclear how bycatch reduction has been quantified (i.e., the "maximum potential delivery threshold" reduction of 9 auks bycaught per boat with technology deployed). We do not deem this calculation to be possible due to a lack of relevant evidence, and even an estimate would be highly speculative at this time.</p>	<p>The Applicant is committed to delivering all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). Although, the Applicant is confident that each of the measures on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided.</p> <p><u>Predator Eradication</u></p> <p>The Applicant is pleased Natural England welcomes that a package of measures for auks has been developed. The Applicant considers that predator eradication as an individual compensation measure would successfully deliver compensation for both guillemot and razorbill. B2.8.3. Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196) provides evidence that guillemot and razorbill both benefit from predator eradication through population increase, re-colonisation and increase in productivity levels. For example Table 1 in Section 6.2 presents the increase in guillemot and razorbill numbers from an eradication project on Lundy Island.</p> <p><u>Bycatch</u></p> <p>The Applicant considers that bycatch reduction as an individual compensation measure would successfully deliver compensation for both guillemot and razorbill. Both species have previously been identified as vulnerable to bycatch in static gillnets (Northridge <i>et al.</i>, 2020). Additionally, the bycatch risk "hotspot" locations for guillemot and razorbill are within the</p>

		<p>same areas during the same time of year (see Section 7 in B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)). Thereby the Applicant considers installing bycatch reduction technology within these locations, specifically in gear during January and February, will provide compensation for both guillemot and razorbill.</p> <p>The Applicant notes the bycatch rate is higher for guillemot than razorbill, however the number of individuals required for razorbill compensation are far lower than those for guillemot (1.67 razorbill compared to 36.58 individuals for guillemot (when including all behaviours) – Applicant values). Therefore, the Applicant considers that despite the lower bycatch rate, razorbill can be compensated in full via bycatch reduction technologies alone.</p> <p>The number of vessels proposed for implementation was identified through analysis of the questionnaire responses on level of bycatch per year combined with the preliminary results of the LEB (Rouxel <i>et al.</i>, 2021). This provided the average number of bycaught individuals that could be reduced per year per vessel, scaling this up, this resulted in seven vessels being required to fulfil the compensation for the relevant species. This is a preliminary estimate and will be recalculated following the success of the LEB identified throughout the bycatch technology selection phase. The “maximum potential delivery threshold” is the maximum number of vessels the Applicant could fund to use the LEB, this was estimated solely through costs of LEB deployment. If the number of boats require stays below the maximum potential delivery threshold, then the Applicant can deliver bycatch as compensation without the need for predator eradication. Although both compensation measures are being taken through as a suite of compensation measures.</p> <p>The preliminary findings from the bycatch reduction selection phase indicate that the LEB has a positive impact on reducing bycatch of large auks, however the Applicant is waiting on further findings to validate these results at the end of the season.</p>
<p>RR-029- APDX:C-50</p>	<p>50 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.3.1.3</p> <p>Natural England considers predator control much less likely to be successful than predator eradication, as the main target species of the measure (guillemot) usually nests on inaccessible ledges. Evidence 8 suggests that the mechanism through which predator eradication might</p>	<p>Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p>

	<p>benefit breeding guillemot is by making marginal (e.g., cliff top) habitat available for nesting. It is likely that only predator eradication would achieve this. We consider that either further evidence needs to be provided supporting the use of predator control as a viable method for the target species, or sites where predator eradication is not possible should be removed from the shortlist.</p>	<p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-51</p>	<p>51 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 1.3.1.4</p> <p>We welcome that all measures will be progressed through feasibility (2022-2023) and early phase implementation (2024-2025; noting that we would usually expect feasibility to have been determined pre-submission) but are concerned that this will be “prior to a project decision on the required compensation option(s) to be taken forward to development (2025+)”. We do not consider it appropriate for the Project to decide post-consent which compensation measures to take forward as this would risk compensation delivery not being fully secured within the DCO. It is our view that a commitment to deliver the package of measures should be secured within the DCO, with a requirement for the Applicant to submit further evidence to SoS should they wish to only pursue one measure (i.e. via a license variation or non-material change). As a minimum we would expect this to be a decision requiring the agreement of the established steering group.</p> <p>Natural England further highlights that even if bycatch reduction technology proves successful, relying on this compensatory measure alone for the lifetime of the project would be high risk. As acknowledged in Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence, fisheries are highly dynamic, and it is not certain that levels of bycatch in identified fisheries (or any other) will</p>	<p>The Applicant will deliver both bycatch reduction and predator eradication compensation measures as part of a package of measures for guillemot and razorbill. These primary measures are also supported by a resilience measure (fish habitat enhancement).The Applicant is confident that each of the measures on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Additionally, the bycatch technology selection phase and predator eradication implementation assessments are currently being undertaken. This will provide more evidence to support the Applicants chosen compensatory measures.</p> <p>Nevertheless, the Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill).</p>

	<p>persist. If bycatch reduction cannot be delivered in any year, and no other compensatory measure is in place, mortality debt will be accumulated.</p> <p>We strongly encourage the Applicant to commit to progressing the full suite of compensatory measures as a package to reduce the risk of being unable to deliver compensation, should it be required.</p>	
<p>RR-029- APDX:C-52</p>	<p>52 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 2.2.1.2</p> <p>We do not agree that there is any certainty that the proposed measures “are capable of more than compensating for the estimated impact”. The potential benefits of bycatch reduction and predator eradication are undisputed. However, there is currently no proven method of bycatch reduction of auks in gillnet (or other) fisheries, and it has not been established that presence of rats is a limiting factor for guillemot at shortlisted sites for predator eradication. Therefore, any potential benefits arising from the compensatory measures cannot be quantified.</p> <p>The inherent uncertainties in the compensation plan should be fully acknowledged, and a commitment to delivering the suite of measures made.</p>	<p><u>Bycatch</u></p> <p>The Applicant is currently undertaking the bycatch technology selection phase and testing the success of the LEB within the target fishery, which has resulted in positive initial preliminary findings as discussed at the Workshop with Natural England held 3rd February 2022. The success of the bycatch reduction selection phase will be used as the primary evidence of the benefits of LEBs on reducing auk bycatch within the target fishery.</p> <p><u>Predator Eradication</u></p> <p>The Applicant has undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)). The Applicant has already undertaken site visits to the Isles of Scilly and Guernsey (including Herm and Sark) (August 2021) and is working with the Alderney Wildlife Trust to identify locations where guillemot and razorbill are limited by predators.</p> <p>The Applicant has furthermore employed international eradication and island restoration experts to undertake a detailed implementation study (as described within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability;

		<ul style="list-style-type: none"> • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p><u>Conclusion</u></p> <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is confident that each of the measures on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Additionally, the bycatch technology selection phase and predator eradication implementation assessments are currently being undertaken. This will provide more evidence to support the Applicants chosen compensatory measures.</p> <p>Nevertheless, the Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill).</p>
<p>RR-029- APDX:C-53</p>	<p>53 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.2.1.11</p> <p>We note that while further case studies are detailed in document 'B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence', evidence of benefit to breeding guillemot is almost completely reliant on the Lundy case study. While the Lundy example is encouraging in this context, it is uncertain that these site and species benefits can be replicated elsewhere. Further, we do not consider that there is sufficient evidence to use predator control as a compensatory measure.</p>	<p>Evidence that predator eradication is effective for any seabird species is generally limited due to a number of factors, including but not limited to the scale of resources required to monitor post eradication success and the sensitivity of species to disturbance from subsequent monitoring. The Applicant has provided a detailed review of predator eradication projects in the UK which have benefited guillemot and razorbill within the Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196). Lundy is one of multiple examples the Applicant refers to in the evidence report which provides evidence of predator eradication schemes which have benefited guillemot and razorbill along with several other seabird species. Lundy (which was one of the more recent examples presented by the Applicant) provides evidence directly relevant to guillemot and razorbill and is in the south of the UK so is most relevant to the locations currently being considered by the Applicant. Other examples have focused on other species during monitoring, with the Applicant providing evidence from seabird census data which suggest most of the eradications have been beneficial to both auk species.</p>

Based upon this review of literature, predator eradication and associated biosecurity offer the opportunity to benefit guillemot and razorbill at The Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands). Pre- and post-monitoring reports from the case studies presented within the aforementioned report (noting that the aims of previous eradication projects often were not targeted at guillemot and razorbill) have shown that the eradication of mammalian predators has benefited both of these species through increases in productivity, nesting populations and recolonisation/ colonisation of new areas previously occupied by invasive species. Predator eradication in appropriate locations is therefore a feasible and evidenced measure which can be delivered as compensation for guillemot and razorbill.

The Applicant presented within their [B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan \(APP-193\)](#) a shortlist of potential islands suitable for an eradication programme. Following further refinement of the shortlist (presented within the Applicants updated predator eradication roadmap Revision 2 of [B2.8.4. Compensation measures for FFC SPA: Predator Eradication: Roadmap](#) the Applicant has built positive relationships with local stakeholders and gathered strong evidence in support of an eradication to benefit guillemot and razorbill at The Bailiwick of Guernsey; including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands). Each location is being progressed by the Applicant through the implementation studies (which will be undertaken by external eradication experts already secured by the Applicant) to gather further evidence to ensure success.

Additionally adaptive management has been proposed in [B2.8.4. Compensation measures for FFC SPA: Predator Eradication: Roadmap \(APP-197\)](#) in case the eradication attempts prove unsuccessful.

Predator control

Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered were small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.

		<p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is only considering full island eradication in relation to the predator eradication measure.</p> <p>The Applicant is therefore confident that the current locations under consideration for eradication would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-54</p>	<p>54 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.2.1.1</p> <p>We do not consider there to be sufficient evidence that predator control can deliver sufficient benefit. We recommend that sites where predator eradication is not possible are removed from the shortlist.</p>	<p>The Applicant is only considering full island eradication in relation to the predator eradication measure. Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p> <p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration for eradication would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-55</p>	<p>55 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.2.1.3</p> <p>The same metrics of success cannot be applied to predator eradication and the bycatch reduction method. Bycatch reduction can quantifiably reduce the mortality of adult birds, and thereby directly compensate for annual losses. It should be noted that it would still be necessary to apply a ratio (multiplier) to the predicted impact to account for uncertainty.</p>	<p>The Applicant acknowledges the need to account for uncertainty and have committed to providing a 1:2 ratio for overall compensation per species. The Applicant has provided an updated calculation document in support of the population required to compensate for potential impact to guillemot and razorbill. A detailed account is provided within: G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA.</p>

	<p>The colonisation of a site, or improved productivity of an existing site due to predator eradication, can also deliver adult guillemots to the breeding population. However, this must be calculated from the observed productivity of the colony. A number of factors must be considered (productivity, recruitment, survival rates, philopatry, etc), and quantifying the (estimated) required colony size for this measure is more closely aligned with the provision of artificial nesting sites (ANS) for kittiwake. The presence of a colony of 70 breeding adults will not necessarily compensate for the estimated mortality of 35 birds per year.</p> <p>We do not consider the scale of compensation possible to have been calculated, and therefore do not accept the assertion that "considerable compensation over and above the potential impact of Hornsea Four" can be provided.</p> <p>In order to calculate the colony size that will be required to compensate for the loss of 35 breeding adult guillemot similar calculations will be required as for the provision of kittiwakes from ANS.</p>	
<p>RR-029- APDX:C-56</p>	<p>56 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.3.2.1</p> <p>It is stated that a predator eradication scheme is potentially feasible at the sites shortlisted here. Elsewhere in the supplied documentation it is suggested that only predator control will be possible at some of these sites. As there is limited evidence to suggest that predator control would deliver effective compensation for these species, clarity is needed on which sites a full predator eradication scheme is possible.</p> <p>We further note that Rathlin Island has already received funding for predator eradication⁹ and should be removed from the shortlist.</p>	<p>The Applicant is only considering full island eradication in relation to the predator eradication measure. Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p> <p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration for eradication would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>

		<p><u>Rathlin Island</u> Since the submission of these documents, it has been publicly announced that Rathlin Island has secured funding. Therefore, Rathlin Island will no longer be considered as part of the shortlist by the Applicant.</p>
<p>RR-029- APDX:C-57</p>	<p>57 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.3.3.2 If the shortlisted sites prove unsuitable following ground-truthing and feasibility assessment, we consider it highly unlikely that sites previously longlisted but disregarded will offer any further opportunities for predator eradication. There is therefore a risk that a suitable site will not be identified making the compensation undeliverable.</p>	<p>The Applicant is confident that each of the measures on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Additionally, the bycatch technology selection phase and predator eradication implementation assessments are currently being undertaken. This will provide more evidence to support the Applicants chosen compensatory measures.</p> <p>Nevertheless, the Applicant is taking through a suite of compensation measures which combined compensate for a 1:2 ratio (1:1 for predator eradication and 1:1 for bycatch reduction). Preliminary findings from the implementation studies are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase and initial findings in the predator eradication being even more promising than expected at this stage.</p> <p>The Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). The Applicant is confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-58</p>	<p>58 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.5.1.9 Evidence has not been provided to support the claim that a population of 70 breeding adults (35 pairs) is sufficient to deliver 35 breeding adults into the biogeographic population. We consider this to be highly unlikely as guillemot productivity does not exceed 1 in England¹⁰, and survival rates of birds up to 5 years old (note, average age of first breeding could be older¹¹) might be expected to be low¹². Calculations should be provided estimating the colony size required to deliver the required number of</p>	<p>The Applicant has provided an updated calculation document in support of the population required to compensate for potential impact to guillemot and razorbill. A detailed account is provided within: G1.41 Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA.</p>

	breeding adults annually, accounting for all relevant parameters (noting that the required compensation level is not yet agreed).	
RR-029-APDX:C-59	<p>59 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 3.6.1.2</p> <p>The project impact includes displacement from the operational phase only. The Applicant has assessed displacement during the construction period as occurring at 50% of the level expected during operation. The total predicted impacts from displacement need to be considered in the implementation timeline.</p>	<p>The Applicant considers the maximum annual potential impact level in its compensation methods. The total predicted impacts from displacement are therefore considered throughout the entire project implementation timeline. The Applicant is confident that the package of compensation measures proposed will deliver viable and effective compensation for the impacts of Hornsea Four see response RR-029-APDX:C-UUU.</p>
RR-029-APDX:C-60	<p>60 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 4.1.1.2</p> <p>There is no proven method of bycatch reduction for the species or fisheries identified, and therefore the potential for reduced mortality cannot be quantified.</p>	<p>In order to determine the most effective bycatch reduction method, the Applicant entered a bycatch reduction technology selection phase during November 2021, focusing on the use of LEB within an active gillnet fishery within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB, specific to guillemot and razorbill bycatch within a commercial gillnet setting.</p> <p>The Applicant has secured 10 fishers to take part in the technology selection phase, with all boats being fitted with a dual camera monitoring system to determine seabird bycatch when fishing with control and experimental nets (i.e. with the LEB deterrent attached). The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. If deemed beneficial to further support the study outcomes from the first year, a second year of technology selection will be undertaken by the Applicant or implementation will commence. The preliminary findings from the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p> <p>The Applicant is also currently undertaking further analysis into gannet bycatch reduction through a bycatch reduction technique review. The Hookpod was identified as a successful bycatch reduction technique in longline fisheries, with studies estimating a 95% reduction in seabirds bycaught. This review (G1.42 Compensation measures for FFC SPA Gannet Bycatch Ecological Evidence) will be provided into Examination at Deadline 1.</p>

RR-029- APDX:C-61	<p>61 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 4.2.2.4</p> <p>It is unclear how (or why, at this stage) the bycatch reduction measure is proposed for implementation across “approximately 7 vessels”. Is this the number of vessels that the Applicant believes will be amenable to the project from their initial engagement with fishers? Further clarification is needed on what this approach is based on. See Point 81.</p>	<p>The number of vessels proposed for implementation was identified through analysis of the questionnaire responses on level of bycatch per year combined with the preliminary results of the LEB (Rouxel <i>et al.</i>, 2021). This provided the average number of bycaught individuals that could be reduced per year per vessel, scaling this up, this resulted in seven vessels being required to fulfil the compensation for the relevant species (see G1.41 Calculation Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA). This is a preliminary calculation and will be recalculated following the success of the LEB identified throughout the bycatch reduction selection phase.</p> <p>Please note that the number of vessels used in the technology selection phase are greater than those expected necessary for the compensation package. For the bycatch reduction technology selection phase, the Applicant secured 10 vessels to partake within only two months, showing how rapidly fishers could be secured by the project. Additionally, a number of other vessels are already expressing interest in participating in future trials or long-term implementation of the measure. The Applicant is therefore confident in securing the number of vessels required for compensation.</p> <p>A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: Calculation Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA, which has been provided to Natural England and discussed during the Workshop on 3rd February 2022.</p>
RR-029- APDX:C-62	<p>62 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 4.4.5.1</p> <p>It is noted that 80% of fishers (that responded to consultation) indicated that they might be willing to take part in a pilot study for the bycatch reduction technique. However, the number of fishers that were consulted, responded to the consultation and the proportion of fishers in the fishery that they represent has not been provided. No conclusion can therefore be made on the sentiment of the fishery from the data provided. This additional information should be provided to put the fishery response into context.</p>	<p>The Applicant received 52 responses to the fisher questionnaires with 42 participants (81% response rate) indicating they would be willing to take part in the bycatch reduction technology selection phase.</p>
RR-029- APDX:C-63	<p>63 - Document used: Volume B2, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan. 4.7.1.2</p>	<p>The bycatch technology reduction selection phase is currently being undertaken (November 2021 – March 2022), focusing on the use of LEB within an active gillnet fishery within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection</p>

	<p>It should be noted that the measure can only be “implemented relatively quickly” if a proven method has been identified. If further trials, development, or testing of other methods are required then implementation could be seriously delayed.</p>	<p>phase will gather further evidence on the efficacy of the LEB with scope to complete a second year in the winter of 2022/2023 should it be deemed beneficial to further support the study outcomes from the first year or implementation will commence. The time required for the bycatch reduction technology selection has been included when devising timescales to minimise the chances of delays i.e. to increase data confidence in the LEB.</p> <p>Ten vessels were secured for the bycatch reduction technology selection phase within two months (with most of the fishers signing up within two weeks), demonstrating how rapidly fishers could be secured by the project.</p>
--	--	---

4.22 Detailed comments: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:C-64	<p>64 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 1.1.2.1</p> <p>It should be noted that while Northridge et al(2020)¹³ represents the best available evidence, the results therein are presented as preliminary estimates of seabird bycatch mortality, extrapolated from limited raw data. The report states, “Annual sampling coverage under the UK bycatch monitoring project has been <1% of total annual UK static net effort, 1-2% of annual UK longline effort and roughly 5% of annual UK midwater trawl effort”. We note that the limited nature of the raw data is acknowledged later in the document. It will be essential that any trial of bycatch reduction techniques also quantifies levels of bycatch in the fishery.</p>	<p>The Applicant is currently undertaking the bycatch reduction selection phase from November 2021 to March 2022, focusing on the use of LEB within an active gillnet fishery within the biogeographic range of guillemot and razorbill. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB. Each vessel used in the selection phase will test both a net with LEBs attached and a control net. The control net will aid in identifying the level of bycatch present without the interference of a reduction technique, thereby allowing for more precise estimates of bycatch within the target fishery.</p>
RR-029-APDX:C-65	<p>65 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 1.2.1.1 (point 4)</p> <p>Anecdotal evidence from a single source is not sufficient to make the unequivocal claim that bycatch has been underestimated within “high risk zones”. We consider the relevance and significance of the evidence has been overstated.</p>	<p>The Applicant notes the concern over the use of the single anecdotal evidence. Fisherman consultation was used to estimate a current bycatch rate for the targeted region. When assessing the questionnaire results all responses were weighted equally by the Applicant for comparison and to calculate the potential bycatch within the target fishery. Due to the sensitivity of seabird bycatch, the Applicant therefore decided to use the questionnaire values as they would be precautionary.</p>

		<p>Seabird bycatch is a sensitive topic with the concerns over byelaws reducing the ability for fishermen to work. Moreover, within the Hornsea Four Compensation Workshop 4 Written Response, JNCC agreed that the bycatch stated within the anecdotal questionnaire should be considered valid. Additionally, Natural England agreed within Workshop 4 that the preliminary estimates from Northridge <i>et al.</i> (2020) were considered underestimates. Northridge <i>et al.</i> (2020) stated "it is likely that sampling under the BMP will not have covered some specific metiers where seabird bycatch occurs at relatively higher rates than in the metiers we report on here". As the high-risk zones identify areas where bycatch is expected to be highest, it is likely that bycatch has been underestimated within this fishery.</p> <p>Additionally, the Applicant is currently undertaking the bycatch technology selection phase which aims to identify the success rate of the LEB through testing in the target commercial fishery. The results from this phase (through the use of a control) will aid in verifying the level of bycatch within the target fishery.</p>
<p>RR-029- APDX:C-66</p>	<p>66 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 1.2.1.1 (point 5)</p> <p>In previous engagement with the Applicant, Fishtek, Birdlife and RSPB on bycatch trials (28 July 2021), net illumination, net visibility and acoustic deterrents were all dismissed as unsuitable. We consider that this advice has been taken onboard by the Applicant as only the Looming Eyes Buoy(LEB)has been taken forward for trial, but we note that the other methods have been retained in all documents. We consider it unlikely that these offer a fall-back option should the LEB trial fail.</p>	<p>The discussion referred to on 28 July 2021, focused on seeking agreement on which method to test during the bycatch reduction selection phase rather than the potential suitability of methods overall. The conclusion of the meeting was the Looming Eyes Buoy (LEB) was the most suitable measure to trial initially, but this did not mean the other measures were deemed unsuitable as potential compensation measures. The LEB offers the most advanced bycatch reduction technology relevant to guillemot and razorbill (based on the connections identified in horizontal dive profiles in Rouxel <i>et al.</i>, 2021). The bycatch reduction technology selection phase has taken the LEB in its prototype form and tested it in an active commercial fishery where the bycatch of guillemot and razorbill is predicted to be high. Other options presented within the bycatch mitigation review within the Applicant's B2.8.1 RP Volume B2 Annex 8.1 Compensation measures for FFC SPA Bycatch Reduction Ecological Evidence (APP-194) report are less advanced in evidence than LEB, but may be available as back up if the LEB was found to be non-effective in reducing bycatch of the target species.</p>
<p>RR-029- APDX:C-67</p>	<p>67 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 1.2.1.1 (point 5 & 6)</p> <p>To Natural England's knowledge, the LEB has so far only been tested and found to be somewhat effective on sea duck. The trial in the Baltic Sea described by Rouxel <i>et al.</i>(2021)¹⁴ focused on the response of long-tailed ducks to the LEB only as it was not conducted in a fishery. In this case a</p>	<p>Although the study only specifically analysed sea ducks, conversations with the ornithologist leading the study at BirdLife International identified that the LEB was created to reduce birds from a 50 m radius around the buoy. Additionally, it was stated that guillemot and razorbill have a horizontal dive profile <50 m. Through the combination of these factors the LEB would technically aid in reducing auk bycatch.</p>

	<p>20-30% reduction in abundance was found within 50m of the LEB. The possibility of habituation was also noted.</p> <p>Until a specific trial has been carried out for this method there is no convincing evidence that the LEB can reduce bycatch of guillemot or razorbill in the target fisheries.</p>	<p>The Applicant is undertaking the bycatch reduction selection phase, with positive initial preliminary findings of success of the LEB, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the bycatch reduction selection phase. The success identified within the bycatch reduction selection phase will be used as the primary evidence of the success of LEBs on reducing auk bycatch within the target fishery.</p> <p>Regarding the potential for habituation, habituation would likely be more common within the Rouxel <i>et al.</i> (2021) study as the LEBs were not used within commercial fisheries. As commercial fisheries do not always fish in the same areas and change location throughout the season, there is a lower opportunity for habituation to occur. Nevertheless, throughout the bycatch reduction selection phase habituation can be assessed.</p>
<p>RR-029- APDX:C-68</p>	<p>68 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 3.3.1.1</p> <p>Interviews of fishers alone is not considered a suitable approach to determine the prevalence of bycatch by region as it relies solely on anecdotal evidence. We consider the relevance and significance of the evidence has been overstated and should be verified through other data sources.</p>	<p>Throughout the development of the bycatch reduction workstream, a variety of methods were used in estimating bycatch, including bycatch rates derived from the UK Bycatch Monitoring Program (BMP) (both UK rates and English Channel specific rates). However, the English Channel bycatch rate was based on older data, and the UK bycatch rate did not state region specifics. Fisherman consultation was therefore used to estimate a current bycatch rate for the targeted region. Due to the sensitivity of seabird bycatch, the Applicant therefore decided to use the questionnaire values as they would be precautionary.</p> <p>Additionally, the Applicant is currently undertaking the bycatch technology selection phase which aims to identify the success rate of the LEB through testing in the target commercial fishery. The results from this phase (through the use of a control) will aid in verifying the level of bycatch within the target fishery. As noted above, there have been positive initial preliminary findings of success of the LEB, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p>
<p>RR-029- APDX:C-69</p>	<p>69 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 4.2.1.2</p> <p>The Applicant states, "Despite this, bycatch monitoring and reporting is vastly underestimated". We disagree with the use of "vastly underestimated" and consider limited/insufficient/inadequate would be</p>	<p>Through analysing all available evidence, the Applicant believes that the bycatch estimate within the English Channel gillnet fishery is greatly underestimated. Northridge <i>et al.</i> (2020) stated "it is likely that sampling under the BMP will not have covered some specific metiers where seabird bycatch occurs at relatively higher rates than in the metiers we report on here". As the high-risk zones identify areas where bycatch is expected to be highest, it is likely that bycatch has been underestimated within this fishery. Natural England previously agreed</p>

	<p>more appropriate. We consider the relevance and significance of the evidence has been overstated.</p>	<p>within Workshop 4 that the preliminary estimates from Northridge <i>et al.</i> (2020) were considered underestimates. Moreover, within the Workshop 4 response, JNCC agreed that the bycatch stated within the anecdotal questionnaire should be considered valid.</p> <p>Nevertheless, the Applicant is currently undertaking the bycatch technology selection phase which aims to identify the success rate of the LEB through testing in the target commercial fishery. The results from this phase (through the use of a control) will aid in verifying the level of bycatch within the target fishery.</p>
RR-029-APDX:C-70	<p>70 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 4.2.1.3</p> <p>It is our understanding that in the following sentence, "The UK BMP have collected data from over 21,000 monitored fishing operations from around the UK and adjacent waters" the word operation is used as a proxy for hauls.</p>	<p>The Applicant agrees with Natural England.</p>
RR-029-APDX:C-71	<p>71 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 6.3.2.2</p> <p>We agree with the conclusion to focus bycatch reduction efforts (for auks) within the English Channel given the predicted levels of bycatch and the absence of more impactful fisheries closer to FFC SPA. However, it will be important to consider the possibility of changing the area of focus depending on the efficacy of the project, as well as potential changes in fisheries, distribution of auks and/or high risk areas. Adaptive management will also need to consider the dynamic nature of fisheries.</p>	<p>The Applicant welcomes Natural England's agreement with the focus of bycatch reduction for auks within the English Channel. The deployment of bycatch reduction techniques is flexible as vessels using the technique can in theory change from year to year, thereby the Applicant can target the relevant fisheries as required (e.g. if there are changes in fishing effort in the current target fishery). Adaptive management will be discussed further with the OOEG.</p> <p>Additionally, the Applicant has committed to a suite of measures thereby increasing resilience of compensation.</p>
RR-029-APDX:C-72	<p>72 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 8.2.1.3</p> <p>While it is considered highly likely that bycatch has been generally underestimated, we would caution against the use of anecdotal evidence from a single fisher to draw any conclusions. We consider the relevance and significance of the evidence has been overstated.</p>	<p>The response from the anecdotal fisher was one of many questionnaires reported, the in-depth reporting of this singular questionnaire was undertaken due to the volume of information it provided. When assessing the questionnaire results all responses were weighted equally by the Applicant for comparison and to calculate the potential bycatch within the target fishery. However, the Applicant notes that the sensitivity of the topic may lead to precautionary rates of bycatch from the questionnaires.</p>
RR-029-APDX:C-73	<p>73 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 8.5.1.1</p> <p>It is encouraging that 80% of the fishers that responded to the consultation have indicated willingness to participate in bycatch</p>	<p>A total of 52 fishers provided responses to the questionnaire.</p> <p>It is not reasonable to suggest that there is a potential bias towards sympathetic fishers or those who experienced low levels of bycatch. The high level of engagement and willingness</p>

	<p>reduction trials. However, it is not clear how many fishers responded to the consultation. Furthermore, it is likely that those that responded are more likely to be amenable to this request. There is a potential bias toward, a) sympathetic fishers and b) fishers who generally experience lower rates of bycatch (possibly due to, e.g., favoured locations, gear type/set up, or fishing intensity). See also Point 62.</p>	<p>to participate in a compensation measure (demonstrated by the good number of responses received) was consequential of the personnel utilised to undertake the questionnaire-based consultation. Target locations for the reduction in bycatch selection phase were identified through a bycatch risk mapping exercise, which identified ICES rectangles with the highest potential bycatch. The Applicant contracted fisheries industry representatives that already had good, often longstanding, relations with fishers targeting these identified ICES rectangles meaning that fishers are anticipated to have been more open in their responses. While consulting, the fishing industry representatives also highlighted to fishers, that they would not have to pay for any potential bycatch reduction measure identified .Furthermore, it was reinforced that this was an information gathering exercise only and, as a result, the fishers felt more comfortable to complete the questionnaire and indicate willingness to participate in any bycatch reduction measure. The level of bycatch reported within the questionnaires differed between the fishers and so it is inaccurate to suggest that those who completed the questionnaires generally experience lower rates of bycatch.</p> <p>Please see the Applicant’s response RR-029-APDX:C-62 and RR-029-APDX:C-65.</p>
<p>RR-029-APDX:C-74</p>	<p>74 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 10.2.2.1</p> <p>We agree with the Applicant’s statement that, “It must be noted that although many bycatch-avoidance measures have been developed and tested successfully in controlled experiments, successful experiments may not translate to effective bycatch reduction in commercial fisheries as conditions differ”. This is an important point and should be considered when assessing the likely success of the LEB trial.</p>	<p>The Applicant agrees with Natural England and are therefore undertaking the bycatch reduction technology selection phase in the target commercial fishery. Focusing within the commercial fishery will allow for direct comparison for how successful the LEB will be as compensation for guillemot and razorbill.</p>
<p>RR-029-APDX:C-75</p>	<p>75 – Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 10.3.1.8</p> <p>The Applicant states, “As no previous studies analysed guillemot or razorbill, the success of net illumination on these target species is difficult to confirm therefore further research would be needed”. In light of this, we consider that listing net illumination in Section 1.2.1.1 (Point 66) as having the highest potential for reducing bycatch of auks without this quoted caveat is potentially misleading.</p>	<p>The Applicant understands the potential confusion from this statement, however, the in-depth bycatch reduction technique review (Appendix C in B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)) compared all methods to the potential success to reduce large auk bycatch. As not all techniques had previously been tested on large auks, comparison to similar species was completed where possible. Lights were shortlisted as have a higher potential to be a successful bycatch reduction technique compared to other techniques identified as this technique fulfils a number of the criterion set out by O’Keefe et al. (2012) see Appendix C in B2.8.1. Compensation measures for FFC SPA:</p>

		Bycatch Reduction: Ecological Evidence (APP-194) , however, would require further research for guillemot and razorbill.
RR-029-APDX:C-76	<p>76 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 10.3.1.13</p> <p>The LEB did not reduce bycatch by up to 30%, it reduced the abundance of long-tailed ducks within a 50m radius of the device (Rouxel et al, 2021)15. To the best of our knowledge the LEB has yet to be trialled in a commercial fishery.</p>	The Applicant is undertaking the bycatch reduction technology selection phase in the target commercial fishery. Focusing within the commercial fishery will allow for direct comparison for how successful the LEB will be as compensation for guillemot and razorbill through identifying a bycatch reduction rate. Preliminary findings from the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the bycatch reduction selection phase.
RR-029-APDX:C-77	<p>77 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 10.5.1.1</p> <p>An appraisal of the evidence suggests that the visual net modification, illumination, and acoustic deterrent methods that have been trialled have varied in effectiveness or applicability according to location and species. The LEB remains comparatively untested. We note that the adoption of any of these methods will require a full trial to determine effectiveness and efficacy for the target species and fishery.</p>	The Applicant is undertaking a bycatch reduction technology selection phase in the target commercial fishery. Through conversations with BirdLife International, it was recommended to focus on testing only one technique during the selection phase to allow for greater statistical power and therefore more robust results. The most recent LEB study (Rouxel et al., 2021) presented the most promising bycatch reduction mitigation for gillnet fisheries in relation to guillemot and razorbill. Furthermore, the study made links (based on time depth recorded data from guillemot and razorbill) to how the mitigation reduction method could reduce bycatch for both auk species. Based on the above, only the LEB is currently being tested as it is the most advance bycatch reduction technique for both the target species and target fishery. Preliminary findings from the LEB are promising, with an initial reduction in bycatch of auks identified. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase
RR-029-APDX:C-78	<p>78 - Document used: Volume B2, Annex 8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence. 11.1.1.1</p> <p>It is highly unlikely that Natural England would deem compensation at a 1:1 ratio to be appropriate, given the high levels of uncertainty in the efficacy of the measure, the likely difficulties in quantifying actual bycatch reduction on an annual basis and compensation not being delivered at the site of impact. See Points 2 & 3.</p>	The Applicant acknowledges and is offering an overall 1:2 compensation ratio per species.

4.23 Detailed comments: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap.

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-79	<p>79 - Document used: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap. 2.1.1.3</p> <p>It is noted that a bycatch "technology selection phase" is planned for 2021-23. However, it is our understanding that this phase is in fact the trialling of a single technique (LEB), and possibly another above-water deterrent (predator kites). If this technology is not taken forward, there is currently insufficient evidence to simply select another technology (e.g., net illumination or modification, acoustic deterrents). Therefore, another trial phase would be required. The aims, objectives, risks, and possible outcomes of the 'selection phase', including implications for implementation timelines, should be presented.</p>	<p>The Applicant states that the bycatch reduction technology selection phase will allow for the identification of a technique to take forward for bycatch reduction. The first quarter of 2022 will allow for identification of the success of the LEB. If the LEB is deemed unsuccessful, then the selection phase allows for another technique to be tested in the winter of 2022/2023 should it be deemed necessary. Nevertheless, the preliminary results of the LEB are promising.</p>
RR-029-APDX:C-80	<p>80 - Document used: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap. 2.1.1.10</p> <p>Early consideration of scaling up compensation is welcomed. However, at this stage it is unclear how much confidence can be placed in the suite of compensation methods proposed being able to deliver any level of compensation. Proof of concept trials are still required to prove bycatch reduction method efficacy before longer term trials can quantify the potential delivery of compensation. Furthermore, levels of impact and compensation ratios are yet to be agreed and will depend on several factors. See Point 3.</p>	<p>The Applicant entered a bycatch reduction technology selection phase during November 2021. The bycatch reduction technology selection phase will gather further evidence on the efficacy of the LEB, specific to guillemot and razorbill bycatch within a commercial gillnet setting. Focusing within the commercial fishery will allow for direct comparison for how successful the LEB will be as compensation for guillemot and razorbill. The preliminary findings are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase and initial findings in the predator eradication being even more promising than expected at this stage. The measure will (if required) be delivered as a package of measures along with predator eradication. Both measures are scalable and flexible in terms of implementation both in their own right, and in synergy within the proposed package of measures for these species. The Applicant is therefore confident that the proposed compensation package can be delivered at the scale required.</p> <p>In relation to the scale of compensation required, the calculation method for compensation is scalable, so can be adjusted based on the final agreed level of impact and compensation ratio.</p>

<p>RR-029- APDX:C-81</p>	<p>81 - Document used: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap. 2.1.1.11</p> <p>It is not clear how bycatch reduction on 7 vessels has been selected. A trial has not yet been conducted and the efficacy of any measure is unknown. Furthermore, actual bycatch in the proposed fisheries has yet to be properly quantified. We note the interaction with the predator eradication program and accept that there is the potential for that to reduce reliance on the bycatch reduction, although we consider the delivery and efficacy of that compensatory measure to remain uncertain at present. See Point 61.</p> <p>Please provide (and reference) the “precautionary assessment” that has been undertaken to inform the decision to implement bycatch reduction on 7 vessels.</p>	<p>The approximate number of vessels proposed for implementation was identified through analysis of the questionnaire responses on level of bycatch per year combined with the preliminary results of the LEB (Rouxel <i>et al.</i>, 2021). This provided an average of the number of bycaught individuals that could be reduced per year per vessel, scaling this up, this resulted in seven vessels being required to fulfil the compensation for the relevant species. This is a preliminary estimate and will be recalculated following the success of the LEB identified throughout the current bycatch technology selection phase.</p> <p>Please noted that the number of vessels used in the technology selection phase are greater than those expected necessary for the compensation package. For the bycatch reduction technology selection phase, the Applicant secured 10 vessels to partake within only two months, showing how rapidly fishers could be secured by the project. Additionally, a number of other vessels are already expressing interest in participating in future trials or long-term implementation of the measure. The Applicant is therefore confident in securing the number of vessels required for compensation.</p> <p>As per the interaction with predator eradication, the Applicant is developing both compensation measures and will implement both if deemed necessary by the Secretary of State. However, the Applicant is confident that each of the measures on their own is robust and deliverable to the scale required to compensate for the Projects impact. The inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Nevertheless the Applicant has committed to a suite of compensation with 1:2 compensation ratio for each species (1:1 for predator eradication and 1:1 for bycatch).</p> <p>The Applicant is confident that any of the proposed measures will sufficiently compensate for the required species for Hornsea Four. A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: Calculation Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA and were discussed with Natural England during the workshops held on 3rd and 14th February 2022.</p>
<p>RR-029- APDX:C-82</p>	<p>82 - Document used: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap. 3.1.1.1</p>	<p>The Applicant entered a bycatch reduction technology selection phase during November 2021. The technology selection phase will run from November 2021 until March 2022. If</p>

	<p>We assume the bycatch technology selection phase (trial) will run for three years. This will generate useful data and allow for consideration of interannual variation. However, it is implied that the outcome of this trial will inform whether predator eradication will be implemented. The wording of the document elsewhere implies only that the scale of the measures will be subject to change. It has been Natural England's understanding that a suite of measures will be taken forward.</p> <p>All compensatory measures proposed for auks present ongoing challenges and uncertainties. We believe committing to the full suite of measures will be essential to ensure confidence that adequate compensation can be delivered over the lifetime of the project.</p>	<p>deemed beneficial to further support the study outcomes from the first year, a second year of technology selection will be undertaken by the Applicant or implementation will commence. There will be a minimum of 6 months data collection in total. However, a similar trial is running simultaneously under RSPB management.</p> <p>As per the suite of measures, the Applicant is developing both predator eradication and bycatch reduction, however is confident that each of the measures on their own is robust and deliverable. The inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Nevertheless the Applicant is committed to providing a suite of compensation measures with an overall compensation ratio of 1:2 (1:1 for predator eradication and 1:1 for bycatch).</p>
RR-029-APDX:C-83	<p>83 - Document used: Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap. 4.1.1.1</p> <p>We welcome further engagement with the Applicant on the trials of bycatch reduction techniques.</p>	<p>The Applicant has continued to engage with Natural England during the development and undertaking of the bycatch technology selection phase during the consultation process. The Applicant will submit results during Examination at Deadline 5 following data analysis once the 2021/22 bycatch technology selection phase has been completed.</p>

4.24 Detailed comments: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:C-84	<p>84 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 1.2.1.1</p> <p>Natural England note that black rat (<i>Rattus rattus</i>) is now extremely rare in the UK, and following eradication on Lundy and The Shiant's can no longer be considered a significant predator of seabirds in the UK. We consider it an oversimplification to define brown rat as the main predator of razorbill and guillemot in the UK, as many populations are not exposed to brown rat predation. The predation of auks by rats should be put into context with pressure from other predators.</p>	<p>The Applicant acknowledges Natural England's comment. Post-submission, site visits to the Bailiwick of Guernsey, including Herm and Sark (along with the relevant islands/ islets around the main islands) have shown that rats (including black rat) are present with evidence from Alderney suggesting that rats are predating and overlapping spatially with guillemot and razorbill nesting habitat. The implementation studies being undertaken aim to identify the abundance and species on each of the islands and islets. Findings from the implementation studies will be presented during Examination at Deadline 5.</p>
RR-029-APDX:C-85	<p>85 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 1.2.1.4, 10.1.1.2 & 10.2.1.2</p>	<p>B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) and B8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196) provides detail on the monitoring and biosecurity measures that will be</p>

	<p>We note that following successful eradication, if biosecurity measures fail and re-invasion occurs, ongoing predator control will not seek to eradicate the predator population. It is concerning that this strategy does not take account of ongoing monitoring. A reduced population of predators could still prevent nesting auks, or significantly reduce their population and/or productivity. In this case, simply controlling the predator population may not be sufficient to deliver the compensatory requirement.</p> <p>Adaptive management should take account of ongoing monitoring, and (potential) steps taken following re-invasion should include complete eradication if required to deliver the compensatory measure.</p>	<p>implemented at the chosen predator eradication location. In particular predator monitoring would commence following the baiting or trapping campaign and would follow the established methods outlined by the eradication contractor. It is anticipated that this monitoring would last at least two years to record the removal of target species from the location. Monitoring for potential re-infestation on the location would continue for the operational phase of the project, at a frequency to be defined within the implementation plan and discussed with the OOEG. This would be included with the biosecurity compensatory measures.</p> <p>Additionally, the B8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196) report states that any eradication programme needs to be coupled with adequate biosecurity protocols to prevent the re-invasion or new invasion of an invasive species. It is vital that a set of biosecurity measures are installed to sustain the subsequent population response of breeding seabirds. Note that predator control would aim to maintain a reduced population of predators rather than keep the island completely predator free.</p> <p>If monitoring indicates that eradication attempts prove unsuccessful, the reasons for the lack of success would be investigated and options identified for improving the eradication programme. If the long-term biosecurity risk proves too high at the initial islands, another location may be chosen (such as those considered in the long-list of sites) for eradication in consultation with the OOEG as explained in the B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap(APP-197).</p>
<p>RR-O29-APDX:C-86</p>	<p>86 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 1.2.1.6, Fig 1 & Table 9</p> <p>It is our understanding that a major non-native predator eradication project at Rathlin Island has already received funding¹⁶. Therefore, this location will not be available and should be removed from the potential locations.</p>	<p>Since the submission of these documents, it has been publicly announced that Rathlin Island has secured funding. Therefore, Rathlin Island will no longer be considered as part of the shortlist by the Applicant. The Bailiwick of Guernsey, including Herm and Sark (along with the relevant islands/ islets around the main islands) were visited by ornithologists on behalf of the Applicant in August 2021. Evidence in support of a predator eradication programme was determined for each location along with the development of relationships with stakeholders. Furthermore, evidence of rats accessing known guillemot and razorbill nesting locations was provided for Alderney by the Alderney Wildlife Trust (who are working with the Applicant to gather further evidence).</p>

		As a result of strong evidence in support of an eradication and the positive relationships built with local stakeholders, the following locations are being progressed by the Applicant through the implementation study: Alderney, Herm and Sark.
RR-029-APDX:C-87	<p>87 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 5.1.1.8</p> <p>The importance of community engagement and buy-in cannot be overstated. Any eradication of mammalian predators is likely to be met by significant resistance. It could be fruitful to engage with individuals and organisations that have carried out successful projects to ensure effective community engagement, i.e., 'lessons learned' are incorporated.</p>	<p>The Applicant has been in contact with specialists who have been involved in previous eradication programmes to specifically discuss the lessons learnt regarding community engagement and undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence APP-196).</p> <p>In addition, the Applicant has employed international eradication and island restoration experts to undertake a detailed implementation study (as described within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that they have undertaken, or have secured plans to undertake, actions to ensure the success of the measure, despite the inherent challenges presented by island predator eradication.</p>
RR-029-APDX:C-88	<p>88 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 5.1.1.10</p> <p>We do not consider there to be sufficient evidence to demonstrate that predator control rather than eradication would result in sufficient long-</p>	<p>Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p>

	<p>term benefit and provide an acceptable compensatory measure. Igual et al (2005)¹⁷ found increased control of black rats (<i>Rattus rattus</i>) lead to increased breeding success (not population size) of Cory's shearwater <i>Calonectris diomedea</i>, although the effect was more pronounced in birds nesting amongst vegetation (where predation was higher) than in rocky habitat. It is of note that this study was conducted in an area with a very high density of rats. Further, the study concludes that "control rather than eradication is very short term. From a conservation point of view, rat control in our population of Cory's shearwater can be considered temporarily satisfactory" and "In our case, complete eradication should be the main outcome of this pilot study". It is suggested that the increased population of breeding guillemot on Lundy is in large part due to the increased habitat made available that was once accessible to rats¹⁸. It appears unlikely that guillemots would nest in areas accessible to rats if any rats at all are present. We consider that sites where only predator control is possible should not be short listed for the compensatory measure.</p>	<p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. The Bailiwick of Guernsey, including Herm and Sark (along with the relevant islands/ islets around the main islands) were visited by ornithologists on behalf of the Applicant in August 2021. Evidence in support of a predator eradication programme was determined for each location along with the development of relationships with stakeholders.</p> <p>Furthermore, evidence of rats accessing known guillemot and razorbill nesting locations was provided for Alderney by the Alderney Wildlife Trust (who are working with the Applicant to gather further evidence).</p> <p>As a result of strong evidence in support of an eradication and the positive relationships built with local stakeholders, the following locations are being progressed by the Applicant through the implementation study: Alderney, Herm and Sark. These sites are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-89</p>	<p>89 - Document used: Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence. 10.2.1.1</p> <p>We suggest that community engagement and buy-in is also a key implementation consideration, as lack of community buy-in is a significant project risk.</p>	<p>As stated in B8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence, the Applicant acknowledges the importance to include stakeholder engagement throughout the implementation process, including engagement with the local community to ensure targets are met and maintained long-term.</p> <p>The Applicant has undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)). The Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four.</p> <p>The Applicant has already undertaken site visits to the Isles of Scilly and Guernsey (including Herm and Sark) (August 2021) and is working with the Alderney Wildlife Trust identify at an</p>

		<p>early stage to identify potential issues and solutions which would increase the success of a potential eradication.</p> <p>The Applicant has furthermore employed eradication and island restoration experts to undertake a detailed implementation study (as described within B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197)) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. Findings from the implementation studies will be presented during Examination at Deadline 5. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
--	--	---

4.25 Detailed comments: : Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap.

Reference	Relevant Representation Comment	Applicant's Response
RR-029- APDX:C-90	90 - Document used: Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap. 2.1.1.3	Predator control was suggested by the applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where

	<p>It has not previously been clear in other documents that there are sites being considered where predator eradication is not possible (due to connectivity at lowest astronomical tide). This should be clearly stated in the short-listing process to provide clarity on whether predator eradication or control is to be undertaken at all shortlisted sites. We advise that sites where only 'control' is an option are not short-listed.</p>	<p>control was being considered was in relation to small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p> <p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey, including Alderney, Herm and Sark (along with the relevant islands/ islets around the main islands) are being considered further on a full eradication and biosecurity measures basis.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p>
<p>RR-029- APDX:C-91</p>	<p>91 - Document used: Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap. 2.1.1.5</p> <p>There is some discrepancy across the documentation. It is suggested here that a suite of measures will be implemented, while in the bycatch documents it is also proposed that one method or another might prove sufficient in isolation.</p> <p>We note that again it is suggested that the suite of measures could provide compensation at a ratio of 1:2 but there is no quantification of the likely benefit of any compensatory measure (alone or cumulatively) to support this statement.</p> <p>We reiterate our view that committing to a suite of measures will be essential to provide confidence that compensation for auks can be delivered. The efficacy and deliverability of the proposed compensatory methods remains highly uncertain. We accept that the measures will interact in terms of delivery, which might allow some flexibility of required outputs.</p>	<p>The Applicant acknowledges Natural England's comment regarding document discrepancy. The Applicant will update this document and will submitted at Deadline 1 Revision 2 of B2.8.4 RP Volume B2 Annex 8.4 Compensation measures for FFC SPA Predator Eradication Roadmap.</p> <p>The Applicant is confident that each of the measures on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of measures provides stakeholders with additional comfort on the level of compensation that can be provided. Additionally, the bycatch technology selection phase and predator eradication implementation assessments are currently being undertaken. This will provide more evidence to support the Applicants chosen compensatory measures.</p> <p>Nevertheless, the Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). Additionally, the Applicant is committed to providing overall compensation at a ratio of 1:2 (1:1 for predator eradication and 1:1 for bycatch reduction), thereby increasing the resilience and likelihood of success.</p> <p>A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: Calculation Methods of Hornsea Four's Proposed</p>

		<p>Compensation Measures for Features of the FFC SPA which has been submitted to Natural England and discussed during the Workshops held on 3rd and 14th February 2022.</p>
RR-029-APDX:C-92	<p>92 - Document used: Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap. 2.1.1.6</p> <p>It is not clear what "precautionary assessment" is referred to that informed the decision to undertake predator eradication at 1-3 locations. We are not aware of any quantification of potential benefits arising for the target species as a result of any proposed compensatory measure. Please clarify the assessment that is referred to in the text.</p>	<p>Predator eradication scale is based on the amount of nesting habitat potential available to be 'unlocked' following predator eradication. 1-3 islands was a precautionary assessment in the first instance as an assessment of potentially available had not been undertaken. Following a preliminary assessment (G1.33 Predator Eradication Island Suitability Assessment: Bailiwick of Guernsey) the Applicant is confident it can deliver the required compensation population for guillemot and razorbill at Alderney (which has a large rat population overlapping known auk breeding habitat). The Applicant is currently undertaking a further implementation studies throughout the islands of the Bailiwick of Guernsey to determine potential locations for adaptive management for predator eradication.</p> <p>A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: Calculation Methods of Hornsea Four's Proposed Compensation Measures for Features of the FFC SPA which has been submitted to Natural England and discussed during the Workshops held on 3rd and 14th February 2022, which has been reviewed by Natural England and discussed during Workshops held 3rd and 14th February 2022.</p>
RR-029-APDX:C-93	<p>93 - Document used: Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap. Appendix A & B</p> <p>We note that the Letters of Comfort from the Alderney Wildlife Trust and Agriculture, Countryside and Land Management Services indicates that the States of Guernsey and Alderney are committed to Ramsar management plans which include mammal eradication. This raises the question of whether the Applicant can offer any additionality at these locations. The Applicant would need to show that their proposals are above and beyond the management plans, and/or that the current management plans would not be implemented without their input. We further note that these areas lie outside UK law which could present complications. We also highlight that the Ramsar site falls outside the UK national site network, so the benefits here would be indirect, i.e. to the wider biogeographic populations.</p>	<p>The Applicant has received Letters of Comfort from Alderney Wildlife Trust and States of Guernsey Agriculture, Countryside and Land Management Services Alderney Wildlife Trust have approval to undertake predator eradication from States of Alderney (States of Alderney responded to the Hornsea Four consultation supporting the investigations and future compensation measures efforts). The correspondence clearly convey effective predator eradication can only be delivered with the input from the Applicant. The proposed compensation measure is therefore additional and above and beyond what would be undertaken by the relevant managing organisation..</p> <p>The Applicant acknowledges that whilst the predator eradication measure proposed cannot be undertaken within the FFC SPA, the birds that the compensation measure will generate will assimilate into the biogeographic population of guillemot and the biogeographic population of razorbill and thereby ensure the coherence of the national site network in the UK is maintained. A reduction in mortality would be undertaken in areas which form part of the wider biogeographic population of guillemot and razorbill as part of the east Atlantic</p>

		breeding population of the species. This population includes individuals from the Flamborough and Filey Coast SPA (Stroud et al., 2016). Further information to support this is provided in (B2.8.1: Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence: Appendix A (APP-194)) .
--	--	---

4.26 Detailed comments: Volume B2, annex 8.7: Outline Gannet, Guillemot and Razorbill Compensation Implementation and Monitoring Plan

Reference	Relevant Representation Comment	Applicant's Response
	No specific comments	Noted.

5 Appendix D – Marine Mammals

5.1 Project Parameters

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-A	Project Description: The project parameters are clearly defined in a marine mammals context.	Noted and captured in the SoCG with Natural England in relation to offshore matters.
RR-029-APDX:D-B	NE position on Worst Case Scenario (WCS): Natural England agrees that the WCS has been outlined, with the exception of clarity being required on the potential for concurrent and simultaneous piling to both occur within a 24-hour period (see below).	The Applicant confirms that the associated Conditions within C1.1: Draft DCO including Draft DMLs (APP-203) have been updated to provide clarity on the concurrent and simultaneous piling scenarios permitted. Please see C1.1.1 Draft DCO including Draft DML submitted at Deadline 1 .

5.2 Baseline Characteristics

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-C	Data suitability and baseline characterisation: We consider the data collected, when used in conjunction with other available data, is sufficient. We welcome the inclusion of the latest publications.	Noted and captured in the SoCG with Natural England in relation to offshore matters.
RR-029-APDX:D-D	Data gaps: The Applicant has presented information on bottlenose dolphin sightings in the northeast from 2018 and 2019. However, sightings	The Applicant acknowledges the fact that only one year of sightings data was presented for the bottlenose dolphin baseline. However, it should be noted that additional Sea Watch

	<p>were only recorded in 2019, meaning that only 1 year of sightings is presented. If available, we consider it advisable to include data from 2020, to confirm the pattern of sightings or any changes.</p>	<p>Foundation data would not serve to provide any additional information on bottlenose dolphin abundance or density estimates for the impact assessment. Additional sightings data would only serve to confirm the presence of bottlenose dolphins in the area, which has already been established with the data presented and considered in the assessment. As such, the Applicant considers that the addition of additional data would have no bearing on the outcome of the assessment.</p>
--	--	--

5.3 Environmental Impact Assessment

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-E	<p>Identified impacts: All potential pressures have been identified.</p>	<p>Noted and captured in the SoCG with Natural England in relation to offshore matters.</p>
RR-029-APDX:D-F	<p>Methodology: The WCS used in the underwater noise modelling currently assumes a maximum of 2 piling events occurring in a 24-hour period simultaneously. There is ambiguity in the documents as to whether concurrent piling (piling at 2 locations within a 24-hour period) could also occur within the project envelope. This could allow for up to 4 piling events within 24-hours which would exceed the WCS currently assessed in the underwater noise modelling. Clarity is needed on the Project's definition of concurrent piling. If it is not the intention of the Applicant to include simultaneous and concurrent piling in the WCS, it should be conditioned in the DCO.</p>	<p>See Applicant response to RR-029-APDX:D-B.</p>
RR-029-APDX:D-G	<p>Methodology: We request additional analysis of UXO clearance at the coast and potential impacts to bottlenose dolphin (particularly belonging to the Coastal East Scotland Management Unit).</p>	<p>The Applicant notes that UXO clearance in more coastal waters has been assessed for both seal species, where it was assumed that the UXO would be either located at the centre of the array, or one-third of the way along the ECC in order to allow for consideration of the higher seal densities near the coast (see Table 4.58 in Volume 2, Chapter 4: Marine Mammals Chapter (APP-016)). The assessment clearly shows that a UXO located within the ECC will impact more grey seals than one located in the centre of the array area.</p> <p>Given that there is a lack of bottlenose dolphin density information for the area, the only density estimate available to use is a uniform density estimate of 0.003 dolphins/km2 (assuming a uniform density across the entire GNS MU, as outlined in Volume A5, Annex 4.1: Marine Mammal Technical Report Part 1 (APP-072)). Since only a uniform density estimate</p>

		<p>is available for the entire GNS MU, the location of the UXO does not influence the assessment in terms of animals impacted. The assessment assumes a 26 km EDR for bottlenose dolphins and results in an estimated 6 animals experiencing behavioural disturbance. The exception to this would be if the UXO were to be located <26 km from the coast, such that the resulting impact zone would be smaller and less animals would be disturbed.</p> <p>As stated in JNCC et al (2020), an explosion is likely to only elicit a startle response and would not result in widespread and prolonged displacement. Therefore, the impact of disturbance from UXO clearance on bottlenose dolphins was assessed as Slight – which is not significant in EIA terms.</p> <p>The Applicant would like to highlight that the UXO clearance assessment is illustrative at this stage until further information is obtained on UXO presence, number and size etc. A separate Marine Licence application will be submitted pre-construction for the detonation of any UXO. Additionally, UXO clearance for the purposes of this assessment is considered to involve the high-order detonation of the UXO in situ. This is considered to be the worst-case scenario since there are alternative low-order and low-yield clearance options now available that are anticipated to result in significantly lower impacts compared to high-order detonations. As such, the Applicant considers that the UXO assessment is appropriate and robust.</p>
RR-029-APDX:D-H	Cumulative Effect Assessment (CEA): The list of projects screened into the CEA seems appropriate, however this should be reviewed before the agreed cut-off date.	Noted. The Applicant can confirm that a final review of the long list against the most recent data sources was made in June 2021 to account for any changes to the status of the projects, plans and activities considered prior to final application (cut-off date for inclusion within the Hornsea Four CEA of 31st May 2021).
RR-029-APDX:D-I	Cumulative Effect Assessment (CEA): The Applicant has not provided sufficient justification to scope out vessel collision risk and vessel disturbance for specific marine mammals. Further justification should be provided and/or the pathways screened in.	<p>Vessel collision risk has been scoped out of the EIA (see Table 4.8 in Volume A2, Chapter 4: Marine Mammals (APP-016)) as it is assumed that all offshore developments will be required to either implement a Vessel Management Plan or to follow best practice guidance and codes of conduct with regards to vessel movement around and in response to marine mammals. This will ensure that the already low risk of collisions is reduced to a negligible level.</p> <p>The Applicant can confirm that vessel disturbance has been included in the marine mammal cumulative assessment (see Section 4.12.6 in Volume A2, Chapter 4: Marine Mammals (APP-016)).</p>
RR-029-APDX:D-J	Assessment conclusion: Pending the clarification on piling, we broadly agree with the assessment outcomes.	Noted and will be captured in the SoCG with Natural England in relation to offshore matters (pending confirmation that the clarifications provided are satisfactory).

5.4 Habitats Regulation Assessment

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-K	Screening: We consider that all relevant sites and receptors have been identified. We welcome the addition of Moray Firth SAC.	Noted and captured in the SoCG with Natural England in relation to offshore matters.
RR-029-APDX:D-L	Screening: Insufficient information has been provided to demonstrate no LSE to harbour seal in The Wash and North Norfolk Coast SAC from vessel collision risk. Further information should be provided in relation to vessel movements and this species.	<p>The Wash and North Norfolk Coast SAC was not considered in the assessment on the basis that the potential for collision risk is limited to individuals that may come into direct contact with vessels, in comparison to consideration of, for example, disturbance from underwater noise, where individuals could be disturbed at distance from source. The sites screened in for potential LSE for collision risk are therefore limited to those where potential for direct connectivity between individuals from a designated site and the Hornsea Four array and or ECC (see paragraph 10.3.3.189 in Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 1 (APP-167)).</p> <p>The Applicant has committed to the implementation of a Vessel Management Plan (Co108 - Volume A4, Annex 5.2: Commitments Register (APP-050)) which will determine vessel routing to and from construction areas and ports to minimise, as far as reasonably practicable, encounters with marine mammals.</p> <p>It is highly likely that a proportion of the vessels will be stationary or slow moving throughout construction activities for significant periods of time, and thus the risk of collision is low. Harbour seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision.</p>
RR-029-APDX:D-M	Methodology: We are supportive of the novel methods used to apportion impacts to SACs, and believe it makes use of the best available evidence.	Noted.
RR-029-APDX:D-N	Assessment: As with the EIA, the assessment has been done on the basis that simultaneous and concurrent piling will not occur at the same time. If these activities could co-occur, the assessment will need to be updated with this as the worst-case scenario. We recommend the relevant DCO conditions are updated to include concurrent as well as simultaneous piling to ensure piling is limited to two piles installed per calendar day.	See Applicant response to RR-029-APDX:D-B.
RR-029-APDX:D-O	Assessment: Further information on vessel movements is required to demonstrate no likely significant effect (LSE) on the harbour seal feature	The Applicant has committed to the implementation of a Vessel Management Plan (Co108 - Volume A4, Annex 5.2: Commitments Register (APP-050)) which will determine vessel

	<p>of The Wash and North Norfolk Coast SAC as a result of vessel collision risk. Whilst the area of construction itself has low numbers of harbour seals, collision risk can also arise whilst vessels are in transit to/from ports, where densities may be higher.</p>	<p>routing to and from construction areas and ports to minimise, as far as reasonably practicable, encounters with marine mammals.</p> <p>It is highly likely that a proportion of the vessels will be stationary or slow moving throughout construction activities for significant periods of time, and thus the risk of collision is low. Harbour seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision.</p>
RR-029-APDX:D-P	<p>Assessment – In Combination: Different tiers have been used between the RIAA and CEA in the ES; the rationale for this and a comparison between them should be provided.</p>	<p>The Applicant notes the comment. Further information has been provided in Section 8.2 of Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 1 (APP-167)). This includes an explanation to support the two different tier systems used and a table of comparison for illustration.</p>
RR-029-APDX:D-Q	<p>Assessment – In Combination: Seismic surveys have not been included; whilst we understand the rationale for this, we can be confident that they will overlap with construction in the future, and therefore they should be included in the in-combination assessment.</p>	<p>The Applicant is seeking clarification from Natural England in relation to this comment and will provide an update on this point at Deadline 2.</p> <p>See Applicant response to RR-029-5.34.</p>
RR-029-APDX:D-R	<p>Assessment conclusion: Owing to concerns regarding the current over-reliance on the SIP process to manage in-combination impacts to the SNS SAC, Natural England cannot rule out AEOI on the SNS SAC. We strongly recommend that a commitment to delivering additional mitigation is secured at this stage.</p>	<p>Noted. See Applicant response to RR-029-5.33.</p>
RR-029-APDX:D-S	<p>Assessment conclusion: We further note that two pathways have been included in the ES that are for activities that are not part of this DCO application - UXO clearance and geophysical surveys. Whilst we welcome these being included for high level consideration in in combination assessments, they will be assessed fully under separate Marine Licences (ML) and it is therefore not possible to make conclusions on their impacts at this time. This pre-empt the results of the detailed assessments that will be done as part of the respective ML applications.</p>	<p>Noted.</p> <p>See Applicant response to RR-029-5.35 in relation to UXO clearance.</p> <p>See Applicant response to RR-029-5.34 in relation to geophysical surveys.</p>

5.5 Mitigation

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-T	<p><u>Main Issues – Mitigation</u></p> <p>The Outline Marine Mammal Mitigation Protocol (OMMMP) includes an appropriate range of mitigation measures, however further discussion is needed with regards to Acoustic Deterrence Device (ADD) duration and the use of bubble curtains. We also suggest the Applicant consider the use of Passive Acoustic Monitoring (PAM).</p> <p>The most effective way that the impact of noisy activities can be managed down is through noise abatement systems (NAS). There are several different types of NAS but all of them work to reduce the level of noise generated at source, therefore reducing the area that is ensonified and reducing the overall impact to marine mammals. We strongly encourage the use of NAS on this project, and request further information on the feasibility of its use here.</p> <p>There are other approaches to reducing noise impacts which the Applicant has considered, and we are supportive of. These include simultaneous piling, which can reduce the overall duration of piling activities, (though the geographical spread of simultaneous piling locations should be limited to ensure the (daily) threshold for an adverse effect is not exceeded); and 'secondary' mitigation measures, such as alternative foundation types to monopiles. We consider that prioritising piling outwith the summer season (March-September inclusive) would also reduce overlap of underwater noise impacts and the SAC.</p> <p>However, none of these mitigation measures have currently been committed to. The Applicant proposes that this will be managed post-consent via the implementation of a Site Integrity Plan (SIP) prior to construction. Natural England have significant concerns over the feasibility of adding mitigation at this late stage when decisions around cost, equipment type etc. have already been made. We therefore strongly</p>	<p>Noted. The Applicant agrees that further discussion is required as to the most appropriate duration of ADD activation.</p> <p>In relation to mitigation within the MMMP, see Applicant response to RR-029-5.33.</p> <p>In relation to simultaneous and concurrent piling, see Applicant response to RR-029-APDX:D-B.</p> <p>In relation to geophysical surveys, see Applicant response to RR-029-5.34.</p>

	<p>recommend that a commitment to delivering mitigation is secured at this stage.</p> <p>We consider it should be secured that only simultaneous or concurrent piling of a maximum of two piles (across both generation and transmission) can occur per calendar day.</p> <p>We consider it should be secured that the Applicant must seek sign-off on geophysical surveys, as this will notify the Regulators and enable them to take them into account in in-combination assessments.</p>	
--	---	--

5.6 Post- consent monitoring

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-U	<p>Main Issues – Post-consent monitoring</p> <p>Natural England advise post consent monitoring is required for the following elements of the project:</p>	
RR-029-APDX:D-V	<ul style="list-style-type: none"> Source level noise of wind turbine generators (WTG) with a direct-drive gearbox for turbines with a 305m rotor diameter (see Point 7). There is a significant gap in knowledge of the underwater noise levels of WTGs of this size. 	<p>The Applicant notes that an estimated operation source noise level has been provided for Hornsea Four turbines in Section 6.3 of Volume A4, Annex 4.5: Subsea Noise Technical Report Part 2 (APP-044), based on a linear fit extrapolation as this was the most conservative extrapolation, leading to the highest, and thus maximum design, estimation of source level noise from the larger 305 m diameter rotor WTGs. The Applicant notes that newer, larger, direct-drive (gearbox-less) designs tend to be more efficient and losses (e.g. in energy which produces noise and vibration) are significantly reduced when compared to older designs that have been measured. Stöber and Thomsen (2021) estimate the direct-drive turbines to be 10 dB quieter than an equivalent gearboxed design. Thus, the linear extrapolation represents a considerably greater noise output and can be considered suitably precautionary and conservative.</p> <p>Due to the low levels of noise produced by WTGs, and the absence of any significant impacts predicted in relation to operational noise, no operational noise monitoring is proposed.</p>
RR-029-APDX:D-W	<ul style="list-style-type: none"> The characterisation of bottlenose dolphin baseline distribution relies on the assumption that their distribution along the northeast English coast is the same as in Scotland. Natural England considers this a significant assumption as it directly affects the prediction of the number of animals potentially affected by the project. We would be supportive of the 	<p>Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.</p>

<p>Applicant undertaking post-consent monitoring to provide evidence to support the use of this assumption in future OWF impact assessments (see Point 10).</p>	
---	--

5.7 Detailed comments: Volume A2, Chapter 4: Marine Mammals

Reference	Relevant Representation Comment	Applicant's Response
<p>RR-029-APDX:D-1</p>	<p>Detailed comments – Volume A2, Chapter 4: Marine Mammals: Point 1 Section 4.5.1.1, Table 4.6: Natural England advised the Applicant during the Evidence Plan process to consider bottlenose dolphin in the project area as part of the Coastal East Scotland (CES) management unit (MU). The Applicant proposed to use the abundance estimates for the Greater North Sea (GNS) MU from the (then unpublished) IAMMWG (2021), noting that this was going to be the first abundance estimate for this population of bottlenose dolphin. The Applicant stated that both MU populations (GNS and CES) could be included in the report if that was more acceptable.</p> <p>In the Environmental Statement (ES) the Applicant has presented the combined GNS MU and the CES MU populations into a single reference population. With regards to the density estimate, the Applicant has assumed uniform distribution of the GNS MU population across the area.</p> <p>Natural England are concerned about the reference population and the density estimate being calculated at different scales (GNS+CES MU and GNS MU alone, respectively), as if applied to certain species and/or MU populations it could lead to a significant 'dilution' of the impacts. It therefore may not be appropriate to apply this approach in future impact assessments. However, in this case we acknowledge that the CES MU population is small and not likely to cause any discernible 'dilution'.</p> <p>We do request however that the Applicant also present the density of the CES MU population based on uniform distribution (although it would be of interest to better understand any range in densities of this MU population e.g. in any 'hotspots'). This will allow for comparison to the density estimate</p>	<p>It is unclear what Natural England means by: "present the density of the CES MU population based on uniform distribution". Does that mean that the CES MU population should be uniformly distributed along the Moray Firth, East Scotland and NE England coastline? If so, the Applicant considers there to be no evidence to underpin this assumption and thus considers it inappropriate.</p>

	<p>derived from the GNS MU. It may also be more representative of the coastal areas where impacts may occur (e.g. from UXO clearance, see Point 3).</p>																																																
<p>RR-029-APDX:D-2</p>	<p>Detailed comments – Volume A2, Chapter 4: Marine Mammals: Point 2 Section 4.11: We advise that the Applicant should also present the number of individuals within the area of Permanent Threshold Shift (PTS) from piling noise based on concurrent monopiles, which is within the Maximum Design Scenario (MDS). This should refer to the areas of impact detailed in the ES Volume A4 Annex 4.5 Subsea Noise Technical Report Part 2 (Section 5.3.2).</p>	<p>As requested, the number of individuals within the area of PTS-onset from piling noise based on concurrent piling is presented below:</p> <table border="1" data-bbox="1211 359 2040 584"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">NW & E Monopile MDS</th> <th colspan="3">NW & E Pinpile MDS</th> </tr> <tr> <th>Area (km²)</th> <th># animals</th> <th>% MU</th> <th>Area (km²)</th> <th># animals</th> <th>% MU</th> </tr> </thead> <tbody> <tr> <td>LF</td> <td>1000</td> <td>10</td> <td>0.05%</td> <td>920</td> <td>9</td> <td>0.04%</td> </tr> <tr> <td>HF</td> <td colspan="3">-</td> <td colspan="3">-</td> </tr> <tr> <td>VHF (aerial + SCANS III)</td> <td colspan="3">-</td> <td rowspan="2">1100</td> <td>1661</td> <td>0.48%</td> </tr> <tr> <td>VHF (acoustic + SCANS III)</td> <td colspan="3">-</td> <td>1792</td> <td>0.52%</td> </tr> <tr> <td>PCW</td> <td colspan="3">-</td> <td colspan="3">-</td> </tr> </tbody> </table> <p>Fields denoted with a dash “-” show where there is no cumulative effect when the two piles are installed simultaneously (i.e.: where the PTS contours at each location were so small that there is expected to be no overlap). The implementation of a piling MMMP at each of the two locations will serve to minimise the risk of PTS from two simultaneous events to negligible levels.</p>		NW & E Monopile MDS			NW & E Pinpile MDS			Area (km ²)	# animals	% MU	Area (km ²)	# animals	% MU	LF	1000	10	0.05%	920	9	0.04%	HF	-			-			VHF (aerial + SCANS III)	-			1100	1661	0.48%	VHF (acoustic + SCANS III)	-			1792	0.52%	PCW	-			-		
	NW & E Monopile MDS			NW & E Pinpile MDS																																													
	Area (km ²)	# animals	% MU	Area (km ²)	# animals	% MU																																											
LF	1000	10	0.05%	920	9	0.04%																																											
HF	-			-																																													
VHF (aerial + SCANS III)	-			1100	1661	0.48%																																											
VHF (acoustic + SCANS III)	-				1792	0.52%																																											
PCW	-			-																																													
<p>RR-029-APDX:D-3</p>	<p>Detailed comments – Volume A2, Chapter 4: Marine Mammals: Point 3 Section 4.11.1.98: With regards to the assessment of PTS from UXO on bottlenose dolphin, Natural England’s primary concern is UXO clearance in close proximity to the coast where bottlenose dolphin primarily from the CES MU may be present. We consider that it would be beneficial for the Applicant to provide an assessment specifically on this scenario. In the assessment we advise that the Applicant should use an appropriate density and compare the number of individuals in the impact zone against the CES MU population in isolation.</p>	<p>See Applicant response to RR-029-APDX:D-G.</p> <p>Given that there is a lack of bottlenose dolphin density information for the area, the Applicant notes that the only density estimate available to use is a uniform density estimate of 0.003 dolphins/km² across the GNS MU (as outlined in Volume A5, Annex 4.1: Marine Mammal Technical Report Part 1 (APP-072)). Since only a uniform density estimate is available, the location of the UXO does not influence the assessment in terms of animals impacted.</p> <p>The assessment assumes a 26 km EDR for bottlenose dolphins and results in an estimated 6 animals experiencing behavioural disturbance. Should all these animals be attributed to the CES MU, this would comprise 3% of the CES MU.</p> <p>As stated in JNCC et al (2020), an explosion is likely to only elicit a startle response and would not result in widespread and prolonged displacement. Therefore, there is predicted to be only short-term and temporary behavioural effects in a small proportion of the population, where reproductive rates may be impacted in the short term (over 1 breeding cycle).</p> <p>The Applicant would like to highlight that the UXO clearance assessment is illustrative at this stage until further information is obtained on UXO presence,</p>																																															

		<p>number and size etc. A separate Marine Licence application will be submitted pre-construction for the detonation of any UXO. Additionally, UXO clearance for the purposes of this assessment is considered to involve the high-order detonation of the UXO in situ. This is considered to be the worst case scenario since there are alternative low-order and low-yield clearance options now available that that are anticipated to result in significantly small impacts compared to high-order detonations.</p>
RR-029-APDX:D-4	<p>Detailed comments – Volume A2, Chapter 4: Marine Mammals: Point 4 Section 4.12.1.10: The Applicant is proposing to screen out the pathway of vessel collision risk from the CEA as “it is expected that all offshore energy projects will employ a vessel management plan.” We advise that not all projects screened into the CEA are offshore energy projects and therefore they may not all have a VMP e.g. seismic projects. Therefore, further justification is needed to demonstrate the appropriateness of screening out this pathway. We recommend the Applicant provide additional rationale on screening out vessel collision risk pathway from CEA for projects without VMPs.</p>	<p>The Applicant highlights that since it is an offence to injure a European Protected Species, it is expected that all vessels involved in offshore developments will follow some form of vessel code of conduct to minimise this impact pathway, even if this is not provided in the form of a VMP.</p> <p>For construction activities across all offshore industries, it is highly likely that a proportion of the vessels will be stationary or slow moving throughout construction activities for significant periods of time, and thus the risk of collision is low. This also applies to activities such as aggregate extraction, marine disposal. Harbour porpoises, dolphins and seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision. For example, there is evidence that harbour porpoise show short-range displacement from construction vessels (e.g. Benhemma-La Gall et al 2021[1]), which suggests that they would likely not be in close enough proximity to vessels for a collision to occur.</p> <p>With specific regard to seismic surveys, and indeed high-resolution geophysical surveys, it is noted that these spend the vast majority of time following a continuous heading at a slow speed of approximately 5 knots, and therefore pose a negligible risk of collision with marine mammals (Schoeman et al 2020[2]). In many such cases, these activities are accompanied by continuous daylight monitoring for marine mammals by a trained observer. Additionally, seismic surveys are known to cause at least localised displacement of many marine mammal species (Stone et al 2017[3]). These factors further reduce the risk of vessel collisions from such activities.</p>
RR-029-APDX:D-5	<p>Detailed comments – Volume A2, Chapter 4: Marine Mammals: Point 5 Section 4.12.6.2: We note that the Applicant has not considered all offshore wind farm projects where the operation and maintenance (O&M) phase overlaps with the construction of Hornsea 4. To illustrate, there are many</p>	<p>The Applicant confirms that operational noise was screened out of the CIA due to the localised effects and an assessment of negligible significance in the project alone assessment.</p>

	<p>projects which are constructing/due to complete construction between 2021 and 2024 that have not been included in the CEA. We also note that no cable and pipeline projects have been screened into the CEA. The Applicant should consider whether all project types mentioned in 4.12.6.2 have been adequately included.</p>	<p>Only projects where the construction periods are expected to overlap with, or occurring the year immediately prior to or after, the construction activity at Hornsea Four have been included in the CIA for underwater noise impacts.</p> <p>Only cable/pipeline projects that have construction activities overlapping with Hornsea Four are considered. Pre-construction UXO clearance at Hornsea Four is expected between Q1 2026 and Q3 2026 inclusive. Pile driving at Hornsea Four is expected between Q4 2026 and Q3 2017 inclusive. No cables or pipelines in the CIA long list have construction activities that overlap with the specified Hornsea Four offshore construction timeline. As such, the Applicant considers that all relevant offshore wind farm projects have been considered in the marine mammals cumulative assessment.</p>
--	--	---

5.8 Detailed comments: Subsea Noise Technical Report Part 1 and 2

Reference	Relevant Representation Comment	Applicant's Response
	<p>Detailed comments – Volume A4, Annex 4.5: Subsea Noise Technical Report Part 1 No specific comments</p>	<p>Noted.</p>
<p>RR-029-APDX:D-6</p>	<p>Detailed comments – Volume A4, Annex 4.5: Subsea Noise Technical Report Part 2: Point 6 Section 5.2.2.3: We welcome the inclusion of consecutive pin piling. However, information has not been provided on how the consecutive pin piling has been modelled. In particular, Natural England would like to understand:</p> <ul style="list-style-type: none"> • If any break between pin piles has been assumed • Whether consideration has been given to the potential for marine animals to return within impact ranges during breaks between plies. • If there is no break between piles and the next pin pile starts at a lower energy, whether that sound would be sufficiently loud to maintain the fleeing response in marine mammals already displaced by previous piling. <p>Further information on how the consecutive pin pile has been modelled and the underlying assumptions in the modelling should be provided.</p>	<p>The Applicant notes that Subacoustech's standard practice for modelling multiple consecutive piling scenarios when it is not known the separation in time between piling events is to assume effectively continuous piling. As such, no gap is assumed between piling events. In the gaps between pile, an individual may flee further, remain stationary or return to the pile. It is believed that a continuation of the fleeing behaviour would represent a most likely but best-case scenario. A return to the original starting position – which for modelling would have to be repeated at each of the multiple piles, would represent an unreasonable worst case, on top of the layers of worst case scenario parameters built into the noise model. A pragmatic decision was therefore to assume that the receptor would remain stationary. Details on the modelling methodology is presented in Section 4 of Volume A4, Annex 4.5: Subsea Noise Technical Report Part 1 (APP-043).</p> <p>The Applicant notes that the question of whether a marine mammal would still display fleeing behaviour for subsequent piles is a reasonable one, as noise levels will</p>

		<p>certainly be lower. The purpose of the modelling is to calculate an overall noise exposure for an individual. At these lower levels, these lower levels contribute relatively little to the overall exposure and thus subsequent piles add relatively little to this overall exposure, whether fleeing or not. However, as the cruising swim speeds used should be slower than a real 'flee' speed, the distance that the individuals will be from the pile in the modelling will be relatively close and thus the assumption should still lead to a worst case.</p>
RR-029-APDX:D-7	<p>Detailed comments – Volume A4, Annex 4.5: Subsea Noise Technical Report Part 2: Point 7</p> <p>Section 6.3.1.6: We welcome the inclusion of details on the source level noise of a WTG with a direct-drive gearbox, which is more representative of the systems proposed for Hornsea 4. However, we note that the direct drive WTG had a 150m diameter rotor, which is significantly smaller than that proposed for Hornsea 4 (305m). Therefore, we still consider there to be a significant gap in knowledge of the underwater noise levels of WTGs of this size. This knowledge gap could be the target of strategic post-construction monitoring undertaken by the project (see Point 48).</p>	<p>The Applicant notes that due to the low levels of noise produced by WTGs, and the absence of any significant impacts predicted in relation to operational noise, the need for operational noise monitoring is considered to be disproportionate.</p> <p>That said, strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.</p>

5.9 Detailed comments: Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1 and Part 2)

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-8	<p>Detailed comments – Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1): Point 8</p> <p>Section 6.1.1.5: The Applicant has presented information on bottlenose dolphin sightings in the northeast from 2018 and 2019. Of these years, sightings were only recorded in 2019, meaning that only 1 year of sightings is presented. If available, we consider it advisable to include data from 2020, to confirm the pattern of sightings or any changes. Data can be sought from the Sea Watch Foundation on bottlenose dolphin sightings from 2020 (and 2021, if available).</p>	<p>The Applicant acknowledges the fact that only one year of sightings data was presented for the bottlenose dolphin baseline. However, it should be noted that additional Sea Watch Foundation data would not serve to provide any additional information on bottlenose dolphin abundance or density estimates for the impact assessment. Additional sightings data would only serve to confirm the presence of bottlenose dolphins in the area, which has already been established with the data presented and considered in the assessment. As such, the Applicant considers that the addition of additional data would have no bearing on the outcome of the assessment.</p>

RR-029-APDX:D-9	<p>Detailed comments – Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1): Point 9</p> <p>Section 6.1.1.6: In the absence of known bottlenose dolphin density in the area of interest, we welcome the range of densities presented by the Applicant and the approach of taking the most precautionary density estimate.</p> <p>For context, the Applicant should also indicate what the density (assuming uniform distribution) would be for the CES MU, as this may provide a more representative density estimate for the coastal areas where impacts may occur.</p>	<p>The Applicant notes Natural England's comment and welcomes agreement on the range of densities presented and the approach of taking the most precautionary density estimate.</p> <p>However, there is no evidence to suggest the density of bottlenose dolphins along the NE England coast is the same as the uniform density within the CES MU, and as such it is not considered to be appropriate to assume similar densities in the region of Hornsea Four.</p>
RR-029-APDX:D-10	<p>Detailed comments – Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 1): Point 10</p> <p>Section 6.1.1.8: We note that the characterisation of bottlenose dolphin baseline distribution relies on the assumption that their distribution along the northeast English coast is the same as in Scotland. Natural England considers this a significant assumption as it directly affects the prediction of the number of animals potentially affected by the project. We would be supportive of the Applicant undertaking post-consent monitoring to provide evidence to support the use of this assumption in future OWF impact assessments.</p>	<p>Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.</p>
	<p>Detailed comments – Volume A5, Annex 4.1: Marine Mammal Technical Report (Part 2)</p> <p>No specific comments.</p>	<p>Noted.</p>

5.10 Detailed comments: B2.2 Report to Inform Appropriate Assessment Part 1:

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-11	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 11</p> <p>General: Within the Report to Inform Appropriate Assessment (RiAA) the Applicant has undertaken assessments of the potential impacts to designated sites for marine mammals from unexploded ordnance (UXO) clearance activities. While we welcome the work undertaken, we cannot</p>	<p>See Applicant responses to RR-029-5.35.</p>

	comment on this section or the AEoI conclusions as we do not have the information to underpin the assessment scenario, nor have we seen any of the proposed mitigation documents. We consider it would be more appropriate for this level of detail to be provided as part of the standalone UXO Marine Licence application.	
RR-029-APDX:D-12	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 12</p> <p>Table 4: Further information is required to demonstrate no likely significant effect (LSE) on the harbour seal feature of The Wash and North Norfolk Coast SAC as a result of vessel collision risk. We acknowledge that the area of construction itself has low numbers of harbour seals (although it is within the foraging range of the SAC). However, collision risk can also arise whilst vessels are in transit to/from ports, where densities may be higher. Information on vessel transit routes, ports for construction and operation and maintenance and anticipated densities (baseline and project addition) along these routes should be provided to support the conclusion of low risk to harbour seals.</p>	<p>The Applicant has committed to the implementation of a Vessel Management Plan (Co108 - Volume A4, Annex 5.2: Commitments Register (APP-050)) which will determine vessel routing to and from construction areas and ports to minimise, as far as reasonably practicable, encounters with marine mammals.</p> <p>It is highly likely that a proportion of the vessels will be stationary or slow moving throughout construction activities for significant periods of time, and thus the risk of collision is low. Harbour seals are relatively small and highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision.</p> <p>Jones et al. (2017)¹ presents an analysis of the predicted co-occurrence of ships and seals at sea which demonstrates that UK wide there is a large degree of predicted co-occurrence, particularly within 50 km of the coast close to seal haul-outs. There is no evidence relating decreasing seal populations with high levels of co-occurrence between ships and animals. In fact, in areas where seal populations are showing high levels of growth (e.g. southeast England) ship co-occurrences are highest (Jones et al. 2017).</p>
RR-029-APDX:D-13	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 13</p> <p>Table 5: We note that the tiers used for the RiAA differ from those used in the cumulative environmental assessment (CEA) in the marine mammal environmental statement (MM ES) chapter. Justification should be provided as to why two different tier systems have been used, as well as a clear comparison of the two systems and any implications for the assessments.</p>	<p>Section 8.2 of Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 1 (APP-167) has been updated to provide more clarity around why the two different tier systems have been used and a clear comparison of the two systems.</p>
RR-029-APDX:D-14	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 14</p> <p>Section 8.2.3.12: We further note that the different definitions of tiers and/or approaches between the MM ES chapter and the RiAA has led to different types of projects being scoped in/out between these two chapters. The</p>	<p>Section 8.2 of Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 1 (APP-167) will be updated to provide more clarity around why the two different tier systems have been used and a clear comparison of the two systems.</p> <p>The Applicant is seeking clarification from Natural England in relation to this comment and will provide an update on this point at Deadline 2.</p>

	<p>most notable change is with respect to seismic surveys, which have been omitted from the RiAA but included in the CEA in the MM ES chapter. We highlight that this is a deviation from the approach taken by previous offshore wind projects including Hornsea 3, which is acknowledged in the text. Whilst we understand the rationale, we cannot consider that the in-combination assessment presented in this RiAA is the worst-case scenario. We understand that the Applicant is proposing to capture any future seismic surveys in the SIP; however, as Natural England has concerns about the current implementation of SIPs (see Relevant Representations, Paragraphs 5.30-5.32). Because of the short lead-in times for seismic surveys, it is paramount that the SIP is not undertaken/finalised too far in advance of construction as this could mean that potentially concurrent seismic activities are not captured; this should be secured in a DCO condition.</p> <p>The approach taken by the Applicant relies heavily on the SIP for mitigation of adverse effect as, at this stage, the project has not committed to undertaking any mitigation measures. That the in-combination assessment does not present the worst-case scenario, yet the thresholds for significant disturbance are already exceeded, further highlights that noise abatement at source should be being considered strategically across the offshore wind industry at earlier stages than the SIP. Therefore, we cannot currently rule out an adverse effect on integrity for the SNS SAC in combination.</p> <p>We strongly recommend that the Applicant commit to mitigation measures at this stage, rather than at the SIP, to reduce potential impacts from the project alone. We consider the mitigation should be included to minimise impacts as far as possible on principle, with the later SIP consultation determining if they can be removed.</p>	<p>See Applicant response to RR-029-5.34.</p>
<p>RR-029-APDX:D-15</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 15</p> <p>Section 10.3.3.3-4: The Applicant has listed the sources of underwater noise from the project and has included geophysical and seismic surveys. However, no information on the surveys themselves (noise sources, duration) have been provided. It is of particular importance that the noise sources are listed, as Natural England’s main concern with regards to underwater noise</p>	<p>See Applicant response to RR-029-5.34.</p>

	<p>production and impacts on marine mammals relates to sub-bottom profilers (SBPs) and airguns.</p> <p>Underwater noise from such surveys have not been assessed in Annex 4.5 Subsea Technical Noise Report, and the pathway of underwater noise from these surveys as part of the project are not assessed in the MM ES chapter. Any such project activities should be included consistently across the marine mammal assessments.</p> <p>We request clarification as to whether these surveys are to be included as part of the DCO, or whether they will be undertaken under a separate licence? If the works are to be submitted for separately, then the assessment of impacts should be presented in support of those applications. It would not be appropriate for the conclusions of those assessments to be pre-empted here.</p> <p>We advise that any geophysical/seismic survey undertaken as part of the pre-construction works would still need to follow to the EPS licencing process.</p> <p>We understand that seismic surveys are not typically undertaken for the offshore wind industry. Can the Applicant please confirm if there is potential for seismic surveys to be undertaken as part of this project?</p> <p>We request the Applicant state whether such geophysical and/or seismic surveys are included in the DCO or will be undertaken under a separate licence. If not part of this licence, the assessment of the associated impact pathways should be revised e.g. do not present definite conclusions. If they are to be included in the licence, the Applicant should consider the need for EPS licence for these activities specifically. More detail will also be needed on the activities and an assessment of impacts in the ES Chapter carried out to determine if these could lead to thresholds being exceeded if done on the same day as piling. We recommend the Applicant commit to providing information/requesting sign off on the surveys so that the Regulators (in consultation with Natural England) can undertake an appropriate in-combination assessment.</p>	
RR-029-APDX:D-16	Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 16	Noted and captured in the SoCG with Natural England in relation to offshore matters.

	<p>Section 10.3.3.33: Natural England agrees with the approach to the assessment of AEoI on the SNS SAC from PTS, and agrees with the conclusion of no AEoI for the project alone with respect to mortality and injury when taking into account the measures in the piling OMMMP.</p>	
<p>RR-029-APDX:D-17</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 17</p> <p>Section 10.3.3.36: Natural England’s understanding from the Project Description ES chapter (A1.4; 4.4.8.4.35) is that there will be no concurrent piling between the Hornsea 4 array area and the HVAC booster station search area; only that there may be simultaneous piling, undertaken by two vessels, within one of these areas at any one time. We advise that this commitment to not undertake concurrent piling between HVAC and array areas should be secured as a licence condition as it is a fundamental part of the assessment of underwater noise impacts for the project alone. Alternatively, a condition could be secured allowing either concurrent or simultaneous piling to occur. See Point 18 and comments on the draft DCO in Appendix A.</p>	<p>See Applicant response to RR-029-APDX:D-B.</p>
<p>RR-029-APDX:D-18</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 18</p> <p>Section 10.3.3.37: The Applicant has acknowledged the potential for concurrent piling to occur, defining it here as piling that “occurs at up to two separate foundation locations per 24 hours”. Clarification is needed on whether this means within the same Scheduled area (i.e. array or HVAC booster station) in keeping with the Project Description (Point 17), or if it could occur across the two areas.</p> <p>We also highlight that Table 3 (Co85) includes the worst-case scenario as simultaneous piling (assumed to be two locations piled at the same time). Clarification is needed on whether there is the potential for both concurrent and simultaneous piling to occur within a 24-hour period (i.e. up to 4 locations in a 24-hour period). If so, this scenario (and associated disturbance impacts) must be assessed as it would comprise the worst-case for number of piling locations in a 24-hour period. If it is not the intention of the</p>	<p>See Applicant response to RR-029-APDX:D-B.</p>

	Applicant to include this in the WCS, then this should be conditioned in the DCO. See also Point 39 and comments on the draft DCO in Appendix A.	
RR-029-APDX:D-19	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 19</p> <p>Section 10.3.3.109-112: We acknowledge that the worst-case for UXO clearance is high order detonation, and that a MMMP for UXO has not been produced yet. Nonetheless, we wish to highlight that our preference is to minimise the number of un-mitigated high order clearances, through the use of low order clearance and/or bubble curtains. We also note that the inclusion of a UXO MMMP was integral to the ES’s conclusion of negligible significance of PTS on marine mammals from UXO detonation.</p>	<p>Noted. In relation to UXO clearance, the Applicant will consider several approaches/methodologies for each UXO identified in surveys. These approaches/methodologies include (but are not limited to) micrositing of infrastructure to avoid the need for UXO clearance, low order disposal, high order detonation, or relocation. The Applicant’s preferred disposal method for UXO clearance would be the low order disposal technique.</p> <p>A separate Marine Licence application will be submitted in the pre-construction phase for UXO clearance. This Marine Licence application will contain a detailed assessment of UXO clearance and an associated UXO MMMP.</p>
RR-029-APDX:D-20	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 20</p> <p>Section 10.3.3.153: See Point 15.</p> <p>At present, geophysical surveys undertaken by the offshore wind industry are exempt from obtaining a Marine Licence (ML). Because of the nature of the ML exemptions, no information on the surveys is available to view or review, and there is no requirement to submit a report on the survey with details. Thus, geophysical surveys with ML exemptions have historically not be captured in in-combination assessments. We therefore do not have confidence that any geophysical surveys undertaken (by both this project and the offshore wind industry generally) will be included in the SIP under the current approach. We request that the Applicant commits to providing details of their geophysical surveys at the time the SIPs (for both piling and UXO clearance) are written to allow the Regulators to undertake a fully informed in-combination assessment of the works.</p>	See Applicant response to RR-029-5.34.
RR-029-APDX:D-21	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 21</p> <p>Section 10.3.3.154: Natural England disagrees that “the type of geophysical survey carried out for OWF is not typically considered likely to result in PTS in marine mammals”. We consider that the types of geophysical surveys undertaken by the offshore wind industry (including those using sub-bottom profilers (SBPs)) have the potential to result in PTS in marine mammals. With</p>	See Applicant response to RR-029-5.34.

	<p>regards to SBPs specifically, many systems utilise frequencies within the hearing range of marine mammals, and emit noise at a source level that is greater than the threshold for PTS. Furthermore, similar to the comment above, such geophysical surveys typically go through the ML exemption route, through which there is no legally-binding condition to undertake marine mammal mitigation to reduce the risk of injury (and disturbance). We advise that the Applicant commit to mitigation for geophysical surveys. We also advise that any geophysical surveys will need to give due consideration to the EPS licencing process.</p>	
<p>RR-029-APDX:D-22</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 22</p> <p>Section 10.3.3.155-156 & Table 34: We note that geophysical surveys are not typically required to undertake a SIP. We therefore do not see how the SIP process would identify the need for a HRA to be undertaken for a geophysical survey.</p> <p>We request that the Applicant commit to consulting with Natural England on their assessment of impacts from geophysical surveys prior to submission of the ML application/exemption for geophysical survey. At this point, Natural England can provide advice on whether a HRA is needed for the survey.</p>	<p>See Applicant response to RR-029-5.34.</p> <p>The Applicant considers that this mechanism will ensure that Regulators are provided with accurate details of proposed surveys at the earliest possible opportunities and discussions on the need for a HRA can be commenced.</p>
<p>RR-029-APDX:D-23</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 23</p> <p>Section 10.3.3.187, 10.3.4.12, 11.3.2.61-64: The assessment of vessel disturbance appears to be focussed on impacts within the array area, during construction. However, little information has been presented in this section of the RiAA on the proposed vessel routes to/from port, such as their locations, the current shipping levels in them and the number of vessels anticipated to transit through them as part of the project. There is the potential for coastal SACs for seals to be impacted by vessel disturbance should vessels repeatedly transit in their vicinity. Further information is required on vessel transit routes and anticipated densities (baseline and project addition) along these routes.</p>	<p>See Applicant response to RR-029-APDX:D-12.</p>

RR-029-APDX:D-24	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 24</p> <p>Section 11.3.2.20: With regards to number of piling locations in a 24-hour period, we refer the Applicant to previous comments raised regarding the potential for both concurrent and simultaneous piling to occur within a 24-hour period. See Points 17,18 & 39.</p>	See Applicant response to RR-029-APDX:D-B.
RR-029-APDX:D-25	<p>Point 25</p> <p>Section 11.3.2.20: If there is the potential for a seismic survey to occur, then the effective deterrent range (EDR) to be used should be 12 km not 5 km, as this would be the worst-case scenario. However, we note that seismic surveys are not explicitly included in the Project Description ES Chapter (only geophysical surveys are), and more generally seismic surveys are not undertaken for offshore wind projects. We therefore advise the Applicant to consider whether reference to seismic surveys can be removed from the assessment.</p>	The Applicant notes that seismic surveys may be required, which is why they are referenced in the assessment. However, if seismic surveys are deemed necessary, these will not be “large seismic airgun surveys” and so according to JNCC 2020 – would therefore all be assumed to have a 5 km EDR.
RR-029-APDX:D-26	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 26</p> <p>Table 31: In relation to Hornsea 4 pre-construction works: We understand that the value of 3,683 km² has been calculated for the maximum area of disturbance around simultaneous/concurrent piling (in Section 10.3.3.38), not pre-construction works, therefore we anticipate that this number is not correct for pre-construction works and should be recalculated. Revise the maximum area of disturbance for the pre-construction surveys.</p>	<p>The Applicant is seeking clarification from Natural England in relation to the inclusion of geophysical surveys within the Report to Inform Appropriate Assessment and will provide an update on this point at Deadline 2.</p> <p>See further responses in relation to geophysical surveys in the Applicant response to RR-029-5.34.</p>
RR-029-APDX:D-27	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 27</p> <p>Table 32: We advise that a figure should be presented to accompany Table 32, showing how overlap between projects can be taken into account in the in-combination assessment and offer a reduction in spatial area by 15-25% (as stated in Section 11.3.2.23). This is important as the Applicant considers this approach provides certainty that primary mitigation will be sufficient.</p>	The Applicant notes that Section 8.2 of Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 1 (APP-167) will be updated to include the requested figure to accompany Table 32.
RR-029-APDX:D-28	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 28</p>	The Applicant is seeking clarification from Natural England in relation to the inclusion of geophysical surveys within the Report to Inform Appropriate Assessment and will provide an update on this point at Deadline 2.

	<p>Section 11.3.2.23: We consider that the values presented in Table 32 are suitably precautionary, rather than excessively so. Of particular note is that Table 32 only considers a single activity, whereas several of the projects in the in-combination assessment have concurrent piling within their MDS, including Hornsea 4. If Hornsea 4 undertook concurrent piling with the worst-case geographical spread, resulting in 3,683 km², the remaining capacity ('headroom') in the threshold would be insufficient to allow even one other project to undertake piling fully within the SNS SAC (i.e. one from Dogger Bank A, B, Norfolk Vanguard and Norfolk Boreas). We understand that this is based on the worst-case scenario for concurrent piling at Hornsea 4, however we do not have any information on the average amount of overlap between two piling locations for example. Nevertheless, this illustrates our concern that it is not an unrealistic scenario that, without mitigation, the thresholds could be exceeded. We also note that these assessments do not take into account other well-established sources of noise such as seismic surveys, which may further contribute to the thresholds in the seasons assessed.</p>	<p>See further responses on geophysical surveys in the Applicant response to RR-029-5.34.</p>
<p>RR-029-APDX:D-29</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 29</p> <p>Section 11.3.2.23: Natural England considers that mitigation of the noise at source is also an extremely beneficial type of mitigation and should not be disregarded in favour of the primary mitigation listed, as the inclusion of noise abatement systems (NAS) could be secured and put in place now, rather than the primary mitigation which will only be finalised once construction timetables are known (in a narrow window prior to construction). It also limits the contribution of the project alone to the disturbance thresholds and therefore reduces the overall impact to the SNS SAC. We further note that, by the time the project has progressed to the stage of producing the SIP, many of the financial decisions have been made and it is less likely that funds will be available to undertake noise abatement at source.</p>	<p>The Applicant notes that at-source mitigation is one of several mitigation measures that are proposed within the suite of measures detailed in F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246). As such, the Applicant will give full consideration to all this mitigation option at the appropriate time. The Applicant notes that it is not possible at this stage in the project development to commit to any particular mitigation measure until such time that the project has confirmation of final hammer energies and foundation types, additional survey data (noise or geophysical data) is collected, and/or information on maturation of emerging technologies is available.</p>
<p>RR-029-APDX:D-30</p>	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 30</p>	<p>See Applicant response to RR-029-5.30.</p>

	Section 1.1.3.2.37: Natural England cannot agree with the conclusion of no AEOI for in-combination disturbance impacts to the SNS SAC due to lack of confidence in the SIP process (see Relevant Representations, Paragraphs 5.30-5.32). We consider that mitigation should be committed to at this stage for future review under the SIP process.	
RR-029-APDX:D-31	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 31</p> <p>Section 1.1.3.2.38: We do not agree that, at this stage, UXO clearance and geophysical/seismic surveys can be considered 'additive'. Given the lack of information on requirements for geophysical/seismic surveys and UXO clearance works, and that these two activities will be undertaken under different licences with different controls/mitigation measures, these two activities should be considered separately. To illustrate, we do not have confidence that the geophysical/seismic surveys would occur on the same days as the UXO clearance in the winter period, which are assumed to be on a maximum of 20 days in the SNS SAC (Section 1.1.3.2.30). There is a risk that impacts (from a seasonal disturbance perspective) will be greater than what has been presented because of the assumed additive nature. The geophysical/seismic survey works should be treated as separate to the UXO clearance.</p>	The Applicant notes the comment. See Applicant response to RR-029-APDX:D-Q.

5.11 Detailed comments: B2.2: Report to Inform Appropriate Assessment Part 10: Appendix G: Marine Mammals – Grey seal RIAA information

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-32	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 10: Appendix G: Marine Mammals – Grey seal RIAA information: Point 32</p> <p>General: We are supportive of this novel approach to apportioning individuals to SACs in order to inform the assessment. We consider that it makes the use of the best available evidence at the time.</p>	Noted.
RR-029-APDX:D-33	Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 10: Appendix G: Marine Mammals – Grey seal RIAA information: Point 33	Noted. An additional figure will be added to the document.

Footnote 1: A figure of the movements of the 9 tagged pups and juveniles should be presented, in order to better understand the movements of these life stages and the difference in movements compared to adult seals. Pups and juveniles are part of the protected feature of the site as well as adults.

5.12 Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 12: Appendix I: Marine Mammals – Bottlenose dolphin RIAA information

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-34	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 12: Appendix I: Marine Mammals – Bottlenose dolphin RIAA information: Point 34</p> <p>General: Please note that we defer to NatureScot to comment on the suitability of the assessment of impact to the Moray Firth SAC.</p>	<p>Noted. The Applicant can confirm that Scottish Natural Heritage (now NatureScot) were issued with the draft HRA Screening Report and the draft RIAA (together with an updated HRA Screening Report) during various stages of the pre-application phase of Hornsea Four. No comments were received from NatureScot in relation to these communications. The Applicant notes that no relevant representation was received from NatureScot and the Applicant are not aware that they have registered as an Interested Party.</p>
RR-029-APDX:D-35	<p>Detailed comments – B2.2: Report to Inform Appropriate Assessment Part 1: Point 35</p> <p>Section 1.4.1.1: We note that a key assumption in this assessment of apportioning is that bottlenose dolphin along the northeast coast of England show the same coastal distribution as when the species is present alongside the Tayside and Fife coast i.e. remain within waters 20m deep and within 2-3 km from the coast. Whilst we acknowledge that this is appropriate due to the lack of information from northeast England at the time of writing, this is a knowledge gap which should be addressed to better inform future apportioning assessments. This data gap could be investigated by the Applicant through their post-consent monitoring. Any such monitoring could also contribute to a more appropriate density estimate for bottlenose dolphin in the region. We request that this is included in the Project's Outline Marine Monitoring Plan.</p>	<p>Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.</p>

5.13 Detailed comments: F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-36	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 36</p> <p>General: Please see the Summary of main issues for Natural England's current position on SIPs. That position notwithstanding, we have provided specific comments on the document below.</p>	Noted.
RR-029-APDX:D-37	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 37</p> <p>Section 1.3.1.1 & Table 2: We welcome the inclusion of the anticipated review process of the SIP. We note that the Applicant has stated that the review of the SNS SAC SIP will occur six to nine months prior to the start of construction. We strongly advise that this timeframe (or similar) is included in the SIP consent condition. This is to ensure that the SIP is undertaken when the final details of projects that may act in-combination, as well as Hornsea 4, are known.</p>	<p>The Applicant considers that the voluntary commitment to undertake consultation on the draft SIP with Natural England and the MMO prior to submission to the MMO for approval, alongside an indicative timescale for doing so, is appropriate and proportionate. This is secured via the Outline Southern North Sea Special Area of Conservation Site Integrity Plan (APP-246). As such, no change to C1.1: Draft DCO including Draft DMLs (APP-203) is proposed in response to this comment.</p>
RR-029-APDX:D-38	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 38</p> <p>Table 3: We note a minor discrepancy between the Project Description and the MDS listed in Table 3 with respect to number of pin piles required for small Offshore Steel Structures (OSS). There are also differences between the MDS in the SIP and the outline MMMP (namely the total number of piling days for other piled infrastructure, for the temporal MDS). We advise that MDS in the SIP is reviewed against the final Project Description in future versions, to ensure the MDS is consistent across all project documents.</p>	<p>Noted. In related to non-WTG piled infrastructure temporal MDS in Table 3 of F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246), the Applicant can confirm that the number of piles will be amended to:</p> <ul style="list-style-type: none"> 'Six small OSS on piled jacket foundations, 16 3.5 m diameter piles per structure (96 piles in total); One offshore accommodation platform on a piled jacket foundation, 16 3.5 m diameter piles; Three HVAC booster stations (small OSS) on piled jacket foundations, 16 3.5 m diameter piles per structure (48 piles in total);' <p>The Applicant notes that the typographic error in relation to the total number of piling days for non-WTG piled infrastructure will be amended to 69.</p> <p>The Applicant can confirm that all values provided in Table 3 in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) remain correct.</p>

		<p>With reference to Volume A2, Chapter 4: Marine Mammals (APP-016), the temporal MDS for 'PTS (auditory injury) from piling noise (MM-C-1)' in Table 4.10 will be updated to state 'Total non-WTC piling days: 69 assuming 5.3 days per jacket foundation over a 12 month piling period.'</p> <p>The Applicant can confirm that these updates will be made to the relevant documents.</p>
RR-029-APDX:D-39	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 39</p> <p>Section 4.1.1.2: We advise that the daily threshold of 20% applies per calendar day, rather than a 24-hour period.</p>	<p>The Applicant notes that the guidance document 'Guidance for Assessment Significance of Noise Disturbance Against Conservation Objectives of Harbour Porpoise SACs' (JNCC, Natural England & DAERA 2020) does not provide a definition of the term 'day'. In order to maintain programme flexibility and to allow piling to occur over shorter overall time period, the Applicant considers that the daily threshold should relate to a 24 hour period.</p>
RR-029-APDX:D-40	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 40</p> <p>Section 4.1.2.1: We consider that both primary and secondary mitigation need to be considered by the Applicant when determining how to provide certainty of no AEoI – please see our Relevant Representations (Paragraphs 5.30-5.32) for Natural England's position on the current use of SIPs.</p>	<p>Noted. Industry wide, each project is required to submit a SIP for approval by the MMO prior to piling in accordance with the conditions of its Marine Licence(s). This will be once construction and piling programmes are known and can therefore be considered by the MMO and form part of its overall determination. The Applicant notes that Natural England's comments are related to industry-wide management and are not project-specific.</p>
RR-029-APDX:D-41	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 41</p> <p>Section 4.1.2.4: Natural England is supportive in principle of the Applicant's suggestion that schedules of piling could be programmed in consultation with the MMO and other noisy projects – however please see our Relevant Representations (Paragraphs 5.30-5.32) for Natural England's position on the current use of SIPs.</p>	<p>Please see response above to RR-029-APDX:D-40</p>
RR-029-APDX:D-42	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 42</p> <p>Section 4.1.3.8: We note the Applicant's point about the use of Noise Abatement Systems (NAS) potentially increasing the overall duration of disturbance. This could have implications particularly for the seasonal threshold of the SNS SAC. However, we highlight that thus far the daily thresholds have been much closer to being exceeded rather than the seasonal thresholds. Therefore, on balance, we recommend that measures</p>	<p>Noted. The Applicant notes that at-source mitigation is one of several mitigation measures that are proposed within the suite of measures detailed in F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246). The Applicant notes that it is not possible at this stage in the project development to commit to any particular mitigation measure until such time that the project has confirmation of final hammer energies and foundation types, additional survey data (noise or geophysical data) is collected, and/or information on maturation of emerging technologies is available.</p>

	to reduce the contribution to the daily threshold, even if it would lead to a slight increase in contribution to the seasonal threshold, should be considered favourably.	
RR-029-APDX:D-43	<p>Detailed comments – F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan: Point 43</p> <p>Section 4.1.3.9: We request that the Applicant provide more information on the likelihood of NAS being suitable for the Hornsea 4 project. Several factors are listed as affecting the suitability of NAS, however these are factors that we would anticipate to be mostly already understood about the site, or possible to make generalisations on based on existing data. We wish to understand the likelihood of NAS being feasible as early as possible, given the Applicant’s inclusion of this measure in both the OMMMP and the Outline SIP.</p> <p>We note that Natural England consider NAS to be the most effective way to manage down the impact of noisy activities. There are several different types of NAS but all of them work to reduce the level of noise generated at source, therefore reducing the area that is ensonified and reducing the overall impact to marine mammals. We strongly encourage the use of NAS on this project, and request further information on the feasibility of its use here.</p>	This comment is under consideration by the Applicant and further information will be provided at Deadline 2 by means of Clarification Note on Underwater Noise Abatement Systems.

5.14 Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:D-44	<p>Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol: Point 44</p> <p>Table 2: We note a minor discrepancy between MDS in the SIP and the OMMMP (namely the total number of piling days for other piled infrastructure, for the temporal MDS). We advise that MDS in the OMMMP is reviewed against the final Project Description in future versions, to ensure the MDS is consistent across all project documents.</p>	<p>Noted. In related to non-WTG piled infrastructure temporal MDS in Table 3 of F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246), the Applicant can confirm that the number of piles will be amended to:</p> <p>‘Six small OSS on piled jacket foundations, 16 3.5 m diameter piles per structure (96 piles in total);</p> <p>One offshore accommodation platform on a piled jacket foundation, 16 3.5 m diameter piles;</p>

		<p>Three HVAC booster stations (small OSS) on piled jacket foundations, 16 3.5 m diameter piles per structure (48 piles in total);’</p> <p>The Applicant notes that the typographic error in relation to the total number of piling days for non-WTG piled infrastructure will be amended to 69.</p> <p>The Applicant can confirm that all values provided in Table 3 in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) remain correct.</p> <p>With reference to Volume A2, Chapter 4: Marine Mammals (APP-016), the temporal MDS for ‘PTS (auditory injury) from piling noise (MM-C-1)’ in Table 4.10 will be updated to state ‘Total non-WTG piling days: 69 assuming 5.3 days per jacket foundation over a 12 month piling period.’</p> <p>The Applicant can confirm that these updates will be made for the relevant documents.</p>
<p>RR-029-APDX:D-45</p>	<p>Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol: Point 45</p> <p>Section 4: We advise that the Applicant should also consider the use of Passive Acoustic Monitoring (PAM) as a monitoring method for pre-piling searches during the hours of darkness or poor weather.</p>	<p>The Applicant notes that while the JNCC (2010) guidance for minimising the risk of injury to marine mammals from piling noise does describe the use of PAM systems and PAM operatives to detect harbour porpoise within a 500 m mitigation zone, it does highlight that that PAM systems can have their limitations and can only detect vocalising species. Since the maximum PTS-onset impact range at full hammer energy predicted at Hornsea Four is 2.9 km for harbour porpoise, PAM is unable to ensure full coverage of the mitigation zone.</p> <p>The JNCC (2010) guidance states that piling should not commence during periods of darkness or poor visibility unless the developer provides enhanced detection of marine mammals (e.g. increased number of PAM systems and PAM operatives). It also states that ADDs should only be used in conjunction with visual and/or acoustic monitoring (JNCC 2010). However, JNCC et al. (2016) have also stated that “the SNCBs consider that certain types of ADDs have the potential to be used as an alternative to the mitigation provided by MMOs and PAM for harbour porpoise, harbour seals and potentially for grey seals. SNCB advice on cases applying to use ADDs as an alternative to MMOs/PAM will be considered on a case-by-case basis”.</p> <p>The Applicant considers there to be sufficient evidence that the Lofitech AS Seal Scarer device is capable of deterring animals out of the predicted HOW4 instantaneous PTS-onset impact ranges; this evidence is summarised below. Therefore, the Applicant considers that should piling work at Hornsea Four commence during periods of darkness or poor visibility (when visual observations are</p>

		impaired), the use of the Loftiech ADD will be sufficient to ensure the chance of a marine mammal being within the mitigation zone is negligible.
RR-029-APDX:D-46	Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol: Point 46 Section 4.4.3.3 & Appendix A: Based on the information provided in the OMMMP, further discussion is needed during Examination between Natural England and the Applicant as to the most appropriate duration of ADD activation.	The Applicant agrees that further discussion is required as to the most appropriate duration of ADD activation. However, the Applicant would like to highlight that the piling parameters will be refined post-consent, following which a final MMMP will be submitted. The final MMMP will include refined PTS-onset impact ranges and recommended ADD activation durations. The Applicant considers that this is an appropriate mechanism to ensure adequate consultation with the MMO and the relevant SNCB, taking into account the latest guidance and best practice at the time.
RR-029-APDX:D-47	Detailed comments – F2.5: Outline Marine Mammal Mitigation Protocol: Point 47 Appendix B: The Applicant notes that previously bubble curtains have been used in waters up to 45m in depth. Further information is needed on whether it is feasible to use bubble curtains in the deeper waters of the site that are >45m, possibly even >60m. We request that more information is provided on the likelihood of bubble curtains and NAS being suitable for the Hornsea 4 project (specifically in regard to deeper waters).	This comment is under consideration by the Applicant and further information will be provided at Deadline 2 by means of Clarification Note on Underwater Noise Abatement Systems.

5.15 Detailed comments: F2.7: Outline Marine Monitoring Plan

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:D-48	Detailed comments – F2.7: Outline Marine Monitoring Plan: Point 48 Section 3.6: This section of the OMMP remains extremely short and lacking on detail. There has been no consideration of the areas of the assessment where assumptions have been made and where the project could contribute to filling knowledge gaps (for example, with regards to operational WTG noise levels (Point 7), or the assumed distribution of bottlenose dolphin close to the coast (Point 10)). Many of our comments and proposals for additional monitoring for marine mammals made during the Evidence Plan process not been sufficiently addressed by the consultation response and new version of the OMMP. We recommend that the OMMP is kept live during examination so an updated, final version can be provided capturing the results of further discussion.	Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.

RR-029-APDX:D-49	Detailed comments – F2.7: Outline Marine Monitoring Plan: Point 49 Table 6: The Applicant has included monitoring undertaken under the MMMP as a monitoring commitment. However, we consider that this monitoring is undertaken for the purposes of mitigation only i.e. it is a pre-piling search. If the data collected are not being used to confirm the results of the ES assessment, then we cannot consider it as EIA-related monitoring.	Noted. This monitoring will be removed from the marine mammals section of the OMMP.
RR-029-APDX:D-50	Detailed comments – F2.7: Outline Marine Monitoring Plan: Point 50 Table 6: We are disappointed to see that the Applicant has reduced the number of monitored piling locations from 6 to 4, in comparison to an earlier version of the OMMP. We request that a justification is provided for the reduction.	The Applicant notes that the monitoring of six piling locations was presented in error in a previous draft of the OMMP and was corrected to refer to the monitoring of four piling locations in the version of the OMMP submitted as part of the DCO Application.
RR-029-APDX:D-51	Detailed comments – F2.7: Outline Marine Monitoring Plan: Point 51 Section 3.6.2.2: We do not consider that the conclusions of the SIP will have bearing on the requirements for monitoring. Monitoring is not only required where an adverse effect is predicted; it should address assumptions in the ES and confirm the ES assessments.	Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.
RR-029-APDX:D-52	Detailed comments – F2.7: Outline Marine Monitoring Plan: Point 52 Section 3.6.2.3: The pre- and post-construction digital aerial surveys are not carried out at a scale that is conducive to understanding impact at the population scales of marine mammals. Natural England advise that the Applicant undertakes strategic monitoring to understand these population level impacts.	Strategic monitoring approaches within the Hornsea zone will be identified and adopted where appropriate nearer the time alongside site specific monitoring campaigns.

6 Appendix E - Marine Geology, Oceanography and Physical Processes

6.1 Project Parameters

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-A	Project Description: Generally, the project description is clear, however there are a number of areas of inconsistency across documents which need to be addressed (see detailed comments below).	Noted. Applicant responses in relation to areas of inconsistency and the intertidal access ramp are addressed within the relevant points below.

	<p>There is also a need for further information in relation to the intertidal access ramp (see point 6 below).</p>	
<p>RR-029-APDX:E-B</p>	<p>NE position on Worst Case Scenario (WCS) and Maximum Design Scenario (MDS): The ES chapter sets out the Maximum Design Scenario (MDS) for the project, however, Natural England note that there are a number of instances whereby the MDS is based on conservative assumptions rather than being underpinned by survey data. For example, sandwave clearance and boulder clearance are based on clearance across the full length of the cable corridor, despite the baseline characterisation indicating that this will not be required. Similarly, the MDS for the HP4/Dogger Bank A&B Cable Crossing footprint area is not clearly defined and the modelled footprint appears significantly smaller than that presented elsewhere in the Marines Processes chapter which, in turn, reduces the WCS for potential scour and sediment transport impacts. Additionally, the requirement for secondary cable protection (rock protection) is based on an estimated percentage, rather than a cable burial risk assessment informed by survey data, as is the percentage of piles that may require drilling. Natural England is concerned that these overly cautious estimates then translate into what is effectively seen by the applicant as an “allowable amount of impact”, and there is little impetus for them to refine this post consent. This approach conflicts with the principles of the ‘mitigation hierarchy’ and the emphasis within it on avoiding and reducing impacts.</p> <p>In light of Paragraph 2.6.196 of NPS EN-3 “The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment” it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave clearance and cable protection and replenishment.</p> <p>Natural England has highlighted a number of marine geology oceanography and physical process receptors that are missing from the assessments. Therefore, we do not agree that the worst-case scenario has been assessed in all cases.</p>	<p>The Applicant considers that sufficient data has been collected on ground conditions and confirms that this data, alongside the Applicant’s experience in the construction of offshore wind farms in the UK and Europe, has been used to define the Maximum Design Scenarios which have then been assessed in line with the Rochdale Envelope approach to assessment to understand the potential impacts on relevant receptors. This is appropriate and proportionate. The Applicant notes that refinements have been made where possible (e.g. limitation of the number of GBS used – Co201 Volume A4, Annex 5.2: Commitments Register (APP-050)), whilst still allowing appropriate flexibility in the project design envelope.</p> <p>Notwithstanding this, the Applicant acknowledges Natural England’s comment and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>

6.2 Baseline Characterisation

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-C	<p>Data suitability and baseline characterisation: The Marine Geology, Oceanography and Physical Processes chapter and technical report provide an extensive range of information and evidence. However, we would wish to highlight a number of gaps in the baseline characterisation including:</p> <ul style="list-style-type: none"> • Adequate description of the underlying geology, seabed sediments and dominant morphological features in the vicinity of, and within, the proposed project area. • Sufficient baseline characterisation and understanding of the Flamborough Front through and/in the vicinity to the HP4 array, coupled with an adequate assessment of the effects of the array on tidal flows, turbulent wakes, and mixing within the water column. • Detailed investigation of the geomorphology of Smithic Bank, its evolution, and the impact of the proposed development on its form and function <p>Therefore, we do not consider the baseline characterisation to be complete at this stage.</p>	<p>The Applicant maintains that the characterisation of the baseline environment for Marine Geology, Oceanography and Physical Processes is robust and appropriate for the purposes of EIA.</p> <p>Notwithstanding the above, these comments have been discussed with the MMO and Natural England and the Applicant has proposed (in agreement with both organisations) further workstreams to validate the baseline characterisation presented in the Applicant's application. The scope of this workstream is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
RR-029-APDX:E-D	<p>Data gaps: Natural England recommends that further data should be sourced in order to provide an appropriate baseline characterisation, including the following:</p> <ul style="list-style-type: none"> • High-resolution geophysical survey data (due to be completed in 2021) to help eliminate uncertainties regarding scour equilibrium depth, sub-surface geology, bedform nature and distribution, sediment mobility. • High resolution bathymetric surveys around Smithic Bank (e.g. swath bathymetry) and accompanying geotechnical surveys (including near the Dogger Bank A&B cable crossing and along the Holderness coastline). • High-resolution bathymetric survey data for the offshore array and offshore export cable corridor (ECC). 	<p>The Applicant does not consider there to be data gaps in the baseline characterisation and maintains that the characterisation of the baseline environment is robust and appropriate for the purposes of EIA.</p> <p>As detailed in Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) (Section 2 of Appendix B), site-specific geophysical evidence from Hornsea Four surveys offers nearly 100% coverage for the nearshore area. Where survey coverage is less than 100%, gaps only remain relevant if there are unresolved features which cannot be adequately interpreted between survey lines. Long-section survey lines are continuous from nearshore to offshore, with cross-lines at appropriate intervals. Subsequent geophysical surveys have provided additional data in this area which has also been considered. Figure 20 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) shows an interpretation of the seabed as an</p>

	<p>•Effects of the proposed foundation structures on turbulent wake-induced mixing, stratification, and, in turn, primary productivity in and around the Flamborough Front.</p> <p>In particular, Natural England would welcome further discussion with the applicant ahead of the examination on appropriate data for Smithic Bank and Flamborough front.</p>	<p>uninterrupted long-section (without any data gaps) based on the available geophysical survey data.</p> <p>The Applicant does not consider there to be data gaps in the baseline characterisation, and as such, additional surveys are not required.</p> <p>Notwithstanding the above, these comments have been discussed with the MMO and Natural England and the Applicant has proposed (in agreement with both organisations) further workstreams to validate the baseline characterisation presented in the Applicant’s application. The scope of this workstream is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
--	--	--

6.3 Environmental Impact Assessment

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:E-EA	<p>Identified impacts: The assessment of marine geology, oceanography and physical processes is split into three broad areas: the landfall, the Export Cable Corridor (ECC) and the array. Natural England consider that the ‘areas of search’ in each case are too narrow, and therefore that the impacts to a number of receptors have not been adequately assessed.</p>	<p>Section 1.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides the Applicant’s justification for the definition of the marine processes study area. The study area encapsulates all potential significant effects. The basis of the study area was established during the Scoping Phase and presented to the Evidence Plan Technical Panel. In-line with the approach commonly applied to offshore wind farm EIAs, the study area is broad, and for the purposes of Hornsea Four extends to the Humber Estuary. Focused sub-areas for the array, export cable and landfall are also included which allow for advective type effects which have the potential to spread at the scale of a spring tidal excursion. The same basis for establishing the study area was described for PEIR.</p>
RR-029-APDX:E-EB	<p>In addition to this, there are several areas where the assessment has not been undertaken or has not been undertaken adequately. This includes the assessment of:</p>	<p>See Applicant response to RR-029-5.36 in relation to ‘Marine Processes’.</p>
RR-029-APDX:E-EC	<p>•The presence of ancillary infrastructure at the landfall location. There is limited information in relation to the temporary access ramp from the cliff down to the beach, and this has not been assessed. Additionally, there are</p>	<p>See Applicant response to RR-029-5.36 in relation to ‘Marine Processes’.</p>

	<p>outstanding matters in relation to the HDD exit pits that need to be resolved (i.e. the requirement for 8 HDD pits for 6 cables and the storage of excavated sediment).</p>	
<p>RR-029-APDX:E-ED</p>	<ul style="list-style-type: none"> The impact of sediment removal and disposal on marine process receptors. Disposal locations for the material removed through sandwave clearance have not been identified, therefore, it is unclear if sediment will be retained within the broader sandbank systems (which has a bearing on the likely recovery of an area) and also the potential impact of that sediment disposal on marine process receptors. 	<p>A full assessment of the sediment removal and disposal on marine processes receptors is provided in Section 7.1 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation) (APP-042). The two proposed disposal locations are presented in Figure 1 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation) (APP-042). As confirmed in paragraph 4.3.1.6 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation) (APP-042), the sediment will be retained in the local sedimentary system.</p> <p>The Applicant notes that details of the dredge and disposal activities is required to be provided in both the Construction Method Statement and the Construction Project Environmental Management and Monitoring Plan (Condition 13(c) and 13(d), respectively, of Schedules 11 and 12 of C1.1: Draft DCO including draft DMLs (APP-203)). The Applicant considers that this mechanism will ensure Regulators can approve details in relation to the dredge and disposal activities.</p>
<p>RR-029-APDX:E-EF</p>	<ul style="list-style-type: none"> The impact of cable installation, reburial, replacement and protection on Smithic Bank (for Hornsea 4 alone and in-combination with other projects) and the resulting impacts on wider receptors, including the impacts of cable crossings in the vicinity of the Bank. 	<p>As presented in paragraph 1.11.2.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), a cable burial risk assessment (CBRA) will be undertaken to understand where burial of cables may be problematic and may require cable protection on the seabed. Section 4.9 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides a detailed review of potential changes to nearshore sediment pathways with Section 4.6.5 considering implications of cable protection measure being placed on Smithic Bank. The influence of this feature on local flows and waves has also been considered within the modelling presented in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p> <p>Paragraph 1.11.2.55 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) concluded that no significant effects would occur on Smithic Bank (or wider receptors) from changes in pathways. This is consistent with Hornsea Project One and Two and Hornsea Three (paragraph 1.12.4.1 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013)).</p>

		<p>The Applicant has committed (Co188 and Co189) to ensure offshore export cable crossings remain clear of Smithic Bank as detailed in Volume A4, Annex 5.2: Commitment Register.</p>
RR-029-APDX:E-EG	<ul style="list-style-type: none"> • Sediment transport impact, scouring, and morphological changes due to the Hornsea 4/Dogger Bank A&B Cable Crossing just seaward of Smithic Bank 	<p>An assessment of the potential for sediment transport changes, scouring and morphological change of Smithic Bank due to the presence of the cable crossing with Dogger Bank A&B is presented in paragraphs 1.11.2.8 to 1.11.2.14 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The assessment concluded no significant effects in EIA terms.</p> <p>The Hornsea Four/Dogger Bank A and B cable crossing seaward of Smithic Bank will have small-scale localised effects which are not considered to have far-field impacts on sediment transport or on the form or function of Smithic Bank, noting the vector for any changes in flows is largely north and south of this structure.</p> <p>Section 1.11.2.12 of Volume A2.1 Marine Geology, Oceanography and Physical Processes (APP-013) and Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) considers local scour around the edges of this crossing developed in areas with increased flows and which remain remote from any influence on Smithic Bank. The local seabed, in the vicinity of nearshore crossing is predominately sandy gravel suggesting a limited capacity for scouring. Flow acceleration has been predicted around the crossing edges which may lead to local scouring of mobile sediments. However, the extent of the scouring would be limited to these areas and remain distant from other features. Any sediment pathways passing this feature are expected to reform in the lee of the structure. In addition, this feature is located seaward of the depth of closure (for waves) and would not interfere with any wave driven nearshore pathways.</p> <p>Therefore, no sediment transport impacts, large-scale scouring or morphological changes are expected as a result of the presence of the proposed Hornsea Four/Dogger Bank A and B cable crossing.</p>
RR-029-APDX:E-EH	<ul style="list-style-type: none"> • The scour potential for an array comprising Gravity Base Structure(GBS) Wind Turbine Generators (WTG), monopile WTGs, box-type GBS Offshore Substations etc and the influence this may have on nearby receptors (e.g. The Hills) in the medium to long-term. 	<p>Scour is a near-field process (metre scales) exhibited around a structure placed on the seabed and when the seabed exhibits mobility. Scouring does not act at the array scale when structures are placed with sufficient spacing.</p> <p>The Applicant has assessed the potential for scouring around foundations in the array in paragraph 1.11.1.95 et seq of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). This assessment did not conclude</p>

		<p>a level of significance in EIA terms owing to the lack marine process receptors in the vicinity of the offshore array. Any scouring within the offshore array area is considered to be a pathway for effects which are considered for impacts in related chapters. Consequently, no impact assessment is offered in paragraph 1.11.1.112 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p> <p>This is further supported by paragraph 4.8.6.4 of Volume A1, Chapter 4: Project Description (APP-010) which states that the minimum spacing of the foundations will be 810 m which exceeds the distance over which scour effects between foundations will be cumulative.</p> <p>For the array area, the presence of foundations on the seabed will be to increase local turbulence (over scales of a few hundred metres) which would typically lead to local (near-field) scouring around individual structures if scour protection was not in place. There is no larger effect on the seabed that extends beyond (to the far-field) the array area that could influence The Hills. The deeper water across the array area limits any effects of waves driving sediment transport. Local scour effects do not extend into the far-field (kilometre scales) and consequently do not have the potential to influence nearby receptors (e.g. The Hills).</p>
RR-029-APDX:E-EI	<ul style="list-style-type: none"> The wave blockage effect of a GBS foundation array (alone and in combination with HP2 and HP1), HVAC Booster Station, and HP4/Dogger Bank A&B Cable Crossing over the lifetime of the Project 	<p>It is the Applicant's position that wave blockage effects have been robustly and fully assessed using standard modelling approaches and is presented in Section 1.11.2.34 to 1.11.2.45 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) and through Section 4.8 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p>
RR-029-APDX:E-EJ	<ul style="list-style-type: none"> The impact of infrastructure that will remain in situ beyond the operational lifetime of the project (including the persistent impact of rock protection and the potential for subsea cables and coastal infrastructure to become exposed). 	<p>It is the Applicant's position that the potential impacts associated with infrastructure remaining in situ during the decommissioning phase of the project has been robustly assessed in the EIA. The effect of infrastructure, including rock protection, left on the seabed is considered to be equivalent to effects during the operational phase. As assessed in Section 1.9.3 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), the assessment considered long-lasting impacts until the physical processes reach an equilibrium, therefore they have not been treated as temporary or reversible in this assessment. As such, the impacts will be no worse than those presented within Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p>

		<p>As stated in Volume A1, Chapter 4: Project Description (APP-010), the Applicant confirms that at the end of the operational lifetime of Hornsea Four, it is anticipated that all structures above the seabed (excluding scour protection and cable rock protection) or ground level will be completely removed. The Crown Estate agreement for lease (Afl) for Hornsea Four requires that the project is decommissioned at the end of its lifetime.</p> <p>The effect of infrastructure left on the seabed is considered to be equivalent to effects during the operational phase. As such, the impacts will be no worse than those presented within Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p>
RR-029-APDX:E-EK	<ul style="list-style-type: none"> The impact of climate change and increased sea level rise on coastal morphology and cliff erosion rates. This should be incorporated into assessment to demonstrate the potential change over the operational lifetime of the project (and any infrastructure that remains in situ). 	<p>A description of the future baseline, in the absence of Hornsea Four, is presented in Section 1.7.11 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). This section includes consideration of climate change (sea level rise, storm surge and waves). This provides a detailed characterisation for the potential change over the lifetime of the development suitable for the purposes of EIA.</p> <p>Cliff erosion rates are referred to in Table 1.5 Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The higher long-term (based on 16 year monitoring period) average cliff erosion rates for Profile 16 have been considered in project design to establish the location of the landward HDD entry pits (and TJB) which is likely to be between 200 and 250 m back from the cliff edge. This provides a period of at least 125 to 156 years before cliff erosion is expected to reach this point. Pertinent to any predictions of cliff erosion is the inherent annual variability associated with the physical processes influencing the coastal behaviour.</p> <p>The long term trend for Profile 16 is negative. If the average retreat rate was based on the last 10 years then a lower average of 1.1 m/year would apply. The shoreline at this location is also adjusting to an equilibrium profile meaning slower rates may occur in the future (based on existing conditions). If climate change effects were to modify existing conditions, then the trend may adjust positively. A cliff recession rate of 1.6 m/yr is considered to be conservative for both present and future erosion rates on this basis.</p>
RR-029-APDX:E-F	<p>Methodology: The assessments within this chapter are impact pathway-led rather than receptor-led. The result of this is that the overall impact to a given</p>	<p>See Applicant response to RR-029-5.38.</p>

	<p>receptor as a result of Hornsea Four is not assessed. A receptor could be subject to a number of impacts that are deemed “not significant” in isolation, and yet the combined effects could have much greater significance. Consequently, it is important that receptor-led assessments are undertaken. The effects of the project are only considered up to the point of decommissioning, and yet cable protection, subsea cables, jointing bays etc are to remain in situ. The impact of this infrastructure beyond the operational lifetime of this project therefore needs to be addressed within the ES, including the persistence of rock protection in the marine environment and the risk of cables (both onshore and offshore) and coastal infrastructure becoming exposed and the remedial measures that are likely to be required.</p> <p>Natural England does not agree that appropriate marine process receptors have been identified for assessment and considers that the “study areas” are too narrow in scope. Consequently, we are unable to agree with a large number of the impact assessment conclusions. Despite several designated sites lying within close proximity of the proposed project area, only Flamborough Head SAC has been identified as a receptor within the Environmental Statement chapter. Although the impacts to designated sites may be subject to separate assessments (i.e.. RIAA and MCZ Assessments), they remain marine process receptors and therefore should also be fully considered within the Environmental Statement.</p>	
<p>RR-029-APDX:E-GA</p>	<p>Cumulative Effect Assessment (CEA): We would advise that the Viking Link interconnector cable should be screened into the marine processes cumulative assessment and thus included in this table.</p> <p>It should be noted that Eastern Green Link and the Northern Endurance Partnership should now be considered in Tier 2. Dogger Bank South Offshore Windfarm is also at scoping stage and should therefore be considered as Tier 2.</p>	<p>The Applicant has not considered the Viking Link interconnector cable in the marine processes cumulative assessment as there will be no spatial or temporal overlap with construction activities.</p> <p>The Applicant can confirm that a final review of the long list against the most recent data sources was made in June 2021 to account for any changes to the status of the projects, plans and activities considered prior to final application.</p> <p>The Applicant can confirm that a final review of the long list against the most recent data sources was made in June 2021 to account for any changes to the status of the projects, plans and activities considered prior to final application (cut-off date for inclusion within the Hornsea Four CEA of 31st May 2021).</p> <p>The Applicant highlights that no planning application has been submitted in relation to the offshore elements of either the Northern Endurance Partnership project or the</p>

		<p>Scotland to England Green Link – SEGL2 (formerly Eastern Green Link) and as such, these projects should remain in Tier 3 of cumulative assessments and no updates to the assessments are required.</p> <p>The Applicant notes that Dogger Bank South Offshore Wind Farm was not on the Planning Inspectorate’s Programme of Projects at the time of the cumulative cut-off date for Hornsea Four (31st May 2021) and in line with the Planning Inspectorate’s Advice Note 17, was not considered a Tier 3 project. Since Hornsea Four DCO submission, Dogger Bank South submitted a Scoping Report which was then subsequently withdrawn in December 2021 and as such, the project should not be considered in cumulative assessments.</p>
<p>RR-029-APDX:E-GB</p>	<p>Certain impacts assessed for the project alone are not considered in the cumulative assessment as they are assessed as ‘not significant’ on a project alone basis. Natural England believe these should be carried forward to the CEA or the Applicant needs to provide further detail to justify the exclusion of these potential cumulative impacts.</p> <p>It should also be noted that the CEA is likely to need to be updated pending updates to the ‘project alone’ assessments</p>	<p>It is the Applicant’s position that the assessments for both the project alone and the CEA remain valid. Those impacts for the project alone which have concluded negligible magnitudes, and so no significant effects in EIA terms, it was not considered proportionate to assess cumulative effects. A negligible magnitude was defined as “Very slight change from baseline condition...” (Table 1.15 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013)). As such, even if the impacts were additive, it is likely that no measurable effect would be observed and so no likely significant effects are anticipated. Therefore, it would be disproportionate to assess this further cumulatively.</p>
<p>RR-029-APDX:E-H</p>	<p>Assessment conclusion: Given our concerns relating to the identification of receptors, data gaps and incomplete assessments, we are unable to agree with the conclusions of the ES at this time.</p> <p>Furthermore, we would highlight that impacts on marine geology oceanography and physical process may give rise to impacts on intertidal and benthic ecology as well as species impacts. We may therefore need to revisit our comments on other ES chapters as additional data and assessment becomes available.</p>	<p>It is the Applicant’s position that the marine processes and benthic and intertidal ecology assessments for both the project alone and the CEA remain valid, proportionate and aligned with best practice. Furthermore, the baseline environment has been adequately characterised for the purposes of EIA and that no further receptors would be identified through further data analysis.</p>

6.4 Report to inform Habitats Regulations Assessment

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-I	<p>LSE Screening: Natural England notes that only Flamborough Head SAC has been screened in for further assessment of changes to physical processes during operation and increased levels of suspended sediment during construction, operation and decommissioning. Based on the information currently available, we consider that Flamborough Head SAC should also be screened in for further assessment of changes to physical processes during construction and decommissioning, as well as beyond the operational lifetime of the project, as well as for potential changes to the hydrodynamic regime (arising as a result of potential impacts to the Flamborough Front). Flamborough and Filey Coast SPA should also be screened in for the same impacts.</p> <p>We also consider that the Humber Estuary SAC/SPA/Ramsar should also be screened in for further assessment of changes to physical processes throughout all stages of the project, and that the Southern North Sea SAC should be screened in for changes to hydrodynamic regime (Flamborough Front) and sediment transport regime.</p>	<p>Flamborough Head SAC</p> <p>Table 1.8 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) identifies Flamborough Head SAC, and specifically the Annex 1 feature of reefs, as a relevant receptor with potential sensitivity to construction activities related to Hornsea Four i.e. excess deposition / smothering of the reef from sediment plumes. Additionally, Appendix C of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides modelling results; specifically Figures C33, C34, C35 and C36 show that deposition within the SAC is not a likely occurrence. The Applicant concluded no LSE from temporary increases in suspended sediments/ smothering on Annex I habitats in Flamborough Head SAC in Table 6 of B2.2: Report to Inform Appropriate Assessment Part 2: Appendix A: Habitat Regulations Assessment Screening Report (APP-168). The Applicant reached a determination of no AEol on Flamborough Head SAC on reefs and submerged or partially submerged sea caves as presented in paragraph 10.2.3.10 of Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1. (APP-167).</p> <p>Therefore, it is the Applicant's position that no further assessment is required to determine no AEol or significant effects in EIA terms on this site.</p> <p>Flamborough and Filey Coast SPA</p> <p>Given that Flamborough and File Coast SPA is further from the proposed development than Flamborough Head SAC, it is the Applicant's position that no further assessment is required to determine no AEol or significant effects in EIA terms on this site.</p> <p>Humber Estuary SAC/SPA/Ramsar</p> <p>The physical processes assessment undertaken, including numerical modelling, clearly indicates that there is no basis for any changes in hydrodynamics to extend to the Humber Estuary SAC/SPA/Ramsar nor any physical processes pathway that would reach the Humber Estuary designated sites. The Applicant concluded no LSE from temporary increases in suspended sediments/ smothering on the Humber Estuary SAC and Ramsar in Table 6 of B2.2: Report to Inform Appropriate Assessment Part 2: Appendix A: Habitat Regulations Assessment Screening Report (APP-168). Therefore, no further assessment is required to determine no AEol on this site.</p> <p>Southern North Sea SAC</p>

		<p>An assessment of the Flamborough Front is provided in paragraphs 1.11.2.24 to 1.11.2.33 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The assessment concluded in paragraph 1.11.2.31 that the magnitude of any impact on the Flamborough Front is considered to be negligible because the influence from any turbulent flow wakes is likely to remain spatially distant. Therefore, no further assessment is required to determine no AEol on this site.</p>
RR-029-APDX:E-J	<p>Assessment conclusion: As a result of Natural England’s concerns relating to the LSE Screening and evidence gaps within the Environmental Statement, we are currently unable to exclude beyond reasonable scientific doubt the potential for impacts to Flamborough Head SAC, Flamborough and Filey Coast SPA, Humber Estuary SAC/SPA/Ramsar and Southern North Sea SAC. Additional measures to avoid/reduce/mitigate potential impacts may need to be explored.</p>	<p>For the reasons provided in the row above, the Applicant does not consider there to be any gap in the evidence base, including baseline surveys, that limit the interpretation of far-field effects on designated sites.</p> <p>The physical process assessment does not identify any pathways that would reach these sites. As such, no further measures are required.</p> <p>The Applicant concluded no LSE from temporary increases in suspended sediments/ smothering in Table 6 of B2.2: Report to Inform Appropriate Assessment Part 2: Appendix A: Habitat Regulations Assessment Screening Report (APP-168) on the following sites:</p> <ul style="list-style-type: none"> • Flamborough Head SAC – Annex I habitats; • Humber Estuary SAC; • Humber Estuary Ramsar; and • Southern North Sea SAC. <p>The Applicant reached a determination of no AEol on Flamborough Head SAC on reefs and submerged or partially submerged sea caves as presented in paragraph 10.2.3.10 of Volume B2 Chapter 2 Report to Inform Appropriate Assessment Part 1. (APP-167).</p> <p>It is the Applicant’s position that sufficient information has been provided to conclude no LSE and/ or no AEol to these sites in relation to marine processes.</p>

6.5 Marine Conservation Zones Assessment

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:E-K	<p>Screening: Natural England note that the applicant has screened in Holderness Inshore MCZ and Holderness Offshore MCZ into assessment due to the potential for impacts from increased suspended sediment.</p> <p>In light of our comments on the ES chapter, we advise that potentially impacts to physical process attributes are also assessed.</p>	<p>Habitat features</p> <p>As presented in paragraph 4.8.2.3 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), the water depths at the HVAC Booster Station Search Area are generally too deep to lead to any shoaling or refraction effects modifying wave energy transformation to this location and there are no additional sheltering influences from the coastline. This is</p>

For habitat features this includes:

- Supporting processes – energy exposure
- Supporting processes – sediment movement and hydrodynamic regime

For the Spurn Head Geological feature of Holderness Inshore this includes:

- Extent of supporting geomorphological processes and associated sediments
- Sediment transport pathways and connectivity to wider environment
- Extent and distribution.

Further information can be found in the SNCB conservation advice which can be accessed through designated sites view. (Site Search (naturalengland.org.uk))

further supported by the evidence from Hornsea Project One and Hornsea Project Two as presented in paragraphs 4.8.2.5 and 4.8.2.3 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#). The modelling of the HVAC booster station foundations and cable crossings with Dogger Bank A and B export cables concluded that the local wave height reductions are discernible from the cluster of HVAC booster stations, but these modifications only extend a short distance and do not reach the coast or act in-combination with the Dogger Bank A and B export cable crossing (see paragraph 4.8.2.8).

The potential cumulative blockage of all relevant projects, including Hornsea 4, from the presence of foundations within arrays is presented in Section 4.8.3 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#). This section is supported by evidence from a review existing blockage modelling in the Hornsea region. An assessment of the potential effect of Hornsea Four on blocking wave energy transmission towards the Holderness coastline is investigated using wave modelling (Appendix C of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#)). The modelling concluded “The most direct approach to the Holderness Coast, which also passes between all the offshore arrays, is for the E wave scenarios (Figure A10). Wave reductions in the range 2.5 to 10 % extend to the west of the offshore arrays but these effects also quickly dissipate over distance without reaching the coast.” (paragraph 4.8.3.17 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#)).

Therefore, based on the extensive evidence presented within the [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#), there is no potential for impacts on habitat features from changes in energy exposure arising either from the HVAC booster stations, cable crossings or foundations in the array. Therefore, no further assessment of this potential impact is required and so wasn’t screened into the Applicant’s MCZ assessment.

The local seabed, in the vicinity of nearshore crossing with the Dogger Bank A and B export cables, is described as mainly sandy gravel suggesting a limited capacity for scouring. Appendix C of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#) provides details of modelling of a MDS case for the combined rock berm along with increased roughness. Flow acceleration was predicted around the edges of the berm which may lead to local scouring of mobile sediments. The extent of the scouring would be limited to these areas and remain distant from other features. Any sediment pathways passing this feature are expected to reform in the lee of the structure. In addition, this feature is located seaward of the depth of closure (for waves) and would not interfere with any wave driven nearshore

pathways (see paragraph 1.11.2.13 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#)). Therefore, the presence of this potential scouring is of limited spatial scale and there is no potential for impacts on the habitat features from changes in sediment movement and hydrodynamic regime within Holderness Inshore or Holderness Offshore MCZs. Therefore, no further assessment of this potential impact is required and so wasn't screened into the Applicant's MCZ assessment. As concluded in paragraph 1.11.2.13 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), any scouring around cable crossings along the offshore ECC is considered to have a negligible magnitude of impact on the seabed and would not have far reaching effects.

As concluded in paragraph 1.11.2.55 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), the likely effect of changes in nearshore pathways to both Smithic Bank and the Holderness Coast is considered to be slight (not significant) adverse significance (In EIA terms) due to more sediment pathways remaining available to feed Smithic Bank.

Spurn Head

The seabed substrate, based on grab samples, at Spurn Head is presented in Figure 9 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#). Details of the data sources to characterise Spurn Head are provided in Table B-1 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#). A description of the geomorphological processes supporting Spurn Head are presented in paragraph 4.8.1.2 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#) which details that sands are also transported in a net southerly direction along the Holderness Coast towards Spurn Head. At around 70 km chainage, waves reduce again due to shoaling across the shallow banks seaward of Spurn Head, known as The Binks, and a rapid re-orientation of the coastline.

Paragraphs 4.8.3.21 to 4.8.3.22 and Figure 46 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#), present an analysis of changes in wave heights for all easterly sector scenarios for nearshore locations (shown on Figure 45) from Flamborough Head (0 km chainage) to Spurn Head (75 km chainage) to confirm the scale of any effects reaching the Holderness Coast (waves arriving at these locations are responsible for driving longshore drift). This analysis concluded that effect of wave blockage from offshore wind farms is not discernible on any baseline waves in the nearshore (demonstrated here for the easterly sector), noting all other sectors show a lesser change in wave heights. A nil effect on waves

		in the nearshore translates into a nil effect on any changes to wave driven longshore drift along the Holderness Coast. Therefore, there is no pathway for impacts on the geomorphological processes, sediment pathways or connectivity to the wide environment which support Spurn Head. Therefore, no further assessment of this potential impact is required and so wasn't screened into the Applicant's MCZ assessment.
RR-029-APDX:E-L	Assessment conclusion: As a result of Natural England's concerns relating to the screening of potential impact pathways, and the evidence gaps within the ES, we are currently unable to exclude beyond reasonable scientific doubt, the potential for significant impacts to Holderness Inshore MCZ and Holderness Offshore MCZ. Additional measures to avoid/reduce/mitigate potential impacts may need to be explored.	<p>For the reasons provided in the row above, the Applicant does not consider there to be any specific gap in the evidence base, including baseline surveys, that limit the interpretation of far-field effects on designated sites.</p> <p>The physical process assessment does not identify pathways that would reach these MCZs. As such, no further measures are required on the basis of these findings.</p>

6.6 Detailed comment: Volume A2.1 Marine Geology, Oceanography and Physical Processes

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-L	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 1</p> <p>General: Paragraph 5.5.9 of NPS EN-1 states that “The applicant should be particularly careful to identify any effects of physical changes on the integrity and special features of Marine Conservation Zones (MCZs), candidate marine Special Areas of Conservation (cSACs), coastal SACs and candidate Coastal SACs, coastal Special Protection Areas (SPAs) and potential Sites of Community Importance (SCIs) and Sites of Special Scientific Interest (SSSI). We highlight that neither Holderness Inshore MCZ nor Holderness Offshore MCZ have been considered in this chapter, yet they remain marine processes receptors. Given their proximity, in places, to the offshore export cable corridor, there is a need to consider the potential environment impacts of the project on these designated sites. It should also be noted that the project has the potential to impact on sites much further afield such as the Humber Estuary SAC and SSSI, and well as the supporting habitat of sites such as the Southern North Sea SAC and Humber Estuary SPA. Natural England's view is that in order to establish</p>	<p>The Applicant has assessed the physical changes on the integrity and special features of both Holderness Inshore and Holderness Offshore MCZs in Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). Therefore, the Applicant has met the requirements of NPE EN-1 in relation to MCZs.</p> <p>For the reasons presented in response to RR-029-APDX:E-I and RR-029-APDX:E-J above, no likely significant effects on marine process receptors will occur on the Humber SAC, Humber SSSI, Southern North Sea SAC or Humber Estuary SPA. Therefore, no further assessment is warranted.</p>

	<p>the regional significance of the project’s impacts in EIA terms, it is important the EIA incorporates these designated sites as receptors.</p>	
RR-029-APDX:E-2	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 2</p> <p>General Comment: The presentation of wave, tide and plume modelling in the Marine Processes chapter does not include the schematics of model output in the Technical Report which makes it difficult to gauge the magnitude of impacts.</p>	<p>Modelling work has been summarised and interpreted for Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) with relevant details drawn across for the determination of magnitude of impacts. Full details of the modelling are provided in the Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). For example, a key interpretation of the wave model output is presented as Figure 1.18 in Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The selected output represents the most severe case of all model scenarios considered for wave attenuation resulting from Hornsea Three (with GBS), One, Two and Four (with GBS) and considers the consequence of wave reduction along the coastline for all easterly wave scenarios. This interpretation confirms that no wave reduction effects reach the coastline, hence no effects on wave driven littoral transport are anticipated.</p>
RR-029-APDX:E-3	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 3</p> <p>Table 1.4: It should be noted that the use of Gravity Base Structures (GBS) as a maximum design scenario was introduced following the Section 42 consultation on the PEIR.</p> <p>Consequently, rather than seeing a refinement of the MDS between PEIR and application, we have seen a significant increase in scope which has substantially increased the significance of impacts for marine geology, oceanography and physical process receptors and therefore introduced an additional element of risk associated with this project.</p> <p>Although a follow up consultation took place in Q3/4 of 2020/21, several of the key areas of concern that were raised by NE and the MMO (Cefas) at this time (and indeed at PEIR) have not been addressed within the final application.</p>	<p>The Applicant notes that the options described within the maximum design scenario represent the conservative maximum design scenario. The proposed design has been carefully selected to respond to the local conditions present and strikes an appropriate balance between engineering feasibility and environmental sensitivity. The reintroduction of GBS foundations is required in response to increasing understanding of the geological complexities present within the array area. Without such foundation types included in the envelope, significant portions of the array site could become sterilised to development owing to challenging ground conditions.</p> <p>Table 1.4 of Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) presents the marine processes consultation responses received during the pre-application phase and how the Applicant has sought to resolve these.</p> <p>As the final layout and distribution of WTG foundations remains unknown at this time, a conservative assumption has been adopted applying the GBS foundation option to all 180 WTG sites in relation to the marine processes modelling. The Applicant notes that refinements have been made where possible (including limitation of the number of GBS to 110 – Co201 Volume A4, Annex 5.2: Commitments Register (APP-050)), whilst still allowing appropriate flexibility in the project design envelope. This refinement of GBS foundations was possible through the Applicant’s understanding of the underlying ground conditions of the array.</p>

		<p>The Applicant will engage with the relevant Interested Parties to understand any outstanding areas of concern via the SoCG process with a review to resolve these.</p>
<p>RR-029-APDX:E-4</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 4</p> <p>Section 1.7.3 & Table 1.6: Natural England do not agree that all the landfall receptors have been fully identified and assessed. As indicated in Point 1 above, several receptors that may potentially be influenced by impacts in the landfall area have not been included in Table 1.6.</p> <p>These include the following designated sites:</p> <ul style="list-style-type: none"> • Holderness Inshore MCZ (including Spurn Head Geological Feature) • Humber Estuary SAC, SPA (supporting habitat), Ramsar, SSSI. • Dimlington Cliffs SSSI <p>In addition, in section 1.7.6.7, Smithic Bank is identified as a local sediment store for material supplied through cliff erosion. Consequently, Smithic Bank should be considered a receptor of the landfall works.</p> <p>It will be important to consider potential impacts to longshore transport within the MCZ where the erosion of the Holderness cliffs and beaches provide a source of coarse and fine sediment that are transported south to Spurn Head and offshore sandbanks by waves and currents. Fine and medium sands can be transported south to the Lincolnshire coast which may bring other designated sites into scope. Therefore, any changes to this longshore drift resulting from this project could cause erosion or accretion of intertidal habitat and influence the morphology of the spit.</p> <p>Given the sparsity of baseline characterisation surveys of the Holderness coastal zone and Smithic Bank, significant environmental effects on the Holderness MCZ and other designated features cannot be ruled out at this stage.</p>	<p>It is the Applicant’s position that all relevant marine process receptors have been appropriately identified given the predicted magnitude of change.</p> <p>It should be noted that Smithic Bank was identified as a marine processes receptor and assessed accordingly within Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). However, to provide additional assurance, an independent study is underway on behalf of the Applicant in response to the Relevant Representations, as discussed with Natural England, seeking to satisfy this comment through the development of a Source-Pathway-Receptor model for Smithic Bank. This model will use available data and literature to show, and quantify where information allows, the linkages between this seabed feature and designated sites. The scope of this analysis is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p> <p>As concluded in Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070) no significant effects are predicted on Holderness Inshore or Holderness Offshore MCZs.</p> <p>Longshore drift has been fully characterised for the coast in section 1.7.1 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). The potential changes in longshore are assessed in paragraphs 1.11.1.118, 1.11.2.35 to 1.11.2.44, 1.11.2.46 to 1.11.2.56, 1.11.3.6 to 1.11.3.10 and 1.15.1.2 of Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). It should be noted that the drift divide defines the point where net longshore drift is to the south. Southerly drift is not possible for locations north of the drift divide since waves from northerly sectors have no capacity to act on this section of the coastline due to sheltering from Flamborough Head.</p>
<p>RR-029-APDX:E-5</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 5</p> <p>Section 1.7.3.4 (see also comment on 1.7.11.10 below): As highlighted in this paragraph,</p> <p>“Assuming the SMP policy of NAI remains unchanged in the future, the best estimates of retreat distance for the short term (0 to 20 years) and</p>	<p>As detailed in the Applicant’s response to RR-029-APDX:E-EK, a detailed, robust and proportional assessment to all potential changes to the physical marine environment have been characterised and assessed in line with paragraph 5.5.7 of NPS EN-1.</p> <p>Section 1.7.3.4 refers to NCERM values which are estimates expressed within confidence limits to account for uncertainty in future projections. In Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), further details are offered. For example, in the</p>

	<p>medium term (20 to 50 years) would be around 33 m and 82 m, respectively (Environment Agency 2020), based on present conditions.” [emphasis added].</p> <p>This does not take into account of the influence of climate change impacts (e.g. sea level rise) as required within paragraph 5.5.7 of NPS EN-1. These predictions are key to understanding the potential for infrastructure to become exposed throughout the project lifetime and the subsequent requirement for remedial works.</p> <p>In addition, giving the dynamic nature of this coastline it is imperative that the ongoing need for remedial works beyond the life span of the project are fully considered.</p>	<p>medium term (20 to 50 years) a 50%ile estimate (i.e. best guess) for retreat rate is around 82 m, considered within a confidence limit of +/-30% (i.e. 57 to 107m). Furthermore, the present long term average retreat rate based on measurements for Profile 16 (closest to the location of the landward HDD entry pits (and TJB)) is 1.57 m/yr which would equate to 55 m retreat over a 35 year period, a value which is comparable to NCERM (if not slightly less conservative).</p> <p>As mentioned previously, waves are not expected to vary due to climate change (and in fact may reduce) and any variations in mean sea level are also expected to be nominal at the end of the operational period (between 0.15 to 0.22m). Therefore, the retreat rates expressed by NCREM are not expected to greatly vary due to climate change effects and not at a level that would exceed present estimates when considered with associated confidence limits.</p> <p>Notably, measured cliff recession at Profile 16 show a negative trend, a slowing rate. If the rate was determined for the last 10 years this would equate to an average of 1.0 m/yr and for a section of the coastline that demonstrates an equilibrium crenulate shoreline profile (i.e. rates that would expect to become slower as the equilibrium is reached).</p> <p>NCERM rates for this section of coastline can be considered conservative against measure rates as well as future rates which may be influenced by climate change.</p> <p>The Applicant notes that the decommissioning plan and programme will be updated during Hornsea Four's lifespan to take account of changing best practice and new technologies. The approach and methodologies employed at decommissioning will be compliant with the legislation and policy requirements at the time of decommissioning.</p>
<p>RR-029-APDX:E-6</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 6</p> <p>Section 1.7.3 & Table 1.6: Insufficient detail is provided in relation to the intertidal access ramp to allow assessment of potential impacts on receptors (including the Holderness Cliffs and foreshore).</p> <p>Although it is the intention that the ramp only be in place for the installation phase (36 months) structure, it needs to be demonstrated that its installation will not result in long-lasting impacts on the Holderness Cliffs or beach at the landfall location, which may in turn give rise to impacts to other sensitive receptors.</p>	<p>As detailed in the Applicant’s response to RR-029-APDX:E-EC a proportionate consideration of the intertidal access ramp is provided in Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). No pathway for effects on marine receptors was identified.</p>
<p>RR-029-APDX:E-7</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 7</p>	<p>Receptors</p>

	<p>Section 1.7.6 & Table 1.8: Natural England does not agree that all the receptors of the ECC have been identified and assessed. As indicated in Point 1 above, there are a number of designated site receptors which may be influenced by impacts in the Export Cable Corridor (ECC) either directly or indirectly as a result of impacts to other marine process receptors. These therefore need to be considered.</p> <p>These include:</p> <ul style="list-style-type: none"> • Holderness Inshore MCZ • Holderness Offshore MCZ • Flamborough and Filey Coast SPA • Flamborough SSSI • Humber Estuary SAC, SPA, SSSI and Ramsar • Greater Wash SPA • Southern North Sea SAC <p>The potential for indirect impacts to the Holderness Coast from the ECC should also be explored.</p> <p>Smithic Bank is a headland-associated sandbank which plays an important role in the Holderness coastal zone through its interaction with tidal flows and waves approaching the shoreline. The sandbank acts as a buffer and is important for the stability of the coastal system, We are concerned that moderate elevation changes to the sandbank through construction/decommissioning (and maintenance) activities, and alterations to the sediment transport processes nearby due to the presence of the Dogger Bank A&B Cable Crossing, might modify the Holderness shoreline response to storm waves, and the Holderness shoreline morphology over the lifetime of the project/installed infrastructure. Consequently, direct and indirect effects on nearby designated sites and those further afield need to be carefully considered.</p>	<p>See the Applicant’s response to “RR-029-APDX:E-I to RR-029-APDX:E-Lwhich demonstrate that all relevant marine process receptors have been identified and assessed appropriately.</p> <p>Smithic Bank</p> <p>As detailed in the Applicant’s response to RR-029-APDX:E-4 above, an independent study is underway by the Applicant in response to the relevant reps, as discussed with Natural England, seeking to satisfy this comment through the development of a Source-Pathway-Receptor model for Smithic Bank. This model will use available data and literature to show, and quantify where information allows, the linkages between this seabed feature and designated sites. This will include the designated site receptors identified in the comment. The scope of this analysis is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p> <p>The Greater Wash SPA</p> <p>The Greater Wash SPA, an area of 3, 536 km² is designated for a number of bird species and is located at least 1.5 km from cable landfall and 500 m from the export cable corridor. With respect to landfall activities, changes to physical processes (suspended sediment concentrations; local morphology changes) have been demonstrated to be localised and as such have no potential to influence the supporting habitats within the Greater Wash SPA. The temporary nature of works along the export cable corridor, resulting in short-lived and localised elevated suspended sediment concentrations is such that there are no impacts predicted upon the supporting habitats within the Greater Wash SPA.</p> <p>Sediment transport processes and Holderness shoreline</p> <p>See the Applicant’s response to RR-029-APDX:E-EG. No sediment transport impacts, large-scale scouring or morphological changes are expected as a result of the presence of the proposed Hornsea Four/Dogger Bank A and B cable crossing.</p> <p>To add further assurance, a further study into the potential requirements for cable protection across Smithic Bank is being undertaken by the Applicant. This will provide further information on whether rock protection (inshore of the 16 m contour) may be required. The outputs from this work will be presented to Natural England and the MMO. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>
RR-029-APDX:E-8	Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 8	The Applicant has appropriately characterised the Flamborough Front. Figure 37 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) presents the location of the

	<p>Section 1.7.9.3: “The offshore array area is located north of the Flamborough Front when this seasonal feature develops.”</p> <p>In Volume A5, Annex 1.1: Marine Processes Technical Report, the Summer front map shows 90-100% occurrence of the Flamborough Front both south and north of the Hornsea Four array area (based on cloud-free satellite images over a 10-year period), Therefore, based on this latter data, the Hornsea Four array area appears to be located within a zone of 90-100% occurrence of the Flamborough Front, which would suggest that the quoted statement above (from Section 1.7.9.3) contradicts this evidence.</p> <p>The Flamborough frontal system separates vertically mixed water in the southern North Sea from seasonally thermally stratified water in the northern North Sea. The front extends offshore from Flamborough Head and curls northwards around Dogger Bank, a southern extension sits over Outer Silver Pit. The waters around Flamborough Head are particularly rich in marine life because of its proximity to an upwelling of nutrients and plankton caused by the Flamborough Front. Given the importance of this frontal system to primary productivity in the North Sea, it is vital to understand the potential impacts of the HP4 alone, and in-combination with other plans and projects.</p>	<p>Flamborough Front for winter, spring, summer and autumn periods as a frequency of occurrence based on satellite data over a 10 year period. The front is a seasonal feature which only develops during summer months. The front is mainly located either south or north of Hornsea Four where the probability of occurrence is 80 to 100% (as shown by the red areas in Figure 37). A separate analysis of modelled data shows that the front is south of the array for the representative period of July 2018.</p> <p>As concluded in paragraphs 1.11.2.18 to 1.11.2.33 of Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), it is the Applicant’s position that the magnitude of change on the Flamborough Front from the presence of structures in the Hornsea Four array is negligible. However, to provide further assurance, an independent study is underway, as discussed with Natural England, seeking to satisfy this comment with respect to the position of Flamborough Front and the potential impacts of Hornsea Four upon this seasonal feature, both in isolation and in-combination with other developments. The scope of this analysis is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
<p>RR-029-APDX:E-9</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 9</p> <p>Table 1.9: Within paragraph 1.7.8.3, it is noted that there is a sand ridge in the north western part of the array which is associated with a larger area of sand ridges and sandbanks known as ‘The Hills’. These are sufficiently close to the array as to be impacted by changes to hydrodynamics and sediment transport.</p> <p>Additionally, within paragraph 1.7.8.2 the Outer Silver pit geological feature (which lies directly adjacent to the array) is referenced, and yet it hasn’t been considered a potential receptor. Further justification should be provided to support its exclusion from further consideration.</p>	<p>The Applicant can confirm that offshore structures placed across the array area will only have localised (near-field) influences on hydrodynamics and sediment transport. These manifest as increased turbulence and wakes which also quickly diminish in their influence over distance in the direction of passing flows. The effect of this increased turbulence would be demonstrated as local scouring around each structure, which in turn is mitigated by scour protection. No larger scale effects are expected which would extend to or impact on features such as The Hills or the Outer Silver Pit geological feature. These issues are considered as MP-C-3 which for the array area is considered in paragraphs 1.11.1.104 to 1.11.1.113 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p>
<p>RR-029-APDX:E-10</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 10</p>	<p>The EIA at application incorporated an appropriate level of conservatism in the assessment to account for any uncertainties in baseline data, arising from the nature of the seabed and</p>

	<p>Table 1.13: Construction: Seabed Preparation Activities</p> <p>The MDS currently makes provision for 100% of the offshore export cable route (across six export cables and a width of 40m per cable) to be cleared of sandwaves (this would include clearance along Smithic Bank). Given that sandwaves have primarily been observed across the northern part of the array, but not along the export cable corridor route (except for a 'very few locations' such as the southern part of the fan area connecting to the array), it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave clearance in line with Paragraph 2.6.196 of NPS EN-3).</p> <p>Furthermore, pre-construction high-resolution geophysical surveys were planned for 2021 (as stated in 4.8.8.14 the Project Description). These data should enable a clear and accurate understanding of the distribution of significant bedforms across the study area, enabling the MDS to be refined. The MDS should therefore be updated, taking account of the pre-construction high resolution geophysical survey data (due to be available Q4 2021)</p>	<p>inherent mobility of bedform features, and early design assumptions. Therefore, the Applicant applied a generic clearance volume across the offshore export cable corridor, assuming seabed levelling across the entire offshore export cable corridor as a maximum design scenario, which is consistent with the approach taken on other offshore wind farms. However, refinement of these volumes would typically be undertaken post-consent but pre-construction as further geophysical data is acquired, as is consistent with other offshore projects. However, the Applicant has brought forward further geophysical and geotechnical data which was collected in 2021 and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>
<p>RR-029-APDX:E-11</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 11</p> <p>Table 1.13: Operation: Scouring around cable protection</p> <p>In Table 1.13 the HP4/Dogger Bank A&B Cable Crossing is described as comprising up to six export cables (HVAC option) from Hornsea Four will cross the export cables (up to two pairs of cables) of Dogger Bank A and B (12 crossings) at a location seaward of Smithic Bank. In the Technical Report (see our comment later), this is also described as potentially 24 individual crossings. In Section 1.11.2.12, the MDS is described as up to 12 crossings. The figure used throughout both this chapter, and the accompanying technical report, should be consistent and accurately represented in the draft DCO/dML. The MDS cable crossing footprint area needs also to be consistent.</p>	<p>The final configuration of the cable crossings will be determined post-consent and through securing of crossing agreements. However, the Applicant has sought to provide a conservative assessment of the potential number of crossings which may be required. The assessment which has been modelled and assessed is based on a conservative configuration for the crossing. Table 7 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) identifies 12 cables for this nearshore crossing. Annex C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) refers to 24 individual crossings, this is a minor discrepancy when two pairs of cables have been considered as four individual cables. The footprint used remains consistent throughout and is based on the indicative arrangement shown in Figure 1.2 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). Therefore, the findings of the assessment remain consistent and valid both in the technical report and EIA chapter.</p>
<p>RR-029-APDX:E-12</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 12</p>	<p>See the Applicants response to RR-029-APDX:E-EK. Section 1.7.11.10 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides due regard to the implications of sea level rise and storm</p>

Section 1.7.11.10: "...existing cliff erosion rates would lead to a retreat distance over the medium term (next 20 to 50 years) of around 82m, even before increased rates of sea level rise are considered."

Cliff erosion rates should be provided that take into consideration increased rates of sea level rise. Moreover, estimated cliff erosion rates should be provided for the entire lifespan of the project, incorporating increased rates of sea level rise.

Estimates should also be provided for the anticipated timing of infrastructure exposure due to seabed lowering or sediment erosion. Remediation plans should also be provided in draft.

surges upon coastal erosion. This section includes consideration of climate change (sea level rise, storm surge and waves). This provides a detailed characterisation for the potential change over the lifetime of the development suitable for the purposes of EIA Erosion rates over the project's lifespan are quantified using available literature. For example, in the medium term (20 to 50 years) a 50%ile estimate (i.e. best guess) for retreat rate is around 82 m, considered within a confidence limit of +/-30% (equivalent to 57 to 107 m).

Long-term average cliff erosion rates are referred to in Table 1.5 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#). Measured cliff erosion is highly variable year to year and shows that the long-term trend for this section of the coastline is negative. If the average retreat rate was based on only the last 10 years, then a lower average retreat rate would apply. The shoreline is also adjusting to an equilibrium profile in response to the prevailing wave climate, such that slower rates may occur in the future for this section of the coast (based on existing conditions and supported by the present negative trend). If climate change effects were to modify existing conditions, then the trend may adjust slightly positively.

As stated within paragraph 1.7.11.10 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), cliff retreat rates may likely increase (i.e. adjust slightly positively) with rising sea level rise and an increasing frequency in storm surges, although waves are not expected to vary due to climate change (and in fact may reduce). Any variations in mean sea level are also expected to be nominal at the end of the operational period (between 0.15 to 0.22 m). Therefore, the retreat rates presented in [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), as expressed by NCREM, are not expected to greatly vary due to climate change and at a level that would exceed present estimates when considered with associated confidence limits.

The Applicant has applied the long-term average cliff recession rate determined from Profile 16 (in closest proximity to the proposed HDD location). Landward infrastructure related to HDD transition joint bays are planned at around 200 to 250 m inland from the present coastline which is expected to provide at least 125 to 156 years before cliff recession reaches this point (and longer if the present retreat rates slow further).

As concluded in [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), no changes to nearshore sedimentary pathways are predicted due to

		the presence of infrastructure associated with Hornsea Four. As such it is the Applicant's position that there is no requirement for remediation plans.
RR-029-APDX:E-13	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 13</p> <p>Section 1.7.11.11: "Over the long-term any increase in mean sea level also has the potential to place the vertical profile of Smithic Bank lower in the tidal frame which would lead to a partial reduction in wave sheltering effects and potentially increased cliff erosion. However, if increased cliff erosion led to increased sediment supply to the bank, then the profile may be able to be maintained in a new dynamic equilibrium."</p> <p>Given the sensitivity of the Holderness Coastline, potential scenarios should be modelled to allow assessment of the potential impacts again taking account of the potential impact of climate change.</p>	<p>The statements referred to are related to the baseline and future baseline due to climate change. Hornsea Four is not expected to vary either condition as presented in paragraphs 1.11.2.34 to 1.11.2.44 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). Modelling scenarios have already been considered for representative wave directions and return period events that currently affect the Holderness Coast. Therefore, there is no requirement for additional modelling to be undertaken.</p>
RR-029-APDX:E-14	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 14</p> <p>Section 1.7.12: Natural England consider that there are a number of gaps in the evidence presented in support of this application. These include:</p> <ul style="list-style-type: none"> • Adequate data/evidence on the underlying geology, seabed sediments and dominant morphological features in the vicinity of, and within, the proposed project area. • Sufficient baseline characterisation and understanding of the Flamborough Front through and/in the vicinity to the HP4 array, coupled with an adequate assessment of the effects of the array on tidal flows, turbulent wakes, and mixing within the water column. • Detailed investigation of the geomorphology of Smithic Bank, its evolution, and the impact of the proposed development on its form and function 	<p>The Applicant considers the evidence base to be fit for the purposes of EIA characterisation. A detailed baseline characterisation is provided in Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p> <p>Underlying geology, seabed sediments and dominant morphological features</p> <p>As detailed in Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) (Section 2 of Appendix B), site-specific geophysical evidence from Hornsea Four offers nearly 100% coverage for the very nearshore area (with a shore-parallel spacing of around 0.02 km, as shown in Figure B-1 in Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067)). Where survey coverage is less than 100%, then gaps only remain relevant if there are unresolved features which cannot be adequately interpreted between survey lines. Long-section survey lines are continuous from nearshore to offshore, with cross-lines at appropriate intervals. Subsequent geophysical surveys have provided additional data in this area which has also been considered within the EIA characterisation.</p> <p>The evidence base draws together multiple lines of evidence rather than rely on a single dataset or survey. In total, a complete view is provided from existing information.</p> <p>Flamborough Front</p> <p>A detailed description of the processes which resulted in the development and sustaining of Smithic Bank is provided in paragraphs 3.4.3.3 to 3.4.3.181 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). It is the Applicant position that this characterisation</p>

		<p>is sufficient for the purposes of undertaking an EIA assessment of potential change on the front.</p> <p>The present hypothesis is any increased mixing due to the presence of foundations would occur locally around each foundation and not at the scale where there would be any cumulative interactions acting at the array scale. As such, an independent study is underway in response to the relevant reps, as discussed with Natural England, seeking to satisfy this comment with respect to the position of Flamborough Front and the potential impacts of Hornsea Four upon this seasonal feature, both in isolation and in-combination with other developments. The scope of this workstream is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p> <p>Geomorphology of Smithic Bank</p> <p>A detailed description of the processes which resulted in the development and sustaining of Smithic Bank is provided in paragraphs 3.3.3.8 to 3.3.3.18 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). Also, it should be noted that Smithic Bank is not currently designated as an Annex I habitat. The Applicant considers that Smithic Bank is reviewed in sufficient detail based on presently available data and information. In order to provide further reassurance a review is to be undertaken to ensure the morphological evolution of the Smithic Bank to provide further detail. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
<p>RR-029-APDX:E-15</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 15</p> <p>Table 1.10: Identification of receptors</p> <p>As highlighted in the comments above, Natural England considers the list of Marine Process Receptors to be incomplete.</p> <p>Identification of impact pathways</p> <p>At construction we would also highlight an impact pathway to coastal processes resulting from placement of the temporary access ramp. In addition, there is the potential lowering of Smithic Bank, or altering its morphology, due to cable installation activities across the sandbank (i.e. Smithic Bank represents a further marine processes receptor here),</p>	<p>The Applicant has not sought to duplicate responses.</p> <p>Identification of receptors</p> <p>See the Applicant’s response to:</p> <ul style="list-style-type: none"> • RR-029-APDX:E-F; • RR-029-APDX:E-1; and • RR-029-APDX:E-1 to J”. <p>Identification of impact pathways</p> <p>See the Applicant’s response to:</p> <ul style="list-style-type: none"> • As detailed in the Applicant’s response to RR-029-APDX:E-EC a proportionate consideration of the intertidal access ramp is provided in Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). No pathway for effects on marine receptors was identified.

	<p>particularly when considering the cumulative effect of the Dogger Bank A&B Crossing and the SEGL2 cable installations).</p> <p>Identification of project phases</p> <p>As infrastructure is to remain in situ beyond the operation of the project, there should be consideration of the long-term impacts beyond decommissioning.</p>	<ul style="list-style-type: none"> As detailed in the Applicant's response to RR-029-APDX:E-EF, Paragraph 1.11.2.55 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) concluded that no significant effects would occur on Smithic Bank (or wider receptors) from changes in pathways. <p>Identification of project phases</p> <ul style="list-style-type: none"> As detailed in the Applicant's response to RR-029-APDX:E-EJ, it is the Applicant's position that the potential impacts associated with infrastructure remaining in situ during the decommissioning phase of the project has been robustly assessed in the EIA.
<p>RR-029-APDX:E-16</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 16</p> <p>Table 1.12 & Co2, Co44, Co45: Natural England notes and welcomes the applicant's commitments to avoid direct overlap of the permanent project footprint with MCZs and SSSIs. However, it should be noted that indirect impacts to these sites could potentially be just as significant.</p>	<p>The Applicant has assessed the physical changes on the integrity and special features of both Holderness Inshore and Holderness Offshore MCZs in Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). See the Applicant's response to RR-029-APDX:E-3.</p> <p>The hydrodynamic and sedimentological assessments undertaken and presented within Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) and Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) show that impacts dissipate with increasing distance from the structure/ activity. The detailed assessments undertaken as part of this application does not suggest that there are significant indirect impacts on designated sites.</p>
<p>RR-029-APDX:E-17</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 17</p> <p>Table 1.12 & Co189: Natural England notes and welcomes that the Dogger Bank cable crossing will be positioned east of Smithic Bank and seaward of the 20m depth contour. However, it still needs to be demonstrated that this location is sufficiently seaward as to avoid alterations to the local wave/current regime, sediment transport regime and morphology of the sandbank.</p>	<p>The Applicant welcomes Natural England's agreement on the locating of the Dogger Bank cable crossing to the east of Smithic Bank and seaward of the 20 m depth contour.</p> <p>For context, the crossing placed seaward of the 20 m depth contour is at least 2.5 km seaward of the commencement of the outer eastern slope of Smithic Bank. The effect of the conservative MDS case of a 3 m high crossing on moderating waves has been included in the modelling; noting Figure 45 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) shows the magnitude and extent of wave height reduction of easterly waves related to the crossing. Wave height reductions are considered to have dissipated at around 350 m from the crossing and are therefore sufficiently remote from the bank. This distance from the crossing is also sufficiently remote from the depth of closure contour (outer closure at around 9 m depth and inner closure at 7 m) so as not to be capable of changing any wave driven sediment transport effects on the bank.</p> <p>In order to assess any alterations to the current regime due to the cable crossing, four numerical modelling scenarios were undertaken (Section 4.6.2.7 and Appendix C of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067)). It is shown that the current</p>

		regime undergoes slight reductions in the locality of the crossing (and in alignment to the generally north-south direction of flows which is not towards the bank) but not in its capacity to transport medium and fine sand. Consequently, an alteration of the general nearshore sediment transport is not anticipated.
RR-029-APDX:E-18	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 18</p> <p>Table 1.12 & Co201: Natural England notes and welcomes the applicant's efforts to refine the maximum design scenario for the use of GBF down to 110 foundations. However, there is limited context provided (i.e. the location of these 110) and therefore it is difficult to refine down the worst-case scenario for the impact assessments.</p>	It is standard practice that the locations of the turbines will be defined post consent and is dependent on numerous factors. This approach has been adopted on all recent wind farm applications. As the final layout and distribution of WTG foundations remains unknown at this time, a conservative assumption has been adopted applying the GBS foundation option to all 180 WTG sites in relation to the marine processes modelling. The Applicant considers that this precautionary approach, combined with the commitment for this to be secured through the Construction Method Statement (Condition 13(1(c) of Schedule 11 of C1.1: Draft DCO including DMLS (APP-203)) in appropriate in order to refine the MDS.
RR-029-APDX:E-19	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 19</p> <p>Section 1.9.2: The temporary beach access ramp will cross from the cliff top onto the beach foreshore and is described as being in place for a short period during the construction of HDD exit pits (around 36 months). We would suggest that 36 months is not short-term, particularly at a low point along a fast-eroding coastline. Therefore, we would wish to see an assessment of the potential impacts of this beach access ramp to cliff stability.</p>	As detailed in the Applicant's response to RR-029-APDX:E-EC, a proportionate consideration of the intertidal access ramp is provided in Volume A2 Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) . No pathway for effects on marine receptors was identified irrespective of the duration of its presence.
RR-029-APDX:E-20	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 20</p> <p>Section 1.9.4: Decommissioning is described in Section 4.13 of the Project Description (Chapter 4 of the ES).</p> <p>This indicates that a large amount of sub surface infrastructure will remain in situ, unless it poses a hazard to sea users at the time of decommissioning. This means that there is potential for infrastructure to become exposed beyond the operational lifespan of the project.</p> <p>Further consideration should be given to the potential for infrastructure to become exposed over time, and the resulting impacts on marine processes and coastal morphology in the context of climate change.</p>	<p>As detailed in the Applicant's response to RR-029-APDX:E-ECJ, it is the Applicant's position that the potential impacts associated with infrastructure remaining in situ during the decommissioning phase of the project has been robustly assessed in the EIA.</p> <p>If any infrastructure became exposed in the future after decommissioning (i.e., previously buried cables) then this would only develop small-scale localised effects proportional to the scale of the object's capacity to interfere with waves or flows. In deeper water any exposed infrastructure would not interfere with waves. Climate change effects would have a more direct and global effect on marine processes than small-scale localised exposed infrastructure.</p>

	<p>The project description also indicates that scour and cable protection (including cable crossings) will remain in situ. The long-term implications of this beyond the operational lifetime of the project also need to be explored.</p>	
<p>RR-029-APDX:E-21</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 21 Section 1.9.5 & Table 1.13: In light of Paragraph 2.6.196 of NPS EN-3, which states that “ Methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment”, further justification should be provided to support the following maximum design parameters:</p> <ul style="list-style-type: none"> • The requirement for up to 8 HDD exit pits for a maximum of 6 cables. • An MDS for sandwave clearance based on clearance along the full length of each of the 6 cables, despite geophysical data being available. • Cable protection based on a percentage of the total cable route rather than available geophysical data. • Drilling will only be required for up to 10% of all pile installations (or up to 10% of the depth across all installations) <p>As previously highlighted, we also consider that the impacts associated with infrastructure remaining in situ beyond the operational lifetime of the project should also be considered.</p>	<p>HDD Exit Pits The Applicant notes that the MDS for exit pits is a total of 8 (relating to 4 pairs of HVDC circuits).</p> <p>Sandwave Clearance The precise location of bedforms requiring seabed clearance was unknown at application due to uncertainties in the nature of the seabed and inherent mobility of these features. Further geophysical and geotechnical data was collected in 2021 to support the ongoing engineering and design but was not available for EIA purposes due to reporting timescales. The EIA currently incorporates a level of conservatism in the assessment to account for any gaps in baseline data and early design assumptions. Therefore the Applicant has applied a generic clearance volume across the offshore export cable corridor, assuming seabed levelling across the entire offshore export cable corridor as a maximum design scenario. The Applicant acknowledges Natural England’s comment and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p> <p>Cable Protection and Drilling See details on MDS refinement above. As detailed in the Applicant’s response to RR-029-APDX:E-EJ, it is the Applicant’s position that the potential impacts associated with infrastructure remaining in situ during the decommissioning phase of the project has been robustly assessed in the EIA</p>
<p>RR-029-APDX:E-22</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 22 Table 1.13: We would be concerned if a 2km length of cable re-burial/de-burial occurred across Smithic Bank, potentially up to 7 times through the lifetime of the project, as is stated here. This highlights the need to fully</p>	<p>As presented in paragraph 1.11.2.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), a cable burial risk assessment (CBRA) will be undertaken to understand where burial of cables may be problematic and/ or susceptible to exposures. Figure 43 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) provides a cross-section profile of Smithic Bank based on the geophysical survey data along with the</p>

	<p>assess the potential impacts of the cable installation across the project lifetime and to bring forward mitigation where needed.</p>	<p>nominal depth of burial for cables at both 2 and 3 m for context. The cross-section also shows the profile of the seabed from 1980 and 2011. The natural variation in the profile of the seabed over the 39 year period (1980 to 2019) suggests that cables are very unlikely to be exposed by natural processes over the lifetime of Hornsea Four meaning the chance for cable reburial and rock protection would appear to be effectively nil. Therefore, it is highly improbable that 2km length of cable will be re-buried seven times throughout the lifetime of the project on Smithic Bank.</p>
RR-029-APDX:E-23	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 23</p> <p>Section 1.9.5 & Table 1.13: The potential impacts of vessels and equipment in the construction/decommissioning and operational phases of the project should also be considered.</p> <p>For example, there is potential for jack-up vessels or vessels with several anchors to hold station to cause indentations on the seabed.</p>	<p>It is not standard practice to assess the potential for jack up vessels and anchors causing indentations on the seabed. This is primarily as it would not result in likely significant effects in EIA terms. Any effects/ indentations on the seabed are not expected to be lasting, highly localised and temporary, especially where the seabed is mobile. Therefore, it is the Applicant’s position that no further assessment of this potential impact is required.</p>
RR-029-APDX:E-24	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 24</p> <p>Section 1.11.1.10 – 12: It is vital that the seabed profile is restored following the excavation of exit pits (particularly given the sensitivities of this area). Material from elsewhere should not be brought in for reinstatement, therefore steps should be taken to store the excavated sediment in a suitable location (potentially onshore). There should be an element of sorting of sediment to enable the sediment structure to be reinstated.</p> <p>The appropriate storage of material should be secured in the DCO/dML as mitigation.</p>	<p>The Applicant notes that the details requested by Natural England will be provided with the Cable Specification and Installation Plan which is conditioned in the DML and will be submitted to and approved in writing by the MMO.</p>
RR-029-APDX:E-25	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 25</p> <p>Section 1.11.1.13- 14: The impact of elevated Suspended Sediment Concentrations (SSCs) and associated sediment deposition due to the excavation of HDD exit pits could affect other sensitive features nearby such as the Holderness Inshore MCZ. Furthermore, there is no mention of the reinstatement of the seabed profile following backfilling of the exit pits. It would be useful to provide an assessment of the potential range of</p>	<p>Impacts of elevated SSC concentrations and associated deposition are assessed in Section 7.1.2 and 7.2.2 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070) for the Holderness Inshore and Holderness Offshore MCZs respectively.</p> <p>HDD is selected as the lowest impact option for the cable landfall when compared to other options such as open cut trenching across the beach. Suspended sediment concentrations in the nearshore are already elevated due to fine materials eroded from the cliffs. The volumes of materials removed from exit pits is small overall and any fine materials released into the marine environment would be rapidly dispersed with concentrations reducing away from</p>

	<p>change in intertidal/subtidal elevation and coastal retreat over the lifetime of the project following reinstatement.</p> <p>Natural England, therefore, cannot agree with the assessment of significance of this impact pathway.</p>	<p>source which would not lead to any greater effects on sensitive features. The seabed profile would be made good by backfilling as such there would be no increase in elevation which could result in coastal retreat.</p> <p>The Applicant considers that the physical processes assessment is proportional to the type, scale and duration of the activity.</p>
RR-029-APDX:E-26	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 26</p> <p>Section 1.11.1.17: There is a discrepancy between the volumes of sandwave clearance quoted here and throughout other documents.</p> <p>Here it is stated that sandwave clearance will be carried out along the offshore EEC for 6 cables with a sweeping width of 40m per cable 757,000m³. Within the Project Description (Volume 4. Chapter 4) the total volume cleared is given as 834,000m² across six export cables and sweeping a width of 40 m per cable. Within the Pro Rata Annex (Vol 4 Annex 4.8) the volume of sandwave clearance is given as 834,00m³ across 6 cables with a clearance width of 30m.</p> <p>Similarly, there appears to be a discrepancy in relation to the array area. The volumes of sandwave clearance should be clarified to enable an accurate assessment and then captured within the DCO/dML.</p>	<p>The volume referred to in Section 1.11.1.17 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) relates to the main ECC corridor only and not the short section which overlaps with the Array Area. Therefore, the assessment on this value remains accurate.</p> <p>The Applicant wishes to highlight that as stated in Volume A4 Annex 4.8 Pro rata Annex (APP-047), the maximum design scenario for sandwave clearance is a width of 40 m, but it is important to note that for the calculations of sandwave clearance areas and volumes, an average corridor width of 30 m has been used.</p>
RR-029-APDX:E-27	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 27</p> <p>Section 1.11.1.17: It is stated that if Trailing Suction Hopper Dredging is carried out to achieve sandwave clearance, spoil disposal will be at a site elsewhere. Locations of spoil disposal need to be identified so that their impact can be assessed.</p>	<p>See the Applicant's response to RR-029-APDX:E-EG and RR-029-APDX:E-ED above.</p>
RR-029-APDX:E-28	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 28</p> <p>Section 1.11.1.29: It is stated that "There is expected to be a low sensitivity of these receptors to sandwave clearance, not least because of the expected absence of such features in this area."</p> <p>However, if sandwave clearance is found to be required in the nearshore zone and, as stated in Section 1.11.1.23, the 'scale of tidal advection is around 10km', then this could affect sensitive coastal receptors.</p>	<p>See the Applicant's response to RR-029-APDX:E-EG and RR-029-APDX:E-ED above.</p> <p>The scale of tidal advection of 10 km is only relevant to fine sediments (silts and muds) that would take time to settle and therefore have the potential to be dispersed over this distance (a spring tidal excursion). Sandwaves would be comprised of larger sized sediment particles that would settle very quickly and not be subject to wider dispersion and therefore not reach the receptors referred to here. As such, the conclusions of sandwave clearance as a short-term activity remain accurate.</p>

	<p>Therefore, the worst-case scenario should be considered here and assessed accordingly.</p> <p>The assessment of sensitivity only considers the fate of the sediment that is removed and does not address the potential impact of the removal on relevant receptors. Furthermore, sediment disposal locations have not been identified, and there is no evidence to support the assumption that “Once deposited, the sand removed from sandwaves is likely to re-join the same bedload transport environment that originally created and moved the bedforms.” (Para 1.11.1.26). Consequently, the impacts to receptors cannot be presumed to be of short-term duration.</p> <p>Based on the applicant’s rationale of focussing on nearshore receptors to the north of the sediment separation Zone, it is unclear why Smithic Bank has not been included in the assessment. However, it should also be noted that whilst the landfall location lies to the north of the longshore sediment transport path divide, this zone is only apparent when sediment movement is averaged over several years. At any given time, sediment transport could be predominantly to the north or south. Therefore, the impact to receptors to the south should also be considered (including the Holderness Inshore MCZ and the Holderness Coast).</p> <p>Again, Natural England highlight that the assessment should consider all sensitive receptors potentially impacted by sediment clearance along the full extent of cable corridor.</p> <p>To address this, the WCS should be considered and presented for plume spreading due to sandwave clearance in the nearshore. A schematic/map(s) should be provided showing the maximum sediment plume concentration, extent, persistence and any associated bed level changes within the array and along the export cable corridor. Marine Process receptors should be clearly identified on the map/schematic.</p>	<p>Once deposited, sands removed from sandwaves become subject to the same processes that created the bedform and will re-join local bedload transport. If this activity occurred on Smithic Bank, then there will be no other effects to the bank.</p> <p>Longshore transport to the north of the drift divide is only possible from waves from southerly sectors which established a net drift to the north only. Waves from northerly sectors have no influence for this section of the coast due to the sheltering effect of Flamborough Head so there is no capacity for any southerly drift. The drift divide is defined at the point where wave sheltering effects from the headland are effectively nil. South of the drift dived the net drift can be considered as the long-term average of waves from all incident directions.</p> <p>The assessment has identified all relevant receptors within reach of likely effects and based on established marine process understanding.</p> <p>Nearshore plume modelling is provided in Appendix C of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) where Figure C25 to C28 demonstrate the extent of dispersion from locally disturbed sediments (whether related to CFE or sandwave clearance). Wider dispersion is only related to the silt fraction whereas sands and gravels fall rapidly out of suspension (Section 5.5.3.5 and Table 4 of Appendix C).</p>
<p>RR-029- APDX:E-29</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 29</p> <p>Section 1.11.1.30 - 31: This assessment of Magnitude and Impact appears to relate to the excavation of exit pits and not sandwave clearance.</p>	<p>The Applicant thanks Natural England for this observation. The paragraph should read: “1.11.1.30 Sandwave clearance is a contingency provision to remove mobile seabed features which could inhibit cable laying. If sandwave clearance occurred in the nearshore (up to HDD exit pits) then effects on local receptors would be negligible. Irrespective of the sensitivity of</p>

	<p>Natural England does not agree with this assessment of magnitude (as negligible) and impact (as not significant) as not all receptors have been adequately considered (e.g. Holderness Offshore MCZ). We advise that further mitigation may be required.</p>	<p>the receptor, the significance of the impact is not significant as defined in the assessment of significance matrix (Table 1.16) and is therefore not considered further in this assessment.” Impacts on Holderness Inshore and Holderness Offshore MCZs from sandwave clearance are provided in Sections 7.1.2 and 7.2.2 Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070).</p>
<p>RR-029- APDX:E-30</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 30 Section 1.11.1.36: Regarding seabed levelling in the HVAC Booster Search Area, it is stated that “During a neap tide the plume will be advected over a shorter distance (up to 6km) than a spring tide (up to 12km)...” Whilst sediment plumes due to seabed preparation for the HVAC booster stations and export cable installation are anticipated to be restricted to be within one tidal excursion distance, there is still the potential for plumes to reach the Holderness Offshore MCZ. This should be considered here. A schematic showing the plume model results on a map of the study area along with the location of sensitive receptors and nearby designated sites would be extremely helpful in assessing any potential impacts to the Holderness Offshore MCZ.</p>	<p>An assessment of seabed preparation for HVAC Booster Search Area on Holderness Offshore MCZ is provided in paragraphs 7.2.2.1 to 7.2.2.9 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). Should suspended sediment plumes reach the Holderness Offshore MCZ, an event which may only occur under spring conditions, suspended sediment concentrations will be comparable to naturally occurring levels (which are within an annual range of 1 to 4 mg/l; Table 18; Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)).</p>
<p>RR-029- APDX:E-31</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 31 Section 1.11.1.39: It is stated that “Spoil mounds at this location are estimated to cover between 10,000 to 717,409m² with an associated maximum height in the range 0.99 to 0.01m.” The range of figures are stated to be the associated maximum height of the spoil mounds due to seabed levelling at the HVAC Booster Station Search Area. However, it is unclear if 0.01m is a maximum height or a likely maximum. Furthermore, the estimated area of the mounds shows ca. 70-fold variation. Natural England would welcome further clarification and a more accurate estimate</p>	<p>The estimated variation in extents and heights of spoil mounds recognises an envelope of possible outcomes recognising different sediment types and dispersion conditions. There is not a single outcome but a range of possible outcomes. The larger area would have a smaller height and a smaller area a higher height. The heights of thickness from an active phase deposit are presented in Table 8 of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) and represent the maximum average sediment thickness.</p>
<p>RR-029- APDX:E-32</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 32 Section 1.11.1.41: No impact assessment is offered here for HVAC Booster Station Search Area seabed levelling as they are considered in other</p>	<p>An assessment of seabed preparation for HVAC Booster Search Area on Holderness Offshore MCZ is provided in paragraphs 7.2.2.1 to 7.2.2.9 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070).</p>

	<p>chapters. However, relevant marine processes receptors that are sensitive to sediment plumes caused by seabed preparation for HVAC Booster Stations should be included here (i.e. Holderness Offshore MCZ).</p>	
RR-029-APDX:E-33	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 33</p> <p>Section 1.11.1.43: In order to determine the WCS impacts due to GBS foundation preparation in the offshore array area, overlapping/concurrent seabed preparation activities should be assessed.</p> <p>We would advise that the fate of dredged material from two neighbouring sites in the centre of the array should be modelled. This should also take account of the overlapping/concurrent seabed preparation activities in the offshore area.</p>	<p>Seabed levelling in the offshore array area is represented in the modelling as a single instantaneous release, noting the amounts of silts in the release are likely to be relatively small as the material removed is likely to be mainly sand (Figure C5 and C6 of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). The sediment concentrations in suspension remain very low away from the points of release and short-lived. Given the limited longevity of the sediments in suspension, of which the predominant material is sand, it is considered unlikely that the addition of a second source to develop an overlapping plume would lead to highly elevated sediment concentrations away from the source of seabed disturbance. Therefore it is the Applicant's position that additional modelling is not required.</p>
RR-029-APDX:E-34	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 34</p> <p>Section 1.11.1.51-52: Seabed levelling in the offshore array area has not been assessed for its impact on marine process receptors. Consequently, the Applicant has not considered potential adverse impacts due to the modification or removal of sandwaves on nearby or adjacent prominent sand ridge and sandbank systems (e.g. The Hills). This is particularly relevant to the northern part of the offshore array area and should be assessed.</p>	<p>There are no marine receptors identified in the offshore array area which are considered to be sensitive to seabed levelling. The effects on the seabed are expected to remain within the array area and would not extend to The Hills. The Hills is also not expected to be a deposition area for silts that may disperse more widely.</p> <p>An assessment of seabed preparation for HVAC Booster Search Area on Holderness Offshore MCZ is provided in paragraphs 7.2.2.1 to 7.2.2.9 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070).</p>
RR-029-APDX:E-35	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 35</p> <p>Section 1.11.1.57 – 1.11.1.67: Although the use of a Controlled Flow Excavator has become standard within offshore windfarm applications, and assessments are made on the assumption that the seabed and associated habitats will recover in the short-term (up to 2 years), we highlight that there is very little evidence available to support this assumption.</p> <p>Natural England recommend that all available evidence is considered, and that there is a commitment to post-consent monitoring to test the assumptions made within this application.</p>	<p>The Applicant has sought to assess the worst case cable installation methodology for the creation of suspended sediment plumes. This assessment considered the use of a Controlled Flow Excavator (CFE). CFE is a very similar methodology for installation as a mass flow excavator which have been widely used in the environment for many years. Therefore, there is sufficient information available to understand the potential recovery of the seabed and associated habitats. As such, there is not sufficient uncertainty, nor are significant effects predicted, as to warrant the need for post-consent monitoring.</p>

RR-029- APDX:E-36	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 36</p> <p>Section 1.1.1.1.64: Whilst SSCs close to the cable trench are discussed, the anticipated maximum spatial extent of the plumes is not discussed. The maximum spatial extent of the plumes, their persistence, and concentrations should be presented here, and consideration given to all sensitive receptors and/or designated sites. Given the proximity of the ECC to the Holderness Inshore and Holderness Offshore MCZs, an assessment of the impact of sediment plumes due to cable trenching needs to be carried out here.</p>	<p>Impacts of elevated SSC concentrations and associated deposition are assessed in Section 7.1.2 and 7.2.2 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070) for the Holderness Inshore and Holderness Offshore MCZs respectively.</p> <p>Figures C17 to C19 of Appendix C of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), provide maps of the spatial extent of the plumes and the associated concentrations at those extents. All values remain low away from the point of release. Equivalent figures are provided for all sediment plume modelled scenarios. A description of the persistence of these plumes is also provided for all modelled scenarios in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p>
RR-029- APDX:E-37	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 37</p> <p>Section 1.1.1.1.65: As with our comment above, the maximum spatial extent of the plumes, their persistence, and concentrations should be fully discussed here and consideration given to all sensitive receptors and/or designated sites within the zone of influence. Similarly, it would aid understanding of these results if the relevant schematics from Appendix C: Results in the Technical Report could be provided alongside this evidence to show the MDS sediment releases for cable trenching in the inshore area west of Smithic Bank.</p> <p>This would, in turn, help understanding of the anticipated maximum effect Flamborough Head SAC/SSSI, and the Holderness Inshore MCZ.</p>	<p>The Applicant has sought to reduce duplication within the DCO Application as it standard practice. Appropriate sign-posting and cross references have been provided to the associated technical report (and its appendices) and therefore the Applicant does not feel that it would have been appropriate to replicate the figures within this chapter.</p>
RR-029- APDX:E-38	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 38</p> <p>Section 1.1.1.1.68: We are concerned that the impact assessment for cable trenching in the nearshore does not consider all sensitive receptors. This assessment should include Holderness Inshore MCZ, and Smithic Bank, both alone and cumulatively with other projects (e.g. Dogger Bank A&B).</p>	<p>Impacts of elevated SSC concentrations and associated deposition are assessed in Section 7.1.2 and 7.2.2 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070) for the Holderness Inshore and Holderness Offshore MCZs respectively. Consideration of Hornsea Four cumulative with Dogger Bank A&B is presented in Section 7.2.5 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070).</p> <p>Smithic Bank in itself is not a receptor for increased SSC or the associated sediment deposition. Therefore, it was not assessed for this impact. for this impact.</p>
RR-029- APDX:E-39	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 39</p>	<p>The Applicant considers that those receptors relevant to marine processes have been identified and no further additional mitigation measures are required in respect to changes in marine processes.</p>

	<p>Section 1.11.1.69-70: Natural England does not agree with the assessment of magnitude and sensitivity as not all sensitive receptors have been considered (as discussed above).</p> <p>We advise that further mitigation may be required.</p>	
RR-029-APDX:E-40	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 40</p> <p>Section 1.11.1.81/ 1.11.1.87: It is anticipated that up to 10% of all pile installations will require drilling (or up to 10% of the depth across all installations). Given that the underlying geology is not known, it is unclear what the 10% is based on, and consequently we are unable to confirm if this is a realistic worst-case scenario</p>	<p>The Applicant acknowledges Natural England’s comment and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>
RR-029-APDX:E-41	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 41</p> <p>Section 1.11.1.85: This discusses sediment plumes, and associated deposition, in the offshore array area. Yet, this section relates to drilling at the HVAC Booster Stations Search Area. This should be corrected and the impacts of drilling at the HVAC Booster Stations should be assessed (for example, for the Holderness Offshore MCZ).</p>	<p>The Applicant notes the error and agrees that the text within Section 1.11.1.85 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) should refer to the offshore ECC not the offshore array.</p>
RR-029-APDX:E-42	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 42</p> <p>Section 1.11.1.85: Sediment plumes, and associated deposition, due to drilling at the HVAC Booster Station Search Area have not been considered in this chapter. No impact assessment has been provided. However, the anticipated maximum extent, concentration and persistence of both should be provided here, in order to allow assessment of ecological consequences.</p>	<p>Section 1.11.1.84 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) considers sediment plumes and associated deposition resulting from seabed levelling as this activity will produce the greatest suspended sediment concentration. Any effects related to drilling, as stated in Section 1.11.1.84, are considered to be similar (but lesser) sediment plumes in comparison to the seabed levelling activity in this area. This approach is consistent with the Rochdale Envelope and therefore any impacts from drilling will be less than those presented for the seabed levelling.</p>
RR-029-APDX:E-43	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 43</p> <p>Section 1.11.1.88: Nine seismic units have been described, based on sub-bottom profiles of stratigraphy across the offshore array area. It is unclear what these seismic units are and how they relate spatially to the project. Further detail should be provided (i.e. a map).</p>	<p>In terms of physical process effects, the seismic unit that is likely to produce the greatest impact results from disturbance to the chalk layer, due to the potential for chalk arisings. Section 1.11.1.88 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) discusses this seismic unit and illustrates it spatially in Figure 1.14.</p>

RR-029-APDX:E-44	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 44</p> <p>Section 1.11.1.91: It is unclear if the drilling rate considers simultaneous drilling (i.e. at two adjacent drilling rigs). This should be clarified.</p>	<p>The assessment undertaken within Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) considers up to two drilling rigs operating at the same time, if required. If this occurred at adjacent sites along a tidal excursion, then there is the potential for sediment plumes to disperse together and lead to higher overall increases in SSC. As the MDS assumes 10% of foundation locations requiring drilling, the Applicant does not consider it to be realistic to expect that two drilling rigs would be operating at the same time, given that 90% of foundations are not expected to require drilling. Therefore, this assessment is considered highly precautionary.</p>
RR-029-APDX:E-45	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 45</p> <p>Section 1.11.1.104 – 1.11.1.106 & Table 1.18: The anticipated maximum scour footprint around each foundation option should be provided. We also advise monitoring scour development around a number of WTGs (GBS and monopile) and OSS in order to validate scour predictions in the ES.</p>	<p>For any location where a foundation is identified to be at risk of scour during the post-consent phase then scour protection will be installed. The maximum scour footprints for each foundation type are presented in Volume A4 Annex 4.8 Pro rata Annex (APP-047). This scour protection will prevent the development of scour and so no monitoring is required. Scour protection extents (Table 1.18) are anticipated to be greater than the extent of any scour for an unprotected foundation (Section 1.11.1.106 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013)).</p>
RR-029-APDX:E-46	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 46</p> <p>Section 1.11.1.109: It is stated that “All foundations are considered sufficiently separated to mitigate the chance of group scour.” Group scour is known to extend beyond the influence of the foundation with large diameter structures such as GBS or jacket structures and, therefore, has a large cumulative environmental effect when taking into the whole Hornsea 4 array. Therefore, further information should be provided to support this assertion and the separation distance should be stated.</p>	<p>Referring to Table 1.18 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), the maximum extents of scour protection is 50 m for a large foundation noting the separation between foundations is 810 m (centre to centre). If this applied to the GBS (Large OSS) then 75 m from centre plus 50 m around foundation leaves a separation of 560 m which is more than sufficient to prevent group scour. If the separation between foundations was close to or less than 250 m then interactions of local scour might be possible leading to group scour. Therefore, it is the Applicant’s position that scour has been appropriately and adequately assessed.</p>
RR-029-APDX:E-47	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 47</p> <p>Section 1.11.1.112: No impact assessment has been carried out for marine processes receptors yet given the proximity of ‘The Hills’ to the array, the potential impact of the array structures on the adjacent seabed and sand ridge/sandbank system should be assessed over the medium to long-term.</p>	<p>See the Applicant’s response to RR-029-APDX:E-EH above.</p>
RR-029-APDX:E-48	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 48</p>	<p>The Applicant would like to confirm that any uncertainty is limited to the form of any near-field effects (i.e. immediately next to the foundations) rather than altering the view about the</p>

	<p>Section 1.11.1.113: It is stated that “Uncertainties in the assessment relate mainly to large box-type foundations, their orientation to incident flows and the actual form of scour development around their bases, although this may not alter the overall assessment of potential effects.”</p> <p>Natural England is concerned with the potential impact of the MDS foundation type, GBS structures, on the physical environment in particular the adjacent sandbank systems (i.e. The Hills).</p> <p>Given the uncertainties stated here regarding large box-type GBS foundations, we would suggest the WCS should be adapted in terms of their potential effect on scour development and, thus, scour protection requirements.</p>	<p>far-field where there is no influence expected. See the Applicant’s response to RR-029-APDX:E-EH above.</p> <p>Furthermore, the Applicant maintains that GBS foundations remain the worst case scenario for the development of scour and therefore have been appropriately identified and assessed.</p>
<p>RR-029-APDX:E-49</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 49</p> <p>Section 1.11.1.115: The use of jack up barges should also be included in the assessment of turbulent wakes and scour in the nearshore if applicable.</p>	<p>Jack-up barges have small diameter legs that would only lead to very small turbulent wakes (and potentially small-scale scouring around each leg) and for a temporary period. Therefore, no likely significant effects in EIA terms were identified on any marine processes receptors. The wakes from cofferdams, which have been considered within the marine processes assessment, would be larger and for a longer period, in comparison. Therefore, the turbulent wakes would be of a lesser magnitude than that assessed for the cofferdams.</p>
<p>RR-029-APDX:E-50</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 50</p> <p>Section 1.11.1.118 -20: It is unclear if the three-month period of cofferdam placement is the total amount of time cofferdams will be in situ, or if each cofferdam could be in place for a maximum of 3 months (with no more than 3 in situ at any one time). This should be clarified in order for Natural England to consider the conclusions of this section. Once clarified, this timeframe should be secured within the DCO/dML conditions.</p>	<p>The Applicant would like to clarify that the three month period refers to each set of three cofferdams, so theoretically there could be three periods of three months to account for up to eight HDD exit pits. Given that the DCO (and DML) powers will be limited to what has been assessed in the EIA, it is the Applicant’s position that a DML condition is not required as it is already inherently secured. However, the Applicant will seek to engage with Natural England on this point through the SoCG process.</p>
<p>RR-029-APDX:E-51</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 51</p> <p>Section 1.11.2.4: Provision has been made for cable protection for up to 10% of the total amount of cables where cable burial cannot be achieved. It is not clear how this figure has been calculated, but we are aware that this figure has been used for other projects. It would, therefore, be beneficial if we could understand how this figure has been calculated.</p>	<p>The Applicant acknowledges Natural England’s comment and can confirm that a workstream is underway to review the maximum design scenarios against the survey data from the 2021 campaign that was not available at a timescale for incorporation into the Environmental Statement. The Applicant will provide an update on this workstream by means of a Clarification Note on the Justification of Offshore Maximum Design Scenarios which will be submitted at Deadline 3.</p>

	<p>Natural England note and welcome that there will be no cable protection within 350m seaward of MLWS (Co188), however, we have particular concern with the impact of cable protection on Smithic Bank and advise that cable protection on or in close proximity of the Bank needs to be avoided, with evidence brought forward to demonstrate any separation distance is sufficient.</p>	
<p>RR-029-APDX:E-51B</p>	<p>The placement of rock protection represents a long-term permanent impact to the seabed and, therefore, should be minimised as far as possible noting that “The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment” (Paragraph 2.6.196 of NPS EN-3). As it is anticipated that rock protection will remain in situ beyond the operational lifetime of the project, it is important that the potential impacts on all sensitive receptors are fully assessed.</p>	<p>See the Applicant’s response to RR-029-APDX:E-EJ above. The expected effects on marine processes due to rock armour are described in Section 1.11.2.6 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p>
<p>RR-029-APDX:E-52</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 52 Section 1.11.2.12: Whilst we welcome the wave and tidal modelling that has been carried out, as presented in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report, there is no specific scour assessment for the HP4/Dogger Bank A&B Cable Crossing. Furthermore, the HP4/Dogger Bank A&B Cable Crossing footprint area used in the wave and tide modelling in the Technical Report is quoted as 500m x 770m, yet the area presented in Figure 5 of the Technical Report suggests that this cable crossing footprint area is approximately 1000m x 2000m. Therefore, we are concerned that the extent of scouring around the HP4/Dogger Bank A&B Cable Crossing could actually be 2 to 2.5 times greater than estimated. Section 1.11.2.12 describes modelling of a MDS case for the combined rock berm occupying an area of 500m by 1000m and up to 3m high. As we have noted above, the wave and tidal modelling in the Technical Report have adopted a cable crossing footprint area of 500m by 770m (by 3m high), yet in Figure 1.2 in the Marine Processes Chapter and Figure 5 in the Technical Report etc, this cable crossing area would appear to be</p>	<p>Scouring is a near-field processes which is not directly represented in this type of model but can be inferred by the predicted changes in flow speeds. The areas with maximum flow accelerations at the corners of the rock berm which overlap with the seabed (rather than on the rock berm) can be deduced as being relevant to the potential to develop local scouring but only if the seabed is erodible (noting the local sediment type is described as sandy gravel). Once any scouring reaches an equilibrium depth, then the effect of local flow accelerations on the seabed will be accommodated by the scour hole. Figure 1.2 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) and Figure 5 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provide a representation of the area within which cables cross rather than the specific location of the far smaller crossing within this area. (N.B the width of the Dogger Bank A&B ECC allows the cables to be placed within this corridor rather than at this width.) To model the MDS case the crossing has been positioned at the closest point possible to Smithic Bank within this area. Details of the rock berm described in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) relate to the plan area of the top of the rock berm, noting side slopes account for an additional width of 25 m around this feature. Therefore, it is the Applicant’s position that the worst-case scenarios have been correctly identified and assessed for the purposes of EIA.</p>

	<p>significantly greater than that used in modelling. The MDS for this cable crossing footprint should be stated in order to assess the worst-case scenario for marine processes.</p>	
<p>RR-029-APDX:E-53</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 53</p> <p>Section 1.11.2.14: It is stated that “Uncertainties in the assessment relate mainly to depth of mobile sediments which may impede full equilibrium scour depths.”</p> <p>Given our comment above, and the uncertainty regarding the mobility of sediments at the Hornsea 4/Dogger Bank A&B Cable Crossing, we cannot agree that scouring at this cable crossing will have a negligible magnitude. Furthermore, there is the additional concern that the Hornsea 4/Dogger Bank A&B Cable Crossing is still not situated in sufficiently deep water as to avoid significantly reducing water depths and, dissipating storm wave energy, at a location just seaward of Smithic Bank.</p> <p>High-resolution geophysical surveys were due to be completed in 2021, and we assume that these would help eliminate some of this uncertainty. This evidence should be provided and used to update the scour assessment at the Dogger Bank A&B Crossing whilst considering the lifetime of the project and climate change impacts. No impact assessment has been offered here for marine processes; therefore, we would wish to see this assessment carried out.</p>	<p>See the Applicant’s response to RR-029-APDX:E-52. Scouring is a near-field process which occurs at a small scale on a live bed. Scouring over depth may be inhibited by less erodible material composition, as per the local sediment type which is described as sandy gravel.</p> <p>The geophysical survey report for the ECC is provided in Appendix E of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report. Interpretation of high-resolution geophysical surveys has been used to classify sub-bottom profiles, e.g. Figure 20 of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). These data have been used to inform the assessment. Geophysical surveys can determine the vertical structure of the seabed from acoustic refraction off different substrate types (densities) but not their erodibility.</p>
<p>RR-029-APDX:E-54</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 54</p> <p>Section 1.11.2.27: It is stated that “The inclusion of 10 GBS box-type foundations in the array with greater widths (75m and 150m), and also non-cylindrical shapes, increases the potential for wake-to-wake interactions across parts of the array which are in the leeward path of the larger foundations.”</p> <p>Whilst it is suggested that the area affected by these wake-to-wake interactions will be limited, this has not been demonstrated or qualified. Evidence should be provided to show the spatial extent of these wake-to-wake interactions.</p>	<p>The final array layout (within which the locations of any larger box-type GBS foundations (if selected) will be specified), is still to be confirmed.</p> <p>Wake-to-wake interactions would only exist if the alignment of a larger foundation with an adjacent foundation was coincident with the alignment of flows.</p> <p>The measurable distance of any wake is likely to be less than the minimum separation between foundations of 810 m, however, the “potential” for interactions increases for the larger foundations, i.e. a larger wake over a longer distance but also dissipating within the minimum separation.</p>

RR-029-APDX:E-55	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 55</p> <p>Section 1.11.2.28: “Turbulent wakes are not expected to interact with the Flamborough Front.” The magnitude of impact has been assessed as ‘negligible’ for this effect.” The Flamborough Front is located close to/overlaps the HP4 array (and HP2 and HP1)/ Given the importance of the Front to primary productivity (and in turn secondary productivity), a better understanding of the potential impacts of the project alone (and in combination) is required.</p>	<p>An assessment of the Flamborough Front is provided in paragraphs 1.11.2.24 to 1.11.2.33 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The assessment concluded in paragraph 1.11.2.31 that the magnitude of any impact on the Flamborough Front is negligible because the influence from any turbulent flow wakes is likely to remain spatially distant. Given the magnitude of this impact, no measurable indirect impacts on ecology including primary or secondary productivity, benthic ecology, birds, mammals or fish are anticipated.</p> <p>The Applicant would like to re-iterate that the proximity and scale of Hornsea Four with the Flamborough Front is small in relation to this feature in its entirety. Also, see the Applicant’s response to RR-029-APDX:E-8.</p> <p>Whilst the Flamborough Front may have the potential to overlap with parts of the Hornsea Project One and Hornsea Project Two arrays, the structures which have been installed within these projects are monopiles which are considered to lead to the smallest scales of turbulent wakes compared to other foundation options. The data presented in Figure 37 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) suggests the Flamborough Front is more often to the north or south of Hornsea project Four.</p>
RR-029-APDX:E-56	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 56</p> <p>Section 1.11.2.30: We would advise that the sensitivity of the Flamborough Front should be considered High until further evidence to the contrary has been provided.</p>	<p>The Applicant notes the opinion of Natural England. However, it is the Applicant’s position that the magnitude of the potential impact is negligible (see response to RR-029-APDX:E-55) and therefore even if the sensitivity were increased if the sensitivity of the feature was considered high then the associated impact according to Table 1.16 would become slight (not significant) rather than neutral (not significant). Therefore, no significant effects in EIA would be predicted</p>
RR-029-APDX:E-57	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 57</p> <p>Section 1.11.2.31 - 32: Given the uncertainties discussed above, we cannot agree at this stage with the assessment of the magnitude of impact on the Flamborough Front, nor the significance of the effect. Therefore, we do not agree the impact assessment. We advise that mitigation will be required.</p>	<p>See the Applicant’s response to RR-029-APDX:E-55 and RR-029-APDX:E-56. No further mitigation is considered necessary as there are no likely significant effects on this basis. Furthermore, the Applicant does not feel there is sufficient uncertainty to warrant additional mitigation measures.</p>
RR-029-APDX:E-58	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 58</p>	<p>The Applicant apologises for any unintended confusion due to the labelling on Figure 46 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The figure has been re-labelled and this change will be presented in an updated version of the document.</p>

	<p>Figure 1.18: Please see our comments on the same graph in Figure 46 of the Technical Report. The legend is not clearly explained, for example, it is unclear what the labels 'E_50pct', 'E_50pct baseline'</p>	
<p>RR-029-APDX:E-59</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 59 Section 1.11.2.41-42: It is stated that the rates of cliff erosion and patterns of longshore drift along the Holderness Coast are the primary environmental interest sensitive to potential changes in wave energy transmission due to Hornsea Four. We would disagree. The form and function of Smithic Bank are equally important since the sandbank protects the coastal hinterland, including the town of Bridlington. Moreover, lowering of Smithic Bank due to HP4 related project impacts could have a significant impact on longshore sediment transport. Therefore, we would advise that both receptors have high environmental value.</p>	<p>As explained in the Applicant's responses to RR-029-APDX:E-EF and RR-029-APDX:E-EG above, Smithic Bank only has a localised influence on the Holderness Coast and mostly for the section updrift of the drift divide. Further justification is also provided in the Applicants responses to Points 4, 7, and 13 above. It is the Applicant's position that Smithic Bank, coastal processes and associated sediment pathways has been appropriately and adequately assessed.</p>
<p>RR-029-APDX:E-60</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 60 Section 1.11.2.43: We are concerned that the wave shadow effect of the Hornsea4 GBS array (and cumulatively with Hornsea 2 and Hornsea 1 array) through the lifetime of the project has not been assessed. This is also the case for the HVAC Booster Station Search Area and the rock berm at the HP4/Dogger Bank A&B Cable Crossing. Therefore, we cannot rule out potential adverse effects to sensitive receptors and designated sites downwind of these areas (e.g. Holderness Offshore MCZ, Holderness Coast, Smithic Bank), until this has been assessed over the lifetime of the project. Moreover, Section 4.8.3.17 in the Technical Report estimates up to 10% wave height reduction effects on the leeward side of the array. Without a consideration of these effects over the lifetime of the project, we cannot understand the spatial extent and potential impacts of the wave shadow effect on downwind receptors.</p>	<p>The Applicant assessed the potential impacts occurring throughout the lifetime of the project in Section 1.11.2 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). This assessment of the operational phase is consistent with numerous recently consented offshore wind farm developments.</p> <p>The Array The Applicant disagrees with this comment. A detailed examination of wave blockage has been provided which includes new modelling representing built windfarms and conservative options for Hornsea Four for the offshore array area, the HVAC booster station and the nearshore crossing. Figure 45 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides a representation of the most severe wave height reductions of all wave scenarios considered which is then examined in Figure 46 at coastal locations to show that no changes occur at the coast. Other scenarios reported in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) demonstrate a lesser effect. Waves passing across the array do not interfere with sediment transport processes since the depths here are too great. Therefore any immediate wave height reductions at this location have no consequence on the receptors identified in Natural England's representation.</p> <p>HVAC booster station</p>

		<p>An assessment of turbulent wakes arising from the HVAC booster substation during the operational phase of the development is assessed in paragraphs 1.11.2.20 to 1.11.2.23 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013).</p> <p>Dogger Bank A&B crossing</p> <p>As concluded in paragraph 1.11.2.13 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) any scour which may occur around cable crossings would be negligible in magnitude and so not significant in EIA terms.</p>
RR-029-APDX:E-61	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 61</p> <p>Section 1.11.2.43-45: We remain concerned that the raised profile of the cable crossing with Dogger Bank A & B just seaward of Smithic Bank could lead to morphological change at Smithic Bank, which in itself plays a vital role in the Holderness coastal sediment transport system. Therefore, we cannot agree at this stage with the conclusion of the assessment.</p>	<p>Numerical modelling (waves; tides) for a conservative case of a 3 m high crossing is presented in Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067). There are no sediment transport regime changes predicted that are sufficient enough to detrimentally affect the form and function of Smithic Bank nor the Holderness coastal sediment transport system. Of further note is that the vector for any changes in flows is largely north and south of the cable crossing.</p>
RR-029-APDX:E-62	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 62</p> <p>Section 1.11.2.50: We remain concerned that the Dogger Bank A&B Crossing (and associated cable protection) is still sufficiently close to Smithic Bank, and in sufficiently shallow water, as to potentially affect the nearshore wave-current and sediment transport regimes. This, in turn could affect the integrity and morphology of Smithic Bank. Therefore, we advise that further assessment be carried out to provide a better understanding of the impact of the Dogger Bank A&B cable crossing on Smithic Bank and the nearshore zone. The cumulative impacts of the Hornsea Four Dogger Bank A&B, and Scotland to England Green Link 2 cables (and their protection) should be considered over the long-term (i.e. lifespan of the crossing).</p>	<p>The Applicant welcomes Natural England’s position (Point 17) on locating the Dogger Bank cable crossing to the east of Smithic Bank and seaward of the 20 m depth contour. It is noted that this depth contour is located at least 2.5 km seaward of the commencement of the outer eastern slope of Smithic Bank. To add further clarity, technical review of the MDS is ongoing to assess the burial depths and any requirement for rock placement upon Smithic Bank.</p> <p>The effect of the conservative MDS case of a 3 m high crossing on moderating waves has been included in the modelling, noting Figure 45 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) shows the magnitude and extent of wave height reduction of easterly waves related to the crossing. Wave height reductions are considered to have dissipated at around 350 m from the crossing and are therefore sufficiently remote from the bank (i.e. they are still over 2 km from the outer eastern slope of Smithic Bank. This distance is also sufficiently remote from the depth of closure contour (outer and inner closure at around 9 m and 7 m, approximately) so as not to be capable of altering any wave driven sediment transport effects on the bank.</p> <p>In order to assess any alterations to the current regime due to the cable crossing, four numerical modelling scenarios were undertaken (Section 4.6.2.7 and Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). It is shown that the current regime undergoes slight reductions in the locality of the crossing (and in alignment to the</p>

		<p>generally north-south direction of flows which is not towards the bank) but not in its capacity to transport medium and fine sand. Consequently, an alteration of the general nearshore sediment transport is not anticipated.</p> <p>The Scotland to England Green Link 2 cable will pass to the north of the offshore ECC, also crossing Smithic Bank and without any requirements for a cable crossing (Section 1.12.8.1 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013)). Although timescales are currently unavailable for the Scotland to England Green Link 2 project and given that the natural variation in the seabed profile over the 39 year period (1980 to 2019) suggests that cables are very unlikely to be exposed by natural processes over the lifetime of Hornsea Four (Figure 43 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)), the only likely cumulative effects with Hornsea Four would be related to construction related sediment plumes. The likelihood of this occurrence is considered low based on presently available information.</p>
<p>RR-029-APDX:E-63</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 63</p> <p>Section 1.11.2.52: We remain concerned about the potential placement of any cable protection across Smithic Bank as this could lead to a reduction in water depth within the water column, and potentially lead to local scour and the formation of a barrier to sediment transport. Significantly altering the profile of the sandbank could have a significant impact on longshore drift, and in turn, could result in impacts to features much further afield.</p> <p>The potential impacts to sandbank morphology due to cable reburial or replacement across Smithic Bank through the lifetime of the project should also be considered.</p> <p>It should be noted that as things stand, the Maximum Design Scenario would allow for an eventuality whereby rock protection was placed along the full length of the cables across Smithic Bank.</p>	<p>See the Applicant's response to RR-029-APDX:E-EF and RR-029-APDX:E-EG. The Applicant highlights that cable protection (rock protection) is not a prerequisite and is only a contingency measure within the Hornsea Four design envelope. Therefore, a degree of precaution has been built into this assessment.</p> <p>Section 11.2.51 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) reviews the issue of rock protection across Smithic Bank. Furthermore, during consultation on the Project Description at the PEIR stage, the MMO indicated that impacts on Smithic Bank could be reduced by crossing the Dogger Bank A&B export cables in water depths greater than 20 m and seaward of Smithic Bank. As a result, the Applicant made a commitment to move the crossing with Dogger Bank A&B east of Smithic Bank to reduce impacts on this receptor (Co189, Volume A4, Annex 5.2: Commitments Register (APP-050)) as well as a commitment to place no cable protection within 350 m seaward of Mean Low Water Springs (MLWS) (Co188, Volume A4, Annex 5.2: Commitments Register (APP-050)).</p> <p>The Applicant notes that any cable protection required on Smithic Bank would be for post-burial remediation. As detailed in paragraphs 1.11.2.46 – 1.11.2.56 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), low profile rock armour berms may have a localised effect on sediment transport at the southern end of the bank only.</p> <p>Figure 43 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) provides a cross-section profile of Smithic Bank based on the geophysical survey data along with the</p>

		nominal depth of burial for cables at both 2 and 3 m for context. The cross-section also shows the profile of the seabed from 1980 and 2011. The natural variation in the profile of the seabed over the 39 year period (1980 to 2019) suggests that cables are very unlikely to be exposed by natural processes over the lifetime of Hornsea Four, meaning the chance for cable reburial and rock protection would appear to be effectively nil.
RR-029-APDX:E-64	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 64</p> <p>Section 1.1.1.2.53 - 56: The wave and tidal modelling results for the Hornsea 4/Dogger Bank A&B Cable Crossing Area presented in the Technical Report, have been based on a cable crossing footprint area of 500m by 770m, whilst the WCS cable crossing footprint area shown in the figures of this chapter clearly show a significantly greater footprint area. Furthermore, whilst we acknowledge that useful wave and tidal flow modelling have been carried out for this area, these have not been taken forward to actually predict changes to sediment transport pathways and, in turn, long-term erosion and/or accretion patterns in the nearshore. Therefore, owing to these uncertainties, we cannot agree with the conclusions that the magnitude of impacts will be negligible to minor, nor that the significance of the effects on Smithic Bank, the Holderness Coast, and other sensitive receptors, will be slight for the project alone, and in combination.</p>	<p>See the Applicant's response to RR-029-APDX:E-52.</p> <p>The figures presented in Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), and Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) provide a representation of the area within which cables cross, rather than the specific location of the much smaller crossing within this area.</p> <p>Details of the rock berm described in Appendix C of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) relate to the plan area of the top of the rock berm, noting that the side slopes account for an additional width of 25 m around this feature. Further, to model the MDS case the crossing has been positioned at the closest point possible to Smithic Bank within this area.</p>
RR-029-APDX:E-65	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 65</p> <p>Section 1.1.1.3.2: As rock berms are expected to remain in situ, their impacts beyond the operational lifetime of the project need to be assessed in the context of any receptors which could be affected by their persistence.</p>	<p>See the Applicant's response to RR-029-APDX:E-EI.</p>
RR-029-APDX:E-66	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 66</p> <p>Section 1.1.1.3.8: Natural England consider Smithic Bank to be of high environmental value.</p>	<p>This is noted by the Applicant. However, the Applicant wishes to highlight that based on the magnitude of impacts on Smithic Bank an increase to sensitivity would not result in predicted significant effects. Furthermore, Smithic Bank is not currently designated as an Annex I habitat.</p>
RR-029-APDX:E-67	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 67</p>	<p>See Applicant response to RR-029-APDX:E-GA.</p>

	<p>Table 1.20: We would advise that the Viking Link interconnector cable should be screened into the marine processes cumulative assessment and thus included in this table.</p> <p>It should be noted that Eastern Green Link and the Northern Endurance Partnership should now be considered in Tier 2. Dogger Bank South Offshore Windfarm is also at scoping stage and should therefore be considered as Tier 2.</p>	
<p>RR-029- APDX:E-68</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 68</p> <p>Section 1.12.7.3 & 1.12.7.4: Given that the proposed Endurance storage facility overlaps the northern part of the HP4 array, and the pipeline will need to be crossed by the HP4 offshore ECC, there may be cumulative impacts which should be considered. This should include the cumulative impact of O&M activities as well as additional wake effects if infrastructure is placed within or adjacent to the Hornsea Four array.</p>	<p>There is effectively no likelihood that any infrastructure related to Endurance would be in close enough proximity to foundations across Hornsea Four to produce wake interactions. Relevant details from Endurance will be considered if made available during Examination.</p>
<p>RR-029- APDX:E-69</p>	<p>Detailed comments – Volume A2.1 Marine Geology, Oceanography and Physical Processes: Point 69</p> <p>Section 1.12.8.1: The SEGL2 landfall site 'may potentially be to the of the Hornsea 4 landfall with a cable which would pass across Smithic Bank to the north of the OECC. Potential cumulative effects with HP4 relate to construction-related sediment plumes should both projects be installed around the same period.</p> <p>SEGL2 cable installation and protection requirements across Smithic Bank when coupled with the Dogger Bank A&B export cables, and HP4 export cables all passing across the sandbank will need to be considered cumulatively in terms of potential impacts to the form and function of the sandbank.</p>	<p>Paragraph 1.12.8.1 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) also states that the likelihood for cumulative sediment plumes during installation activities of both projects is effectively nil as the chance for this occurring in the same period is minimal.</p> <p>Existing evidence suggests that the section of Smithic Bank planned to be crossed by Hornsea Four is demonstrably stable for equivalent periods to the operational lifetime of this project. See Figure 43 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067).</p>

6.7 Detailed comments: Volume A5, Annex 1.1: Marine Processes Technical Report

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-70	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 70</p> <p>Section 3.2.4.1: Holderness Inshore MCZ (including Spurn Head Feature), Humber Estuary SAC, SPA (supporting habitat), Ramsar, SSSI., Dimlington Cliffs SSSI, and Smithic Bank should be included as landfall study area receptors.</p>	<p>Holderness Inshore MCZ is considered within Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). The Humber Estuary Sac, SPA and Ramsar are assessed within the RIAA (see Volume B2, Chapter 1: Report to Inform Appropriate Assessment Part 1 (APP-167) and Volume B2, Chapter 2: Report to Inform Appropriate Assessment Part 2 (APP0168)). Smithic Bank is considered as a receptor for the offshore ECC activities within Table 8 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). All relevant SSSIs are considered in Volume A2, Chapter 2: Benthic and Intertidal Ecology.</p> <p>The Applicant has provided detailed justification in responses to RR-029-APDX:E comments from Natural England, noting that no measurable impacts would be observed at the designated sites such as Flamborough Head SAC, Humber Estuary SAC, SPA, Ramsar and SSSI, Holderness Inshore MCZ and Dimlington Cliffs SSSI as a result of the temporary access ramp.</p>
RR-029-APDX:E-71	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 71</p> <p>Section 3.3.3.13: It is stated that “On the outer (easterly) flank, sandwave asymmetry is with the flood tide, moving sands to the south-west onto the bank..” Natural England queries if this is correct.</p>	<p>This statement relates to the northern end of the bank. Figure 19 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) illustrates the sand transport vectors which supports this statement. Figure 19 includes the northern end of Smithic Bank where high resolution survey data resolves distinctive sandwave asymmetry.</p>
RR-029-APDX:E-72	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 72</p> <p>Section 3.4.1.4: It is stated here that wave energy transmission through the Hornsea 1 array undergoes no detectable reduction due to the monopile foundations now installed. It also states that this “...outcome is also expected to remain true for Hornsea Project Two based on a similar final design which greatly alleviates the case of potential cumulative impacts with Hornsea 4”. Evidence needs to be provided to support this assumption.</p> <p>Natural England highlights that given that the WCS for HP4 comprises: 110 GBS WTC, 70 mono-suction WTC, 3 GBS OSS (large) GBS, 7 GBS OSS (small) plus one accommodation platform, this presents quite a different</p>	<p>The primary evidence is the review of wave measurements passing through Hornsea Project One which has been subject to scrutiny with the Evidence Plan Technical Panel and is reported in Orsted (2020). The EIA for Hornsea Project One and Two both considered larger diameter gravity base foundations which therefore assumes any other foundation option would have a lesser effect. Monopiles are the foundation options with the minimal amount of blockage which alleviates the case for any potential cumulative effects with Hornsea Four. The wave modelling has considered all projects with outputs that further substantiate this point.</p> <p>Wave energy blockage for all projects has been modelled to demonstrate no wave height reductions reach the coastline hence would not affect the coastline over the lifetime of the project, noting return period events up to 100 years have been assessed</p>

	<p>scheme layout to HP1. Therefore, we have concerns regarding the potential impacts on wave energy transmission over the lifetime of not only Hornsea 4, but also when combined with Hornsea 1 and Hornsea 2, and advise that this should be fully investigated.</p>	
RR-029-APDX:E-73	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 73</p> <p>Figure 36: A full year of data has been assessed from the 3-D baroclinic model, but only a snapshot from the end of July 2018 has been provided in Figure 36. This does not provide any information on the temporal variation of the front at each position. Further schematics showing the Flamborough Front position throughout the year should be provided to help understand the potential impacts.</p>	<p>Figure 36 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) has been presented for July 2018 as this is the characteristic month when the feature is most developed. The Flamborough Front is a seasonal feature which only develops during the summer months, as confirmed from the analysis of ten years' worth of satellite data (Figure 37 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067)).</p> <p>An independent study is underway which will provide further assurance to the position of Flamborough Front and the potential impacts of Hornsea Four upon this seasonal feature, both in isolation and in-combination with other developments. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
RR-029-APDX:E-74	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 74</p> <p>Figure 37 & 3.4.3.11: Figure 37 title presents seasonal front maps for the frequency of occurrence across the study area and also the position of the Flamborough Front from the 3-D baroclinic model for July 2018. The latter is a snapshot from one year, and not representative of the average position of the front over a number of years. Furthermore, the Summer front map shows 90-100% occurrence of the front both south and north of the Hornsea Four array area (based on cloud-free satellite images over a 10-year period), Based on this latter data, the Hornsea Four array area would appear to be located within a zone of 90-100% occurrence of the Flamborough Front. This appears to contradict the last sentence in Section 3.4.3.11 "...Hornsea Four also occupies a location where there is an apparent reduced frequency of occurrence for the front.". Therefore, we do not agree with the quoted statement. The potential extent of overlap with the Flamborough Front needs to be clarified.</p>	<p>See the Applicant's response to RR-029-APDX:E-73.</p> <p>Figure 37 of Volume A5, Annex.1.1: Marine Processes Technical Report (APP-067) presents the location of the Flamborough Front for winter, spring, summer and autumn periods as a frequency of occurrence based on satellite data over a 10 year period. The front is mainly located either south or north of Hornsea Four where the probability of occurrence is 80 to 100% (red areas). A separate analysis of modelled data shows that the front is south of the array for the representative period of July 2018.</p>
RR-029-APDX:E-75	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 75</p> <p>Section 4.3.4.1/ 4.3.5.1: Provisions exist for boulder clearance along the offshore ECC and within the offshore array area as well as within the</p>	<p>The Applicant notes that methods for boulder clearance are described in Volume A1, Chapter 4: Project Description (APP-010). Where a high density of boulders is present, the expectation is that a plough will be required to clear the cable installation corridor. Where the boulder plough is used to clear the cable routes, it will result in the redistribution of</p>

	<p>HVAC booster station search area., yet it is not stated where these boulders will be removed to and therefor the potential impact of this cannot be considered. Further clarification should be provided and the potential impacts to marine process receptors should be assessed.</p>	<p>boulders along the edges of the cable routes affected. However, the boulder density will not be high enough to form an artificial reef given the small width of the clearance corridor. It is considered unlikely that the use of ploughs will create a greater seabed disturbance than a Control Flow Excavator (CFE) (BERR, 2008) which has been assessed within the marine processes assessment (Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). The plough will move the boulders to the width of the plough on the seabed.</p> <p>Where medium and low densities of boulders are present, a subsea grab is expected to be employed to relocate the boulders. This allows the boulders to be relocated in a 'natural' scattered manner, with only limited seabed interaction and therefore does not disturb seabed sediments. All boulders will be retained within the Order Limits. The boulders would be relocated from their source to a location within the surveyed area that has been declared 'clear' of other possible hazards or constraints (i.e. other boulders, Archaeological Exclusion Zones (AEZs), Unexploded Ordnance (UXO)) from review of the post-consent geophysical survey results and subsequent inspection surveys and UXO clearance campaigns. Therefore, the exact location of relocation cannot be known at this time.</p>
<p>RR-029- APDX:E-76</p>	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 76</p> <p>Section 4.3.6.29: Modelling of an indicative sediment plume and spoil deposition event from seabed levelling within the array is based on one site located central to the array. However, this does not consider any overlapping impacts from concurrent seabed preparation activities, therefore the cumulative impact cannot be assessed. We would, therefore, advise considering carrying out the modelling for two neighbouring sites within the centre of the array.</p>	<p>Full details of the temporal and spatial extent of the modelled scenarios is presented in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p> <p>Sediments disturbed in the offshore array area are mainly sands which settle out relatively quickly with minimal residual effects after three days from cessation. Suspended sediment concentrations remain low during the period of disturbance. A second concurrent source of suspended sediment plumes would act in an additive capacity with overall concentrations also remaining very low. There is no case to represent this with modelling as the net effect can be adequately deduced from the model results.</p>
<p>RR-029- APDX:E-77</p>	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report: Point 77</p> <p>Figure 46: It is not clear what the legend means in Figure 46, for example, 'E_50pct', 'E_50pct baseline' etc. Consequently, we cannot interpret or draw any conclusions from this figure.</p>	<p>The Applicant apologises for any unintended confusion due to the labelling on Figure 46 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The figure has been re-labelled and will be provided in an updated version of the document.</p>

6.8 Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix A, B, C

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-78	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix A – Comparison of Marine Processes across the former Hornsea Zone: Point 78</p> <p>Section 9. Geology: Neither Chapter 1 nor the Annex 1.1 Technical Report provide a map of regional solid geology. This is an important part of the baseline characterisation and should be included.</p>	<p>The Applicant notes that Figures 1.13 and 1.14 of Appendix A of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides mapped geological information (depth to base of Holocene layer; seabed to top of chalk layer) pertinent to the marine processes assessment.</p>
RR-029-APDX:E-79	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix B– B2, B3, B4, B5: Point 79</p> <p>Figures B3-B6, Figures B7-B10, Figures B11-14 Figures B15-B18: It would be helpful if sensitive receptors and designated sites could be included in these figures.</p>	<p>The Applicant does not consider that any sensitive receptors are in range of the potential changes described by the model which are limited to a distance of less than one kilometre around the footprint of the rock berm. Therefore, alterations to the figures is not required to inform the assessment.</p>
RR-029-APDX:E-80	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix C – Marine Processes Modelling: Point 80</p> <p>General Comment: It would have been helpful if a number of the figures presented in this annex had been included in the main chapter for context, or better signposted to from the main chapter.</p>	<p>See the Applicant's response to RR-029-APDX:E-37.</p>
RR-029-APDX:E-81	<p>Detailed comments – Volume A5, Annex 1.1: Marine Processes Technical Report - Appendix C, 4.4 Cable Crossing Protection Scenarios: Point 81</p> <p>Section 4.4.1.1: The configuration of the Hornsea 4/Dogger Bank A&B Cable Crossing is described here as having the potential for up to 24 individual crossings within a relatively local area which is just seaward of Smithic Bank. However, in Table 7 of the Technical Report, the number of cable crossings at the HP4/Dogger Bank A&B Cable Crossing is stated as 12 (with up to 2 cable pairs). Moreover, in Table 1.13 of the Marine Processes Chapter which discusses the MDS for marine processes impacts, it is stated that 'up to six export cables (HVAC option) from Hornsea Four will cross the export cables (up to two pairs of cables) of Dogger Bank A and B (12 crossings)'. A consistent definition of this cable crossing should</p>	<p>The Applicant would like to confirm that two pairs of cables represents four cables. Details of the rock berm are described in Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) and relate to the plan area of the top of the rock berm, noting that the side slopes account for an additional width of 25 m around this feature. Further, to model the MDS case the crossing has been positioned at the closest point possible to Smithic Bank within this area. The Applicant therefore considers the representation of the crossing in the model to be highly conservative.</p>

be used throughout, if possible, explicitly stating 12 or 24 cable crossings and the MDS for the cable crossing footprint area should also be stated.

6.9 Detailed comments: Volume A2, Chapter 11: Infrastructure and Other Users

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-82	Detailed comments – Volume A2, Chapter 11:Infrastructure and Other Users: Point 82 Figure 11.9: This map should indicate the presence of any designated sites and sensitive receptors.	The Applicant does not consider it necessary to indicate designated sites and sensitive receptors on figures within Volume A2, Chapter 11: Infrastructure and Other Users (APP-023) .
RR-029-APDX:E-83	Detailed comments – Volume A2, Chapter 11:Infrastructure and Other Users: Point 83 Figure 11.9: The proposed Endurance CO2 storage facility pipeline should also be shown on the map, if the location is known.	The Applicant can confirm that no planning application has been submitted in relation to the offshore elements of the Northern Endurance Partnership project and as such, no locations of the proposed pipeline exist in the public domain.

6.10 Detailed comments – Volume 4, Annex 4.8: Pro-Rata Annex

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:E-84	Detailed comments – Volume 4, Annex 4.8: Pro-Rata Annex: Point 84 Table 1: It is unclear why the three HVAC Booster Stations and Accommodation Platforms are not included in this table. Natural England would like to see a pro-rata breakdown of the seabed preparation works for the HVAC booster station.	As shown in Table 4.7 of Volume A1, Chapter 4: Project Description (APP-010) , the small OSS foundation options will be used for the HVAC booster stations and accommodation platforms. Therefore, the foundations for the HVAC Booster Stations and Accommodation platforms are the same as either the Wind Turbine Generators or the Offshore Substation foundation types, the details of which are included in the tables in Volume A4, Annex 4.8: Pro-rata Annex (APP-047) . Including these figures separately would result in significantly larger tables with no new information in the annex. However, the Applicant would be willing to provide this should it still be deemed necessary.

7 Appendix F -Benthic and Intertidal Ecology

7.1 Project Parameters

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-A	Project Description: The project parameters are clearly defined.	This is welcomed by the Applicant and is captured in the SoCG with Natural England in relation to offshore matters.
RR-029-APDX:F-B	<p>NE position on Worst Case Scenario (WCS) and Maximum Design Scenario (MDS): The ES chapter sets out the Maximum Design Scenario (MDS) for the project, however, Natural England note that there are a number of instances whereby the MDS is based on conservative assumptions rather than being underpinned by survey data. For example, sandwave clearance and boulder clearance are based on clearance across the full length of the cable corridor, despite the baseline characterisation indicating that this will not be required. Additionally, the requirement for secondary cable protection (rock protection) and replenishment is based on an estimated percentage, rather than a cable burial risk assessment informed by survey data, as is the percentage of piles that may require drilling. Natural England is concerned that these overly cautious estimates then translate into what is effectively seen by the Applicant as an "allowable amount of impact", and there is little impetus for them to refine this post consent. This approach conflicts with the principles of the 'mitigation hierarchy' and the emphasis within it on avoiding and reducing impacts.</p> <p>In light of Paragraph 2.6.196 of NPS EN-3, which requires that "The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment", it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave clearance and cable protection and replenishment.</p>	See Applicant response to RR-029-APDX:E-B.

7.2 Baseline Characterisation

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-CA	<p>Data suitability and baseline characterisation: Natural England are generally satisfied with the baseline data collected including the method and consider the sampling frequency within the order area to be adequate. However, it is unclear how the benthic environment as characterised within the benthic study area has been used to inform impacts outside the order limits where habitats may be different, therefore our confidence in this area of the assessment is lower. Clarification on this matter would be useful.</p>	<p>The Applicant welcomes Natural England's agreement with the baseline data collection and sampling frequency within the Hornsea Four Order Limits.</p> <p>The Hornsea Four benthic subtidal ecology study area is defined by a 10 km buffer surrounding the array area, and a 14 km buffer around the offshore ECC, to represent the tidal ellipse distance, in order to incorporate the maximum distance sediments may travel in one tidal cycle (Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). A detailed characterisation of the benthic ecology baseline is presented in Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068). As presented in Section 1.2 of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068), using existing data, including benthic subtidal grab data from former Hornsea Zone, other Hornsea projects and Dogger Bank A and B Offshore Wind Farms (Dogger Bank A & B), together with publicly available information, new data collected specifically for Hornsea Four and benthic habitat modelling, the objective was to develop a robust baseline description of the subtidal benthic and intertidal resources within the Hornsea Four Order Limits and surrounding area. In addition to this, the habitat model (Figure 2.4 to Figure 2.7 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014)) revealed the biotopes across the site, particularly in the offshore section of Hornsea Four benthic subtidal ecology study area. Therefore, it is the Applicant's position that there is adequate information for the purposes of baseline characterisation for benthic ecology</p>
RR-029-APDX:F-CB	<p>Natural England wish to see additional raw data relating to the classification of Stony Reef to confirm it is in fact of 'low' reefiness. We also request a more precautionary approach is taken in any reef assessments conducted during pre-construction surveys.</p>	<p>The Applicant notes that paragraph 2.7.1.36 of Volume A2, Chapter 2: Benthic and Intertidal Ecology Chapter (APP-014) provides a brief overview of the stony reef assessments conducted during pre-construction surveys, with the full stony reef survey report including images taken during this habitat classification presented in Appendix D8 of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p><i>As noted in paragraph 5.5.3.8 et seq. of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068), the patches of stony reef habitat recorded during this survey were scored as 'low' resemblance, as per the qualifying criteria set out in regulatory guidance on assessing stony reef habitats (Irving 2009). Additional to setting out the reef qualifying</i></p>

		<p>criteria thresholds, this guidance also suggests that “When determining whether an area of the seabed should be considered as Annex I stony reef, if a ‘low’ is scored in any of the four characteristics (composition, elevation, extent or biota), then a strong justification would be required for this area to be considered as contributing to the Marine Natura site network of qualifying reefs in terms of the EU Habitats Directive”. This suggests that the patches identified during this survey would not be considered to contribute to the National Site Network unless there is strong justification. Given that none of these reefs are designated features of any sites within the National Site Network or any other marine protected areas (MPA) and that ‘low’ was generally scored against each of the qualifying criteria for the majority of seabed images in each area, it is unlikely that any impacts associated with the installation of the proposed Hornsea Four offshore export cables will be of any significance in the context of the National Site Network.</p> <p>Furthermore, Condition 17(2)(a) of Schedules 11 and 12 of C1.1: Draft DCO including DMLs (APP-203) requires the Applicant to determine the location, extent and composition of any potential habitats of principle importance (Section 41 of the NERC Act) including biogenic or geogenic reef features (as defined by Irving (2009) and Gubbay (2007) as part of the pre-construction surveys. Additionally, habitats of principal importance (Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act) will be avoided where possible, informed through the undertaking of survey works pre-construction (as secured by Condition 13(1)(a) of Schedules 11 and 12 of C1.1: Draft DCO including DMLs (APP-203).</p>
RR-029-APDX:F-D	Data gaps: Other than the limitations mentioned above there are no data gaps within the Benthic and Intertidal Ecology Chapter.	This statement is welcomed by the Applicant.

7.3 Environmental Impact Assessment

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:F-E	<p>Identified impacts: Further consideration needs to be given to the impact of drill arising material being deposited on the seabed, as this could be different in composition to the surface sediments and may affect benthic communities. Monitoring at other windfarms have found drill arising mounds to persist in the environment for many years therefore the</p>	<p>It is the Applicant’s position that the impact of drill arising material being deposited on the seabed has been adequately assessed, with sections 4.4.5 and 4.4.6 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), providing evidence from drilling operations at other offshore wind farms, including Hornsea Project One.</p> <p>The Applicant highlights that the habitat loss from drilling and drill arisings is of a smaller magnitude than the presence of project infrastructure, with the drill arisings considered to be</p>

	<p>impacts of any such mounds left following construction need to be fully assessed.</p> <p>The impacts of contaminated sediments being disturbed, put into suspension and re-deposited within the benthic study area is not fully assessed.</p>	<p>within the scale of the maximum GBS footprint based on best evidence. Therefore, the change in habitat from the presence of drill arising mounds is smaller than that assessed for the GBS footprint. As such, the correct MDS for this potential impact has been identified in accordance with the principles of the Rochdale Envelope. Moreover, as detailed in the 'Long-term habitat loss / change from the presence of foundations, scour protection and cable protection (BIE-O-8)', while the impact will be locally significant and comprise a long-term or permanent change in seabed habitat within the footprint of the structures and scour and cable protection, the footprint of the area affected is however highly localised.</p> <p>Drill arisings as a result of construction activities are expected to be deposited in the vicinity of the works. The assessment on contaminants is detailed under 'Direct and indirect seabed disturbances leading to the release of sediment contaminants (BIE-C-6).' in Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014). As such, the Applicant considers that impacts of contaminated sediments being disturbed, put into suspension and re-deposited within the benthic study area is adequately assessed. Further clarification relating to the potential impacts of disturbing sediment-bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
<p>RR-029-APDX:F-F</p>	<p>Methodology: (Please also see overarching comments on EIA methodology in our main Representation).</p> <p>We do not agree with the assessments of magnitude for permanent and temporary habitat loss, this is largely due to the definition of these terms being too broad and without a suitable incremental step between minor and moderate</p> <ul style="list-style-type: none"> • Natural England does not agree with the term 'minor' being used to describe temporary loss/disturbance of subtidal habitat due to the extent of the receptor for which this impact covers. • Natural England does not agree with the term 'minor' being used to describe long-term habitat loss/change of subtidal habitat due to the permanent nature of this impact. 	<p>The Applicant notes that Table 2.14 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014): 'Definition of terms relating to magnitude of an impact', highlights that 'minor' impacts as well as being temporary, also relate to change, over a minority of the receptor, and/or limited but discernible alteration to key characteristics or features of the particular receptors character or distinctiveness'. Moreover, since PEIR, the Applicant reclassified the magnitude as 'minor'. It is the Applicant's position that the magnitude of these impacts should not be increased further. Additional explanation justifying the position has been provided within the assessment: <i>'While the impact will be locally significant and comprise a long-term or permanent change in seabed habitat within the footprint of the structures and scour and cable protection, the footprint of the area affected is highly localised. As the habitats and characterising biotopes are common and widespread throughout the wider region the loss of these habitats is assessed as discernible and the magnitude is assessed as minor'</i>.</p>

RR-029- APDX:F-GA	<p>Cumulative Effect Assessment (CEA): Viking Link should be screened into the CEA.</p> <p>It should be noted that Eastern Green Link and the Northern Endurance Partnership should now be considered in Tier 2. Dogger Bank South Offshore Windfarm is also at scoping stage and should therefore be considered as Tier 2.</p>	<p>The Applicant confirmed that the Viking Link cable has been screened in to the benthic and intertidal ecology cumulative assessment (as presented in Section 2.12 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014)).</p> <p>The Applicant can confirm that a final review of the long list against the most recent data sources was made in June 2021 to account for any changes to the status of the projects, plans and activities considered prior to final application (cut-off date for inclusion within the Hornsea Four CEA of 31st May 2021).</p> <p>The Applicant highlights that no planning application has been submitted in relation to the offshore elements of either the Northern Endurance Partnership project or the Scotland to England Green Link – SEGL2 (formerly Eastern Green Link) and as such, these projects should remain in Tier 3 of cumulative assessments and no updates to the assessments are required. The Applicant notes that Dogger Bank South Offshore Wind Farm was not on the Planning Inspectorate’s Programme of Projects at the time of the cumulative cut-off date for Hornsea Four (31st May 2021) and in line with the Planning Inspectorate’s Advice Note 17, was not considered a Tier 3 project. Since Hornsea Four DCO submission, Dogger Bank South submitted a Scoping Report which was then subsequently withdrawn in December 2021 and as such, the project should not be considered in cumulative assessments.</p>
RR-029- APDX:F-GB	<p>Certain impacts assessed for the project alone are not considered in the cumulative assessment, as they are assessed as ‘not significant’ on a project alone basis. Natural England believe these should be carried forward to the CEA or the Applicant needs to provide further detail to justify the exclusion of these potential cumulative impacts (Construction phase: - Direct and indirect seabed disturbances leading to the release of sediment contaminants & Operation and maintenance phase - Increased risk of introduction or spread of MINNS due to presence of subsea infrastructure and vessel movements).</p> <p>It should also be noted that the CEA may need to be updated following adjustments to the ‘project alone’ assessments.</p>	<p>It is the Applicant’s position that the assessments for both the project alone and the CEA remain valid. For those impacts for the project alone which have concluded no significant effects in EIA terms, it was not considered proportionate to assess cumulative effects. As such, even if the impacts were additive, it is likely that no measurable effect would be observed and so no likely significant effects are anticipated.</p>
RR-029- APDX:F-H	<p>Assessment conclusion: We are unable to agree with the assessment conclusions related to permanent and temporary habitat loss due to the issue raised above in relation to the methodology and definitions around different levels of magnitude.</p>	<p>This is noted and the Applicant will continue to actively engage with Natural England through the SoCG process to seek to resolve these issues raised in the representation.</p>

	<p>Further discussion on how best to define magnitude in these cases along with refinement of the MDS will help improve our confidence in these conclusions.</p> <p>There are also a number of issues within the Marine Geology, Oceanography and Physical Processes chapter which could have implications on benthic aspects, therefore Natural England's advice may evolve as further information is provided.</p>	
--	--	--

7.4 Report to inform Habitats Regulations Assessment

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-I	<p>LSE Screening: Natural England notes and welcomes that increases in suspended sediment concentrations at Flamborough Head SAC have been screened into the assessment for this site.</p> <p>Assessment conclusion: Natural England notes that there is no information provided in relation to the likely disposal locations for the disposal of sandwave material removed during site preparation works and would welcome clarification on this point to support the assumptions made within the assessment.</p> <p>Based on our comments in Appendix E, we are unable to exclude the potential for impacts to a number of designated benthic sites. Please see Appendix E for further details.</p>	<p>Agreement on the inclusion of SSC as a potential impact on Flamborough Head SAC is welcomed by the Applicant.</p> <p>As presented in Figure 1 of Volume A4, Annex 4.4: Dredging and Disposal Site Characterisation (APP-042), the Applicant proposes to dispose of material within two disposal sites which align with the Hornsea Four Order Limits. A detailed assessment of the disposal of material is presented in Volume A4, Annex 4.4: Dredging and Disposal Site Characterisation (APP-042) for all activities arising in spoil, including sandwave clearance, and concluded no significant effects on any of the identified receptors.</p> <p>As confirmed in Tables 62 and 63 of B2.2: Report to Inform Appropriate Assessment Part 1 (APP-167), it is the Applicant's position that no adverse effects will occur within National Site Network sites as a result of temporary increases in suspended sediment concentrations (SSC) / smothering, including but not limited to sandwave clearance.</p>

7.5 Marine Conservation Zones Assessment

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-J	<p>Screening: Natural England note and welcome that the impact of increases in suspended sediment concentrations on Holderness Inshore MCZ and Holderness Offshore MCZ.</p>	<p>As detailed above, a nil effect on waves in the nearshore translates into a nil effect on any changes to wave driven longshore drift along the Holderness Coast. Therefore, there is no pathway for impacts on the geomorphological processes, sediment pathways or</p>

	<p>However, there are a number of indirect impact pathways described in Appendix E (Marine geology, oceanography and physical processes) of our response which require further consideration.</p>	<p>connectivity to the wide environment which support Spurn Head. Therefore, no further assessment of this potential impact is required and so wasn't screened into the Applicant's MCZ assessment.</p>
<p>RR-029-APDX:F-K</p>	<p>Screening: Natural England notes that there is no information provided in relation to the likely disposal locations of sandwave material removed during site preparation works and would welcome clarification on this point to support the assumptions made within the assessment.</p> <p>Based on our comments in Appendix E, we are unable to exclude the potential for impacts to a number of designated sites. Please see Appendix E for further details.</p>	<p>See Applicant response to RR-029-APDX:E-ED.</p> <p>Details of the potential impacts associated with the disposal of material during sandwave clearance is detailed in paragraphs 7.1.2.2 to 7.1.2.3 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070). As presented in Figure 1 of Volume A4, Annex 4.4: Dredging and Disposal Site Characterisation (APP-042), the Applicant proposes to dispose of material within two disposal sites which align with the Hornsea Four Order Limits. A detailed assessment of the disposal of material is presented in Volume A4, Annex 4.4: Dredging and Disposal Site Characterisation (APP-042) for all activities arising in spoil, including sandwave clearance, and concluded no significant effects on any of the identified receptors.</p> <p>As concluded in paragraph 8.1.1.4 of Volume A5, Annex 2.3: Marine Conservation Zone Assessment (APP-070), indirect effects during construction, operation and maintenance and decommissioning associated with increases in SSC and associated deposition were assessed. It was concluded that the construction, operation and maintenance and decommissioning activities would result in short term, intermittent and localised increases in SSC and localised sediment deposition, resulting in a minor magnitude of impact. The sensitivity of the features at each site were assessed as, as a maximum, medium, with a maximum significance of slight adverse attributed in each case. Therefore, it is the Applicant's position that no significant effects on Holderness Inshore and Holderness Offshore MCZs would occur as a result of sandwave clearance and disposal of the associated material.</p> <p>As confirmed in Tables 62 and 63 of B2.2: Report to Inform Appropriate Assessment Part 1 (APP-167), it is the Applicant's position that no adverse effects will occur within National Site Network sites as a result of temporary increases in suspended sediment concentrations (SSC)/ smothering, including but not limited to sandwave clearance.</p>

7.6 Mitigation

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-L	<p>Main Issues – Mitigation</p> <p>Natural England would like to see the following mitigation incorporated into the project to limit impacts on benthic ecology.</p> <ul style="list-style-type: none"> • If Sabellaria reef is encountered Natural England would wish to see the developer commit to micrositing around any patches of reef during both the construction and O&M phase, as stated by Co48 & Co84 • Natural England would also like commitments Co48 and Co84 expanded to include Annex I habitat (outside designated sites) with the potential to include stony reef, if qualifying examples were found in pre-construction surveys • Data from pre-construction geophysical surveys should be used to update the assessment of sandwave and boulder clearance areas, and cable protection and replenishment quantities. The associated figures within the DCO parameters should be refined accordingly. • The Applicant should commit to depositing spoil material as close to the site of production as is practical to ensure sediment composition is unchanged (as is best practice and proposed within the current Disposal Site Characterisation document). <p>Where drilling is required to install piles and the composition of the drill arising is different to that of the surface sediment, mitigation measures should be introduced to reduce the impact on the benthic environment. To minimise impacts, Natural England recommend such material (which is a waste product of construction operations and is not integral to the project) is disposed of at a licensed marine disposal/landfill site, as per standard best practise undertaken by other marine users.</p>	<p>The Applicant can confirm that habitats of principal importance (Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act) will be microsited around, as committed to in Co48 and Co84 (as set out in Volume A4, Annex 5.2: Commitments Register (APP-050) and secured by Condition 13(1)(a)(v) of Schedules 11 and 12 of C1.1: Draft DCO including Draft DMLs (APP-203). This process will be informed by the biogenic and geogenic reef surveys outlined in Conditions 17 (pre-construction) and 19 of Schedules 11 and 12 of C1.1: Draft DCO including Draft DMLs (APP-203).</p> <p>See the Applicant's response to Natural England's comment RR-029-5.40.</p> <p>As confirmed in paragraph 4.3.1.6 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation) (APP-042), the spoil material will be retained in the local sedimentary system, as far as reasonably practicable.</p> <p>The Applicant can confirm that all material associated with Hornsea Four that requires disposal will be disposed of within the limits of a licensed disposal site.</p>

7.7 Post-consent monitoring

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-M	<p>Natural England advise post consent monitoring is required for the following elements of the project:</p> <ul style="list-style-type: none"> • Where it has not been possible to remove drill arising material from the site, long term monitoring would be required of mounds post construction to assess impacts on biotopes, sediment composition and marine processes. If they are found to persist long term the developer may be required to fulfil additional mitigation or decommissioning requirements. • Whilst Natural England appreciates the evidence from the study which has taken place in Belgium on gravity-based structures (GBS) and the site-specific assessment based on a combination of an evidence-based approach, expert opinion, and project-specific modelling to evaluate blockage related effects within Hornsea 4, we do not consider this sufficient evidence. The use of GBS is new in UK waters and the impacts on the surrounding environment and recoverability are not fully understood. Therefore, we believe it is important that a robust post construction monitoring program is incorporated into the Hornsea 4 project of any GBS used. • Natural England welcome the Particle Size Analysis (PSA) monitoring along the cable route pre and post construction. 	<p>Monitoring of Drill Arisings</p> <p>The Applicant notes that standard engineering and design surveys which will be carried out pre- and post-construction and as summarised in Table 2 of Volume F2, Chapter 7: Outline Marine Monitoring Plan (APP-242), will provide data on the persistence of any drill mounds with various acoustic surveys capable of being interpreted for the purposes of monitoring seabed changes, which would reveal changes in sediment transport associated with the presence of any mounds which may be interpreted to predict associated changes in the benthic communities.</p> <p>GBS Monitoring</p> <p>From pre-application discussions with Natural England and the MMO on the proposed monitoring to be included within F2.7: Outline Marine Monitoring Plan (APP-242), the Applicant understands that Natural England and the MMO consider that there is a degree of uncertainty in respect of the potential impacts of larger turbines and the scale of larger windfarms in comparison to the Round 1 and Round 2 windfarms at which much of the monitoring of benthic communities has been undertaken, noting that the wider industry would benefit from a strategic monitoring programme to address this data gap. Having considered this point, the Applicant's position is that project-specific monitoring of benthic organisms (other than that already proposed for biogenic and geogenic reef), is unwarranted given the low sensitivity of organisms to disturbance in the region and the low risk that Hornsea Four presents. Moreover, programmes such as The Crown Estate Enabling Programme and BEIS Strategic Environmental Assessment (SEA) Research Programme are more appropriate vehicles for consideration of strategic monitoring.</p> <p>Notwithstanding the above, standard engineering and design surveys which will be carried out pre- and post-construction, irrespective of foundation type, and as summarised in Table 2 of Volume F2, Chapter 7: Outline Marine Monitoring Plan (APP-242), will provide data on the impacts of GBSs on the seabed environment (if used), with various acoustic surveys capable of being interpreted for the purposes of monitoring seabed changes, which would reveal changes in sediment transport associated with the presence of GBSs which may be interpreted to predict associated changes in the benthic communities.</p>

		<p>PSA Monitoring Agreement on the PSA monitoring is welcomed by the Applicant.</p>
--	--	--

7.8 Detailed comments: Volume A2.2 Benthic and intertidal ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-1	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 1</p> <p>Section 2.7.1.10- 2.7.1.14: For hydrocarbons, the ES mainly focuses on comparison with published regional background concentrations, except for THC concentrations within the array area which are compared to the UKOOA SEI (to fauna) threshold of 50µg g-1. It would be useful if the following toxicity threshold exceedances for hydrocarbons (from the technical report) were also highlighted within the existing baseline description of the ES, to allow potential impacts to fauna to be fully considered within this chapter as required:</p> <ul style="list-style-type: none"> • THC at Station ECC_20 exceeded the UKOOA SEI threshold, and this is not highlighted within the ES (para 2.7.1.12). • The technical report highlights several individual parent PAH compounds at Stations ECC_20 and ECC-21 exceed the Canadian ISQG level (Threshold Effect Level (TEL), the concentration that may affect certain sensitive species. These exceedances would be useful to be included within Para 2.7.1.14 of the ES. • Also at Station ECC_20 one PAH parent compound (fluoranthene) also exceeded the ISQG Probable Effects Level (PEL), the concentration at which adverse biological effects are likely to occur in a wide range of species. This exceedance would be useful within Para 2.7.1.14 of the ES. • It would be useful to provide further context by comparison of the PAH concentrations to the CEFAS AL 1 limit of 0.1mg/kg. (Marine Licensing: sediment analysis and sample plans - GOV.UK (www.gov.uk)). 	<p>This is noted by the Applicant. A full contaminant assessment has been undertaken across the Hornsea Four Order Limits (Section 2.7.1 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014)). The full results are presented within Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p>Further clarification relating to the potential impacts of disturbing sediment-bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>

RR-029-APDX:F-2	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 2</p> <p>Section 2.7.1.15: Of the metals, arsenic at several stations across both the array and ECC exceeded the ISQG (TEL) and CEFAS Action Level 1 (AL1). At ECC Station ECC_14, arsenic also exceeded the ISQG PEL and this is not stated within the ES (para 2.7.1.16). Neither the ES or technical report explores the potential source for the regionally elevated arsenic and it would be useful to understand (for example from existing literature or previous surveys) whether this is considered to be natural (e.g. associated with sediment mineralogy, underlying geology) or anthropogenic in origin.</p>	<p>This is noted by the Applicant. A full contaminant assessment has been undertaken across the Hornsea Four Order Limits (Section 2.7.1 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014)). The full results are presented within Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p>Further clarification relating to the potential impacts of disturbing sediment bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
RR-029-APDX:F-3	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 3</p> <p>Section 2.7.1.18: The ES does not provide an assessment as to whether there was any evidence the above elevated contaminants were having an adverse effect on the baseline benthic community composition and structure, particularly within the ECC. This is touched upon within the array survey report, however comparisons in the technical report mainly focus on the link between the variation in physical sediment properties. Natural England recommends this aspect is clarified by the Applicant. This will help to further inform whether the contaminants would be a cause for concern (or not) due to sediment disturbance and re-suspension impacts from construction activities, or if removed for sediment disposal.</p>	<p>Further clarification relating to the potential impacts of disturbing sediment bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
RR-029-APDX:F-4	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 4</p> <p>Section 2.7.1.34: It is noted that the geophysical data and DDV did not reveal the presence of Sabellaria aggregations (Annex I reef). However, as Sabellaria spinulosa individuals were the dominant taxon in grab samples at ECC Stations 17 to 21, the suitability of this substrate for the potential colonisation of Sabellaria should be considered for assessment as part of pre-construction surveys. If Sabellaria reef is encountered Natural England would wish to see the developer commit to micro-siting around any patches of reef during both the construction and O&M phase as stated by</p>	<p>The Applicant notes that the presence and dominance of <i>S. spinulosa</i> at these stations is recorded with Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068). Furthermore, according to Gubbay (2007), the numbers of <i>S. spinulosa</i> identified within the surveys is not considered high enough to quantify as an Annex I reef habitat or a Sabellaria reef biotope. Moreover, as detailed in Section 1.2 of Appendix A, Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068), grab samples targeted the range of different sediments and depths observed in the geophysical study.</p> <p>The Applicant will conduct biogenic and geogenic reef surveys as part of pre-construction survey efforts, to identify any biogenic reef features and to enable micro-siting around such features, if present.</p>

	Co48 and Co84. Consequently, this condition should be secured in the draft DCO/dML	
RR-029-APDX:F-5	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 5</p> <p>Section 2.7.1.36: The ES and Benthic Technical report should be expanded to further clarify the overall justification of 'low' grade Annex I stony reef against the Irving (2009) criteria. Stony reef does not have to be unbroken as stated in paragraph 2.7.1.36; a mosaic of stony reef and sediment also qualifies if the percentage of cover of cobbles and boulders is great enough to meet the criteria set by Irving (2009).</p> <p>There is evolving guidance on the justification of 'low' resemblance to stony reef topic and this should be kept under review for pre-construction surveys (Refining the criteria for defining areas with a 'low resemblance' to Annex I stony reef (JNCC Report No. 656)).</p> <p>The 2020 Stony Reef assessment revealed a range of stony reef classifications (from low to medium) at Stations ECC_22 and ECC_23. On a precautionary basis we query why this range was not cited rather than using the majority, particularly as a low confidence score was assigned to the acoustic data due to its quality. We note the approach of stating a classification range was used for the classification of Sea Pen and Burrowing megafauna community within the array report (see Section 2.2.1).</p> <p>Natural England also query why Annex I stony reef habitat was not carried forward as a Valued Ecological Receptor (VER) on a precautionary basis, as was undertaken for the sea-pen and burrowing megafauna habitat. For consistency we recommend Annex I stony reef habitat is included within the impact assessment.</p> <p>Natural England would also like commitments Co48 and Co84 expanded to include Annex I habitat (outside designated sites) with the potential to include stony reef, if qualifying examples were found in pre-construction surveys. These commitments should be secured in the draft DCO/dML.</p>	<p>The evidence on the justification of stony reef habitat is provided in the Ocean Ecology Survey Report – Appendix D8 of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068). The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the technical report and chapter documents.</p> <p>The Applicant notes that the quality of the data from the dropdown video is not low. Moreover, this recorded data demonstrates that the stony substrata had a low resemblance to cobble reef in most instances. As a result, the assessment was therefore based on this data. 'Coarse and mixed sediments with moderate to high infaunal diversity and scour tolerant epibenthic communities' was carried through into the assessment, therefore, low grade stony reef is assessed ecologically. Annex I reef was not assessed based on the conclusions of the survey report.</p> <p>The Applicant can confirm that the foundations and cables will be micro-sited around habitats of principal importance wherever reasonably practicable and will be subject to agreement with the MMO.</p> <p>As per commitment Co84, benthic monitoring will be undertaken at pre-construction phases of the proposed development in order to determine the location, extent and composition of any habitats of principal importance (Section 41 of the 2006 Natural Environmental and Rural Communities (NERC) Act). In the event that habitats of principal importance are identified in the pre-construction survey; post-construction monitoring will also be carried out with a focus on these identified habitats.</p> <p>The Applicant will be undertaking a pre-construction survey to identify any areas of potential reef, and whilst this assessment is based on low grade reef The Applicant believes that it is proportionate based on the results of the Ocean Ecology survey which revealed that the majority of sites across each transect were low quality reef. However, a thorough review of stony reef habitat will be reassessed at pre-construction.</p>
RR-029-APDX:F-6	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 6</p>	<p>The Applicant highlights that Table 1 of Volume A4, Annex 4.8: Pro rata Annex (APP-047) presents a breakdown of the maximum parameters per foundation type and relate to the</p>

	<p>Table 2.12 (MDS): The jack up vessel (JUV) footprint is on all occasions twice the value presented in the Volume 4, Annex 4.9: Pro-rata Annex. However, from descriptions in the text it appears to be correct in Table 2.12 and probably incorrect in Pro-Rata Annex. This was raised in our comments on the draft ES in November 2020</p>	<p>installation of the foundation only. The MDS presented in Table 2.12 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014) represents the JUV footprints associated with the installation of the entire WTG (e.g. foundation plus turbine components). As such, the values presented within both Volume A4, Annex 4.8: Pro rata Annex (APP-047) and Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014) are correct and no amendments are required.</p>
<p>RR-029-APDX:F-7</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 7</p> <p>Table 2.13: As raised on previous draft versions of the ES the highest proportion of temporary habitat disturbance in the Hornsea 4 array area and offshore ECC comes from boulder and sandwave clearance, which correspond to almost 80% of total temporary disturbance.</p> <p>In light of Paragraph 2.6.196 of NPS EN-3, which states that “The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment”, it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave and boulder clearance. Geophysical data – either project specific or otherwise - should be used to refine this assessment to a more realistic area. Natural England note that the Applicant has undertaken geophysical survey work in 2021. These data should be used to update the assessment and refine the DCO parameters.</p>	<p>See Applicant response to RR-029-APDX:E-B.</p>
<p>RR-029-APDX:F-8A</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 8</p> <p>Section 2.11.1.2: The total maximum area of temporary loss/disturbance of subtidal habitat due to construction activities is predicted to be up to approximately 75.9 km² (1.6% of the total seabed area).</p> <p>Natural England feel that the definition of magnitude does not align with the levels of disturbance being described here. The impact in this case is temporary (as evidence suggests recovery), but Natural England would argue that 75km² can't be considered a minority of the receptor and with this in mind magnitude should be higher, which would in turn impact the significance of the effect. However, we acknowledge that these figures</p>	<p>A detailed description of the activities resulting in this area of disturbance are provided in Table 2.12 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014). It should be noted that this is the greatest spatial area which may be impacted in accordance with the Rochdale Envelope approach. The Applicant maintains that the temporary habitat disturbance will represent a local spatial extent, short term intermittent impact, affecting a relatively small portion of the benthic subtidal habitats in the Hornsea Four Order Limits. As a result, the Applicant maintains that an assessment of minor magnitude is valid. In addition, most benthic receptors are known to have a high degree of tolerance to this impact, based on MarESA assessments. Therefore, the assessment of significance remains valid.</p>

	are based on MDS and a precautionary approach has been taken when calculating these, therefore impacted area should be smaller.	
RR-029-APDX:F-8B	Natural England recommend refining the MDS as the project develops (as mentioned above in point 7) to ensure impacts to the benthic environment are recorded as accurately as possible. This will help assess future projects fairly when cumulative assessments are conducted.	See Applicant response to RR-029-APDX:E-B.
RR-029-APDX:F-9	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 9</p> <p>Section 2.11.1.22: It is not clear how all the habitats within 14km of the order limits are considered in the assessment of significance of impact, as data and biotope information has not been collected within this area. There may be habitat within 14km that differ from those presented in this report in relation to habitats found in ECC and array area and therefore sensitivities may be different.</p> <p>The developer should make it clear what evidence has been used for assessments of impacts outside the order limits, whether this be modelled habitat maps or expert judgement, in order to help give the reader confidence in any assessments of impacts being made.</p>	<p>See the Applicant’s response to RR-029-APDX:F-CA.</p> <p>It is the Applicant’s position that the baseline characterisation of benthic habitats within the study area is robust and sufficient for the purposes of EIA. As such, confidence may also be placed in the consideration of significance provided.</p> <p>Details of all data sources used to characterise the benthic habitats is provided in Section 3.2 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014).</p>
RR-029-APDX:F-10	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 10</p> <p>Section 2.11.1.23: Flamborough SAC and Holderness Offshore MCZ are close to the cable route and therefore could be affected by higher levels of SSC and deposition.</p> <p>Natural England recommend referring to the assessment carried out in B2.2: Report to Inform Appropriate Assessment Part 1 (10.2.3.8) and A5.2.3 Marine Conservation Zone Assessment (Section 7) when describing the effect of increased suspended sediment and deposition from the ECC on the nearby protected sites, rather than dismissing the impacts as minor.</p>	This is noted by the Applicant.
RR-029-APDX:F-11	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 11</p> <p>Section 2.11.1.29: Here it is stated that ‘The communities associated with subtidal chalk reef habitat, which is a protected feature of the Flamborough Head SAC are expected to have some tolerance to</p>	<p>It is the Applicant’s position that it is appropriate to cite and base assessment on relevant peer-reviewed literature.</p> <p>The Applicants notes that the conservation advice package by Natural England on Flamborough Head SAC noted moderate sensitivity to smothering from the disposal of dredged soils and a moderate–high sensitivity to siltation from dredging. However, due to</p>

	<p>increases in SSC (De-Bastos and Hill 2016c; Tillin and Hill 2016), particularly as these habitats are near the coast, where background SSC levels are highest. Sensitivity of many animals associated with soft rock habitats to light sediment deposition would also be expected to be limited, due to the resilience of some characterising species (De-Bastos and Hill 2016c) and the natural sediment mobility in these areas.’</p> <p>Natural England advises that the sensitivity of designated features within MPAs should be taken from the relevant conservation advice package and associated advice on operations, rather than wider references.</p>	<p>the location of Hornsea Four ECC (1.2 km away), it is not anticipated to result in a significant impact on Flamborough Head SAC. In addition, indirect impacts using a 10 km tidal excursion have been screened into the assessment on a precautionary basis (Table 2.9 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014)) and a moderate sensitivity was used in the assessment, based on peer-reviewed literature and the MarESA assessment.</p>
<p>RR-029-APDX:F-12</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 12</p> <p>Section 2.11.1.39 – 2.11.1.41: Sediment contamination has been discussed in point 1 of this table, and those comments are also relevant to this section of the impact assessment (2.11.1.39 onwards). More discussion of toxicity thresholds is required to help fully assess the impact these contaminated sediments might have to the faunal community.</p> <p>THC concentrations are compared to regional UKOOA, 2001 background data. It is also as important to compare these to the aforementioned SEI thresholds (UKOOA, 2001, 2005) and Kingston, 1992 for impacts to fauna community as a result of sediment disturbance. For PAHs, while comparison to OSPAR BACs, is useful to assess if concentrations are typical of background levels, it is thresholds such as the ISQG TEL and PEL that will provide confidence in the potential toxicity of PAH concentrations along with comparison to CEFAS Action Level 1.</p> <p>We also note that the statement that “As concentrations are higher than CEFAS AL 1 at all stations along the ECC” is incorrect. CEFAS AL 1 was exceeded at 7 of the ECC stations and the Canadian ISQG TEL at 15 of the ECC stations.</p> <p>Natural England recommends the Applicant provides evaluation of these additional thresholds as part of the determination of the magnitude of impact.</p>	<p>This is noted by the Applicant. A full contaminant assessment has been undertaken across the Hornsea Four Order Limits (Section 2.7.1 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014)). The full results are presented within Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p>Further clarification relating to the potential impacts of disturbing sediment bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
<p>RR-029-APDX:F-13</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 13</p>	<p>The assessment detailed with Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) highlights the detailed assessment undertaken within the Technical Report (Volume A5,</p>

	<p>Section 2.11.1.43: There is little evidence provided of the impact of direct and indirect seabed disturbances leading to the release of sediment contaminants (BIE-C-6) but the magnitude is concluded to be negligible which rules out the need to consider sensitivity. Addressing point 13 above will improve evidence of the impact.</p> <p>Natural England would encourage the ExA to seek advice from Cefas on possible impacts and significant of disturbing contaminated sediments as they have more expertise in his area.</p>	<p>Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068)). Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014).</p> <p>Further clarification relating to the potential impacts of disturbing sediment bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
<p>RR-029-APDX:F-14</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 14</p> <p>Section 2.11.2.5: Natural England have previously commented on a draft version of this ES chapter in November 2020 and did not agree with the assessment of magnitude for ‘long-term habitat loss/ change’ due to the use of the term ‘high reversibility’ concluding negligible magnitude.</p> <p>The magnitude has been re-assessed as minor and acknowledgment made that some infrastructure will be permanent. However Natural England still question if this is the most appropriate term given than the definition for minor is ‘discernible, temporary change’. We appreciate that the definition ‘moderate’ magnitude (Considerable, permanent / irreversible changes, over the majority of the receptor) is also not appropriate for this scenario as it is not affecting the majority of the receptor. Therefore, it seems to fit neither category well.</p> <p>Natural England wish to have more discussion with the developer on this issue and request further scientific justification or refinement of the magnitude of impact.</p>	<p>This is noted and the Applicant will continue to actively engage with Natural England through the SoCG process in relation to the issues raised in the representation</p>
<p>RR-029-APDX:F-15</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 15</p> <p>Section 2.12.1.7: Natural England advise that the following two impacts should not have been excluded from the CEA based on Hornsea 4 alone not leading to significant impacts. These two impacts have been assessed as ‘non significant’ rather than ‘negligible’ where the methodology states they could be excluded from the CEA. Natural England believe a CEA should be carried out for these two impacts (appreciating it will probably</p>	<p>It is the Applicant’s position that the assessments for both the project alone and the CEA remain valid. Those impacts for the project alone which have concluded negligible magnitudes, and so no significant effects in EIA terms, it was not considered proportionate to assess cumulative effects. A negligible magnitude was defined as “Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptors character or distinctiveness” (Table 2.14 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014)). As such, even if the impacts were</p>

	<p>conclude 'not significant'), or provide further detail to justify the exclusion of these potential cumulative impacts</p> <ul style="list-style-type: none"> • Construction phase: - Direct and indirect seabed disturbances leading to the release of sediment contaminants: the potential significance of the impact from Hornsea 4 alone has been assessed as not significant. • Operation and maintenance phase - Increased risk of introduction or spread of MINNS due to presence of subsea infrastructure and vessel movements (e.g., ballast water) may affect benthic ecology and biodiversity: the potential significance of the impact from Hornsea 4 alone has been assessed as not significant 	<p>additive, it is likely that no measurable effect would be observed and so no likely significant effects are anticipated.</p>
<p>RR-029-APDX:F-16</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 16</p> <p>Section 2.13.1.10: Natural England does not believe there is sufficient information or evidence available on the Endurance Carbon Capture project to reach the anticipated conclusion that there would be no significant impact. The Applicant admits there is limited detail on the project at this time, and it is not possible to make a detailed assessment. Natural England would like the assessment to acknowledge that there may be overlap with the construction phase of the Endurance Carbon Capture project and Hornsea 4 as the timelines provided are very tight in relation to consent and start of construction. There is also no acknowledgment (in this report or the Annex 3.5 Offshore cumulative effects) that the two projects overlap in spatial extent, which can only magnify the impacts.</p> <p>Natural England require the assessments of impacts in combination with the Endurance Carbon Capture project to be reviewed at a later date when more information is available. The same concerns are also relevant to section 2.13.2.</p>	<p>The Applicant highlights that no planning application has been submitted in relation to the offshore elements of the Endurance Carbon Capture and Storage (CCS) project and as such, there is limited information available to base assessment on, and this project should remain in Tier 3 of cumulative assessment.</p> <p>The Applicant considers that the assessment on Endurance CCS has followed the guidance set out in PINS Advice Note 17 (Cumulative effects assessment relevant to nationally significant infrastructure projects) which states</p> <p><i>“For ‘other existing development and/or approved development’ falling into Tier 3, the applicant should aim to undertake an assessment where possible, although this may be qualitative and at a very high level.”</i></p> <p>The Applicant acknowledges that cumulative assessments may need to be updated if further details on the Endurance CCS are submitted to planning authorities.</p>
<p>RR-029-APDX:F-17</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 17</p> <p>Section 2.13.1.20: The nearshore ECC area is busy with Bridlington A disposal site (2.7km away) and construction and operation of Dogger A&B export cable leading to high levels of suspended sediments in the water</p>	<p>It is the Applicant’s position that the findings of the assessment remain valid and there would not be any significant cumulative effects in EIA terms. This position is owing to the planned construction for Dogger Bank A and B cables between 2021 and 2024. The earliest possible date for the start of the construction of Hornsea Four is early 2024. It is therefore likely that</p>

	<p>column. Natural England query if cumulative effects of suspended sediment from these 3 projects in the ECC areas can still be quantified as minor in magnitude.</p>	<p>the installation of Hornsea Four's export cable will be following the completion of Dogger Bank A and B export cables.</p> <p>Moreover, only a small portion (approximately 4%) of the Dogger Bank A and B export cables intersects with the Hornsea Four benthic subtidal ecology study area, and therefore the maximum amount of sediment released cumulatively with Hornsea Four will be considerably less. It should also be noted that the worst-case scenario for the projects (Hornsea Four, Dogger Bank A and B) assumes that the whole volume of sediment from the excavated trenches for the export cables is released for dispersion regardless of the extraction method used and therefore the amount that is released is likely to be of a lower volume. As such, The Applicant considers that a minor magnitude is appropriate.</p>
<p>RR-029-APDX:F-18</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 18</p> <p>Section 2.14.1.11 – 2.14.1.13 & 2.14.1.19: As per point 15 above Natural England has concerns over the term 'minor' being used to assess magnitude of the long-term habitat loss/change alone and in combination with other projects. The term 'minor' does not account for the permanent nature of these effects and in turn a 'slight' effect (not significant in EIA terms) is very subjective. The area affected within the CEA is 15.36km² (5 times that of Hornsea Project Four in isolation).</p> <p>The same can be said for impacts associated with colonisation of WTG (2.14.1.19).</p> <p>Natural England wish to have more discussion with the developer on this issue and request further scientific justification or refinement of the magnitude of impact.</p>	<p>This is noted and the Applicant will continue to actively engage with Natural England through the SoCG process to seek to resolve the issues raised in the representation.</p>
<p>RR-029-APDX:F-19</p>	<p>Detailed comments – Volume A2.2 Benthic and intertidal ecology: Point 19</p> <p>Table 2.24: There is a typo in Table 2.24 under Long-term habitat loss/change from the presence of foundations, scour protection and cable protection (BIE-O-8) where residue impact is assigned 'Not significant', however in the main body of the report (2.11.2.9) it is assigned slight significance,</p>	<p>It is understood that the residual impact cited by Natural England for BIE-O-8 is a typographic error and should be 'Slight significance (not significant in EIA terms)'.</p>

7.9 Detailed comments: Volume A5.2.1 Benthic and intertidal ecology technical report

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-20	<p>Detailed comments – Volume A5.2.1 Benthic and intertidal ecology technical report: Point 20</p> <p>Section 5.4.2.7: The number of stations where the CEFAS AL1 threshold was exceeded does not match the results tabulated within the Appendix D for the ECC benthic survey.</p> <p>Further consideration of the source and therefore the level of potential concern for the elevated As concentrations is not fully explored and this is highlighted in comments to the ES point 2.</p> <p>Natural England suggest using available literature to explore the regional trend for As.</p>	<p>A full contaminant assessment has been undertaken across the Hornsea Four Order Limits (Section 2.7.1 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014)). The full results are presented within Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p>Further clarification relating to the potential impacts of disturbing sediment bound contaminants is provided in G1.44 Hornsea Four Contaminated Sediments Clarification Note which was submitted into Examination at Deadline 1. This clarification note seeks to provide assurance that contaminated sediments have been appropriately and robustly assessed by the Applicant.</p>
RR-029-APDX:F-21	<p>Detailed comments – Volume A5.2.1 Benthic and intertidal ecology technical report: Point 21</p> <p>Section 5.5.3.8 & Appendix D8 – Section 4 results: As per point 5 above, Natural England want to see the raw data behind the stony reef assessment and each score given to the 4 categories of reefiness to fully understand the justification of low grade reef being assigned. The technical report shows that within the area delineated at Station ECC_23, 'medium' resemblance to stony reef was classified for two of the four fixes, and the area classified overall as 'low' resemblance to stony reef. At Station ECC_22 for one of the areas assessed overall as 'low' resemblance Annex I stony reef there were two fixes recording 'medium' resemblance to stony reef separated by approximately 10m.</p>	<p>The Applicant notes that Appendix D8 of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) provides a detailed review of the raw data which provides evidence for the classification process. The four distinct patches of Annex I stony reef habitat recorded during this survey were scored as 'low' resemblance as per the qualifying criteria set out in the regulatory guidance for assessing stony reef habits (Irving, 2009). This guidance also suggests "When determining whether an area of seabed should be considered as Annex I stony reef, it a 'low' is scored in any of the four characteristics (composition, elevation, extent or biota), then a strong justification would be required for this area to be considered as contributing to the Marine Natura Site Network of qualifying reefs in terms of the EU Habitats Directive." This suggests that the patches identified during this survey would not necessarily be considered to be contributing to the Marine Natura Site Network unless there is strong justification. Given that none of these reefs are designated features of any Marine Natura Sites or any other marine protected areas and that the 'low' was generally scored against each of the qualifying criteria for the majority of seabed images in each area, it is unlikely that any impacts associated with the installation of the proposed Hornsea Project Four export cable route will be of any significance in the context of the Marine Natura Site Network. Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014) has, however, considered any impacts to potential low-grade reef present.</p>

<p>RR-029- APDX:F-22</p>	<p>Detailed comments – Volume A5.2.1 Benthic and intertidal ecology technical report: Point 22 Section 5.5.4.2 & 2.7.1.20 of chapter 2 Benthic and intertidal Ecology – Figure 2.3: Natural England wish to highlight the subjective nature of habitat classification. The biotopes mapped (Figure 11) at the boundary of the ECC and Array area reveal two distinct biotopes A5.242 & A5.261. These differences could be related to data being collected during different surveys and analyses undertaken by separate contractors. The geophysical sediment delineation and PSA data are essentially similar. Had the two survey data sets been considered as a whole, classification may have been different.</p>	<p>The Applicant notes that paragraph 2.7.5.3 of Volume A2, Chapter 2, Benthic and Intertidal Ecology (APP-014) has stated that biotopes presented “<i>should not be considered as definitive</i>”. The habitats presented, however, “<i>represent a robust characterisation of the receiving environment</i>”. In addition, the data collected and collated by the contractors was thoroughly assessed prior to inclusion in the ES.</p>
------------------------------	---	--

7.10 Detailed comments: F2.15: Outline Offshore Cable Installation Plan

Reference	Relevant Representation Comment	Applicant’s Response
<p>RR-029- APDX:F-23</p>	<p>Detailed comments – F2.15: Outline Offshore Cable Installation Plan: Point 23 Section 6.2.1.1: Within the Sandwave clearance plan, location information should include area of impact and volume of sandwave clearance at clearance and disposal locations. Information should also be clearly provided on habitats impacted and comparison of plans to ES predictions.</p>	<p>The Applicant notes that the Outline Cable Installation Plan states that the following details will be considered:</p> <ul style="list-style-type: none"> • Details of locations where sandwave clearance is required to install cable below reference seabed level; • Expected volumes of sediment to be dredged and disposed, if relevant; • Proposed locations for disposal, if relevant, including: <ul style="list-style-type: none"> ○ Consideration of Habitats of principal importance (Section 41 of the 2006 Natural Environment and Rural Communities (NERC) Act; ○ Consideration of Archaeological Exclusion Zones (AEZ); and ○ Proximity to dredge location. <p>The Applicant notes that the Cable Specification and Installation Plan is conditioned in the DML and will be submitted to and approved in writing by the MMO and as such, should provide comfort that the details requested will be included.</p>

7.11 Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation):

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-24	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 24</p> <p>Section 3.2: Huge volumes of spoil requiring disposal are predicted to be produced across the array area and ECC from seabed preparation, drilling and cabling. However, there is no MDS calculation of area which will be affected by disposal of this material, either in terms of temporary habitat loss from smothering or change in substrate type (should particle size be significantly different).</p> <p>We request the Applicant provide this to allow impacts to be fully assessed.</p>	<p>The Applicant notes that Section 7.1.3 of Volume A4.4.4: Dredging and Disposal Site Characterisation (APP-042) provides an assessment of the dispersal of drilled and dredged material and the impact of the disposal of this material.</p>
RR-029-APDX:F-25	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 25</p> <p>Section 3.1.3.1: This paragraph in relation to HDD exit pits is not clear as to if there will be any impact on the intertidal area. It is stated that '8 exit pits will be excavated in the shallow subtidal area'. However, it then goes on to say, 'The HDD exit pit may be located above mean high water (MHW), within the Hornsea Four intertidal area (intertidal punch out) or below mean low water (MLW)'. The location of the exit pits will cause different impacts depending if it is intertidal or subtidal. The benthic chapter states no temporary habitat disturbance will occur within the intertidal, which would not be the case should HDD exit pits emerge above MHW.</p> <p>Can the Applicant please clarify the position of HDD exit pits, and if there is a possibility they will be above MHW, amend the benthic and intertidal ecology report, MDS in relation to intertidal habitat loss and incorporate additional impacts.</p>	<p>As noted in Volume A1, Chapter 4: Project Description (APP-010), the HDD exit pits will be located at a minimum of 400 m and a maximum of up to 1,500 m from the TJB, though the final locations will be confirmed post-consent.</p>
RR-029-APDX:F-26	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 26</p>	<p>The Applicant can confirm that the volumes of material associated with trenching, as set out in Table 2 and 3 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation)</p>

	<p>Table 2: It is not clear where the volumes of material for disposal associated with trenching come from and this is not made clear in the project description. Natural England would welcome clarification on whether this material is actively collected and disposed of, or if not the volume of material which will be likely be suspended in the water column as a result of displacement from the cable trenching activity.</p>	<p>(APP-042) relate to material that will be suspended in the water column as a result of cable trenching activity. Therefore, this is a precautionary assessment of material to be disposed of.</p>
<p>RR-029-APDX:F-27</p>	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 27</p> <p>Section 4.3.1.4 & 4.3.1.5: Options should be kept open should a project come along in relevant timescales that could effectively use the spoil material. Consideration of disposal at this stage should not preclude beneficial or other use if it becomes viable. Natural England suggest this option remains under consideration.</p> <p>We recognise that there are vessel movements associated with transport of the spoil – however any project that needed the spoil would also likely have vessel movements associated with it, which would be reduced or eliminated by use of spoil from this project. This is therefore not a reason not to consider re-use as the overall impacts would be the same or less.</p>	<p>Noted.</p>
<p>RR-029-APDX:F-28</p>	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 28</p> <p>Section 6.1.1.2: Where there is near surface chalk and drilling is required for foundation installation, then drill arisings will be composed of chalk and may differ significantly in composition from the surface sediments (as acknowledged in 6.1.1.1)</p> <p>Monitoring of chalk drill arisings at Lynn and Inner Dowsing and Lincs OWF has shown these mounds to persist in the environment rather than be winnowed away. This has potential to change the biotopes locally and should be considered in this context in this report and the ES.</p>	<p>The Applicant notes that the form of chalk arisings depend on the form of the chalk layer, the size and type of the drill, and the pressure of the drill. Lynn and Inner Dowsing drilled for smaller diameter piles into a dense (hard) chalk layer (around 3 to 12 m below the surface (to reach a layer of Upper Cretaceous Chalk). Larger diameter clasts (20 to 100 mm) remained close to the pile. The original concern for Lynn and Inner Dowsing was in regard to chalk plumes of the finer silt sized fraction, however monitoring did not detect any such chalk plumes (COWRIE ScourSed-09, 2010).</p> <p>Section 4.4.6.5 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) notes that Sheringham Shoal Offshore Wind Farm (90 km to the south of Hornsea Four) also encountered Cretaceous Chalk but was still able to drive all piles into the seabed without the need of drilling (Carotenuto et al. 2018). This project is closer to Hornsea Four in terms of geology and is likely to be more representative of the chalk likely to be encountered.</p> <p>Table 6 of Volume A4 Annex 4.4 Dredging and Disposal Site Characterisation (APP-042) presents a summary of impacts from disposal of material from seabed preparation, sandwave clearance, pile drilling and cable trenching within the Hornsea Four Order Limits</p>

		including potential impacts on benthic ecology. No changes to biotopes are predicted locally within the Applicant's Environmental Statement.
RR-029-APDX:F-29	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 29</p> <p>Section 5.2.2.8: Whilst areas may have low resemblance to stony reef, it would still be beneficial to this habitat to avoid deposition of sediment in these areas. Please see comments above in point 5 on assessment of stony reef and use caution with regards to depositing material in the vicinity of any potential examples of this habitat.</p>	<p>The Applicant notes that micrositing mitigation would be agreed through consultation with the MMO and Natural England on the identified sensitive features which are required to be avoided (e.g. biogenic and geogenic reef) including avoidance of interaction with spoil material. Pre-construction surveys required for micrositing are described within F2.7: Outline Marine Monitoring Plan (APP-242). These surveys will then inform the layout which will be agreed post consent through the Design Plan (submission of which is conditioned in the DML) which will be submitted to and approved in writing by the MMO.</p>
RR-029-APDX:F-30	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 30</p> <p>Section 6.1.1.5 & 6.1.2.4: Natural England welcome the Applicant's plan to deposit spoil material close to the site of production as it is best practice to try and ensure sediment composition is unchanged. This is particularly important in the case of larger particles, which should not be deposited on finer sediments as they are likely to persist and change the habitat composition.</p> <p>However, Natural England would like the Applicant to commit to this best practice either through a formal commitment or within a mitigation agreement.</p>	<p>As confirmed in paragraph 4.3.1.6 of Volume A4, Annex 4.4: Dredging and Disposal (Site Characterisation) (APP-042), the spoil material will be retained in the local sedimentary system, as far as reasonably practicable.</p>
RR-029-APDX:F-31	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 31</p> <p>Section 6.2.2.2 and 6.2.3.2: As in point 1 & 13 above, high levels of contaminants have been found in some sediment samples as described in the 'benthic and intertidal ecology' chapter and 'Technical report'. Should evidence arise that the dredging and disposal of these sediments could have environmental impacts due to the high contaminant levels they contain, Natural England wants to see measures in place to minimising this effect.</p>	<p>An assessment of the potential effects associated with the accidental release of pollutants on benthic receptors was scoped out of the assessment. Given the designed-in mitigation measures (see Table 2.11 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014)) which are proposed (i.e., the implementation of a Construction Project Environmental Management and Mitigation Plan (CPEMMP), it is considered that the likelihood of accidental release is extremely low. Furthermore, the biotopes present within the array area and ECC are considered to be tolerant of chemical pressures, as presented within the MarESA assessment. As such, this impact has therefore been scoped out of the assessment.</p>
RR-029-APDX:F-32	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 32</p> <p>Section 7.1.2.5: As above in point 28 Natural England have concerns that material depositing following drilling is likely to create mounds</p>	<p>See Applicant's response to RR-029-APDX:E-28.</p> <p>As presented in paragraph 4.4.4.3 of Volume A5, Annex 1.1: Marine Processes Technical Report, the particle size of drill arisings is unknown at present and depends on many variables, not least; local rock type(s), size of drill, drill speed, drill pressure, etc. However, in</p>

	<p>significantly different to surface sediments, which will persist in the environment rather than be winnowed away. This has potential to change the biotopes and topography locally and should be considered in the impact assessment for benthic ecology and marine processes.</p>	<p>some cases, semi-permanent cuttings piles have formed of relatively large clasts, for example at North Hoyle (DECC, 2008b). Given the highly localised nature of these mounds they will only represent a fraction of the seabed in the array. Furthermore, the change in potential topography is akin to the presence of scour protection and therefore the Applicant's position is that no further assessment is required.</p>
RR-029-APDX:F-33	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 33</p> <p>Table 6: In table 6 Broadscale habitat features of the Holderness Offshore and Inshore MCZs are given a sensitivity of the receptor as Low, when it should be medium to light smothering. This is recorded correctly in the MCZ assessment document.</p>	<p>The Applicant will correct the sensitivity of the receptor for the Holderness Offshore and Inshore MCZs in Volume A4, 4.4: Dredging and Disposal Site Characterisation (APP-042).</p>
RR-029-APDX:F-34	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 34</p> <p>Section 8.1.1.3: As above (point 32) Natural England are concerned that drill arisings (specifically those containing chalk) will have lasting impact on the seabed (as seen at LID and Lincs OWF). Natural England appreciate it is not possible to know when or where drilling to install foundations will be necessary at this stage, but ask that necessary steps are taken to reduce the impacts related to the deposition of the drill arising material. Where the composition of the drill arising is different to that of the surface sediment, mitigation measures should be included within the DCO to reduce the impact on the benthic environment. It would be preferable to dispose of the material (which are a waste product of construction operations and are not integral to the project) at a licensed marine disposal /landfill site, as per standard best practise undertaken by other marine users. If removal is not possible then long term monitoring would be required of mounds post construction and may result in additional mitigation or decommissioning requirements if they are found to persist long term.</p>	<p>See Applicant's response to RR-029-APDX:E-28.</p> <p>The Applicant can confirm that all material associated with Hornsea Four that requires disposal will be disposed of within the limits of a licensed disposal site.</p>
RR-029-APDX:F-35	<p>Detailed comments – Volume A4.4.4: Dredging and Disposal (Site Characterisation): Point 35</p> <p>Section 8.1.1.4: Natural England welcome the PSA monitoring along the cable route pre and post construction. There is only good evidence on</p>	<p>Agreement on PSA monitoring is welcomed by the Applicant.</p>

	<p>impacts and recovery from sandwave clearance at one site (Race Bank). Therefore, there would be benefit in building up a comprehensive understanding of impacts from sandwave clearance by monitoring at more locations.</p>	
--	---	--

7.12 Detailed comments: Volume A4.5.3 Offshore Cumulative Effects Appendix A Screening Matrix

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:F-36	<p>Detailed comments – Volume A4.5.3 Offshore Cumulative Effects Appendix A Screening Matrix: Point 36</p> <p>General: It is not clear how ongoing effects of projects already operational are taken into account when assigned category a (included as part of the topic baseline and hence not considered within the cumulative impact assessment) within the screening matrix. This is the case for many cables, pipelines & oil and gas plans or projects as well as shipping activity. For example all existing oil and gas infrastructure in the vicinity are already changing the habitat and therefore the ability to withstand further pressures and justify the use of non significant or minor judgements in EIA terms. In the long term the issue is that there will be multiple projects affecting the same widespread habitats with low sensitivity. If all of these are assessed as negligible and the baseline doesn't change, then it is hard for the reader to understand if and at what point the level of construction/ infrastructure starts to be an issue.</p>	<p>It is noted in PINS Advice Note Seventeen (PINS 2019) that where other projects are expected to be completed before the construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of assessment in the construction and operational phase (noting that the assessment should clearly distinguish between projects forming part of the baseline and those in the CEA).</p> <p>Table 3 of Volume A4, Annex 5.3: Offshore Cumulative Effects presents the CEA long list screening criteria which differentiates between 'Project, plan or activity is considered as part of the baseline environment but has ongoing effects' which are screened in, and 'Project, plan or activity included as part of the baseline environment (therefore not a consideration in the CEA)' which are screened out.</p>

8 Appendix G – Fish and Shellfish Ecology

8.1 Project Parameters

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:G-A	<p>Project Description: Natural England is generally satisfied with the project description.</p>	<p>Noted and captured in the SoCG with Natural England in relation to offshore matters.</p>

<p>RR-029-APDX:G-B</p>	<p>NE position on Worst Case Scenario (WCS) and Maximum Design Scenario (MDS): The Environmental Statement chapter (ES) sets out the Maximum Design Scenario (MDS) for the project, however, Natural England note that there are a number of instances whereby the MDS is based on conservative assumptions rather than being underpinned by survey data. For example, sandwave clearance and boulder clearance are based on clearance across the full length of the cable corridor, despite the baseline characterisation indicating that this will not be required. Additionally, the requirement for secondary cable protection (rock protection) is based on an estimated percentage, rather than a cable burial risk assessment informed by survey data, as is the percentage of piles that may require drilling. Natural England is concerned that these overly cautious estimates then translate into what is effectively seen by the applicant as an “allowable amount of impact”, and there is little impetus for them to refine this post consent. This approach conflicts with the principles of the ‘mitigation hierarchy’ and the emphasis within it on avoiding and reducing impacts.</p> <p>In light of Paragraph 2.6.196 of NPS EN-3, which states “The methods of construction, including use of materials should be such as to reasonably minimise the potential for impact on the physical environment”, it seems appropriate to reduce the MDS and provide a more accurate estimate of sandwave clearance and cable protection and replenishment.</p> <p>Natural England consider that the WCS have been assessed, with the exception of habitat loss resulting from drilling activity which has not been assessed.</p>	<p>See Applicant response to RR-029-APDX:E-B.</p>
------------------------	--	---

8.2 Baseline Characterisation

Reference	Relevant Representation Comment	Applicant’s Response
RR-029-APDX:G-C	<p>Data suitability and baseline characterisation: Natural England is broadly satisfied with data collected and baseline characterisation, although note</p>	<p>The Applicant welcomes the agreement on the baseline characterisation agreement and this has been captured in the SoCG with Natural England in relation to offshore matters.</p>

	<p>that some of the data are old (overall 10 years). Overall, we would defer to Cefas regarding the suitability of data.</p> <p>Natural England agree with the identification of herring and sandeel as key species of concern that require species-specific assessments, owing to their close affiliation with seabed sediments within the project boundary.</p>	<p>The Applicant welcomes agreement on the key species of concern for the fish and shellfish EIA assessment.</p> <p>Applicant responses to the Marine Management Organisation (MMO) representation (which captures Cefas input) is presented in the Applicant responses to RR-020-3.6.1 – RR-020-3.6.25.</p>
<p>RR-029- APDX:G-DA</p>	<p>Data gaps: It was not possible to fully assess the behavioural responses in herring in relation to piling noise. This is important information to inform whether spawning herring around Flamborough Head or herring migrating south past the Hornsea Four array will be affected by piling noise.</p>	<p>The Applicant acknowledges the behavioural effects, as defined by the 135dB SEL threshold have not been presented within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015). However, this is due to the use of the 135dB SEL threshold (which is based on a study within a quiet loch) being expressly recommended by the authors of the paper (Hawkins et al. 2014) as not appropriate for use in determining impacts from underwater noise on fish. Notwithstanding the above, it would not be considered appropriate to use a threshold based on study from a quiet loch within a much noisier area such as the southern North Sea (which is subject to high levels of anthropogenic activity and consequently noise) as the fish within this area will be acclimated to the noise and would be expected to have a correspondingly lesser sensitivity to noise levels. Therefore, it is the Applicant’s position that the behavioural responses for herring have been adequately addressed in paragraphs 3.11.1.128 to 3.11.1.131 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015).</p>
<p>RR-029- APDX:G-DB</p>	<p>Additional information is required to establish a more accurate peak herring spawning timeframe. Further examination of herring spawning using historic data (from International Herring Larvae Survey) including ‘back calculating’ for eggs and larvae should be carried out in order to better establish the peak herring spawning times for the Hornsea Project Four site and thereby justify the efficacy of the proposed seasonal restriction.</p>	<p>The Applicant has prepared a separate clarification note (G1.10 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction) to provide further analysis and justification of the “peak” spawning period for herring, using the methodology proposed by Cefas as part of the Hornsea Four Evidence Plan process. The aim of this note is to agree the timing of this “peak” spawning period and the associated piling restriction timing. The clarification note was submitted as part of the Applicant’s response to Deadline 1.</p> <p>Following an interrogation of the IHLS data and the available literature to identify the key timings and durations for herring larval development, a back-calculation based on the IHLS survey dates and larval lengths at survey has been undertaken to estimate the start of the “peak” spawning season.</p> <p>Based on the variable information in the literature regarding larval hatch sizes, the back-calculation indicates, with suitably precautionary assumptions, that the mean start of the “peak” spawning season is between approximately the 5th and 8th of September, with this considered to be a conservative estimate.</p> <p>Therefore, the Applicant considers it appropriate to conclude that the proposed seasonal restriction for Hornsea Four (1st September – 16th October) acts to effectively cover the</p>

		<p>“peak” of the spawning season, with additional conservatism incorporated into the proposed dates beyond that required based on the back-calculations as informed by available literature, and as a result provides a robust mitigation of the potential effects of piling of the HVAC booster station on herring spawning.</p>
--	--	---

8.3 Environmental Impact Assessment

Reference	Relevant Representation Comment	Applicant’s Response
<p>RR-029-APDX:G-E</p>	<p>Identified impacts: Impacts related to habitat loss as a result of drill arisings have not been assessed. Natural England feel this is a relevant impact pathway as chalk is present under the array area. It is therefore possible the deposited material from drilling could have a different composition to that of the seabed.</p> <p>There is also new evidence to consider in relation to the effect of EMF on shellfish.</p>	<p>In relation to habitat loss as a result of drill arising, see Applicant response to The Applicant notes that there is the potential for the development of mounds from drilling (if used), however, the spatial footprint from this would be less than that from seabed preparation works for gravity base foundations (GBS) and as such, GBS represent the worst case scenario for habitat loss and so any effect from drilling mounds would be less than this. Therefore, in accordance with the methodology presented within Volume A1, Chapter 5: Environmental Impact Assessment Methodology (APP-011), only the worst case scenario (seabed preparation works for GBS) has been presented an assessed within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015).</p> <p>The Applicant acknowledges recent research conducted in this field, notably papers by Scott <i>et al</i> 2018;2021 investigating the effects of electromagnetic fields (EMF) on crustacea. It is to be noted however, that these studies have investigated EMF strengths significantly higher than those that receptors will typically be exposed to as a result of offshore wind cables in the marine environment. Specifically, the lowest experimental EMF used in Scott <i>et al</i>. (2021) was a factor of 10 higher than that expected for Hornsea Four with no impacts identified at this EMF strength. Effects were only noted in these studies using EMF strengths which were a factor of 20 – 1,000 higher than those expected from Hornsea Four cables. Therefore, taking into account the new research available, it is still considered that it is unlikely that there would be any impacts to crustaceans from EMF emitted from Hornsea Four cables. Therefore, it is the Applicant’s position that impacts arising from EMF have been correctly scoped out of the ES as per the rationale provided in Table 3.8 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) and the Scoping Opinion (PINS, 2018).</p>
<p>RR-029-APDX:G-F</p>	<p>Methodology: (Please see Natural England’s overarching comments on EIA methodology in our main Representation).</p>	<p>Where the significance of effect could be slight or moderate, expert judgement, taking into consideration the scale of any effects, site specific data, previous survey reports including</p>

	<p>The methodology presented implies that, for an impact on a receptor for which sensitivity is high while the magnitude of the impact is minor, the significance of effect is slight or moderate. It is stated that 'where a range of significance of effect is presented, the final assessment for each effect is based upon expert judgement'. In all cases within this report the significance is scaled down to 'slight' which concerns Natural England. We consider that further justification should be provided in such instances.</p>	<p>both characterisation surveys of the region around Hornsea Four, and also that from post-construction surveys for various offshore wind farms, has been used to determine the final significance. Appendix A of Volume A1, Chapter 5: Environmental Impact Assessment Methodology (APP-011) provides details of the professional expertise in relation to the authors of the Hornsea Four Environmental Statement.</p>
<p>RR-029- APDX:G-GA</p>	<p>Cumulative Effect Assessment (CEA): Viking Link should be screened into the CEA.</p> <p>It should be noted that Eastern Green Link and the Northern Endurance Partnership should now be considered in Tier 2. Dogger Bank South Offshore Windfarm is also at scoping stage and should therefore be considered as Tier 2.</p>	<p>The Applicant notes that the Viking Link cable has been screened in to the fish and shellfish cumulative assessment (as presented in Section 3.12 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015).</p> <p>The Applicant can confirm that a final review of the long list against the most recent data sources was made in June 2021 to account for any changes to the status of the projects, plans and activities considered prior to final application (cut-off date for inclusion within the Hornsea Four CEA of 31st May 2021).</p> <p>The Applicant highlights that no planning application has been submitted in relation to the offshore elements of either the Northern Endurance Partnership project or the Scotland to England Green Link – SEGL2 (formerly Eastern Green Link) and as such, these projects should remain in Tier 3 of cumulative assessments and no updates to the assessments are required. The Applicant notes that Dogger Bank South Offshore Wind Farm was not on the Planning Inspectorate's Programme of Projects at the time of the cumulative cut-off date for Hornsea Four (31st May 2021) and in line with the Planning Inspectorate's Advice Note 17, was not considered a Tier 3 project. Since Hornsea Four DCO submission, Dogger Bank South submitted a Scoping Report which was then subsequently withdrawn in December 2021 and as such, the project should not be considered in cumulative assessments.</p>
<p>RR-029- APDX:G-GB</p>	<p>Certain impacts assessed for the project alone are not considered in the cumulative assessment as they are assessed as 'not significant' on a project alone basis. Natural England believe these should be carried forward to the CEA or the Applicant needs to provide further detail to justify the exclusion of these potential cumulative impacts</p> <p>It should also be noted that CEA may require updating, pending the outcome of some of the updated 'project alone' assessments.</p>	<p>As stated in paragraph 3.12.17 of within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), the following impacts have been scoped out on the basis that they have been assessed as having a negligible significance of effect on fish and shellfish ecology and having a highly localised nature or having management measures in place (as confirmed in the Scoping Report, and Evidence Plan Meeting 3 with Natural England, the MMO and Cefas (30/04/2019)):</p> <ul style="list-style-type: none"> • Direct and indirect seabed disturbances leading to the release of sediment contaminants;

		<ul style="list-style-type: none"> • Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species; and • Direct disturbance resulting from maintenance during operation. <p>All such impacts are anticipated to be highly localised, within the immediate vicinity of the works, and it is on this basis that no cumulative effects with other projects are anticipated – i.e. it is not considered that impacts will reach a sufficient large scale to act cumulatively with other plans or projects. It is not the case that they were screened out of the CEA on the basis of the “not significant” conclusion for the project alone. Additionally, as stated in paragraph 3.11.1.44 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), in relation to direct disturbances potentially leading to the release of sediment contaminants, contaminant levels found within the Hornsea Four study area were all found to be comparable to the wider regional background, with the potential release of any sediment bound contaminants likely to be rapidly dispersed with the tide and/or currents. Therefore, this impact will also not contribute to a cumulative effect.</p>
<p>RR-029- APDX:G-H</p>	<p>Assessment conclusion: We are not convinced with the conclusion that there are no significant effects on herring spawning grounds due to the highly variable spawning density data year on year.</p>	<p>Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), shows the core high intensity spawning areas utilised from 2007 – 2021. As detailed in paragraph 3.7.1.7 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), whilst the 2019/2020 and 2020/2021 spawning seasons, as presented in Figure 26 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), show high densities of herring spawning partially overlapping the ECC. These high density spawning areas extend over a wide region and it is a minor overlap with the ECC in relation to the size of spawning area. In addition, the 2019/2020 and 2020/2021 seasons also present generally high values across the survey area, giving a somewhat exaggerated appearance due to the standardised scaling of the IHLS data year to year of the relative importance of the ECC to the spawning grounds for herring on the fixed scale used in the figures (i.e., the fixed scale between years shows the relative change in abundance recorded year to year but can therefore result in a loss of detail regarding “hot spot” locations if wider areas have high abundances in that year). Therefore, despite the interannual variations shown in Figures 24 to 26 of the Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), the core high intensity spawning area is located to the north of the ECC, as presented within Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015). Therefore, on this basis it is the Applicant’s position that the assessment conclusion on no significant effects in EIA terms remains valid.</p>

8.4 Mitigation

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:G-I	In the absence of further data to support assumptions relating to a peak spawning season, Natural England consider that a more precautionary approach to mitigation should be applied with piling halted between 1st August and 31st October.	See Applicant response to RR-029-APDX:G-DB.

8.5 Post-consent monitoring

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:G-J	We consider that there may be a requirement for pre-and post-consent monitoring of sandeel habitat but defer to Cefas in relation to the details of this.	The Applicant notes that a commitment has been made to undertake targeted Particle Size Analysis (PSA) survey within the export cable corridor along planned cable routes and adjacent areas – focused on cable sections where it is thought that flow tools may be required (e.g. sandwaves or more challenging ground conditions) to provide a baseline of the sediment suitability within the cable corridor for herring and sandeel spawning (as defined by Reach et al. (2013) and Latto et al. (2013) for herring and sandeel, respectively). This pre-construction and post-construction monitoring is detailed in F2.7: Outline Marine Monitoring Plan (APP-242) .

8.6 Detailed comments: Volume A2.3 Fish and Shellfish Ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:G-1	Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 1 Table 3.2 & Table 3.8: A new paper has recently been published which provides new evidence of impacts of EMF on shellfish. Natural England advise that the Applicant reviews Scott et al (2021) and reconsiders the scoping out of EMF impacts on fish and Shellfish.	The Applicant acknowledges and has reviewed the recent publication by Scott <i>et al.</i> , (2021), investigating the effects of EMF on crustacea. It is to be noted however, that this study investigated EMF strengths significantly higher than those that receptors will typically be exposed to as a result of offshore wind cables in the marine environment. Specifically, the lowest experimental EMF used in Scott <i>et al.</i> (2021) was a factor of 10 higher than that

		<p>expected for Hornsea Four with no impacts identified at this EMF strength. Effects were only noted in this study using EMF strengths which were a factor of 20 – 1,000 higher than those expected from Hornsea Four cables. Therefore, taking into account the new research available, it is still considered that it is unlikely that there would be any impacts to crustaceans from EMF emitted from Hornsea Four cables, therefore the Applicant proposes that this impact remains scoped out.</p>
RR-029-APDX:G-2	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 2 Section 3.7.1.7: Whilst Natural England welcome the commitment to avoid piling during the period 1st September to the 16th October within the HVAC search area (Co190), we do not believe the evidence presented is strong enough to limit this measure to that 6-week period. The spawning season for Herring is 1st August – 31st October. The 6-week period proposed here is based on a piling restriction used for Triton Knoll OWF. The Applicant is asked to provide site specific evidence to support a ‘peak’ Herring spawning season for the Hornsea 4 area or is advised to follow a precautionary approach and halt piling from 1st August - 31st October. This issue was raised previously in our advice on the draft ES in November 2020.</p>	<p>See Applicant response to RR-029-APDX:G-DB.</p>
RR-029-APDX:G-3	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 3 Section 3.11.1.5: The technical report shows the International Herring Larvae Survey (IHLS) larval densities to vary from year to year. This makes it difficult to say with certainty that there is no overlap between the ECC area and high-density spawning areas. Therefore, Natural England believe the magnitude of impact of direct disturbance (as well as other impacts discussed later, see point 5) on herring spawning grounds should be higher than minor on a precautionary basis as there is the potential for impacts to lead to ‘loss of resource’.</p>	<p>See Applicant response to RR-029-APDX:G-H. Taking into consideration the points raised in Applicant response to RR-029-APDX:G-H, as well as the localised nature of the impact of direct disturbance, the magnitude of impact of direct disturbance on herring is considered to be minor, and is not anticipated to lead to a ‘loss of resource’.</p>
RR-029-APDX:G-4	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 4 Section 3.11.1.20: Natural England do not feel the impacts associated with drilling foundations, in particular the mounds formed following disposal of drill material, have been considered in the impact assessment (as raised previously in Nov 2020). This also applies to the benthic chapter. Whilst the impacts from increased suspended sediment are considered,</p>	<p>See Applicant response to RR-029-APDX:G-E in relation to drill mounds. As such, it is the Applicant’s position that the Rochdale Envelope has been correctly applied and the worst case has been assessed and any impacts arising from drilling mounds will be lower than those assessed.</p>

	<p>there is no mention of temporary or long-term habitat loss/change in habitat as a result of drill arisings forming persistent mounds or changing surface substrate type. Whilst the area affected might be less than the presence of the infrastructure itself, the area impacted by disposal will be in addition to the infrastructure itself and therefore needs to be considered in the impact assessment.</p>	
<p>RR-029-APDX:G-5</p>	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 5 Section 3.11.1.37: Natural England welcome the adjustment of sensitivity of spawning herring to SSC from medium to high, however Natural England still have concerns with the magnitude of this impact being assessed as ‘minor’.</p> <p>As the IHLS larval data has shown, spawning hotspots move around from year to year across the ECC and the area to the north. This will in turn affect the proximity of herring spawning to construction activities, and the magnitude of these impacts potentially lead to ‘loss of resource’. This could result in the impact becoming more significant in EIA terms. This matter requires further consideration.</p>	<p>Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), shows the core high intensity spawning areas utilised from 2007 – 2021. As detailed in paragraph 3.7.1.7 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), whilst the 2019/2020 and 2020/2021 spawning seasons, as presented in Figure 26 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) show high densities of herring spawning partially overlapping the ECC, this represents a minor overlap with the high density area which extends over a wide region. In addition, the 2019/2020 and 2020/2021 seasons also present generally high values across the survey area, giving a somewhat exaggerated appearance due to the standardised scaling of the IHLS data year to year of the relative importance of the ECC to the spawning grounds for herring on the fixed scale used in the figures (i.e. the fixed scale between years shows the relative change in abundance recorded year to year but can therefore result in a loss of detail regarding “hot spot” locations if wider areas have high abundances in that year). Therefore, despite the interannual variations shown in Figures 24 to 26 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), the core high intensity spawning area is located to the north of the ECC, as presented within Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), and therefore impacts from SSC are not considered to result in a significant effect on spawning herring.</p>
<p>RR-029-APDX:G-6</p>	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 6 Section 3.11.1.72: Whilst the implementation of a seasonal piling restriction goes some way to minimum risk to the herring spawning ground in the vicinity of HVAC, Natural England do not consider that sufficient evidence has been presented to limit this ‘peak’ spawning period to just 6 weeks. As per our comments on the draft Environmental Statement in November 2020 and above in point 2 we wish to see additional evidence provided to support this ‘peak’ spawning period of The Banks herring spawning ground, or an expansion in the ‘peak’ period to cover the full</p>	<p>See Applicant response to RR-029-APDX:G-DB.</p>

	<p>spawning season in order to reduce the effect on herring. Until this is addressed, we can't agree with the magnitude of effect on herring from piling being assessed as 'minor' at this time.</p>	
RR-029-APDX:G-7	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 7 Section 3.12.2.5: Natural England suggests the calculated combined suspended sediment levels is reduced in line with the area of overlap between the Dogger Bank A & B export cables and the fish and shellfish study area. This will allow a more accurate cumulative impact to be assessed.</p>	<p>It is not possible to quantify some impacts from other projects by the percentage overlap with the Hornsea Four study area. An example of this would be the release of suspended sediments - values from Dogger Bank A & B cannot simply be allocated on a pro-rata basis in line with percentage overlap as sediment release is unlikely to be uniform throughout the project. In order to address this, the percentage overlaps have been presented in the text to contextualise the precautionary nature of the MDS. This is standard practice for offshore wind projects. In line with Natural England's advocated approach to the 'consented vs as-built' situation, Hornsea Four have taken the precautionary approach and considered the consented projects within all CEAs. This approach means assessments will always be considering the worst case in terms of cumulative impacts.</p>
RR-029-APDX:G-8	<p>Detailed comments – Volume A2.3 Fish and Shellfish Ecology: Point 8 Section 3.12.2.13, 3.12.2.45, 3.12.3.9, 3.12.3.16 & 3.12.3.27: Natural England does not believe there is sufficient information or evidence available on the Endurance Carbon Capture project to reach the anticipated conclusion that there would be no significant impact. The Applicant recognises there is limited detail on the project at this time, and it is not possible to make a detailed assessment.</p> <p>Natural England would like the Applicant to acknowledge that there may be overlap with the construction phase of the Endurance project and Hornsea 4 as the timelines provided are very tight in relation to consent and start of construction. There is also no acknowledgment (in this report or the Annex 3.5 Offshore cumulative effects) that the two projects overlap in spatial extent, which can only magnify the impacts.</p> <p>Natural England require the assessments of impacts in combination with the Endurance Carbon Capture project to be reviewed at a later date when more information is available. This is the case for all impact receptor pathways for which the Endurance Carbon Capture project is currently assessed against.</p>	<p>See Applicant response to RR-029-APDX:F-16.</p>

8.7 Detailed comments – Volume A5.3 Fish and Shellfish Ecology Technical Report:

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:G-9	<p>Detailed comments – Volume A5.3 Fish and Shellfish Ecology Technical Report: Point 9</p> <p>General: We note that some of the data sets used within the technical report are quite old (circa 10 years). We would defer to Cefas (MMO) on the appropriateness of this.</p>	Applicant responses to the Marine Management Organisation (MMO) representation (which captures Cefas input) is presented in RR-020-3.6.1 – RR-020-3.6.25. It is the Applicant's position that the data used to inform the baseline characterisation is appropriate and sufficient for the purposes of EIA.
RR-029-APDX:G-10	<p>Detailed comments – Volume A5.3 Fish and Shellfish Ecology Technical Report: Point 10</p> <p>Section 3.2.2.3 & Figures 24 – 26: Natural England consider that statements throughout this report and the ES describing high density herring spawning areas as not overlapping with the ECC are not correct, given the mobile nature of spawning hotspots as shown in the heat maps of IHLS data.</p> <p>There are high larval densities occurring in the ECC in the years 2011-2012, 2019-2020 and especially in 2020-2021 This should lead to a precautionary approach being taken when assessing magnitude of impacts with regard to herring spawning and effects of construction & operation, particularly as two of these high density years are the two most recent years of data we hold.</p>	See Applicant response to Natural England's RR-029-APDX:G-H.

9 Appendix H -Onshore Ecology & Landscape, Seascape and Visual Effects

9.1 Summary of main issues related to onshore ecology

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-A	Summary of main issues related to onshore ecology Baseline Characterisation	Noted.

	<p>Data suitability and baseline characterisation</p> <p>Generally, surveys and investigation are adequate in identifying risks and mitigation to prevent harm to designated sites.</p> <p>Data gaps</p> <p>No surveys have been carried out for Best and Most Versatile (BMV) soils. However, the additional data required has been identified as part of the DCO, mitigation, CoCP and EMP. No changes are required.</p>	
<p>RR-029- APDX:H-B</p>	<p>Commitments and mitigation</p> <p>Commitments and mitigation important to the scheme to prevent impacts:</p> <ul style="list-style-type: none"> o River Hull Headwaters (Ecology): Outline Ecological Management Plan, Co122, Co123 & Co168 o River Hull Headwaters (Hydrology – geomorphology, quality and resources): Outline Code of Construction Practice, Co4, Co14, Co18, Co19, Co124, Co127. • Soils: Co8, Co10, Co61 o Air Quality (Ecological receptors): Co114 <p>In particular, the following should be secured through the DCO:</p> <ul style="list-style-type: none"> o Co4 (Pollution Prevention Plan) o Co14 (Construction Drainage Scheme) o Co18 (Hydrogeological risk assessment to inform crossing method) o Co19 (Onshore Infrastructure Drainage Strategy) o Co124 (Code of Construction Practice) o Co127 (Onshore Decommissioning Plan) o Co168 (Ecological Management Plan) 	<p>Noted. It can be confirmed that commitments mentioned in this comment are secured via C1.1: Draft DCO including draft DML (APP-203). The mechanism securing each commitment is detailed in the column named 'How is the Commitment secured?' in A4.5.2: Commitments Register (APP-050). Of the list provided in this relevant representation:</p> <ul style="list-style-type: none"> • Co4 is secured via DCO Requirement 17 (Code of construction practice); • Co14 is secured via DCO Requirement 13 (Surface and foul water drainage); • Co18 is secured via DCO Requirement 17 (Code of construction practice); • Co19 is secured via DCO Requirement 13 (Surface and foul water drainage) and DCO Requirement 15 (Surface water); • Co124 is secured via DCO Requirement 17 (Code of construction practice); • Co127 is secured via DCO Requirement 24 (Onshore decommissioning); and • Co168 is secured via DCO Requirement 10 (Ecological Management Plan).

9.2 Summary of main issues related to landscape, seascape and visual effects

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-C	<p>In compiling this response the following documents have been considered in relation to;</p> <ul style="list-style-type: none"> • Landscape, Seascape and visual effects • A2.10 Seascape, Landscape and Visual Resources • F2.8 Outline Landscape Management Plan • A3.4 Landscape and Visual • A6.4.1 Landscape and visual Resources: Wireframes and photomontage 	Noted.
RR-029-APDX:H-D	<p>Summary of main issues</p> <p>In keeping with Natural England's statutory remit, our comments will be limited to those aspects of the scheme which have the potential to affect the special character of designated landscapes.</p> <p>Seascape</p> <p>General</p> <p>As with our previous responses, Natural England will limit our comments to those aspects of the scheme which have the potential to affect the special character of the Flamborough Head Heritage Coast (FHHC) and its seascape setting.</p> <p>Visual impact</p> <p>At minimum distances in excess of 68km from the coastline of the East Riding Natural England is confident that the turbines of Hornsea 4 will not be visible, when viewed with the naked eye, from onshore locations.</p> <p>Lighting</p>	<p><i>Landscape</i></p> <p>The Applicant is aware of the current project to consider the Yorkshire Wolds for AONB status. At the time of writing, no potential boundary or statement of special qualities has been published, and so no conclusions can be drawn as to the potential of the Hornsea Four Project to impact on the future designation.</p> <p>The effects of the OnSS and onshore ECC on landscape character are fully assessed within the landscape and visual impact assessment (LVIA), presented in A3.4: Landscape and Visual (APP-028). This includes consideration of the 'Open High Rolling Farmland' landscape, which covers the Yorkshire Wolds National Character Area (NCA), and the locally designated Yorkshire Wolds Important Landscape Area (ILA). The onshore ECC passes through the 'Open High Rolling Farmland' for a short section, while the OnSS is in a different landscape. The LVIA concludes that significant effects of the OnSS on landscape character would be limited to the area east of the A164, which is outside both the NCA and the ILA. Direct effects on the 'Open High Rolling Farmland' from construction of the export cable corridor will be temporary and not significant.</p> <p>It is noted that the Yorkshire Wolds ILA was a notable receptor in the site selection process of the OnSS (see Table 4 of APP-038) which has limited the effect on the designation.</p>

	<p>Following earlier discussions with the Applicant we no longer have concerns about the effects of the lighting proposed for the HVAC Booster Stations on the special character of the Flamborough Head Heritage Coast. See Document F2.17 for details.</p> <p>Landscape Designated sites</p> <p>Natural England is currently assessing the Yorkshire Wolds against the criteria for designation as an Area of Outstanding Natural Beauty (AONB). The proposed development is located within the Yorkshire Wolds. Whilst initial assessment phase does not confer any additional planning protection, it is possible that this could become a material consideration in planning decisions during the determination period. Natural England would be pleased to provide further information in relation to this matter as it becomes available.</p>	<p>The presence of a national designation such as AONB indicates a high level of value placed on the landscape and may influence the effects identified in LVIA by increasing the sensitivity of the landscape receptor. The magnitude of change, which is assessed as 'small' for the 'Open High Rolling Farmland', would not be altered.</p> <p>The Applicant is open to further discussion with Natural England to understand the timescales for the designation project, and any emerging information on boundaries or special qualities.</p>
--	--	---

9.3 Detailed comments: A3.6 Land Use and Agriculture

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-E	A3.6 Land Use and Agriculture Natural England would have preferred BMV surveys to have been completed prior to application. But commitment to surveys and mitigation is adequate to prevent significant harm to BMV soils.	Noted.

9.4 Detailed comments: A4.3 Selection and Refinement of the Onshore Infrastructure

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-F	Natural England found some errors in the selection criteria e.g. Table 10 states that black should be used for routes intersecting SSSIs. But in table 11 both routes intersect a SSSI but they are in amber. Also, there was no assessment of BMV soils in the route selection.	It is acknowledged that an inconsistency regarding the application of a black criteria is evident in Table 11. It is noted that irrespective of this, the results of the site selection and route planning process would remain unchanged. It is also acknowledged that due to the assistance and input of Natural England during the evidence plan process, significant adverse

	<p>From the information provided it is difficult to ascertain whether it is the most sustainable route. However, the mitigation and surveys for onshore issues from the other parts of the document are adequate to prevent impacts.</p>	<p>effects are anticipated to be prevented at the crossing locations associated with the River Hull SSSI.</p> <p>It is noted that Natural England consider the mitigation and surveys for onshore issues are adequate to prevent impacts.</p>
--	--	---

9.5 Detailed comments: A4.4.2 Onshore Crossing Schedule

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-G	<p>In the crossing schedule table the 'Related Co Number' only mentions Co1 for the SSSI crossing points. It does not mention Co18, Co124, & Co168 which contain specific measures for the SSSI and is an important part of the mitigation for crossing.</p> <p>If this document is a working document for keeping track of mitigation measures at each crossing point, Natural England suggest this is addressed. The correct mitigation is identified in the commitments Co18, Co124 & Co168, provided these are secured for all relevant crossings with SSSI this should be acceptable.</p>	<p>It is acknowledged that commitments 18, 124 and 168 are relevant to the River Hull Headwaters SSSI and are identified in A4.5.2: Commitments Register (APP-050) and secured via the relevant DCO Requirements and associated plans. The purpose of the 'Related Commitment Number' column in A4.4.2: Onshore Crossing Schedule (APP-040) is to list commitments that are relevant to crossing methodology (such as Co1, which commits to trenchless technology at certain locations, or Co27, which protects specific trees within the crossing schedule itself).</p>

9.6 Detailed comments: A4.5.6 Location of Onshore Cumulative Schemes

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-H	<p>To the best of Natural England's knowledge, this appears accurate. However, we would defer to the Local Planning Authority on this matter.</p>	Noted.

9.7 Detailed comments: A6.3.2 Extended Phase 1 Target Note Tables

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-I	The document doesn't reference the River Hull Headwaters SSSI, where Natural England believe it should, however it doesn't affect the outcome of the application.	The Applicant acknowledges the omission of reference to the River Hull Headwaters SSSI in APP-101 and notes that it doesn't affect the outcome of the application.

9.8 Detailed comments: A6.3.4 Breeding Bird Survey Report

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-J	The document doesn't reference the River Hull Headwaters SSSI, but it doesn't affect the overall outcome of the application.	The Applicant acknowledges the omission of reference to the River Hull Headwaters SSSI in APP-103 and notes that it doesn't affect the outcome of the application.

9.9 Detailed comments: F2.6 Outline Onshore Infrastructure Drainage Strategy

Reference	Relevant Representation Comment	Applicant's Response
RR-029-APDX:H-K	General There is no mention of SSSI or the need to consult NE within this document. Although not mentioned, this is in the Code of Construction Practice so Natural England consider this acceptable.	Noted.

8 Annex 6 – Full response to Marine Management Organisation (MMO) (RR-020)

Annex 6 – Marine Management Organisation (MMO) (RR-020)

1.1 General comments on the application

Reference	Relevant Representation Comment	Applicant's Response
RR-020-1.1.1	The MMO has concerns about the timeframes for submission of documents. The MMO advise that a 6-month lead period (prior to the commencement of activities) rather than 4-month, would be more appropriate to allow sufficient time to review the submissions and resolve any issues; the submissions may require multiple rounds of consultation and the shorter the lead time, the higher the risk that there will be delays to the Applicant's project delivery timeframe. In addition to this the MMO has requested the removal of a determination timescale. This matters are expanded in sections 2.1.2-2.1.14.	Please see detailed response below in comments RR-020-2.1.2 to RR-020-2.1.14.
RR-020-1.1.2	The MMO has ongoing concerns in relation to underwater noise and disturbance impacts to fish and marine mammals and so at this stage cannot agree with the seasonal restriction timescale in the current dDCO. This is expanded in sections 2.1.15 and 3.7.32-3.7.36.	Noted. Applicant responses in relation to underwater noise and disturbance impacts to fish and marine mammals are addressed under the relevant points below (RR-020-3.7.1 – RR-020.3.7.39).
RR-020-1.1.3	The MMO has concerns on the use of materiality within the DMLs. This has been expanded in section 2.1.16 to 2.1.20.	Please see detailed response below in comments RR-020-2.1.16 to RR-020-2.1.20.
RR-020-1.2.1	The Applicant should demonstrate that they have considered whether the project adheres to all the relevant marine plans and policies in the area. The MMO recommends that this is presented in a single, coherent document instead of a number of separate references throughout the submission. The relevant marine plan policies that should be met can be identified using the Explore Marine Plans tool and policy information on the following website: Further comments can be found in section 3.1.	The Applicant has provided a marine plan policy review as part of the Applicant's response to Deadline 1 (G1.40 Marine Plan Policy Review).

1.2 dDCO and DMLs

Reference	Relevant Representation Comment	Applicant's Response
RR-020-2.1.1	dDCO Major Comments: Collaboration	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.

	<p>2.1.1: The dDCO contains 2 DMLs consisting of one for the generation assets (Schedule 11) and one for the transmission assets (Schedule 12). Splitting the assets into two separate DMLs ensures smooth transitions during the transfer of benefit. If a transfer of benefit were to happen, it is unclear what mechanisms would be in place to ensure two different asset holders working in the same area would collaborate together, especially with regard to in-combination effects. This is considered a potential risk to the project by the MMO. The MMO is therefore considering requesting the inclusion of a collaboration condition to go within the DML. The MMO will confirm this within its next written response.</p>	
RR-020-2.1.2	<p>dDCO Major Comments: Timescales</p> <p>2.1.2: Timescales - Part 4, Condition 14 refers to a timescale of four months to submit documentation.</p> <p>14.—(1) Each programme, statement, plan, protocol or scheme required to be approved under condition 13 (save for that required under condition 13(1)(f)) must be submitted for approval at least four months prior to the intended commencement of the relevant stage of the licensed activities, except where otherwise stated or unless otherwise agreed in writing by the MMO.</p> <p>(2) The pre-construction monitoring surveys, construction monitoring, post-construction monitoring and related reporting required under condition 13(1)(f) must be submitted in accordance with the following, unless otherwise agreed in writing with the MMO— (a) at least four months prior to the first survey of the relevant stage, detail of any pre-construction surveys and an outline of all proposed monitoring; (b) at least four months prior to construction of the relevant stage, detail on construction monitoring; and (c) at least four months prior to commissioning of the relevant stage, detail of postconstruction (and operational) monitoring;</p> <p>(3) The MMO must determine an application for approval made under condition 13 within a period of four months commencing on the date the</p>	Noted.

	<p>application is received by the MMO, unless otherwise agreed in writing with the undertaker.</p> <p>(4) The licensed activities for the relevant stage must be carried out in accordance with the approved plans, protocols, statements, schemes and details approved under condition 13, unless otherwise agreed in writing by the MMO.</p>	
RR-020-2.1.3	<p>2.1.3: The MMO has concerns over these timescales as it is not enough time to fully assess and review documents and therefore request that this is changed to six months. Comments on timescales are below from 2.1.4 to 2.1.20.</p>	<p>Following Relevant Representation comments from both the MMO and Natural England, the Applicant has reviewed the pre-construction submissions and considered the points raised. To avoid a one size fits all approach, and as proposed by Natural England in their comment RR-029-APDX:A-10, it is proposed that the following documents be changed to a 6 month submission requirement:</p> <ul style="list-style-type: none"> Outline Marine Written Scheme of Investigation Outline Fisheries Coexistence and Liaison Plan Outline Design Plan Outline Offshore Cable Installation Plan HVAC Booster Station Lighting Plan <p>In the Applicant's opinion these documents are most suitable for early submission, as other plans and documents may require refinement or modification with 6 months of submission owing to the nature of the documents.</p>
RR-020-2.1.4	<p>2.1.4: Condition 14 sets out the requirements for the Applicant to submit all pre-construction documentation at least four months prior to the commencement of the construction works. The MMO does not agree that a four month timescale provides sufficient time for the post consent documentation to be considered prior to the start of commencement of works. The MMO believes that a four month pre-construction submission date is unrealistic and even counterproductive, as the pre-construction sign-off process is not always straight forward.</p>	<p>Please see response to RR-020-2.1.3 above.</p>
RR-020-2.1.5	<p>2.1.5: The four month timescale was deemed appropriate for round 1 developments, which were smaller, closer to shore and with fewer complex environmental concerns. The documents in question require in depth analysis</p>	<p>Please see response to RR-020-2.1.3 above.</p>

	by both MMO staff and statutory consultees and as such, there needs to be as much time as practically possible to allow this process to take place.	
RR-020-2.1.6	<p>2.1.6: It is very common that documents submitted under these type of conditions require multiple rounds of consultation to address stakeholder concerns. This process alone can be very time consuming and the proposed four month submission time would not account for any additional time that the Applicant may require to update documents throughout the process. The MMO further notes that some documents require additional assessment processes, for example a Southern North Sea (“SNS”) Special Area of Conservation (“SAC”) Site Integrity Plan (“SIP”) may require post consent Habitats Regulations Assessment (“HRA”) considerations to be made. The MMO appreciates that the Applicant could be working within tight time schedules post consent, and as such, we advise that a more suitable timescale is provided to reduce risks that could lead to project delays.</p>	Please see response to RR-020-2.1.3 above.
RR-020-2.1.7	<p>2.1.7: For example, the timescale of one in depth plan (such as SNS SIP) could potentially follow this path:</p> <ul style="list-style-type: none"> a) Up to 4 weeks to acknowledge and review the document within the MMO. b) Up to 6 weeks for external consultation with stakeholders on this documentation. c) Up to 4 weeks once consultation is closed to allow for the MMO to review the responses and possibly ask for additional information from the Applicant. At this stage the MMO and the Applicant could be in discussion to agree on an approach to the responses. d) Up to four weeks to allow for the Applicant to undertake any actions resulting from any MMO request for further information. Depending on the level of detail, and Applicant resources, this could represent a further significant time period. 	Please see response to RR-020-2.1.3 above.

	e) Once actions are completed and information is returned to the MMO, the MMO could need to undertake new consultations	
RR-020-2.1.8	2.1.8: It is noted from the above that, even if the discharge of documentation were to follow the current estimated timescales, and no further communication was required from the Applicant (which is highly unlikely) the current estimated turnaround equates to 18 weeks, which is longer than the 16 weeks suggested by the Applicant. It should also be noted that the above timescale applies to only one document, when in reality, the number of in-depth discharge requirements could far exceed 30 in total.	Please see response to RR-020-2.1.3 above.
RR-020-2.1.9	2.1.9: The MMO recognises that the current draft outlines that the 4 month timing could be changed with written agreement of the MMO. The MMO notes that the condition wording implies that it is for the Applicant to request a change and for the MMO to agree. It is far more likely that the Applicant will ask the MMO to reduce timescales for certain documents, as has been the MMO's experience thus far.	Please see response to RR-020-2.1.3 above.
RR-020-2.1.10	2.1.10: The MMO considers it is important to address the practicalities of these types of sign-off as well as the specific wording held within the consent. If the works are submitted 4 months prior to the construction start date then there is risk that the Applicant will have already begun preparing for construction. If sign off cannot be achieved within the 4 month window then there is a risk that the Applicant will face cost implications of this, for instance the costs from vessels sitting idle and the potential need to resource storage areas for wind farm infrastructure components that should have been installed. By amending the submission timescale to 6 months there is more time to undertake the required process with less risk of needing an extension or the Applicant facing delays.	Please see response to RR-020-2.1.3 above.
RR-020-2.1.11	MMO Determination 2.1.11: Condition 14 (3) includes a specified determination period within which the MMO must determine whether or not to issue consent under this condition. The MMO strongly considers it inappropriate to put timeframes on decisions of such a nature. The MMO would not willingly seek to constrain our ability to	Please see response to RR-020-2.1.3 above.

	make an appropriate and timely decision on post consent sign-off of plans and documentation.	
RR-020-2.1.12	2.1.12: Under such tight restrictions if the evidence obtained does not provide the MMO with confidence that risks have been dealt with robustly, the determination may result in a refusal of the application for discharge. The undertaker would then have to restart the process and provide updated documentation in this instance	Please see response to RR-020-2.1.3 above.
RR-020-2.1.13	2.1.13: The MMO acknowledges that the Applicant may wish to create certainty around when to expect a determine on applications for approvals required under the conditions of a licence, and whilst the MMO acknowledges that delays can be problematic for developers the MMO advises that it does not delay determining whether to grant or refuse such approvals unnecessarily, we make determinations in as timely a manner as is possible.	Please see response to RR-020-2.1.3 above.
RR-020-2.1.14	2.1.14: The MMO's view is that it is for the developer to ensure that it applies for any such approval in sufficient time as to allow the MMO to properly determine whether to grant or refuse the approval application. Therefore the provision under condition 14 (3) should be removed from the DML, notwithstanding this the MMO recommends a timescale of 6 months for submission of all discharge documents	The Applicant considers this condition to be appropriate to ensure the timely delivery of Hornsea Four. The Applicant notes that a similarly worded condition has been included by the Secretary of State in the Hornsea Three, Norfolk Boreas and Norfolk Vanguard DCO deemed marine licences.
RR-020-2.1.15	Seasonal Restriction 2.1.15: Seasonal restriction – The MMO does not agree with the current seasonal restriction of ‘between 1st September to 16 October each year’ in Schedule 12, Part 2, Condition 23 and requests that this is updated to “between 1st August and 31st October each year”. The reasoning for this has been set out within sections 3.7.32 to 3.7.36.	See Applicant response to MMO’s points RR-020-3.7.24 - 3.7.29.
RR-020-2.1.16	DML Materiality 2.1.16: The MMO strongly considers that the activities authorised under the dDCO and DML should be limited to those that are assessed within the EIA, and so the statement within the DML “unlikely to give rise to any materially new or materially greater environmental effects” should be updated to clarify this.	The Applicant considers that the current drafting in paragraph 9 of Part 1 the DMLs is sufficient. This is in line with the drafting on similar projects such as Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas. Paragraph 9 of each DML states: “Any amendments to or variations from the approved details must be in accordance with the principles and assessments set out in the environmental statement. Such agreement may only be given in relation to immaterial changes where it has been

		<p>demonstrated to the satisfaction of the MMO that it is unlikely to give rise to any materially new or materially greater environmental effects from those assessed in the environmental statement.”</p> <p>The Environmental Statement captures the results of the EIA, meaning that this paragraph limits the activities permitted by the DCO and DMLs to those assessed by the EIA. Any change to approved details which leads to a change in the likely significant effects assessed in the Environmental Statement would be considered material and would no longer be authorised by the DMLs.</p>
RR-020-2.1.17	<p>2.1.17: The intention behind EIA is to protect the environment by ensuring that in deciding whether to grant a development consent for a project, and in deciding what conditions to attach to that consent, the decision has full knowledge of what the likely significant environmental effects of the project/development will be. That knowledge then guides the consent process and what conditions, if any, to attach to the consent. Additionally,</p> <p>there is considerable public consultation under the EIA process because the process recognises the importance of local knowledge in environmental decision making.</p>	Please see the response to comment RR-020-2.1.16
RR-020-2.1.18	<p>2.1.18: The EIA legislation was designed to apply to those plans/projects which could be sufficiently detailed and particularised at the application stage, to allow the consenting decision to be taken in the full knowledge of what the likely significant effects of that plan or project would be. In such circumstances, it would be unnecessary to create a legal obligation under the order which requires the activities to remain within what was assessed under the EIA, because the consent authorises the detailed and well particularised project, assessed in the EIA to be carried out, and therefore, providing the development is constructed as per the consent, those works would, by default, remain within the parameters of the EIA.</p>	Please see the response to comment RR-020-2.1.16
RR-020-2.1.19	<p>2.1.19: If the Applicant is wanting to retain some flexibility and is proposing that the works that can be carried out should be restricted to those which “do not give rise to materially new or materially different environmental effects”</p>	Please see the response to comment RR-020-2.1.16.

	<p>to those assessed in the EIA. The concern with this is that the inclusion of the word "materially" here would allow the undertaker to carry out works whose effects are outside of the likely significant effects assessed in the EIA, providing they do not do so materially, i.e. in any significant way, greatly, or considerably. This is not what the purpose of the EIA process is, and it runs contrary to the purpose of EIA. The other issue with this is that whilst the undertaker is responsible for producing the environmental information and statement on which the EIA decision is based, the appropriate authority is responsible for the EIA consent decision, the inclusion of the word materially essentially means that the undertaker makes the decision as to what is and what is not material. Under EIA it is for the appropriate authority to determine what the likely significant effects will be and how those should be mitigated.</p>	
RR-020-2.1.20	<p>2.1.20: On this basis, the MMO does not consider that it is appropriate to use the word "material" in these circumstances.</p>	Please see the response to comment RR-020-2.1.16
RR-020-2.2.1	<p>dDCO Interpretations Comments – Part 1 Article 2 & 3</p> <p>2.2.1: The MMO has provided comments on the interpretations sections—where applicable, these are relevant to the DML interpretations sections as well</p>	The Applicant notes the comments from the MMO. Please see further responses to comments on the interpretations below.
RR-020-2.2.2	<p>2.2.2: "'box-type gravity base structures" means a structure principally of steel, concrete, or steel and concrete with a square base which rests on the seabed due to its own weight with or without added ballast or additional skirts and associated equipment including J-tubes, corrosion protection systems and access platform(s) and equipment"</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.
RR-020-2.2.3	<p>2.2.3: "'bridge link" means []"</p>	The Applicants provides the following definition for "bridge link";

	<p>The MMO maintains a watching brief on this interpretation.</p>	<p>A bridge link can be used for interconnection between any combination of permanent offshore installation assets (e.g. Offshore Substation (OSS) and accommodation platform). It is a steel truss structure installed 20-25m above sea level, with provision for overhead clearance for personnel, lighting fixtures and ancillary cabling.</p> <p>The definition in the draft DCO will be updated.</p>
RR-020-2.2.4	<p>2.2.4: ""buoy" means any floating device used for navigational purposes or measurement purposes"</p> <p>The MMO requests clarity as to whether LIDAR buoys and wave buoys will be required and if so it should be clearly stipulated within the DMLs</p>	<p>Lidar and wave buoys would fall within the definition, being floating devices used for monitoring purposes. The Applicant is content to amend the definition of "buoy" to expressly include those as examples, for clarity.</p>
RR-020-2.2.5	<p>2.2.5: ""cable crossings" means a crossing of existing sub-sea cables or pipelines or other existing infrastructure by a cable or, where cables run together in parallel, a set of cables, authorised by this Order together with cable protection"</p>	<p>See response below to comment RR-020-2.2.6.</p>
RR-020-2.2.6	<p>2.2.6: The MMO would like to understand whether this is for all cable crossings? In addition, please can the Applicant clarify if cable protection is needed to be included within this interpretation since cable protection is a separate interpretation.</p>	<p>The Applicant confirms this definition applies to all cable crossings. "Cable protection" and "cables" have been defined separately but taken together they form part of the cable crossings.</p>
RR-020-2.2.7	<p>2.2.7: ""commence" means the first carrying out of any licensed marine activities authorised by this marine licence, save for pre-construction surveys and monitoring approved under this licence and the activities set out in article 2(d), and "commenced" and "commencement" must be construed accordingly"</p> <p>The MMO requests that the Applicant clarifies what the intention is by including pre-construction surveys, monitoring and the activities set out in article 2(d)?</p>	<p>Yes, the Applicant has intentionally excluded pre-construction surveys, monitoring and the activities set out in article 2(d) is to ensure that obligations to provide extensive plans, documents and information (such as those to be provided under paragraph 13 of Part 2 of Schedules 11 and 12) are not required when undertaking minor operations such as pre-construction surveys and monitoring which would inform the production of such plans, as this would be disproportionate to the risk of or scale of potential impact. No change to the dDML proposed in response to this comment.</p>
RR-020-2.2.8	<p>2.2.8: ""extent of marine licence plans" means the plan or plans certified as the extent of marine licence plans by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents etc)"</p>	<p>The Applicant confirms this is a typographical error and the term is not used elsewhere in the dDCO or DMLs. The Applicant has therefore deleted this reference.</p>

	<p>The MMO notes this is a new interpretation and would like the Applicant to please explain the reasoning behind its inclusion?</p>	
RR-020-2.2.9	<p>2.2.9: “gravity base structure” means a structure principally of steel, concrete, or steel and concrete with a base which tapers as it rises which rests on the seabed due to its own weight with or without added ballast or additional skirts and associated equipment including J-tubes, corrosion protection systems and access platform(s) and equipment”</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	<p>Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.</p>
RR-020-2.2.10	<p>2.2.10: “horizontal directional drilling” refers to a boring technique involving drilling in an arc between two points”</p> <p>The MMO asks if further information can be set out such as “horizontal directional drilling” means a trenchless technique for installing an underground duct between two points without the need to excavate vertical shafts”</p>	<p>Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.</p>
RR-020-2.2.11	<p>2.2.11: “jacket foundation” means a lattice type structure constructed of steel and additional equipment such as, J-tubes, corrosion protection systems and access platforms attached to the sea bed by means of either a suction bucket or piles”</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	<p>Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.</p>
RR-020-2.2.12	<p>2.2.12: “LAT” means lowest astronomical tide”</p> <p>The MMO understands that LAT was used by Hornsea Project Three. For this Project the MMO requests that this is updated to use “highest astronomical tide” (“HAT”). The MMO believes that especially when discussing</p>	<p>The Applicant’s position is that the use of LAT is appropriate and consistent with other Orsted projects. In response to RR-029-APDX-A-4 the Applicant has provided a comparison of LAT vs HAT measurements for information. This is also provided here.</p>

	<p>ornithological compensation it would be more efficient to use HAT as this can clearly show the minimum clearance rate and amendments to the rate for compensation. The MMO advises that if changed, this would need to be reflected in the following interpretations; "offshore accommodation platform", "offshore electrical installations", "offshore HVAC booster station", "offshore HVDC converter station" and "offshore transformer substation" (HVAC stands for High Voltage Alternating Current).</p>	
RR-020-2.2.13	<p>2.2.13: ""maintain" includes inspect, upkeep, repair, adjust, and alter and further includes remove, reconstruct and replace (including replenishment of cable protection), to the extent assessed in the environmental statement; and "maintenance" must be construed accordingly"</p> <p>The MMO requests further information is included within this interpretation and that it should be similar to: ""maintain" includes inspect, upkeep, repair, adjust, and alter, and further includes remove, reconstruct and replace (but only in relation to any of the ancillary works in Part 2 of Schedule 1 (ancillary works), any cable, any component part of any wind turbine generator, offshore electrical substation, offshore accommodation platform, meteorological mast, and the onshore transmission works described in Part 1 of Schedule 1 (authorised development) not including the removal, reconstruction or replacement of foundations and buildings associated with the onshore project substation), to the extent assessed in the environmental statement; and "maintenance" must be construed accordingly".</p>	<p>The Applicant's position is that the current definition of "maintain" is appropriate and notes that it is consistent with the Hornsea Three Offshore Wind Farm Order 2020.</p>
RR-020-2.2.14	<p>2.2.14: ""monopile foundation" means a steel pile, driven and/or drilled into the seabed and associated equipment including J-tubes, corrosion protection systems and access platforms and equipment"</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	<p>Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.</p>
RR-020-2.2.15	<p>2.2.15: ""mono suction bucket foundation" means a steel cylindrical structure which partially or fully penetrates the seabed and remains in place using its</p>	<p>Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.</p>

	<p>own weight and hydrostatic pressure differential, and may include additional equipment such as J-tubes, corrosion protection systems and access platforms”</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	
RR-O20-2.2.16	<p>2.2.16: ““operation” means the undertaking of activities authorised by this Order determined by the undertaker not to be part of either the construction or decommissioning of the authorised development”</p> <p>The MMO believes that this interpretation should be clearer. Being determined by the undertaker does not provide confidence at this stage on the difference between construction, decommissioning and operation. The MMO notes that this could be dealt with upon the provision to include an outline operation and maintenance plan.</p>	The Applicant notes the comments of the MMO and has amended the definition of “operation” for clarity in the dDCO.
RR-O20-2.2.17	<p>2.2.17: ““outline site integrity plan” means the document certified as the outline site integrity plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents etc)”</p> <p>The MMO requests further detail on this plan such as: ““outline HOW04 Southern North Sea Special Area of Conservation site integrity plan” means the document certified as the outline HOW04 Southern North Sea Special Area of Conservation Site Integrity plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents etc)”</p>	The Applicant confirms that it will update reference to the outline site integrity plan in the dDCO to “Outline Southern North Sea Special Area of Conservation Site Integrity Plan.”
RR-O20-2.2.18	<p>2.2.18: ““pontoon gravity base type 1 structure” means a structure principally of steel, concrete, or steel and concrete with a base made up of up to two rectangular pontoons which rests on the seabed due to its own weight with or without added ballast or additional skirts and associated equipment including J-tubes, corrosion protection systems and access platform(s) and equipment”</p>	Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.

	<p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	
RR-020-2.2.19	<p>2.2.19: “pontoon gravity base type 2 structure” means a structure principally of steel, concrete, or steel and concrete with a base made up of a pontoon arranged in a rectangle around an open centre which rests on the seabed due to its own weight with or without added ballast or additional skirts and associated equipment including J-tubes, corrosion protection systems and access platform(s) and equipment”</p> <p>The MMO would like clarity on whether any additional information is required for this interpretation such as: transition piece, fenders and maintenance equipment, boat access systems, access ladders and access and rest platform(s) and equipment.</p>	Currently the Applicant considers that the definitions as drafted provide a suitable level of detail.
RR-020-2.2.20	<p>2.2.20: “(3) All distances, directions, capacities and lengths referred to in this Order are approximate and distances between points on a work comprised in the authorised development shall be taken to be measured along that work”.</p> <p>The MMO believes there are some parameters that are not approximate such as disposal volumes and therefore these should be set out with a saving provision similar to this condition from Norfolk Boreas Offshore Wind Farm:</p> <p>“(3) All distances, directions and lengths referred to in this Order are approximate, save in respect of the parameters referred to in paragraph 1(c) and paragraph 1(e) (disposal volumes in connection with Work Nos. 1 to 4B) in Part 1, Schedule 1 (authorised development) requirements 2 to 11 and requirement 16 in Part 3, Schedule 1 (requirements) and conditions 1-8 in Part 4, Schedules 9 and 10 of the deemed marine licences for the generation assets, conditions 1-3 in Part 4, Schedules 11 and 12 of the deemed marine licences for the transmission assets and condition 2 in Part 4, Schedule 13 of the deemed marine licences for the project</p>	The Applicant confirms that it has amended paragraph 3 of article 2 of the dDCO to clarify that, as a limited exception to the general saving position, the maximum disposal volumes are definite maximum and not approximate.

	interconnector assets.”	
RR-O20-2.3.1	<p>2.3.1: Part 2 Article 5 (5) “The Secretary of State shall determine an application for consent made under this article within a period of eight weeks commencing on the date the application is received by the Secretary of State, unless otherwise agreed in writing with the undertaker.”</p> <p>The MMO ultimately defers to the Secretary of State, however, believes that eight weeks is too short of a timescale to include full consultation.</p>	The Applicant confirms that it has removed this timeframe in article 5(5) of the dDCO.
RR-O20-2.3.2	<p>2.3.2: Part 2 Article 5 (12) “Sections 72(7) and (8) of the 2009 Act (variation, suspension, revocation and transfer) do not apply to a transfer or grant of the whole or part of the benefit of the provisions of the deemed marine licences to another person by the undertaker pursuant to an agreement under paragraph (1).”</p> <p>The MMO does not agree with Article 5 in its current form. The MMO highlights that once a DCO is consented the DMLs become standalone consent to be administered by the MMO and governed by the MCAA 2009.</p> <p>The MMO requests justification or rationale as to why these provisions and a deviation from the provisions of Marine and Coastal Access Act 2009 (“MCAA 2009”) are required for the purpose of the two DMLs for this project.</p>	The Applicant notes that the drafting proposed in article 5(12) of the dDCO is consistent with that of other similar projects, including Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas . The Applicant does not consider that any change is necessary.
RR-O20-2.3.3	<p>2.3.3: Part 7 Article 38 - Certification of plans and documents, etc.</p> <p>It is the MMO's position that the ES should be updated at the end of Examination. This is because throughout the Examination process further information can be requested and provided by the Applicant that directly links to the conclusions of the ES, including addendums to chapters etc.</p> <p>The MMO understands that this can be a large undertaking but believes it is paramount so that these updates can be easily identified as part of the Environmental Statement and as a Certified document.</p>	The Applicant notes the comments of the MMO and proposes that should any updates be needed to the Environmental Statement, it will submit a schedule of changes along with an updated impacts register by the close of examination.

	<p>The MMO welcomes Article 38 to reference Schedule 15 for the Certified documents and plans as this would help with clarity at the post consent stage. The MMO will review the updated Schedule 15 once this has been updated further.</p>	
RR-020-2.3.4	<p>2.3.4: Part 7 Article 39.—(1) “Any difference under any provision of this Order, unless otherwise provided for, shall be referred to and settled in arbitration in accordance with the rules at Schedule 14 of this Order, by a single arbitrator to be agreed upon by the parties, within 14 days of receipt of the notice of arbitration, or if the parties fail to agree within the time period stipulated, to be appointed on application of either party (after giving written notice to the other) by the Secretary of State.”</p> <p>The MMO believes that this condition should be updated to include the following wording at the start: "Subject to article 42 (saving provisions for Trinity House) any difference..."</p>	<p>The Applicant notes the comments of the MMO and has updated article 39 accordingly.</p>
RR-020-2.4.1	<p>2.4.1: Part 1, Article 1 “Work No. 1 – (a) an offshore wind turbine generating station with a gross electrical output of over 100 megawatts comprising up to 180 wind turbine generators, each fixed to the seabed by one of monopile foundations, mono suction bucket foundations, gravity base structures or jacket foundations”</p> <p>The MMO is still reviewing this requirement with regards to the wording “over 100 megawatts” and will provide an update at the next deadline.</p>	<p>The Applicant notes the comments of the MMO however this drafting has been confirmed by the Secretary of State on a number of occasions, including in the Hornsea Three Offshore Wind Farm Order 2020.</p>
RR-020-2.4.2	<p>2.4.2: Part 1, Article 1 “Work No. 9— temporary works as follows — (a) temporary vehicular access tracks; (b) temporary works area to support the construction activities in Work No.7; (c) temporary logistics compounds to support the construction of Work Nos. 5, 6, 7, and 8; and (d) temporary construction ramp”</p> <p>The MMO notes that works 9(a) and 9(d) are below mean high water springs and have been included in Schedule 12 the DML. The MMO requests clarity on why these are within the onshore section of the dDCO. In addition to this the</p>	<p>The Applicant notes that the intertidal area seaward of MHWS and landward of MLWS is within the jurisdiction of both the MMO and the LPA, which is reflected in the current drafting of the dDCO. The Applicant notes that this is a common occurrence and that systems are or can be put in place between the MMO and the LPA to govern enforceability in such circumstances, in line with their statutory duties, as this is not a situation unique to this project.</p>

	<p>MMO would like to understand how the management and enforcement of these activities will happen if they are both under the Local Planning Authority and MMO's regulator remit.</p>	
<p>RR-020-2.4.3</p>	<p>2.4.3: Part 1, Article 1 "In connection with such Work Nos. 1 to 5 and to the extent that they do not otherwise form part of any such work, further associated development comprising such other works as may be necessary or expedient for the purposes of or in connection with the relevant part of the authorised development and which fall within the scope of the work assessed by the environmental statement, including—</p> <p>(a) scour protection around the foundations of the offshore structures</p> <p>(b) cable protection measures such as the placement of rock, split pipe system, and/or concrete mattresses;</p> <p>(c) cable crossings;</p> <p>(d) the removal of material from the seabed within the Order limits required for the construction of Work Nos. 1 to 5 and the disposal within Work No. 1 of up to 7,300,596 cubic metres of inert material of natural origin and within Work Nos. 2, 3 and 4 up to 4,491,735 cubic metres of inert material of natural origin produced during construction drilling, seabed preparation for foundation works, cable installation preparation works (such as sandwave clearance and boulder clearance) and excavation of horizontal directional drilling pits; and</p> <p>(e) removal of static fishing equipment;"</p> <p>For scour protection the MMO highlights that scour protection has been used to stabilise the use of jack-up barges in similar locations on offshore wind farms as the Project and would like clarity on if the Applicant will be including this use within the Project.</p> <p>In addition to this the MMO would like clarity on where the disposal volumes for drill arisings in connection with any foundation drilling are within the dDCO/DML. The MMO believes that drill arising should be explicitly stated within the dDCO/DML and the following section should be included in the</p>	<p>Rock protection is not planned for deployment at the spudcans of any jack up vessels, although it has been required on a limited number of occasions in the past on other projects.</p> <p>It is not yet know for certain if this will be a requirement at any locations at HOW04, however, steps will be taken to avoid jacking up in areas where the spudcans would require scour protection. If it is a requirement at any locations on HOW04, the quantity of rock used will form part of the total amount of rock volumes evaluated as part of this application.</p> <p>In relation to the MMO's comments on the disposal volumes for drill arisings in connection with any foundation drilling, this detail is currently in the A4.4.8 Pro-rata Annex (APP-046) which is a certified document under article 38 of the dDCO and secured for these purposes by condition 1(9) of Schedule 11 and condition 1(13) of Schedule 12.</p>

	above Article: (f) disposal of drill arisings in connection with any foundation drilling up to a total of XX cubic metres.	
RR-020-2.4.4	<p>2.4.4: Part 3, Requirement 2 (6) "The total combined seabed footprint area for wind turbine generator foundations must not exceed—</p> <p>(a) 330,645 square metres excluding scour protection; and</p> <p>(b) 1,056,471 square metres including scour protection.</p> <p>(7) The wind turbine generators comprised in the authorised project must be constructed in accordance with the parameters set out in the pro-rata annex."</p> <p>The MMO requests that the maximum footprint area per turbine is presented within the dDCO and DML as well as the total. The MMO notes there is reference to the pro-rata annex which may cover this request. However, until this document is provided the MMO position remains that maximum footprints per individual structure and as a total need to be clearly stipulated within the dDCO.</p>	The pro-rata annex was provided as part of the Applicant's DCO submission, document A4.4.8 Pro-rata Annex (APP-046) . The maximum footprint area per turbine for each proposed foundation type is presented on Page 7, Table 1 in A4.4.8 Pro-rata Annex (APP-046) .
RR-020-2.4.5	<p>2.4.5: Part 3, Requirement 2 (10) "No offshore electrical installation or offshore accommodation platform—</p> <p>(a) jacket foundation employing pin piles forming part of the authorised project may—</p> <p>(i) have a pin pile diameter of greater than four metres; and</p> <p>(ii) employ more than 16 pin piles per jacket foundation; and"</p> <p>The MMO notes that in Chapter 4 Project Description in Table 4.9 Maximum design parameters for piled jacket foundations states that for small and large substations the maximum number of piles would be 16. However it also states:</p> <p>'If a single very large substation jacket were required, this could have more than 16 piles, however the total number of piles across the windfarm would remain within the Project Envelope as this would result in overall fewer large substations.'</p>	The maximum number of piles per jacket foundation of offshore electrical installation or offshore accommodation platform will not be more than 16. The text from Table 4.9 in the A1.4 Project Description (APP-010) has been removed. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.

	<p>In the above condition and Schedule 11 and 12 Conditions for the Design Parameters the maximum number of piles is 16. The MMO requests that the dDCO/DML is updated to include the maximum total number of piles that could be used.</p>	
RR-020-2.4.6	<p>2.4.6: Part 3, Requirement 2 (12) & (14)“ The total seabed footprint area for offshore electrical installation foundations must not exceed—</p> <p>(a) 101,250 square metres excluding scour protection; and</p> <p>(b) 371,250 square metres including scour protection.</p> <p>(14) The offshore electrical installations and offshore accommodation comprised in the authorised project must be constructed in accordance with parameters set out in the pro-rata annex.”</p> <p>The MMO requests that the maximum footprint area per electrical installation is presented within the dDCO and DML as well as the total. The MMO notes there is reference to the pro-rata annex which may cover this request. However, until this document is provided the MMO position remains that maximum footprints and volumes per individual structure and as a total need to be clearly stipulated within the dDCO</p>	<p>The pro-rata annex was provided as part of the Applicant’s DCO submission, document A4.4.8 Pro-rata Annex (APP-046). The maximum footprint area per electrical installation is presented on Page 7, Table 1 in A4.4.8 Pro-rata Annex (APP-046).</p>
RR-020-2.4.7	<p>2.4.7: Part 3, Requirement 4. “The total volume of scour protection for wind turbine generators, offshore accommodation platforms and offshore electrical installations may not exceed 2,241,221 cubic metres and must be in accordance with the pro-rata annex.”</p> <p>The MMO requests that the maximum volume of scour protection per turbine and per each structure is presented within the dDCO and DML as well as the total. The MMO notes there is reference to the pro-rata annex which may cover this request. However, until this document is provided the MMO position remains that maximum footprints and volumes per individual structure need to be included on the dDCO.</p>	<p>The maximum volume of scour protection per turbine and per each structure, according to foundation type, is presented on Pages 5 and 6, Table 1 in A4.4.8 Pro-rata Annex (APP-046) which was submitted as part of the DCO application.</p>

RR-020-2.4.8	<p>2.4.8: Part 3, Requirement 5.— (5) “The total number of the cable crossings must not exceed—</p> <p>(a) 32 within the area of Work Nos. 1 and 2(d); and</p> <p>(b) 54 within the area utilised for Work No. 2(e);</p> <p>unless otherwise agreed with the MMO.”</p> <p>The MMO notes the inclusion of “unless otherwise agreed with the MMO” and reference to unless otherwise agreed with the MMO needs to include “in writing” at the end to ensure an audit trail is kept and maintain transparency. In addition to this the MMO requests further clarity on what the intention is behind this provision.</p> <p>The MMO also highlights that Schedule 12, Part 2, Condition 1 (11) states that “cable crossings must not exceed 92”. The MMO requests further clarity which works the remaining six cable crossings will be part of and why these are not specifically set out within the dDCO/DML.</p>	<p>The total number of cable crossings is incorrect in the draft DCO and should equal the total number as set out in Part 3, Requirement 5. The draft DCO has been updated and resubmitted at Deadline 1 to correct this from “cable crossings must not exceed 92” to “cable crossings must not exceed <u>86</u>”. Additionally, “in writing” will be added as requested by the MMO.</p>
RR-020-2.4.9	<p>2.4.9: Part 3, Requirement 5.— (6) “The total volume of cable protection must not exceed 2,042,000 cubic metres with a maximum footprint of 2,058,000 square metres.(7) The cables and cable circuits comprised in the authorised development must be constructed in accordance with the parameters set out in the pro-rata annex.”</p> <p>The MMO requests that the volume of cable protection per works is presented within the dDCO and DML as well as the total. The MMO notes there is reference to the pro-rata annex which may cover this request. However, until this document is provided the MMO position remains that maximum footprints and volumes per individual structure need to be included on the dDCO.</p>	<p>The volume and area of rock protection per cable or crossing are provided in Table 2 of A4.4.8 Pro-rata Annex (APP-046) which was submitted as part of the DCO application.</p>
RR-020-2.4.10	<p>2.4.10: The MMO requests that the following requirement is included within the dDCO:</p> <p>“Offshore decommissioning</p> <p>XX. No offshore works may commence until a written decommissioning programme</p>	<p>The Applicant does not believe it is necessary to include such wording in the dDCO since the requirement to prepare a decommissioning plan for the offshore works is subject to a separate regulatory regime operated by the Secretary of State under the Energy Act 2004), outside of the development consent order process under the Planning Act 2008. Requirements should only be imposed where necessary, and any such requirement would encroach on another statutory regime.</p>

	in compliance with any notice served upon the undertaker by the Secretary of State pursuant to section 105(2) of the 2004 Act(a) has been submitted to the Secretary of State for approval.”	
RR-020-2.5.1	2.5.1: Please note that all comments set out below refer to both Schedule 11 and 12 unless otherwise stated.	Noted.
RR-020-2.5.2	2.5.2: The MMO requests that the number continues going into Part 2 of Schedule 11 and 12. The MMO believes this will make it easier to read as ordinarily the provisions referred to under Part 1 would be referred to as Articles and Part 2 would provisions would be referred to as Conditions, as these are the conditions of the licence, but the numbering would run throughout the entire Schedule without restarting at any point.	This is not the convention in statutory instruments. The Applicant notes that this is not something which has been adopted in the DCOs for similar projects such as Norfolk Vanguard, Norfolk Boreas or Hornsea Project Three.
RR-020-2.5.3	2.5.3: Interpretations ““cable protection replenishment” means []” The MMO maintains a watching brief on this interpretation.	The Applicants provides the following definition for “cable protection replenishment”; “The restoration, to a former level or condition, of cable protection lost by natural seabed processes or human activity. The definition has been updated in the draft DCO
RR-020-2.5.4	2.5.4: The MMO notes that if “LAT” remains then this should be swapped around with “large offshore transformer substation” to be alphabetical	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.5	2.5.5: The MMO requests that the statutory nature conservation body is defined within the DMLs.	The Applicant does not believe this is necessary. A definition of statutory nature conservation bodies was not included in the DCO for Hornsea Project Three and is a term widely understood in the industry.
RR-020-2.5.6	2.5.6: Part 1 Article 4 (a) – (g) The MMO believes it would be more helpful if this Article was in alphabetical order. The MMO requests that the MMO Local Office Is updated to the Beverley Office rather than Lowestoft and that the email address is included as below: “Marine Management Organisation (local office) Email: Tel: 0208 026 0519;” The MMO notes Condition 10 mentions that a document should be submit to the Civil Aviation Authority (“CAA”). The MMO requests that the CAA address and information is added to this section.	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.

	<p>In addition to this the MMO believes there needs to be some reference to the marine consents mailbox and the MCMS system with the addition of wording similar to:</p> <p>"(XX) Unless otherwise advised in writing by the MMO, the address for electronic communication with the MMO for the purposes of this licence is marine.consent@marinemanagement.org.uk or where contact to the local MMO office is required is marinemanagement.org.uk.</p> <p>(XX) Unless otherwise advised in writing by the MMO, MCMS must be used for all licence returns or applications to vary this licence. The MCMS address is: https://marinelicensing.marinemanagement.org.uk/mmofox5/fox/live/MMO_LOGIN/</p>	
RR-020-2.5.7	<p>2.5.7: Part 1, Article 2 "(a) the deposit at sea within the Order limits seaward of MHWS of the substances and articles specified in paragraph 4 below and within Work No.1 when combined with the disposal authorised within the array area disposal site by the deemed marine licence granted under Schedule 12 of the Order of up to 7,300,596 cubic metres of inert material of natural origin produced during construction drilling or seabed preparation for foundation works and cable installation preparation works within the array area disposal site"</p> <p>The MMO believes that this condition needs to be updated to include reference to the disposal sites and also to separate the volumes per disposal activity. In addition to this, boulder clearance needs to be included within the description. The MMO suggests similar wording to:</p> <p>"(a) the deposit at sea within the Order limits seaward of MHWS of the substances and articles specified in paragraph 4 below and within Work No.1 when combined with the disposal authorised within the array area disposal site by the deemed marine licence granted under Schedule 12 of the Order of up to 7,300,596 cubic metres of inert material of natural origin produced during construction drilling or seabed preparation for foundation works and</p>	<p>The Applicant does not believe it is necessary to specify the origins of the materials to be disposed of and notes that this was not a requirement in the DCO for Hornsea Project Three. The Applicant does not consider there to be any benefit to separating out the origins of the materials in such a way.</p>

	<p>cable installation preparation works, including sandwave clearance and boulder clearance within the array area disposal site reference [XX] comprising- ;</p> <p>(i) XX m3 for cable installation;</p> <p>(ii) XX m3 for the wind turbine generators; and</p> <p>(iii) XX m3 for the offshore accommodation platform”</p>	
RR-020-2.5.8	<p>2.5.8: Part 1, Article 2 - The MMO believes that drill arisings should be included within this section and include the following section:</p> <p>“(h) the disposal of drill arisings in connection with any foundation drilling up to a total of 399,776 cubic metres”</p> <p>If this is not included, then it needs to be clear in Article 2 (a) on the volumes of drill arisings.</p>	<p>The Applicant believes that the volumes of materials that will need to be disposed of is already sufficiently covered by the current drafting of the DMLs. The Applicant notes that it was not required to specify the volumes of drill arisings to be disposed of in the DCO for Hornsea Project Three.</p>
RR-020-2.5.9	<p>2.5.9: Part 1, Article 5 – the MMO has reviewed the coordinates and would like clarity that these are the correct coordinates and in the correct order as upon review these did now match the work plans.</p>	<p>The MMO are correct. The coordinates in C1.1 Draft DCO including Draft DMLs are an older version than those in the works plans. The coordinates in Schedules 1, 11 and 12 of the draft DCO and DML have been updated to correspond to those in the work plans.</p>
RR-020-2.5.10	<p>2.5.10: Part 1, Article 6 “This licence remains in force until the authorised project has been decommissioned in accordance with a programme approved by the Secretary of State under section 106 (approval of decommissioning programmes) of the 2004 Act, including any modification to the programme under section 108, and the completion of such programme has been confirmed by the Secretary of State in writing.”</p> <p>The MMO requests a slight amendments to this section as below:</p> <p>“This licence remains in force until the authorised scheme has been decommissioned in accordance with a programme approved by the Secretary of State under section 106 (approval of decommissioning programmes) of the 2004 Act, including any modification to the programme under section 108 (reviews and revisions of decommissioning programmes), and the completion of such programme has been confirmed by the Secretary of State in writing.”</p>	<p>The Applicant agrees with the comments of the MMO to add “(reviews and revisions of decommissioning programmes)” to paragraph 6 of Part 1 of Schedule 11. However, the Applicant does not agree with the substitution of “authorised scheme” for “authorised project” as this term has not been used anywhere else in the dDCO.</p>
RR-020-2.5.11	<p>2.5.11: Part 1, 7 “The provisions of section 72 (variation, suspension, revocation and transfer) of the 2009 Act apply to this licence except that the</p>	<p>Please see response below to point RR-020-2.5.12.</p>

	provisions of section 72(7) and (8) relating to the transfer of the licence only apply to a transfer not falling within article 5 (benefit of the Order)."	
RR-020-2.5.12	2.5.12: As set out in section 2.3.2 the MMO does not agree with Article 5 in its current form. The MMO highlights that once a DCO is consented the DMLs become standalone consent to be administered by the MMO and governed by the MCAA 2009.	The Applicant notes that the drafting proposed in paragraph 7 of Part 1 of Schedule 11 and 12 of the dDCO is consistent with that of other similar projects, particularly Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas. The Applicant does not consider that any change is necessary.
RR-020-2.5.13	2.5.13: The MMO requests justification or rationale as to why these provisions and a deviation from the provisions of Marine and Coastal Access Act 2009 ("MCAA 2009") are required for the purpose of the two DMLs for this project.	Please see the response to point RR-020-2.5.12 above.
RR-020-2.5.14	<p>2.5.14: Part 1, 9 "Any amendments to or variations from the approved details must be in accordance with the principles and assessments set out in the environmental statement. Such agreement may only be given in relation to immaterial changes where it has been demonstrated to the satisfaction of the MMO that it is unlikely to give rise to any materially new or materially greater environmental effects from those assessed in the environmental statement."</p> <p>The MMO would like clarity on what "approved details" is and requests that this is defined within Part 1(1).</p> <p>The MMO notes that "Any amendments to or variations from the approved details must be in accordance with the principles and assessments set out in the environmental statement" does not provide for the MMO to approve any amendments or variations. It needs to be clear how this will take place.</p> <p>In relation to "any materially new or materially greater environmental effects from those assessed in the environmental statement."</p> <p>The MMO has set out its position in dDCO major issues in sections 2.1.16 to 2.1.20.</p>	Please see the response above to point RR-020-2.1.16.
RR-020-2.5.15	2.5.15: Part 2 Design Parameters – as per sections 2.4.7 & 2.4.9, the MMO requires individual structures areas and volumes and footprint areas of scour and cable protection to be presented within the dDCO and DML.	The maximum areas and volumes of scour and cable protection per structure, according to foundation type, are presented in Tables 1 and 2 of A4.4.8 Pro-rata Annex (APP-046) .

RR-020-2.5.16	<p>2.5.16: Part 2, Maintenance of the authorised development – the MMO does not agree that maintenance can take place prior to approval of an operation and maintenance plan regardless of activities being assessed within the ES. The MMO believes that an additional condition to provide an Operation and Maintenance plan to be submitted to the MMO six months prior to any maintenance works taking place should be included within the DML.</p>	<p>The Applicant is considering this request with the intention of preparing an Outline O&M plan which relates to licensable activities. Once the Outline O&M Plan is prepared, the interpretations and the deemed marine licence conditions will be updated accordingly and the Outline O&M Plan submitted into Examination (currently anticipated for Deadline 2).</p>
RR-020-2.5.17	<p>2.5.17: Part 2, Condition 4 "(2) No maintenance works whose likely effects are not assessed in the environmental statement may be carried out, unless otherwise approved by the MMO."</p> <p>Please add "in writing" after "the MMO".</p>	<p>The Applicant notes the comments of the MMO and has updated the dDCO accordingly.</p>
RR-020-2.5.18	<p>2.5.18: Part 2, Condition 4 "(3)(f) cable protection replenishment"</p> <p>The MMO maintains a watching brief on the addition of an interpretation for this condition.</p>	<p>Please response above to comment RR-020-2.5.3</p>
RR-020-2.5.19	<p>2.5.19: Part 2, Condition 4 "(4) Where the MMO's approval is required under paragraph (2), approval may be given only where it has been demonstrated to the satisfaction of the MMO that the approval sought is unlikely to give rise to any materially new or materially greater environmental effects from those assessed in the environmental statement."</p> <p>Please see comments in section 2.1.16 to 2.1.20 on the concerns the MMO has relation to materiality in the DMLs.</p>	<p>Please see the response above to point RR-020-2.1.16.</p>
RR-020-2.5.20	<p>2.5.20: Part 2, Condition 4 "(5) In undertaking activities under condition 4(3)(f), the undertaker must not reduce water depth by more than 5% unless agreed with the MMO."</p> <p>Please add "in writing" after "the MMO".</p>	<p>The Applicant notes the comments of the MMO and has updated the dDCO accordingly.</p>
RR-020-2.5.21	<p>2.5.21: Part 2, Condition 5 "(1) The undertaker must issue to operators of vessels under its control operating within the Order limits a code of conduct to prevent collision risk or injury to marine mammals."</p> <p>The MMO requests that "order limits" is defined within Article 1(1) of the DMLs.</p>	<p>The Applicant does not consider that any change to the wording of the dDCO is necessary. "Order limits" is a commonly used and widely understood term.</p>

RR-020-2.5.22	<p>2.5.22: Part 2, Condition 7 "(1)(a)(ii) the masters and transport managers responsible for the vessels notified to the MMO in accordance with condition 16."</p> <p>The MMO requests clarity on what " transport managers" are.</p>	The Applicant notes the comment of the MMO and has no update at this time. The term Transport Manager is used in other Windfarm Development Consent Orders, for example Hornsea Project Three, without definition.
RR-020-2.5.23	<p>2.5.23: Part 2, Condition 7 "(3)(c) on board each vessel or at the office of any transport manager with responsibility for vessels from which authorised deposits or removals are to be made."</p> <p>The MMO believes that there should be a copy of the licence "on board each vessel and at the office of any transport manager" and requests that this is updated.</p>	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.
RR-020-2.5.24	<p>2.5.24: Part 2, Condition 7 "(7) The undertaker must inform the MMO Local Office in writing at least five days prior to the commencement of the licensed activities and within five days of the completion of the licensed activity."</p> <p>The MMO requests that this condition is updated to "14 days prior to the commencement of the licensed activities", this is to ensure there is enough time to organise compliance inspections.</p>	The Applicant does not consider that it is necessary to extend the timeframe at Part 2 paragraph 7(7). The timeframe of five days prior to commencement was accepted for Hornsea Project Three, Norfolk Boreas and Norfolk Vanguard.
RR-020-2.5.25	<p>2.5.25: Part 2, Condition 7 "(8)... Confirmation of notification must be provided to the MMO within five days."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.
RR-020-2.5.26	2.5.26: Part 2, Condition 7 (9) & (10) should state "UK Hydrographic Office" rather than UKHO as this is what is defined.	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.
RR-020-2.5.27	2.5.27: Part 2, Condition 7 "(10) The notices to mariners must be updated and reissued at weekly intervals during construction activities and at least five days before any planned operations and maintenance works (including, for the avoidance of doubt, each instance of major component exchange, ladder replacement or cable related works) and supplemented with VHF radio broadcasts agreed with the MCA in accordance with the construction programme approved under condition 13(1)(b) and monitoring plan approved under condition 13(1)(f). Copies of all notices must be provided to the MMO	The Applicant has added "to mariners" after "copies of all notices" in the dCO.

	<p>and UKHO within five days of issue, save for in the case of a notice relating to operations and maintenance, which must be provided within 24 hours of issue.”</p> <p>Please update this condition to state “Copies of all notices to mariners must be provided to the MMO”.</p>	
RR-020-2.5.28	<p>2.5.28: Part 2, Condition 7 “(11) The undertaker must notify the UK Hydrographic Office and the Defence Geographic Centre both of the commencement (within fourteen days), progress and completion of construction (within fourteen days) of the licensed activities in order that all necessary amendments to nautical and aeronautical charts are made and the undertaker must send a copy of such notifications to the MMO.</p> <p>The MMO believes “the Defence Geographic Centre” should be defined in Article 1(1) of the DML.</p>	The Applicant notes the Defence Geographic Centre is permanently closed and has therefore removed the definition from the dDCO.
RR-020-2.5.29	<p>2.5.29: Part 2, Condition 7 “(15) The undertaker must ensure that the MMO, the MMO Coastal Office, local mariners, local fishermen's organisations and the Source Data Receipt Team at the UK Hydrographic Office (UKHO), Taunton, Somerset, TA1 2DN (sdr@ukho.gov.uk) are notified within five working days of completion of each instance of cable repair, replacement or protection replenishment activity.”</p> <p>Please update “the MMO Coastal Office” to “the MMO Local Office” and the MMO believes “(UKHO)” should be replaced with “UK Hydrographic Office” as this acronym has not been used and is not within Article 1(1).</p>	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.
RR-020-2.5.30	<p>2.5.30: Part 2, Condition 8 “(4) The undertaker must during the whole period from commencement of the licensed activities to completion of decommissioning of the authorised project seaward of MHWS notify Trinity House and the MMO of any failure of the aids to navigation and the timescales and plans for remedying such failures, as soon as possible and no later than 24 hours following the undertaker becoming aware of any such failure.”</p> <p>Please add “in writing” after “the MMO”.</p>	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.

RR-020-2.5.31	<p>2.5.31: Part 2, Condition 11 “(6) The undertaker must ensure that any rock material used in the construction of the authorised project is from a recognised source, free from contaminants and containing minimal fines.”</p> <p>The MMO requests that this condition is updated to similar wording of the below:</p> <p>“(6) (1) No gravel or rock may be placed in the marine environment until detail of its source has been submitted to and approved by the MMO in writing.</p> <p>(2) Unless a shorter period is agreed with the MMO in writing, the undertaker must use reasonable endeavours to submit the details at least 3 months prior to the proposed placing of the gravel or rock.”</p>	<p>The Applicant does not consider this proposed alternative condition wording to be practicable or necessary. The requirement to ensure rock material is from a recognised source, free from contaminants and containing minimal fines ensures there is no need for a pre-approval mechanism. . The Applicant notes that this was not a requirement under the DCO for Hornsea Project Three.</p>
RR-020-2.5.32	<p>2.5.32: Part 2, Condition 11 “(7) In the event that any rock material used in the construction of the authorised project is misplaced or lost below MHWS, the undertaker must report the loss to the MMO Local Office within 48 hours of becoming aware of it and if the MMO, in consultation with the MCA and Trinity House, reasonably considers such material to constitute a navigation or environmental hazard (dependent on the size and nature of the material) the undertaker must endeavour to locate the material and recover it.”</p> <p>The MMO believes that “rock material” should be defined in Article 1(1), In addition to this the MMO requests this condition should be updated to the following wording:</p> <p>“(7) In the event that any rock material used in carrying out any licensed activity is misplaced or lost below MHWS, the undertaker must report the loss to the MMO Local Office within 24 hours of becoming aware of the Incident. If the MMO, in consultation with the MCA and Trinity House, reasonably considers such material to constitute a navigation or environmental hazard, the MMO must notify the undertaker and the undertaker must use reasonable endeavours to locate the material and recover it. In the event that undertaker</p>	<p>The Applicant notes the comment of the MMO in relation to definition of “rock material” and proposes no update at this time.</p> <p>The Applicant confirms they shall report the loss of any rock material to the MMO Local Office within 48 hours of becoming aware of such an event.</p>

	is unable to locate and recover the material, the undertaker must demonstrate to the MMO that reasonable attempts have been made to locate, remove or move any such material."	
RR-020-2.5.33	<p>2.5.33: Part 2, Condition 11 "(8) The undertaker must ensure that no waste concrete slurry or wash water from concrete or cement works are discharged into the marine environment. Concrete and cement mixing and washing areas should be contained to prevent run off entering the water through the freeing ports."</p> <p>Please update "entering the water through" with "entering the marine environment through".</p>	The Applicant notes the comments of the MMO and has updated the dDCO accordingly.
RR-020-2.5.34	<p>2.5.34: Part 2, Condition 11 "(10) All dropped objects within the Order limits must be reported to the MMO using the Dropped Object Procedure Form as soon as reasonably practicable and in any event within 48 hours of the undertaker becoming aware of an incident. On receipt of the Dropped Object Procedure Form, the MMO may require relevant surveys to be carried out by the undertaker (such as side scan sonar) if reasonable to do so and the MMO may require obstructions to be removed from the seabed at the undertaker's expense if reasonable to do so."</p> <p>The MMO requests this condition should be updated to the wording "within 48 hours" with "within 24 hours":</p>	The Applicant confirms they shall report the loss of any rock material to the MMO Local Office within 48 hours of becoming aware of such an event.
RR-020-2.5.35	2.5.35: Part 2, Condition 12 - Force majeure - the MMO is currently reviewing this condition and will provide further comments in the next written representation.	Noted.
RR-020-2.5.36	<p>2.5.36: Part 2, Condition 13.—(1) "The licensed activities for each stage of construction of the project must not commence until the following (insofar as relevant to that activity or stage of activity) has been submitted to and approved in writing by the MMO, in consultation with, where relevant, Trinity House and the MCA—"</p> <p>The MMO requests clarity on what the Project is defining "stages" are at this stage.</p>	The detail on the stages of construction will be provided to the MMO prior to commencement of the authorised development under paragraph 27 of Part 3 of Schedule 1 of the dDCO.

RR-020-2.5.37	<p>2.5.37: Part 2, Condition 13. (1) "...to ensure conformity with the description of Work No. 1 and compliance with conditions 1 and 2 above"</p> <p>The MMO believes that this provision should also include condition 3.</p>	<p>The Applicant notes the comments of the MMO and has amended the dDCO accordingly.</p>
RR-020-2.5.38	<p>2.5.38: Part 2, Condition 13 (1) "(c) (iii) cable installation"</p> <p>The MMO notes that Chapter 5 Project Description states fibre optic cables may be buried. As such the MMO requests that this is updated to state this: "cable (including fibre optic cable) installation"</p>	<p>The Applicant notes the comments of the MMO and has amended the dDCO accordingly.</p>
RR-020-2.5.39	<p>2.5.39: Part 2, Condition 13 (1) "(h) (i) technical specification of offshore cables below MHWS within that stage"</p> <p>The MMO advises that this wording is updated to:</p> <p>"technical specification of offshore cables (including fibre optic cable) below MHWS, including a desk-based assessment of attenuation of electromagnetic field strengths, shielding and cable burial depth in accordance with industry good practice"</p> <p>In addition to this the MMO would like to be included and receive information on the connection at landfall, and we request that this is highlighted within this document.</p>	<p>The Applicant notes the comments of the MMO and has amended the dDCO accordingly.</p>
RR-020-2.5.40	<p>2.5.40: Part 2, Condition 13 (1) "(j) In the event that driven or part-driven pile foundations are proposed to be used, the licensed activities, or any stage of those activities must not commence until a site integrity plan for that stage which accords with the principles set out in the outline site integrity plan has been submitted to the MMO and the MMO is satisfied that the plan provides such mitigation as is necessary to avoid adversely affecting the integrity (within the meaning of the 2017 Regulations) of a relevant site, to the extent that harbour porpoise are a protected feature of that site"</p>	<p>The Applicant does not consider that the proposed condition adds anything further to the existing wording. Under condition 13(1)(j) as currently drafted, the Applicant cannot commence licensed activities (or any stage of those activities) until the MMO is satisfied that the site integrity plan provides adequate mitigation to avoid adverse effects on integrity. The Applicant does not see the benefit of dictating that the site integrity plan must repeat guidance and objectives readily accessible elsewhere which the Applicant will need to comply with in any event. The Applicant notes that the MMO's proposed condition has not been included for Hornsea Project Three, Norfolk Vanguard or Norfolk Boreas.</p>

The MMO has updated the standard condition in relation to designated sites for harbour porpoise. This is due to the outcome of the Review of Consents undertaken by the Secretary of State, the MMO advise that, like any new application, it will need to be in line with the Review of Consents condition. The MMO would like condition 13 (1)(j) to be removed and replaced with the new standalone condition outlined below.

When the standalone condition is added, the Interpretations section will need to be updated to include:

““JNCC Guidance” means the statutory nature conservation body ‘Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs’ Joint Nature Conservation Committee Report No.654, May 2020 published in June 2020 as amended, updated or superseded from time to time”.

The MMO propose the following wording for the new SIP condition:

“Southern North Sea Special Area of Conservation Site Integrity Plan 25- (1) No piling activities can take place until a Site Integrity Plan (SIP), which accords with the principles set out in the in principle XX Project Southern North Sea SAC Site Integrity Plan, has been submitted to, and approved in writing, by the MMO in consultation with the relevant statutory nature conservation body.

(2) The SIP submitted for approval must contain a description of the conservation objectives for the Southern North Sea Special Area of Conservation (SNS SAC) as well as any relevant management measures and it must set out the key statutory nature conservation body advice on activities within the SNS SAC relating to piling as set out within the JNCC Guidance and how this has been considered in the context of the authorised scheme.

(3) The SIP must be submitted to the MMO no later than six months prior to the commencement of the piling activities.

	<p>(4) In approving the SIP the MMO must be satisfied that the authorised scheme at the pre-construction stage, in-combination with other plans and projects, is in line with the JNCC Guidance.</p> <p>(5) The approved SIP may be amended with the prior written approval of the MMO, in consultation with the relevant statutory nature conservation body, where the MMO remains satisfied that the Project, in-combination with other plans or projects at the pre-construction stage, is in line with the JNCC Guidance.</p>	
RR-020-2.5.41	<p>2.5.41: Part 2, Condition 13 "(2) Subject to condition 13(3), the licensed activities or any relevant stage of those activities must not commence unless no later than four months prior to the commencement of the relevant stage a marine written scheme of archaeological investigation for the stage in construction has been submitted to and approved by the MMO, in accordance with the outline marine written scheme of investigation, and in accordance with industry good practice, in consultation with the statutory historic body to include—"</p> <p>Please update "submitted to and approved by the MMO" to "submitted to and approved by the MMO in writing" and "with the outline marine written scheme of investigation" to "with the outline marine written scheme of archaeological investigation".</p>	<p>The Applicant has updated the name of the outline marine written scheme of investigation to the outline marine written scheme of archaeological investigation and updated the dDCO accordingly.</p> <p>In relation to the MMO's request to add "in writing" after "approved by the MMO", the Applicant notes the comment and has updated the dDCO accordingly.</p>
RR-020-2.5.42	<p>2.5.42: Part 2, Condition 13 "(4) In the event that driven or part-driven pile foundations are proposed to be used, the hammer energy used to drive or part-drive the pile foundations must not exceed 5,000kJ."</p> <p>The MMO would like the maximum pin pile hammer energy to be defined within this condition so it is clear the maximum for each type of foundation.</p>	<p>The Applicant notes the comments of the MMO and has updated the dDCO accordingly to provide clarity. The reference to 5,000kJ relates to the maximum hammer energy used to drive monopiles. The maximum hammer energy to be used for pin piles is 3,000kJ.</p>
RR-020-2.5.43	<p>2.5.43: Part 2, Condition 13 "(7) The licensed activities or any part of those activities must not commence until a fisheries coexistence and liaison plan in accordance with the outline fisheries coexistence and liaison plan has been submitted to and approved by the MMO."</p> <p>Please add "in writing" after "the MMO".</p>	<p>The Applicant notes the comments of the MMO and has amended the dDCO accordingly.</p>

RR-020-2.5.44	<p>2.5.44: Part 2, Condition 14.—(1) “Each programme, statement, plan, protocol or scheme required to be approved under condition 13 (save for that required under condition 13(1)(f)) must be submitted for approval at least four months prior to the intended commencement of the relevant stage of the licensed activities, except where otherwise stated or unless otherwise agreed in writing by the MMO.</p> <p>(2) The pre-construction monitoring surveys, construction monitoring, postconstruction monitoring and related reporting required under condition 13(1)(f) must be submitted in accordance with the following, unless otherwise agreed in writing with the MMO—</p> <p>(a) at least four months prior to the first survey of the relevant stage, detail of any pre- construction surveys and an outline of all proposed monitoring;</p> <p>(b) at least four months prior to construction of the relevant stage, detail on construction monitoring; and</p> <p>(c) at least four months prior to commissioning of the relevant stage, detail of postconstruction (and operational) monitoring”</p> <p>As set out in sections 2.1.2 to 2.1.10, the MMO requests that this is updated to six months.</p>	Please see the responses provided above to the comments at RR-020-2.1.2 to 2.1.10.
RR-020-2.5.45	<p>2.5.45: Part 2, Condition 14 (3) “The MMO must determine an application for approval made under condition 13 within a period of four months commencing on the date the application is received by the MMO, unless otherwise agreed in writing with the undertaker.”</p> <p>As set out in sections 2.1.11 to 2.1.14, the MMO requests that this is removed. The MMO’s position remains that it is inappropriate to apply a strict timeframe to approvals under the conditions of the DML given this would create disparity between licences issued under the DCO process and those issued directly by the MMO, as marine licences issued by the MMO are not subject to set determination periods. The MMO’s view is that it is for the developer to ensure</p>	Please see the responses above to the comments to RR-020- 2.1.11 to 2.1.14.

	that it applies for any such approval in sufficient time as to allow the MMO to properly determine whether to grant or refuse the approval application.	
RR-020-2.5.46	<p>2.5.46: Part 2, Condition 16 "(1) The undertaker must provide the following information to the MMO—</p> <p>(a) the name and function of any agent or contractor appointed to engage in the licensed activities not less than ten working days prior to such agent or contractor commencing any licensed activity; and</p> <p>(b) each week during the construction of the authorised project a list of the vessels currently and to be used in relation to the licensed activities."</p> <p>The MMO requests this condition should be updated to the following wording:</p> <p>"(1) The undertaker must provide the following information to the MMO—</p> <p>(a) the name, company number, address and function of any agent, contractor or subcontractor appointed to engage in the licensed activities not less than ten working days prior to such agent or contractor commencing any licensed activity; and</p> <p>(b) each week during the construction of the authorised project a list of the vessels currently and proposed to be used in relation to the licensed activities, including the master's name, vessel type, vessel IMO number and vessel owner or operating company"</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.47	<p>2.5.47: Part 2, Condition 17 (2)..."(a) a full sea floor coverage swath-bathymetry survey that meets the requirements of IHO S44ed5 Order 1a, of the Order limits and a buffer outside to—"</p> <p>The MMO believes IHO S44ed5 Order 12a should be defined in Article 1(1).</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.48	2.5.48: Part 2, Condition 18 (2) "Subject to receipt from the undertaker of specific proposals pursuant to this condition the construction monitoring plan must include, in outline—	The Applicant notes the comments here, and in RR-029-APDX:A-11, and is undertaking an assessment of the potential inclusion of this condition. Potential updates to the proposed dDCO wording will be provided as soon as practicable.

	<p>(a) where piled foundations are to be employed, unless otherwise agreed by the MMO in writing, details of proposed monitoring of the noise generated by the installation of the first four monopile foundations to be constructed collectively under this licence and the licence granted under schedule 12 of the Order"</p> <p>The MMO requests that this is updated to include "the first four monopile foundations of each piled foundation type to be constructed"</p>	
RR-020-2.5.49	<p>2.5.49: Part 2, Condition 18 (2) "(b) vessel traffic monitoring by automatic identification system for the duration of the construction period, including annual reporting to the MMO and MCA"</p> <p>The MMO advises that construction monitoring must include traffic monitoring in accordance with the outline navigation monitoring strategy. Once this is provided, it should include the provision of reports on the results of that monitoring periodically as requested by the MMO in consultation with Trinity House and the MCA.</p>	<p>The Applicant notes the comments of the MMO. The Outline Marine Monitoring Plan contains details of marine traffic monitoring and the Applicant agrees to provide results of that monitoring periodically as requested by the MMO in consultation with Trinity House and the MCA.</p>
RR-020-2.5.50	<p>2.5.50: Part 2, Condition 18 (3) "The results of the initial noise measurements generated in accordance with condition 18(2)(a) must be provided to the MMO within six weeks of the completion of installation of the fourth foundation of each foundation type for the MMO to determine whether any further noise monitoring will be required."</p> <p>The MMO requests that this condition is updated to the following wording: "The results of the initial noise measurements monitored in accordance with subparagraph (1) must be provided in writing to the MMO within six weeks of the installation of the first four piled foundations of each piled foundation type. The assessment of this report by the MMO will determine whether any further noise monitoring is required. If, in the opinion of the MMO in consultation with the statutory nature conservation body, the assessment shows significantly different impacts to those assessed in the environmental statement or failures in mitigation, all piling activity must cease until an</p>	<p>The Applicant notes these comments and is undertaking an assessment of the potential inclusion of this condition. Potential updates to the proposed dDCO wording will be provided as soon as practicable.</p>

	update to the marine mammal mitigation protocol and further monitoring requirements have been agreed."	
RR-020-2.5.51	<p>2.5.51: Part 2, Condition 19 "(4) Within 12 weeks of completion of any cable repair or replacement works, the undertaker must undertake a post installation survey along the section of cable that has undergone repair or replacement to demonstrate the successful burial of the cable, and submit a report to the MMO on its findings."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.52	<p>2.5.52: Part 2, Condition 20 "Any monitoring report compiled in accordance with the monitoring plans provided under conditions 17, 18 and 19 must be provided to the MMO no later than four months following receipt by the undertaker of the results of monitoring to which it relates, unless otherwise agreed with the MMO."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.53	<p>2.5.53: Part 2, Condition 21 "(2) The undertaker must notify the MMO of the successful submission of Forward Look or Close Out data pursuant to paragraph (1) above within 7 days of the submission."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and will amend the dDCO accordingly.
RR-020-2.5.54	<p>2.5.54: Part 2, Condition 21 "(3)(a) "Marine Noise Registry" means the database developed and maintained by JNCC on behalf of Defra to record the spatial and temporal distribution of impulsive noise generating activities in UK seas"</p> <p>The MMO believes that this should be part of the interpretations in Article 1(1) and JNCC and Defra also need to be defined</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.55	<p>2.5.55: Part 2, Condition 21 "(3)(b) "Forward Look" and "Close Out" requirements are as set out in the UK Marine Noise Registry Information."</p> <p>Please update this condition to expand on the interpretations further:</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.

	<p>"Forward Look" means the requirements as set out in the UK Marine Noise Registry Information Document Version 1 (July 2015) as amended, updated or superseded from time to time;</p> <p>"Close Out" means the requirements as set out in the UK Marine Noise Registry Information Document Version 1 (July 2015) as amended, updated or superseded from time to time;</p>	
RR-020-2.5.56	<p>2.5.56: Part 2, Condition 22 "(1) An annual maintenance report must be submitted to the MMO within one month following the first anniversary of the date of commencement of operations, and every year thereafter."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.57	<p>2.5.57: Part 2, Condition 22 "(3) Every fifth year, the undertaker must submit to the MMO, within one month of that date, a consolidated maintenance report, which will..."</p> <p>Please add "in writing" after "the MMO".</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.58	<p>2.5.58: Part 2, Condition 23 "(1) The licenced activities may not be commenced until a written scheme setting out the stages of construction of the authorised development seaward of MHWS has been submitted to and approved by the MMO."</p>	Please see comments below in response to RR-020-2.5.59.
RR-020-2.5.59	<p>2.5.59: Please update "may" to "must" and add "in writing" after "the MMO". In addition to this the MMO requests a timescale is included within this condition and requests six months prior to the pre-construction surveys.</p>	The Applicant notes the comments of the MMO. The change from "may" to "must" and the addition of "in writing" is accepted. In relation to the MMO's request that a timescale of six months prior to pre-construction surveys be included in the condition, please see the Applicant's comments at 2.1.2 to 2.1.10 above.
RR-020-2.5.60	<p>2.5.60: Part 2, Condition 24 (Schedule 11) and Condition 26 (Schedule 12).— (1) "The undertaker must submit a close out report to the MMO and the relevant statutory nature conservation body within three months of the date of completion of construction. The close out report must confirm the date of completion of construction and must include the following details—</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly. The Applicant notes this condition has been imposed by the Secretary of State in the Norfolk Vanguard and Norfolk Boreas DCOs.

	<p>(2) the final number of installed wind turbine generators; and (3) as built plans.”</p> <p>The MMO requests that this condition is updated to the following conditions: 24/26.—(1) “The undertaker must submit a close out report to the MMO in writing and the relevant statutory nature conservation body within three months of the date of completion of construction. The close out report must confirm the date of completion of construction and must include the following details— (a) the final number of installed wind turbine generators; and (b) the installed wind turbine generator parameters relevant for ornithological collision risk modelling. (2) Following completion of construction, no further construction activities can be undertaken under this licence.”</p>	
RR-020-2.5.61	<p>2.5.61: Schedule 12, Part 2, Condition 1 “(11) The total number of cable crossings when combined with the deemed marine licence granted under Schedule 11 of the Order must not exceed 92, unless otherwise agreed between the undertaker and the MMO.” The MMO would like clarity on why this condition is not in Schedule 11.</p> <p>Please add “in writing” after “the MMO”.</p>	The Applicant notes the comments of the MMO and has amended the dDCO accordingly.
RR-020-2.5.62	<p>2.5.62: Schedule 12, Part 2, Condition 23.- “In the event that driven or part driven pile foundations are to be used to install Work No. 3, no impact piling may be undertaken between 1st September and 16th October each year within the area of Work No. 3 as shown on the offshore works plans unless otherwise agreed in writing by the MMO after consultation with the relevant statutory nature conservation body.”</p> <p>The MMO requests that the date period is updated from “between 1st September and 16th October each year” to “between 1st August and 31st October each year”. The reasoning for this has been set out within sections 3.7.32 to 3.7.36</p>	See Applicant’s detailed response to comments RR-02-3.7.26 to RR-020-3.7.29.

1.3 Environmental Statement

Reference	Relevant Representation Comment	Applicant's Response
RR-020-3.1.1	3.1.1: The MMO has reviewed Chapter 2 and requests further information in relation to the East Inshore and Offshore Marine Plans and the North East Offshore Marine Plan where the Project overlaps with these plans.	The Applicant has provided a marine plan policy review as part of the Applicant's response to Deadline 1 (G1.40 Marine Plan Policy Review).
RR-020-3.1.2	3.1.2: The Applicant fails to explain how the project complies with the above marine plans and which policies have been scoped in or out along with justification.	Please see above response to RR-020-3.1.1.
RR-020-3.1.3	3.1.3: The MMO understands that some specific policies have been included within specific ES chapters, however, there should be a section within this chapter that sets out how the project complies with all the marine plan policies.	Please see above response to RR-020-3.1.1.
RR-020-3.1.4	3.1.4: The MMO has attached an example template to use when considering the Marine Plans (See Appendix A). The MMO requests that you use the following website to prepare this document :	Please see above response to RR-020-3.1.1.
RR-020-3.2.1	3.2.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Chapter 1 Marine Geology Oceanography and Physical Processes: a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology d) EN010098-000703-A2.1 ES Volume A2 Chapter 1 Marine Geology Oceanography and Physical Processes e) EN010098-000755-A5.1.1 ES Volume A5 Annex 1.1 Marine Processes Technical Report f) EN010098-000729-A4.4.1 ES Volume A4 Annex 4.1 Offshore Crossing Schedule g) EN010098-000732-A4.4.4 ES Volume A4 Annex 4.4 Dredging and Disposal Site Characterisation h) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and	Noted.

	<p>Transboundary Effects Offshore Summary</p> <p>i) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects</p>	
<p>RR-020-3.2.2</p>	<p>3.2.2: There is extensive documentation regarding coastal processes in this chapter along with ES Volume A5 Annex 1.1 Marine Processes Technical Report and the subsidiary documentation. Existing physical monitoring surveys have been used from the area supplemented by swath bathymetry surveys along the proposed Export Cable Corridor ("ECC"). Whilst a "high level" overview has been provided by these surveys, detailed interpretation has shown that gaps exist especially in the Smithic bank area. It is noted that in Table 1.4 Page 16 that Joint Nature Conservation Committee ("JNCC") have identified Smithic Bank as a potential Annex I feature.</p>	<p>The Applicant welcomes the MMO's acknowledgement that there is extensive documentation regarding coastal processes. In relation to Smithic Bank, the Application considers that the characterisation of the baseline environment for Smithic Bank is fit for the purposes of Environmental Impact Assessment (EIA).</p> <p>The Applicant wishes to highlight the importance of acknowledging that Smithic Bank is not designated as an Annex I feature and is not identified as a qualifying feature of any designated site. Furthermore, as stated in paragraph 1.7.6.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), there are no proposals to designate Smithic Bank as such. As noted in Table 1.4 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), Smithic Bank was identified as a physical processes receptor and its importance as a feature is recognised and has been assessed as such. In addition, if the Smithic Bank were designated, an increase in sensitivity (from Medium to High) would not result in significant effects owing to the maximum magnitude being minor. As stated in paragraph 1.11.2.55 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), the justification for this non-significant effect on Smithic Bank is based on the magnitude of effect (no more than minor) and because more pathways would remain available to feed Smithic Bank than those which would be partially affected by any export cable crossings.</p> <p>Notwithstanding the above, these comments have been discussed with the MMO and Natural England and the Applicant has proposed (in agreement with both organisations) to carry out additional work or analysis to validate the baseline characterisation. The scope of this analysis is presented in G1.46 Marine Processes Supplementary Works Scope of Works which was submitted into Examination at</p>

		Deadline 1. An update on this workstream is expected to be submitted into Examination by Deadline 3.
RR-020-3.2.3	3.2.3: The MMO believes that further information should be provided to provide enough evidence on the baseline. As well as offshore physical surveys for wave and tidal currents, a number of swath bathymetry and geotechnical surveys have been undertaken. Supplementing this is a numerical modelling exercise that allows different scenarios to be explore e.g. turbidity plumes from cable excavation or seabed preparation. Whilst this gives a good overall evidence base, there are a number of areas where the evidence base is either patchy or non-existent. These include the cable route around Smithic bank and the coastline. The MMO would expect to see additional Swath Bathymetry and geotechnical surveys from just offshore of the cable crossing with Dogger Bank A+B area and the Holderness coastline.	The Applicant considers the evidence base to be fit for the purposes of EIA characterisation. As detailed in Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) (Section 2 of Appendix B), site-specific geophysical evidence from Hornsea Four surveys offers nearly 100% coverage for the nearshore area. Where survey coverage is less than 100%, gaps only remain relevant if there are unresolved features which cannot be adequately interpreted between survey lines. Long-section survey lines are continuous from nearshore to offshore, with cross-lines at appropriate intervals. Subsequent geophysical surveys have provided additional data in this area which has also been considered. Figure 20 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) shows an interpretation of the seabed as an uninterrupted long-section (without any data gaps) based on the available geophysical survey data at the point of application. The Applicant does not consider the evidence base to be non-existent or patchy, and as such, additional surveys are not required.
RR-020-3.2.4	3.2.4: The Maximum Design Scenario ("MDS") has correctly used the use of GBS as its worst realistic scenario as this involves large structures (conical concrete structures) and significant amounts of seabed preparation. In the offshore GBS/Monopile/jacket zone the MMO agrees with the conclusion except for those associated with the potential changes to Flamborough Front please see comment 3.2.11.	Noted and will be captured in the Statement of Common Ground (SoCG) with the MMO.
RR-020-3.2.5	3.2.5: Two key issues that were raised during the Evidence Plan Process are still outstanding; the cable crossing and the impacts on Flamborough Front.	Noted and addressed in the Applicant responses to RR-020-3.2.6 and RR-020-3.2.7 below.
RR-020-3.2.6	3.2.6: Firstly, whilst further modelling of the cable crossings has been undertaken in regard to waves and currents, this has not been taken further to determine changes to sediment transports, especially cumulatively for the 54 crossings. The MMO would welcome this determination to fully assess the impacts.	The Applicant notes that with the exception of the nearshore crossing with Dogger Bank A & B, all crossings are in sufficiently deep water where waves would have no effect on the seabed. As stated in paragraphs 1.11.2.7 – 1.11.2.17 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) , each cable crossing would have a very localised effect on flows (metre

		<p>scales) with the possibility of developing local scouring around the periphery of rock berms where the seabed was mobile. The Applicant highlights that the effects of the cable crossings would not act cumulatively due to the large spacing between crossings (at kilometre scales). Larger scale sediment pathways would not be affected by the isolated small-scale effects. As detailed in Table 1.11 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), changes to offshore sediment pathways were scoped out at the Scoping stage on this basis. This scoping out was based on the Planning Inspectorate’s (PINS) Scoping Opinion (PINS Scoping Opinion, November 2018, ID 4.1.2). Further justification is also provided in Sections 4.6.2 and 4.6.3 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067).</p>
RR-020-3.2.7	<p>3.2.7: Secondly, the impact on Flamborough front, especially any changes (positively and negatively) to primary productivity (and subsequently secondary productivity) has not yet been fully addressed. Whilst it is noted that Natural Environment Research Council (“NERC”) EcoWinds (Ecological consequences of offshore wind) research project may assess this potential impact, any outcomes not likely to be within the consenting period, which is potentially three years away. Therefore, taking a pragmatic approach, all the information available should be provided and the Applicant should:</p> <ul style="list-style-type: none"> a) take a full part in the research project; and b) use satellite thermal imagery to determine if cold water thermal plumes exist when the front is present (spring to autumn) 	<p>The Applicant notes that impacts on the Flamborough Front are presented in paragraphs 1.11.2.18 – 1.11.2.33 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), with no significant effects on the Flamborough Front predicted. As such, the Applicant considers that there will be no indirect effects (positive or negative) on biogeochemistry associated with the front, including, but not limited to, primary and secondary production. It is the Applicant’s view that further research and analysis is not necessary.</p> <p>The Applicant notes that as detailed in paragraphs 1.11.2.18 – 1.11.2.33 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), the Applicant considers that any increased mixing due to the presence of foundations would occur locally around each foundation (at the meter scale) and not at the scale where there would be any cumulative interactions acting at the array scale (at the kilometer scale). The Applicant considers that the suggestion to use satellite imagery to determine cold water thermal plumes (i.e. due to mixing between warmer surface and colder bottom water occurring from small-scale individual foundation</p>

		<p>wakes) would not be detectable by satellites due to the limitations in image spatial resolution of 1.1 km. Furthermore, the location of the front is considered to be mainly south of the array area (Figure 37 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)), limiting the chances of any direct interaction. As such, the Applicant considers the use of satellite thermal imagery to determine if cold water thermal plumes develop as a consequence of increased mixing around foundations relevant to the location of the front is neither necessary nor feasible.</p>
RR-020-3.2.8	<p>3.2.8: Except for the Smithic Holderness export cable area with Dogger Bank A+B export cables there is not an adequate description of the potential cumulative and inter-related impacts and effects on the physical and biological environment. For instance, whilst Figure B17 from the ABPmer modelling report shows the changes in velocity around one cable crossing, this in the MDS could be multiplied by 54 (section 3.3.3.19). Furthermore, these changes in the waves/current regime should be taken to the next stage of sediment transport and long term erosion/deposition.</p>	<p>In relation to the physical environment, cumulative and inter-related impacts are considered within Section 1.12 and 1.14 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013). The Applicant considers that the marine processes assessment in relation to cable crossings is considered proportionate and in line with industry best practice for EIA requirements. Figure B17 within Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) represents a special case for the nearshore crossing with Dogger Bank A & B, which would be the largest crossing, and the Applicant wishes to highlight that all other crossings are considerably smaller and in much deeper water (below the influence of waves) with proportionally lesser effects. As such, the Applicant considers that there is no basis for multiplying the effects of the nearshore crossing on the physical environment by 54 as suggested. The likely effect at crossings remains as localised disturbance, with potential for local scouring around the edge of rock berms to achieve an equilibrium condition. Given the highly localised nature, it is highly improbable that impacts from the cable crossings would interact.</p> <p>In relation to the biological environment, cumulative and inter-related impacts are considered in the relevant topic-specific chapters of the ES.</p>

RR-020-3.2.9	<p>3.2.9: Adverse effects, in terms of coastal processes, are identified and then linked via a pathway to a sensitive receptor (the SPR (Source-Pathway-Receptor) methodology). Therefore, whilst there maybe adverse impacts locally around (say) a structure, if no receptor is nearby, no adverse impact is assumed and thus is discounted. In this project many of the impactors are offshore are thus discounted. However, the MMO still has major concerns about the cumulative impact of cables crossing Smithic Bank.</p>	<p>Noted. The Applicant notes that the approach taken is the proportional approach presented to the Marine Ecology and Processes Evidence Plan Technical Panel.</p> <p>For clarity, the Applicant notes that the cumulative impact of cables on Smithic Bank is considered in Section 1.12 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) in relation to the impacts from Hornsea Four, Dogger Bank A & B export cable landfall works, and the Scotland England Green Link 2 (SEGL2) interconnector.</p> <p>The likelihood is that cable laying for each project will occur at different periods so will result in no cumulative impacts in relation to any sediment plumes. An assessment of the seabed profile for the route across Smithic Bank related to Hornsea Four (Figure 43 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)) suggests cable burial at 2 m below seabed is more than adequate to offset any smaller fluctuations identified between former profiles of the seabed over the 39-year period 1980 to 2019. Placement of rock armour across Smithic Bank for any remedial measures is unlikely on this basis for Hornsea Four, hence no cumulative impact with other projects during the operational period.</p> <p>To add further assurance, a further study into the potential requirements for cable protection across Smithic Bank is being undertaken by the Applicant. This will provide further information on whether rock protection (inshore of the 16 m contour) may be required. The outputs from this work will be presented to Natural England and the MMO. An update on this workstream is expected to be submitted into Examination by Deadline 3.</p>
RR-020-3.2.10	<p>3.2.10: The MMO believes the evidence that has been supplied is appropriate with surveys within the offshore license area and along the export cable route. However, the coverage and intensity of surveys around the Smithic Bank and Holderness coast zone is sparse and further information is required.</p>	<p>See Applicant responses to RR-020-3.2.2 and RR-020-3.2.3 above. As detailed in Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) (Section 2 of Appendix B), site-specific geophysical evidence from Hornsea Four surveys offers nearly 100% coverage for the nearshore area. The Applicant considers that site-</p>

		<p>specific surveys offer one line of evidence, which have been augmented with a range of other information sources as noted in Appendix B of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067). Therefore, it is the Applicant's position that the baseline information presented is adequate for the purpose of EIA characterisation.</p>
RR-020-3.2.11	<p>3.2.11: No unbiased statistical accuracy assessment has been carried out, but a calibration and validation exercise was undertaken which is industry standard practise. It should be noted that the resolution of the model does not allow predictions of turbidity levels from for example a cable excavation at distances less than 50m.</p>	<p>The performance of the wave and tidal models are demonstrated by offering a visual comparison between observed and modelled parameters, as is standard practice, and for a suitable range of conditions.</p> <p>The Applicant notes that the coastal process model is used to determine far-field effects (as is standard practice) using a suitable level of detail in the refinement of the model grid (Figure 10 of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)) but averages out near-field effects at the resolution of the model grid. The Applicant notes that Table 6 of Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides a basis for assessing sub-grid effects for the near-field not resolved directly by the model and based on continuity of mass from point of release. The Applicant considers that the combination of approaches offers a complete and robust assessment.</p>
RR-020-3.2.12	<p>3.2.12: The MMO believes that not all species/features of concern have been correctly identified. The importance of Smithic bank is not put into a sub-region context. It provides shelter for the Holderness coast from easterly waves and controls the "sediment divide" actually on the coast. It should be noted that this is not an actual sediment divide but rather a statistical construct where when averaged over many years the sediment in neither moving north or south. Thus, at any one time, sediment along the whole frontage maybe moving north or south. It's only when this is averaged that the divide is revealed.</p>	<p>The Applicant believes all species/features of concern relevant to marine processes have been identified and adequately assessed in the ES. The Applicant notes that Figure 1.10 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides the context of Smithic Bank in relation to the local sediment pathways and along the Holderness coast, and Figure 1.2 for the local setting. As such, the Applicant considers that Smithic Bank has been appropriately placed into context within the DCO Application. The Applicant notes that the sediment divide is established by the sheltering effect of Flamborough Head limiting the prevailing NE waves affecting the coastline to the north of the</p>

	<p>The importance here is that Smithic Bank is a “reservoir” of sediments that feeds the Holderness coast (a receptor) and the Marine Conservation Zone (MCZ), as well as the wider regional sediment transport pathways (to the Humber and Wash). An additional review is required for a realistic worst case scenario on sediment transport patterns and pathways (and magnitudes) where all the exports cables (six from Hornsea 4 and four from Dogger Bank A+B) have been constructed with excavations to the design depth of 2m and subsequent cable protection (rock dumping).</p>	<p>divide, meaning littoral drift to the north is only driven by waves from the SE.</p> <p>The Applicant does not consider Smithic Bank to be a “reservoir” of sediment that feeds the Holderness coast. As stated in paragraphs 3.3.3.10 – 3.3.3.13 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067), Smithic Bank is formed of sandy sediments mainly derived from the erosion of the Holderness coast (source) which are moved along the coast and become recirculated by Flamborough Head. In addition, some sandy sediments from the north of Flamborough Head (secondary source) may also feed the bank. There may be some sands lost from the southern end on the bank which merge onto the Holderness coast, as indicated by the seabed profile and sediment types at this location.</p> <p>The Applicant highlights that cable protection installation is not a prerequisite and is only a contingency measure within the Hornsea Four design envelope. Section 11.2.51 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) reviews the issue of rock protection across Smithic Bank. Furthermore, during consultation on the Project Description at the Preliminary Environmental Information Report (PEIR) stage, the MMO indicated that impacts on Smithic Bank could be reduced by crossing the Dogger Bank A&B export cables in water depths greater than 20 m and seaward of Smithic Bank. As a result, the Applicant made a commitment to move the crossing with Dogger Bank A & B east of Smithic Bank to reduce impacts on this receptor (Co189, Volume A4, Annex 5.2: Commitments Register (APP-050)) as well as a commitment to place no cable protection within 350 m seaward of Mean Low Water Springs (MLWS) (Co188, Volume A4, Annex 5.2: Commitments Register (APP-050)).</p>
RR-020-3.2.13	<p>3.2.13: As identified above, the region between off just offshore of the export cable crossing with Dogger Bank A+B and the Holderness coastline is both particularly sensitive to changes in the regional sediment transport pathways due to the cumulative nature of the cable burial and cable protection and the</p>	<p>The Applicant acknowledges that the Holderness coast is sensitive to erosion due to storm waves; sediment transport along the coast is driven by waves; and cable burial would not expect to change waves at the coast (as detailed in paragraphs 1.11.2.34 – 1.11.2.45</p>

distance to the receptors. After the sediment transport assessment, it is suggested that annual swath bathymetry surveys (with recording of the backscatter for sediment composition) would identify sediment transport features (sand waves, ripples) and differences between years could form the basis of a monitoring plan. This would have both engineering (ensuring cables are covered) and environmental benefits, and the MMO welcomes this.

of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#).

As detailed in paragraphs 3.3.3.8 – 3.3.3.18 of [Volume A5, Annex 1.1: Marine Processes Technical Report \(APP-067\)](#), the Applicant highlights that all available data along the route of cables crossing Smithic Bank has not shown any bedform features such as sandwaves to be present, noting that such features are present at the northern end of the bank. In addition, geophysical surveys undertaken for Dogger Bank A & B also failed to identify any sandwaves at the section of Smithic Bank where export cables will cross.

The Applicant notes that any cable protection required on Smithic Bank would be for post-burial remediation only. As detailed in paragraphs 1.11.2.46 – 1.11.2.56 of [Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes \(APP-013\)](#), low profile rock armour berms may have a localised effect on sediment transport at the southern end of Smithic Bank only. The Applicant concludes that this is not expected to alter any sediment exchanges with the Holderness coast.

To add further assurance, a further study into the potential requirements for cable protection across Smithic Bank is being undertaken by the Applicant. This will provide further information on whether rock protection (inshore of the 16 m contour) may be required. The outputs from this work will be presented to Natural England and the MMO. An update on this workstream is expected to be submitted into Examination by Deadline 3.

As presented in Section 3.3.2 of [F2.7: Outline Marine Monitoring Plan \(APP-242\)](#), when taking account of the precautionary approach to assessment, there are considered to be no significant uncertainties in the assessment conclusions and therefore no monitoring requirements specifically related to marine processes have been identified, beyond standard geophysical surveys. These standard seabed surveys will inform a wide range of engineering

		<p>elements relevant to the marine processes assessment, including changes in seabed topography and scour around foundations. Where these surveys are being undertaken as part of the standard pre-construction geophysical survey campaign, the specification of the surveys will be agreed with the MMO and its advisors during consultation in the post-consent phase.</p> <p>All of the assessments of the potential impacts of Hornsea Four set out in Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) were concluded to be likely to result in effects of negligible or slight adverse significance (not significant in EIA terms). This is, in part, due to the commitments made as described in Volume A4, Annex 5.2: Commitments Register (APP-050) and the present assumptions in the assessment being considered to offer a conservative assessment to offset uncertainties. Therefore, it is the Applicant's position that no additional monitoring, such as annual bathymetric surveys, are required and are considered disproportionate to the findings of the assessment and uncertainties. Furthermore, bathymetric changes can occur from natural events, as well as human activity within the marine environment, and any changes observed would not be able to be directly attributed to the presence and activities associated within Hornsea Four. As such, the Applicant considers that monitoring is not justified and would be of limited value.</p>
RR-O20-3.2.14	3.2.14: The MMO has identified minor technical and presentational comments that affect the overall confidence in the conclusions and would like amendments or further information on.	Noted.
RR-O20-3.2.15A	<p>3.2.15: Referring to Volume A2 Chapter 1 – Marine Geology, Oceanography and Physical Processes</p> <p>a) Section 1.7.5.2 – Whilst the present day shoreline profile has been produced, cliff and beach recession rates are significant along the Holderness coastline. What is the projected profile at the end of 35 years? How will the export cable be managed over this lifetime?</p>	<p>The Applicant notes that paragraph 1.7.3.4 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides details of the projected retreat for the relevant section of coastline which is likely to be 82 m (+/- 30%, i.e. 57 and 107 m) over the next 20 to 50 years, based on present conditions (taken from National Coastal Erosion Risk Mapping (NCERM) (2022)). Hence at the end of 35 years, the repositioning of the coastline is</p>

		<p>likely to be within this range of values. Furthermore, Table 1.5 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) provides details of average rates of cliff recession based on local monitoring. If these rates are applied to the next 35 years, then distances of 43 to 55 m would apply, values which are comparable to the estimates based on NCERM (2022).</p> <p>The projected foreshore profile at 35 years is likely to be comparable to the present day profile, with the base of the cliff placed further back. The main intertidal profile at this time would be expected to remain comparable to present day given the underlying Bolder Clay defines a less erodible base layer. Figure 7 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) shows the beach profile from available monitoring over the period 2003 to 2018 substantiating a relatively stable intertidal area and a retreating cliff line. The Applicant notes that the export cable is to be installed by Horizontal Directional Drilling (HDD) means across the intertidal and would remain buried under the present (and future) beach with the transition joint bays placed around 200 to 250 m landward of the cliff edge. Therefore, the transition joint bays would be placed well below the area that could be subject to recession over the lifetime of Hornsea Four.</p>
RR-O20-3.2.15B	b) Section 1.7.62. (Bridlington Harbour dredging) does not align with that in Section 1.7.3.7.	Paragraph 1.7.3.7 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) is developed directly from dredging returns to develop “typical values” whereas paragraph 1.7.6.2 refers to values from Cefas (2010) expressed between minimum and maximum values. The information generally aligns, noting the maximum tonnage is different. The Applicant confirms that this is attributed to the date of information referred, noting the Cefas information dates from 2010.
RR-O20-3.2.15C	c) Section 1.7.8.7 Is the use of 70m long pin piles now standard practice? Will these be driven or drilled? How will these interact with Chalk layer (Fig 1.14)?	The Applicant notes that the use of piles with lengths of 70 m or more has been standard practice for many years in the offshore renewables industry. Piles of this size can used for both jackets

		<p>supporting Wind Turbine Generator (WTG) or Offshore Substation (OSS) structures and it is notable that the Hornsea Project Two OSS jacket structures are supported on piles with a pile penetration of approximately 64 m. Pile penetration will depend on the design solutions used during detail design.</p> <p>The Applicant confirms that it is expected that the piles can be driven for most foundation locations, with drilling required at up to 10% of foundation locations as the MDS.</p> <p>In relation to how the piles will interact with the chalk layer, the Applicant notes that the requirement to drill into chalk depends on the hardness of the substrate. Pre-construction geotechnical surveys will provide further information on the geotechnical conditions at foundation locations associated with the final layout. Notably, Sheringham Shoal, 90 km to the south of Hornsea Four, encountered Cretaceous Chalk but was still able to drive all piles into the seabed without the need of drilling (Carotenuto et al. 2018), and at Lynn & Inner Dowsing Offshore Wind Farms, sites even further to the south, drilling was required through patches of hard chalk at six of 54 monopile installations.</p>
RR-020-3.2.15D	d) Section 1.11.1.43 What contingency has been made for extra dredging due to new sand waves etc (from say a more recent survey)?	<p>The MDS volumes presented in the ES for seabed preparation are conservative and contain sufficient contingency for such instances. The value represents removal of a mobile layer which may include sandwaves.</p> <p>To add further assurance, a further study into the potential requirements for cable protection across Smithic Bank is being undertaken by the Applicant. This will provide further information on whether rock protection (inshore of the 16 m contour) may be required. The outputs from this work will be presented to Natural England and the MMO. An update on this workstream is expected to be submitted into Examination by Deadline 3</p>
RR-020-3.2.15E	e) Section 1.11.1.169 – If Bridlington Harbour experiences significant extra dredging that cannot be attributed to other causes, will Orsted support dredging operations as this was identified as a receptor?	<p>As stated in paragraphs 1.11.1.57 – 1.11.1.70 of Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013), there is not expected to be any significant impacts on</p>

		Bridlington Harbour from elevated levels of siltation as a result of Hornsea Four. As such, the Applicant considers that no remedial dredging operations are required.
RR-020-3.2.15F	f) Section 1.11.1.101 – “The depth of scour could be limited by underlying immobile sediment layers” – Surely the Sub bottom Profiler should have identified these layers. If not, why not?	The Applicant notes that Sub-Bottom Profiler (SBP) data provides an indicator of depth of sediment layers (as reflectors) but not their erodibility.
RR-020-3.2.16G	3.2.16: Referring to ES Volume A5 Annex 1.1 g) Section 3.3.2.17 shows the profiles of the seabed with sediment transport indicators. As part of the regional assessment (see paragraph 23), these vectors should be assembled to form a map of sediment transport vectors.	The Applicant notes that Figure 19 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) provides details of sediment transport vectors represented by net bedload transport. Paragraph 3.3.2.17 relates to suspended particulate matter (which is presented in Figure 16).
RR-020-3.2.16H	h) Section 4.3.5.1 indicates that boulders will be removed – where will these be deposited and will they form an artificial reef?	The Applicant notes that methods for boulder clearance are described in Volume A1, Chapter 4: Project Description (APP-010) . Where a high density of boulders is present, the expectation is that a plough will be required to clear the cable installation corridor. Where the boulder plough is used to clear the cable routes, it will result in the redistribution of boulders along the edges of the cable routes affected. However, the boulder density will not be high enough to form an artificial reef given the small width of the clearance corridor. It is considered unlikely that the use of ploughs will create a greater seabed disturbance than a Control Flow Excavator (CFE) (Department for Business, Enterprise and Regulatory Reform (BERR), 2008) which has been assessed within the marine processes assessment (Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). The plough will move the boulders to the width of the plough on the seabed. Where medium and low densities of boulders are present, a subsea grab is expected to be employed to relocate the boulders. This allows the boulders to be relocated in a ‘natural’ scattered manner, with only limited seabed interaction and therefore does not disturb seabed sediments. All boulders will be retained within the Order Limits. The boulders would be relocated from their source to a location within the surveyed area that has been declared ‘clear’ of

		<p>other possible hazards or constraints (i.e. other boulders, Archaeological Exclusion Zones (AEZs), Unexploded Ordnance (UXO)) from review of the post-consent geophysical survey results and subsequent inspection surveys and UXO clearance campaigns. Therefore, the exact location of relocation cannot be known at this time.</p>
RR-020-3.2.16I	<p>i) Section 4.5.3.16 – Whilst the diagram of scour at F3 GBS is useful, does this represent the same oceanographic and substrate types and hence scour that prevails at Hornsea 4?</p>	<p>The Applicant notes that although oceanographic and substrate types relate to the scouring process, the form and extent of seabed scour is mainly due to the shape and dimension of the obstacle to incident flows and the turbulence that is then dissipated onto the seabed. Oceanographic conditions and substrate type relating to F3 are provided in Section 4.5.3.14 of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067) and are influences on the rate of scour. F3 Gravity Base Structure (GBS) is a suitable analogue to what might be expected to occur at Hornsea Four as it has a comparable shape and dimension.</p>
RR-020-3.3.1	<p>3.3.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Annex 4.4 Dredging and Disposal Site Characterisation:</p> <ul style="list-style-type: none"> a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology d) EN010098-000703-A2.1 ES Volume A2 Chapter 1 Marine Geology Oceanography and Physical Processes e) EN010098-000755-A5.1.1 ES Volume A5 Annex 1.1 Marine Processes Technical Report f) EN010098-000729-A4.4.1 ES Volume A4 Annex 4.1 Offshore Crossing Schedule g) EN010098-000732-A4.4.4 ES Volume A4 Annex 4.4 Dredging and Disposal Site Characterisation h) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and Transboundary Effects Offshore Summary 	<p>Noted.</p>

	i) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects	
RR-020-3.3.2	3.3.2: The environment surrounding the proposed dredge area has been thoroughly characterised in terms of both physical and chemical composition, based on a sampling regime conducted in 2019, which is appropriate.	Noted – the Applicant welcomes this confirmation.
RR-020-3.3.3	3.3.3: However, aside from the descriptions provided within the dredge and disposal site characterisation report, the MMO has been unable to locate the results of the sampling regime. The MMO would expect these to be provided, preferably within the MMO results table as set out within the pre-application stage. This would allow the MMO to accurately judge the suitability of material for disposal at sea, and also allow for easy submission for the annual returns for OSPAR (Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)) and London Convention/ London Protocol, which is an obligation on the MMO.	The Applicant highlights that the results of the sampling regime for both the array area and ECC are presented in Appendix A and D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) respectively.
RR-020-3.3.4	3.3.4: The dredge and disposal site characterisation report correctly highlights that dredging may lead to sediment plumes, which could create indirect effects on other receptors as a result of increased suspended sediment concentration, deposition and potential release of contaminants (noting these will be discussed in the relevant chapters for individual receptors). The report also highlights that the material to be dredged is predominantly coarse sand, and therefore the likelihood of persistent plumes is low. The MMO believes that this is an accurate conclusion.	MMO agreement noted.
RR-020-3.3.5	3.3.5: In addition, the Marine Geology, Oceanography, and Physical Processes chapter highlights that the dredging / disposal activities have the potential to impact licenced disposal site HU015 in terms of altering dispersion characteristics. It also notes that this site has the potential to act cumulatively if disposal events aligned with the cable-laying activities in the nearshore region.	Noted
RR-020-3.3.6	3.3.6: The evidence base used with relation to dredge and disposal operations is the results of a ground-investigation undertaken within the Array and ECC areas in 2019.	This is correct.
RR-020-3.3.7	3.3.7: However, as stated above the sampling locations for the chemical analysis have not been provided within the ES. Nor have any details regarding	The Applicant notes that all sampling locations are shown in Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical

	<p>the sampling and/or analysis methods (beyond descriptions within the dredge and disposal site characterisation report highlighting that hydrocarbons and metals were examined). These details should be included in the ES. The MMO believes that the results have been produced using appropriate methods from MMO approved laboratories but would like confirmation on this.</p>	<p>Report (APP-068) (Figure 3). Sampling locations are also shown in the survey report appendices: Appendix A of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) (Figure 1.1) in relation to the array area, and Appendix D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) (Figure D 1).</p> <p>The Applicant can confirm that sampling and analysis methods have been presented in the relevant sections of Appendix A and D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068), for the array area and ECC respectively.</p>
RR-020-3.3.8	<p>3.3.8: The ES concludes that potential impacts related to dredging and disposal operations are negligible. The MMO agrees with this conclusion, based on the information provided, which suggests that material is likely to be comprised mostly of coarse sand with low levels of observed contamination.</p>	<p>MMO agreement noted.</p>
RR-020-3.3.9	<p>3.3.9: For dredge and disposal the main cumulative and inter-related impacts concern the active disposal site HU015. This is identified and discussed in the Marine Geology, Oceanography, and Physical Processes chapter, which concludes that impacts are not likely to be significant given that disposal at the HU015 site occurs predominantly on an ebb tide, therefore moving sediment away from the shoreline, and also that such disposal is sporadic, with small relatively small volumes being deposited in comparison to those disposed by the Hornsea Four project.</p>	<p>Noted.</p>
RR-020-3.3.10	<p>3.3.10: The ES has addressed previous comments regarding the inclusion of a table clearly highlighting the total dredge volume for the Array and ECC areas. In addition, figures have been included showing the location of particle size analysis (“PSA”) samples from both the Array and ECC areas, as recommended in the pre-application stage.</p>	<p>Noted.</p>
RR-020-3.3.11	<p>3.3.11: However, comments are still outstanding regarding the inclusion of details relating to the sampling and analysis of marine sediment from within the proposed dredge area and these are set out below.</p>	<p>The Applicant can confirm that the sampling and analysis of marine sediment from within the proposed dredge area has been provided, as addressed within the relevant points below.</p>
RR-020-3.3.12	<p>3.3.12: The Applicant has stated that 21 samples have been analysed for chemical composition in the array area and further sample collection is due in</p>	<p>The Applicant notes that all sampling locations are shown in Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical</p>

	2019 for the ECC. These need to be represented on a map, and preferably, the coordinates provided.	Report (APP-068) (Figure 3). Sampling locations and coordinates are also shown in the following survey report appendices: Appendix A of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) (Figure 1.1 and Table 1.1) in relation to the array area, and Appendix D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) (Figure D 1 and Table B, Appendix D 1) in relation to the ECC.
RR-020-3.3.13	3.3.13: The MMO has not been able to determine if the chemical analyses were carried out in line with MMO guidance. However, the results appear low which is not unexpected due to the coarse nature of the material and offshore location of majority of samples.	Noted. The Applicant can confirm that sampling and analysis methods have been presented in the relevant sections of Appendix A and D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) , for the array area and ECC, respectively.
RR-020-3.3.14	3.3.14: As outlined previously, all results should be submitted in the MMO template to allow for easy submission for the annual returns for OSPAR and London Convention/ London Protocol which is an obligation on the MMO.	The Applicant highlights that the results of the sampling regime for both the array area and ECC are presented in Appendix A and D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) , respectively.
RR-020-3.3.15	3.3.15: The MMO is unable to designate or allow any dredge and disposal activities until this information has been provided.	Information has been provided – see above.
RR-020-3.3.16	3.3.16: In addition to this, the MMO understands the Applicant would like to designate the full ECC as a disposal site. Figure 3 within ES Volume A4 Annex 4.4 Dredging and Disposal Site Characterisation shows that there is overlap with the Dogger Bank A&B ECC. The MMO cannot designate overlapping disposal sites. The Applicant will need to include use of this disposal site or the preferred option of splitting the disposal sites to either side of the Dogger Bank A&B ECC (intertidal and offshore) and update the documents to show this.	Noted.
RR-020-3.3.17	3.3.17: Pending verification, quality assurance and the additional information requested above being provided, it is likely that the disposal sites will be the following: a) Array Disposal Site – HU223 b) ECC Disposal Site 1 – HU224 c) ECC Disposal Site 2 – HU225	Noted.

RR-020-3.3.18	3.3.18: Please note: The MMO will confirm when these can be included within the Deemed Marine Licences.	Noted.
RR-020-3.4.1	<p>3.4.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Chapter 2 Benthic and Intertidal Ecology:</p> <p>a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction</p> <p>b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description</p> <p>c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology</p> <p>d) EN010098-000704-A2.2 ES Volume A2 Chapter 2 Benthic and Intertidal Ecology</p> <p>e) EN010098-000756-A5.2.1 ES Volume A5 Annex 2.1 Benthic and Intertidal Ecology Technical Report</p> <p>f) EN010098-000739-A4.5.1 ES Volume A4 Annex 5.1 Impacts Register</p> <p>g) EN010098-000741-A4.5.2 ES Volume A4 Annex 5.2 Commitments Register</p> <p>h) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and Transboundary Effects Offshore Summary</p> <p>i) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects</p>	Noted.
RR-020-3.4.2	3.4.2: The MMO believes that the intertidal survey and subsequent characterisation are appropriate.	Noted – the Applicant welcomes this confirmation.
RR-020-3.4.3	3.4.3: The Array and export cable corridor have been characterised using a combination of historical data, geophysical data, drop down video (“DDV”) (for fauna and sediments at all stations and Annex I stony reef under a separate survey design) and grab (for fauna and sediment composition). Each of the locations sampled by grab (and DDV) have been assigned a European nature information system (“EUNIS”) biotope and corresponding JNCC Marine Nature Conservation Review (“MNCR”) biotope classification. All information has been used to develop predictive habitat distributions across the Project area. Whilst this is a sensible approach, which has been alluded to in previous consultations, the MMO has major concerns regarding some of the classifications and model outputs following review of the raw data. The MMO	The Applicant notes that the predictive habitat model utilised the best available data for the array area and ECC, in addition to the results obtained from site- specific surveys, to produce a detailed predictive survey habitat map. The primary purpose of creating the predictive habitat model was to address data gaps identified at PEIR, due to planned further survey work not being available at that time. The model was generally well-received by consultees, so it remained within the DCO Application, despite the data gaps being filled. Since the PEIR version of the model, further geophysical and benthic site-specific survey data (particularly with reference to the ECC) has been added to the model.

	<p>also believes that further information should be brought through into the ES chapter to provide evidence for the classifications and model outputs.</p>	<p>With regards to concerns surrounding classification and model outputs, this has been considered within the data limitations of the predictive habitat model. However, the Applicant stresses that where site specific data have been collected, this has been prioritised within the predictive habitat model and supersedes the large-scale habitat maps. Further detail on data limitations is presented in Section 2.7.5 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014). In addition, the Applicant would like to stress that all biotope classifications were allocated through a standardised approach using multivariate analysis. All the evidence for biotope classifications are presented in Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) and associated appendices.</p>
RR-O20-3.4.4	<p>3.4.4: While some of the biotope classifications reflect the dominant species present in the samples, many of the biotope classifications are only loosely based on the species present. This information has been provided in the appendices of the technical document but should be highlighted in the main technical document and ES Chapter e.g. in terms of biotope confidence, especially as biotopes have been taken forward for impact assessment.</p>	<p>Noted. The Applicant notes that benthic ground-truthing data was classified using the EUNIS classification hierarchy to biotopes (to a maximum level five). This classification was primarily based on depth, sediment type and species composition. A detailed explanation of the benthic subtidal ecology and EUNIS classification process was presented within Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) and the associated appendices. The Applicant notes that this explanation was provided within Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) with a cross-reference to Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) where the further detail was provided. The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the ES technical report and chapter documents.</p>
RR-O20-3.4.5	<p>3.4.5: Following on from the previous point, the echinoderm species, <i>Amphiura filiformis</i> (<i>A.filiformis</i>), is one of the dominant species in terms of abundance and distribution across the Array area but none of the biotopes account for this. This is similar for the polychaete, <i>Sabellaria spinulosa</i> (<i>S.spinulosa</i>), which was dominant at several stations along the ECC. Whilst the dominance of these species is recognised in the Appendices of Volume 5, Annex 2.1: Benthic</p>	<p>The Applicant notes that although <i>Sabellaria spinulosa</i> individuals were identified within benthic grab samples at five sampling stations within the offshore ECC (ECC_17 to ECC_21), the only aggregation observed in DDV footage was a small patch encrusting a pebble, which was not therefore classified as potential Annex I reef. A detailed review of the Side Scan Sonar (SSS) and</p>

	<p>and Intertidal Ecology Technical Report this information does not come through into the ES chapter. This is extremely important in relation to <i>S. spinulosa</i>, where the biotope that has been assigned to stations ECC17-ECC21 is an epifaunal biotope that does not mention <i>S. spinulosa</i> in the list of species. The MMO recommends revising the biotopes for ECC17-ECC21 to SS.SBR.PoR.SspiMx (<i>Sabellaria spinulosa</i> on stable circalittoral mixed sediment) as it matches better with the species composition found at these stations.</p>	<p>multi-beam echo sounder (MBES) bathymetry data acquired within the Hornsea Four Order Limits found no evidence of the distinctive signatures which would typically be associated with the presence of biogenic reef. As a result, the inclusion of <i>S. spinulosa</i> has not been included in the ES and the Applicant does not consider it appropriate to revise the biotope to SS.SBR.PoR.SspiMx (<i>Sabellaria spinulosa</i> on stable circalittoral mixed sediment), as the individuals identified were not considered quantifiable as a reef feature, as detailed in Appendix A and Appendix B of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p> <p>Moreover, the Applicant recognises the concern from the MMO in relation to <i>A. filiformis</i>. However, the Applicant notes that <i>A. filiformis</i> is considered in the assessment, in relation to the biotope account of <i>A. filiformis</i>, <i>Kurtiella bidentata</i> and <i>Abra nitida</i> (SS.SMu.CSaMu.AfilMysAnit).</p>
RR-020-3.4.6	<p>3.4.6: The MMO believes that maps showing distribution of dominant species along with maps of species richness, abundance and diversity should be included. This would align with information provided in other offshore wind farms ES's and provide transparency within the ES.</p>	<p>The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the ES technical report and chapter documents. Abundance bar graphs have been provided in Appendix A (Figure 2.4 and 2.5) and Appendix D (Figure D6, D7 and D8) of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p>
RR-020-3.4.7	<p>3.4.7: Species composition of each of the multivariate groups identified in Figure 8 of the Annex 2.1 Benthic and Intertidal Ecology Technical Report (Annex 2.1 Benthic Report) should also be provided and transferred through to the ES chapter. The absence of this information in the ES chapter and main text of the technical report makes it extremely difficult to have confidence in the assessments.</p>	<p>The Applicant notes that the main contributing species of each multivariate grouping shown in Figure 8 is provided within paragraphs 5.5.2.10 to 5.5.2.18 of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) under the heading 'Multivariate Analysis of Community Composition'. These main species are detailed in Figure 2.4 and Figure 2.5 of Appendix A and Figure D7 and Figure D8 in Appendix D (Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068)).</p> <p>The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the ES technical report and chapter documents.</p>

RR-020-3.4.8	<p>3.4.8: Some biotope classifications do not reflect the sediment types or species present; this has resulted in the species distribution modelling to over-estimate the distribution of certain biotopes. For example, Figure 19 of Annex 2.1 Benthic Report above shows that SS.SCS.CCS.MedLumVen is predicted to occur along parts of the ECC and southern part of the Array, despite the biotope not being identified in the most recent sampling campaign. Similarly, although SS.SMx.CMx.MysThyMx was identified (loosely) at a couple of stations, the model predicts it to occur across the majority of the Project area despite the sediment across the area being classified as sands. The MMO requests that the model outputs are sense checked against the other data that has been collected across the Project area and for the confidence in these distribution models to be clearly articulated in the ES.</p>	<p>The Applicant notes that the model collates all available physical and biological point data across the area of interest to help understand the occurrence of potential biotopes over the wider study area. The model predicts the biotopes likely to occur within the Hornsea Four Order Limits, in some cases these habitat requirements overlap due to preferred ecological conditions. With regards to concerns surrounding model outputs, the Applicant notes that this has been considered within the data limitations of the predictive habitat model. However, the Applicant stresses that where site specific data have been collected, this has been prioritised within the predictive habitat model and supersedes the large-scale habitat maps. Further detail on data limitations is presented in Section 2.7.5 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) as amended by A5.2.1.1 Benthic and Intertidal Ecology Technical Report Schedule of Change (AS-009).</p>
RR-020-3.4.9	<p>3.4.9: The Valued Ecological Receptors ("VER's") (Table 2.9 of Chapter 2: Benthic Ecology) should subsequently be revised to reflect any changed in biotope classifications.</p>	<p>Based on the Applicant's responses to the above points raised by the MMO, it is not considered appropriate to revise any of the VERs in Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014).</p>
RR-020-3.4.10	<p>3.4.10: As certain information has been omitted from the ES chapter (species richness, abundance, diversity) it is difficult to assess Table 2.9 with confidence.</p>	<p>Based on the Applicant responses to the above points raised by the MMO, it is not considered appropriate to update Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014).</p>
RR-020-3.4.11	<p>3.4.11: Although the brittlestar dominated, biotope SS.SMu.CSaMu.AfilMysAnit was not identified using the data gathered, the Array was dominated by <i>A. filiformis</i>, therefore this needs to be recognised in the VERs: Table 2.9. This is also relevant for <i>S. spinulosa</i> along the cable route.</p>	<p>The Applicant notes that <i>A. filiformis</i> is considered in Table 2.9 under biotope under 'AfilMysAnit.' (see fourth row). <i>S. spinulosa</i>, is not considered in Table 2.9, as although it is a VER, a detailed review of the data acquired within the Hornsea Four Order Limits found no evidence of the distinctive signatures which would typically be associated with the presence of biogenic reefs. As a result, the limited abundance of <i>S. spinulosa</i> identified within the surveys is not considered high enough to quantify as an Annex I reef habitat, as detailed in the Gubbay (2007) JNCC Report. Further information can be found in Appendix A, Appendix B and Appendix D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068).</p>

RR-020-3.4.12A	3.4.12: The potential impacts identified in Table 2.12 of Chapter 2 appear accurate for each stage of the development (construction, operation and decommissioning).	Noted – the Applicant welcomes this confirmation.
RR-020-3.4.12B	However, the MMO has also reviewed the Impacts Register and note that although Electric Magnetic Field (“EMF”) has been scoped out of benthic ecology, shellfish and fisheries early on in the scoping phase, further research has been conducted in this field and needs to be considered within the ES. The MMO believes that this should be updated.	<p>The Applicant acknowledges recent research conducted in this field, notably papers by Scott et al. (2018 & 2021) investigating the effects of EMF on crustacea. It is to be noted however, that these studies have investigated EMF strengths significantly greater than those produced by offshore wind farm cables in the marine environment. Specifically, the lowest experimental EMF used in Scott et al. (2021) was a factor of 10 higher than that expected from Hornsea Four cables, with no impacts identified at this EMF strength. Effects were only noted in these studies using EMF strengths which were a factor of 20 to 1,000 times higher than those expected from Hornsea Four cables.</p> <p>The Applicant notes that previous offshore wind farm monitoring of invertebrate species revealed no behavioural changes as a result of EMF (DONG, 2005; MMO, 2014). In addition to this, the embedded mitigation measures (e.g. Co83 ‘where possible, cable burial will be the preferred option for cable protection’ Volume A4, Annex 5.2: Commitments Register (APP-050)) will increase the distance between potentially sensitive species and EMF, reducing the likelihood of any behavioural response. For this reason, the Applicant considers the risk of impact from EMF during operations is not significant for benthic species and should remain scoped out of assessment.</p> <p>In relation to fish and shellfish species, the Applicant notes that the spatial extent of EMFs will be limited to the immediate vicinity of the cable, and where possible cable burial will be the preferred option for cable protection (commitment Co83), therefore it is considered that the risk to fish and shellfish species from EMF during operations is not significant.</p> <p>Therefore, it is considered unlikely that there would be any impacts to crustaceans from EMF emitted by Hornsea Four cables. As such,</p>

		the Applicant considers that impacts from EMF should remain scoped out of assessment.
RR-020-3.4.13	3.4.13: Although the evidence gathered appears appropriate, the evidence presented is insufficient to allow a decision on the project to be made. As indicated above, the MMO has major concerns about some of the biotope allocations, absence of key species from some of the biotopes and some of the biotope models. A review of information needs to be undertaken and information brought into the ES chapter to enable an accurate characterisation. Currently important information is buried within the technical appendices which does not allow this.	Based on the Applicant responses to the above points raised by the MMO, it is not considered appropriate to revise any biotopes considered within Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) . Highly technical detail is set out in the ES technical reports, to ensure main ES chapters are not disproportionately long and unwieldy and so they remain accessible to non-specialists as well as specialists. The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the ES technical report and chapter documents. The location of where information is presented does not preclude the MMO from considering it.
RR-020-3.4.14	3.4.14: The impact assessments have compared biotopes identified within the Project area to the sensitivities assessed by Marine Evidence based Sensitivity Assessment ("MarSEA"). This is appropriate for those biotopes that have been confirmed within the area and have species composition which reflects those characterising the biotopes. However the MMO has some further major comments on the conclusions on biotopes.	Noted.
RR-020-3.4.15	3.4.15: Some of the biotopes modelled using data from other developments close by have not been identified within the Hornsea 4 Project area. This has been highlighted for a sandy mud biotope characterised by <i>A. filiformis</i> , <i>Kurtiella bidentata</i> and <i>Abra nitida</i> and an impact assessment has not been carried out on that biotope (please refer to comments above regarding the absence of a biotope characterised by the most dominant species in the Array; <i>A. filiformis</i>), however others that were also not identified in the most recent sampling campaign have been taken forward for impact assessment. This is inconsistent.	The Applicant notes the MMO's concern in relation to <i>A. filiformis</i> but clarifies that <i>A. filiformis</i> is considered in the assessment. In addition, the existing baseline and assessment consider biotopes present within nearby developments to determine the potential presence of these biotopes within the Hornsea Four Order Limits. All biotopes identified within the most recent sampling campaign have been considered in the assessment, in addition to any biotopes which may be present in the area.
RR-020-3.4.16	3.4.16: Table 2.16 and Table 2.18 of Chapter 2 highlight low confidence in the assessments for some biotopes but still assesses the overall significance of effect as slight rather than moderate. Confidence needs to be considered in the final assessments. If there is low confidence in the sensitivity assessments, then the final assessment should err on the side of caution.	The Applicant notes the MMO's comments and clarifies that the assessment confidence presented in Table 2.16 and Table 2.18 is based on the MarESA confidence assessment, which details whether the information is available in data or literature. Furthermore, the impact on benthic receptors could result in either a slight (not

		significant) or moderate (significant) effect. The overall significance is considered slight due to the widespread nature of the habitats within the wider region. The geographical spread of these habitats is considered in Section 2.7.1 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) .
RR-020-3.4.17	3.4.17: Based on the comments above, the impact assessments will need to be included for some of the additional biotopes e.g. the suggested addition of SS.SBR.PoR.SspiMx, the inclusion of A. filiformis within the assessments.	See Applicant responses to RR-020-3.4.15 and RR-020-3.4.11.
RR-020-3.4.18	3.4.18: The assessment for spread of non-native invasive species (“NIS”) has predicted the magnitude as negligible based on the current scientific knowledge. The absence of information on species colonising the turbines makes predicting the presence and spread of NIS extremely difficult. This suggests that monitoring of the foundations should be undertaken to increase the knowledge base and to help provide more accurate assessments.	Noted. The Applicant highlights that Hornsea Four does not represent a new potential vector for invasive non-native species due to the presence of other existing offshore wind farms and the presence of oil and gas infrastructure and hard infrastructure within the immediate area. As detailed in Table 2.11 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) and commitment Co111 of Volume A4, Annex 5.2: Commitments Register (APP-050) ‘a marine biosecurity plan detailing how the risk of introduction and spread of invasive non-native species will be minimised’. When taking into consideration the designed-in measure Co111, the potential significance of the impact from Hornsea Four alone has been assessed as not significant. As such, the Applicant does not consider that additional monitoring of invasive non-native species is appropriate.
RR-020-3.4.19	3.4.19: In relation to decommissioning it is not clear whether any gravel laid during seabed preparations will also be removed upon decommissioning. The removal of this substrate will determine the extent of seabed recovery as the majority of the Array area and cable route is sand. If removal is not possible then the benthic communities colonising the area will not be the same as found in the baseline environment. Please include the likelihood of removal of these base layers, and any consequences if removal is not possible, in the assessments.	As stated in Volume A1, Chapter 4: Project Description (APP-010) , the Applicant confirms that at the end of the operational lifetime of Hornsea Four, it is anticipated that all structures above the seabed or ground level will be completely removed excluding scour and cable protection (which will remain in situ). Therefore, it is anticipated that any materials surrounding foundations (such as the gravel laid during seabed preparations) will be retained and is not proposed to be removed in accordance with the decommissioning plan and any best practice at the time of decommissioning. In relation to habitat loss, and as stated in paragraph 2.11.2.5 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014) ,

		<p>this has been considered as the MDS in the assessment relating to a long-term or permanent change in seabed habitat. Correspondingly, in Section 2.11.3 of Volume A2, Chapter 2: Benthic and Intertidal Ecology (APP-014), the removal of the gravel layer is considered the MDS for decommissioning impacts such as habitat disturbance, increased suspended sediments and loss of introduced habitat. As such, the Applicant considers that appropriate MDS' have been adopted for each relevant impact and the assessment is robust and appropriate. Therefore, both eventualities of the gravel remaining in situ and being disturbed have been assessed.</p> <p>The Crown Estate agreement for lease (AfL) for Hornsea Four requires that the project is decommissioned at the end of its lifetime. Additionally, the Applicant highlights that the Energy Act (2004) requires that a decommissioning plan must be submitted to and approved by the Secretary of State for Business, Energy and Industrial Strategy.</p> <p>The Applicant notes that the decommissioning plan and programme will be updated during Hornsea Four's lifespan to take account of changing best practice and new technologies. The approach and methodologies employed at decommissioning will be compliant with the legislation and policy requirements at the time of decommissioning.</p> <p>The Applicant notes that all chapters identify that decommissioning should be agreed at the relevant time with the relevant consultees but a worst case approach is taken relevant to the impact being considered. This is considered to be appropriate.</p>
RR-020-3.4.20	3.4.20: The surveys undertaken to characterise the benthic environment do not cover the entirety of the Array and ECC e.g. the acoustic survey was not 100% coverage and the benthic survey was not extensive. However, the MMO believes that the geophysical survey covered the areas where Wind Turbine Generators ("WTGs") will be placed, and the benthic survey characterised those sediments that are dominant across the Project area.	Noted.

RR-020-3.4.21	3.4.21: The biotope modelling was undertaken to fill in gaps where sampling was not undertaken, however some of the biotopes are unlikely to be as extensive in the Project area as predicted due to the sediment types present. The MMO advises another review of the models using the most recent data collected as this new information does not appear to have affected the outcomes of the models.	See Applicant response to RR-020-3.4.3.
RR-020-3.4.22	3.4.22: The analyses have not been presented as clearly as they should be. Much of the information that is needed to assess the results has not been brought through into the ES chapter which makes assessing the adequacy of the impact assessments extremely difficult. The technical report and ES chapter needs to be reviewed as per previous comments and further information brought through into the main text.	The Applicant does not consider it appropriate or proportionate to replicate the significant detail across both the ES technical report and chapter documents.
RR-020-3.4.23	3.4.23: No significant adverse effects were identified; therefore, no mitigation is proposed. This is appropriate based on the benthic habitats present.	Noted – the Applicant welcomes this confirmation.
RR-020-3.4.24	3.4.24: The methodology used to obtain and gather the data is appropriate in most cases and standard practices have been used.	Noted – the Applicant welcomes this confirmation.
RR-020-3.4.25	3.4.25: The MMO previously raised the potential issue of obtaining contaminant samples from a Hamon grab as this gear mixes the sediment. The MMO is not aware of any studies being undertaken to compare the results of using this gear type compared with those obtained using the standard gear type (Day grab) used for this purpose, nor know of the consequences of using this gear type on the concentrations of the contaminants. It would be beneficial to compare results with any other data nearby that has been collected using the correct gear, to provide confidence in the results.	<p>A 0.1 m² Mini-Hamon grab was used to collect the physio-chemical data due to the course nature of the sediment in the survey area, i.e., the sediment was too coarse to obtain success day grab samples. Sediments with a finer particle size, such as clays and muds, can act as adsorption surfaces for contaminants that may be released into the water column if the sediment is disturbed (Cefas, 2001). Sediments with larger particle sizes (e.g. sands) are not typically associated with elevated concentrations of anthropogenic contaminants. Hydrocarbons in particular are closely linked to the spatial distribution of sediment types. The concentrations of metals in sediments are generally higher in the coastal zone and around estuaries, decreasing offshore, indicating that river input and run-off from land are significant sources.</p> <p>As presented in Appendix A of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068), Results of the chemical analyses revealed that hydrocarbon concentrations across the majority of the Hornsea Four survey area were within the</p>

		expected United Kingdom Offshore Operators Association (UKOOA) (2001) background concentrations. Some elevation in total hydrocarbon (THC) concentrations was noted nearby existing infrastructure which was expected. Gas chromatography traces were typical of background levels of hydrocarbon inputs in areas of historical oil and gas exploration such as the North Sea (McDougall, 2000). Therefore, it is the Applicant's position that the surveys were sufficient for the purposes of characterisation for the purposes of EIA.
RR-020-3.4.26	3.4.26: The use of models to fill gaps in data collection is appropriate and has been employed for other OWF developments when data is scarce, however it is not clear how the physical data collected has been used to refine the model outputs. Some of the biotopes predicted to be present do not fit well with the sediment recorded along the ECC and Array. Further validation of the models is required.	See Applicant response to RR-020-3.4.3.
RR-020-3.4.27	3.4.27: Data was collected specifically for the project due to absence of historical data across much of the site. The models of predicted biotopes (based on historical data) were produced due to the absence of data at Preliminary Environmental Impact Report ("PEIR"). It is unclear how these have been updated using the site-specific data collected across the Project area as the some of the model outputs predicts the likelihood of some habitats being present where the sediment collected from the recent surveys does not corroborate. Section 7.2.2 of Annex 2 Benthic Report sets out how the recent survey data was applied to the model and states that the most recent data was prioritised over older data. However, this does not appear to come through in some of the model outputs.	See Applicant response to RR-020-3.4.3.
RR-020-3.4.28	3.4.28: It is not clear from the text in the reports whether an unbiased statistical accuracy assessment has been undertaken. The models use a combination of computational analysis and expert judgement; however, it would be beneficial to have a confidence element to the models due to the poor match, in some cases, to the physical data.	As noted in Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) , confidence scores were assigned to all polygons to give an indication of their accuracy.
RR-020-3.4.29	3.4.29: <i>S. spinulosa</i> was identified at stations ECC17-21 in high numbers being the dominant species at these stations, however the biotope assigned did not	The presence of this species and dominance at these stations is recorded with Volume A5, Annex 2.1: Benthic and Intertidal

	include <i>S. spinulosa</i> as a characterising species and therefore does not reflect the faunal composition of those stations. Whilst the species was identified in high numbers, no reef was identified in the grab samples. However, the presence of this species and dominance at these stations should be mentioned in the ES chapter. It is not clear whether the geophysical data was interrogated at the stations to determine whether any reef signatures were apparent. The MMO requires clarification on this matter.	Ecology Technical Report (APP-068) . Furthermore, the numbers of <i>S. spinulosa</i> identified within the surveys is not considered high enough to quantify as an Annex I reef habitat or a <i>Sabellaria</i> reef biotope. Moreover, as detailed in Section 1.2 of Appendix A, Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-068) , grab samples targeted the range of different sediments and depths observed in the geophysical study. The Applicant will conduct biogenic and geogenic reef surveys as part of pre-construction survey efforts, to identify any biogenic reef features and to enable micro-siting around such features, if present.
RR-020-3.4.30	3.4.30: A number of embedded mitigation commitments have been detailed in the commitments register and in Table 2.12 of Chapter 2 which are appropriate. There are two commitments (Co48 and Co84) to avoid any habitats of principle importance under the NERC Act 2006. The location of these will be informed through pre-construction surveys including micro siting where possible. The absence of <i>S. spinulosa</i> reef from the locations identified as containing high abundances of the species must therefore be confirmed.	The Applicant can confirm that in line with Co84 (Volume A4, Annex 5.2: Commitments Register (APP-050)), foundations and cables will be micro-sited around habitats of principal importance wherever reasonably practicable (subject to agreement with the MMO). Additionally (and also in line with Co84), benthic monitoring will be undertaken at pre-construction phase of the proposed development in order to determine the location, extent and composition of any habitats of principal importance (Section 41 of the 2006 Natural Environmental and Rural Communities (NERC) Act). In the event that habitats of principal importance are identified in the pre-construction survey; post-construction monitoring will also be carried out with a focus on these identified habitats.
RR-020-3.4.31	3.4.31: The MMO has raised a number of issues in relation to monitoring and these have been set out within Section 4.5.	Noted. Applicant responses in relation to monitoring are addressed within RR-020-4.5.1 to RR-020-4.5.21.
RR-020-3.5.1	3.5.1: In providing this response the MMO has reviewed the following documents unless otherwise stated all comments relate to Chapter 3 Fish and Shellfish Ecology: a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology d) EN010098-000705-A2.3 ES Volume A2 Chapter 3 Fish and Shellfish Ecology	Noted

	<p>e) EN010098-000759-A5.3.1 ES Volume A5 Annex 3.1 Fish and Shellfish Ecology Technical Report</p> <p>f) EN010098-000708-A2.6 ES Volume A2 Chapter 6 Commercial Fisheries</p> <p>g) EN010098-000647-A5.6.1 ES Volume 5 Annex 6.1 Commercial Fisheries Technical Report</p> <p>h) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and Transboundary Effects Offshore Summary</p> <p>i) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects</p>	
RR-020-3.5.2	<p>3.5.2: The MMO believes that the existing environment been characterised appropriately. As such, shellfish of commercial importance to the region has been found to include brown crab <i>Cancer pagurus</i>, prawn/langoustine/scampi <i>Nephrops norvegicus</i>, European lobster <i>Homarus gammarus</i>, velvet swimming crab <i>Necora puber</i>, common whelk <i>Buccinum undatum</i>, brown and pink shrimp <i>Crangon crangon</i> and <i>Pandulus montagui</i>, and king scallop <i>Pecten maximus</i>. European common squid <i>Alloteuthis subulata</i> were identified as the most common cephalopod in the region. Please note however that this has squid's species name has been given as 'subulate' throughout the text, rather than 'subulata'.</p>	<p>The MMO confirmation of the sufficiency of the baseline characterisation for shellfish is welcomed by the Applicant. The correction of the squid species name will be added to the Schedule of Change for the Fish and Shellfish Chapter.</p>
RR-020-3.5.3	<p>3.5.3: The MMO would like to understand which data source(s) was/were used to inform of <i>A. subulata</i> presence? Squids <i>Loligo vulgaris</i>, <i>Loligo forbesii</i>, <i>Illex coindetii</i>, and <i>Todaropsis eblanae</i> also exist in the area and the MMO would like to understand why these weren't represented.</p>	<p>As presented in Table 3.6 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), the North Sea International Bottom Trawl Surveys (IBTS) were a key data source utilised to inform the fish and shellfish baseline, and informed the presence of <i>A. subulata</i>. As stated in paragraph 3.7.8 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), <i>A. subulata</i> were identified as the most common cephalopod in the region. Whilst the species <i>Loligo vulgaris</i>, <i>Loligo forbesii</i>, <i>Illex coindetii</i>, and <i>Todaropsis eblanae</i> were recorded within the IBTS surveys, they were not caught in high abundances, and were therefore not addressed specifically within the baseline. As defined in Section 3.7.3 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), the Applicant undertook a 'Valued Ecological Receptor' approach to allow the assessment to focus on receptors of ecological or commercial value to the area. As</p>

		these species were not assessed as being of key value to the site, the receptors were not described within the baseline or considered a focus of the assessment.
RR-020-3.5.4	<p>3.5.4: The MMO believes that all the potential impacts have been accurately identified these are set out below.</p> <p>Construction Phase:</p> <ul style="list-style-type: none"> a) Direct damage (e.g. crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from construction activities. b) Temporary localised increases in Suspended Sediment Concentration ("SSC") and smothering. c) Direct and indirect seabed disturbances leading to the release of sediment contaminants. d) Mortality, injury, behavioural changes and auditory masking arising from noise and vibration. <p>Operation Phase:</p> <ul style="list-style-type: none"> a) Temporary localised increases in SSC and smothering. b) Long-term loss of habitat due to the presence of turbine foundations, scour protection and cable protection. c) Increased hard substrate and structural complexity as a result of the introduction of turbine foundations, scour protection and cable protection. d) Direct disturbance resulting from maintenance during operation. <p>Decommissioning phase:</p> <ul style="list-style-type: none"> a) Direct damage (e.g., crushing) and disturbance to mobile demersal and pelagic fish and shellfish species arising from decommissioning activities. b) Temporary localised increases in SSC and smothering. c) Direct and indirect seabed disturbances leading to the release of sediment contaminants. d) Mortality, injury, behavioural changes and auditory masking arising from noise and vibration. 	The Applicant welcomes agreement on the scope of the potential impacts assessed for shellfish within the EIA chapter.

RR-020-3.5.5	<p>3.5.5: The MMO acknowledges that fishing effort displacement has been considered, though considered not likely significant. Further, the Applicant has contracted a Fishing Industry Representative ("FIR") and a Commercial Fisheries Advisor ("CFA") to assist with fisheries liaising to maintain regular communications with the fishing industry via Notices to Mariners ("NtMs"), Kingfisher bulletins, project update emails and meetings with individual fishers and also fisheries' representatives such as National Federation of Fisherman's Organisations ("NFFO"), Holderness Fishing Industry Group ("HFIG") and European fisheries stakeholders. This will continue throughout pre-construction and construction phase of the Project.</p>	<p>This is welcomed and noted by the Applicant.</p>
RR-020-3.5.6	<p>3.5.6: In relation to Section 3.11.1.7 of the Fish and Shellfish Ecology report states <i>"The proposed Hornsea Four ECC also overlaps with a large scallop ground located along the Hornsea coast (Cefas 2019), although it should be noted that key scallop grounds are also located across the English Channel, the Irish Sea and off the coasts of Scotland (Cappell 2018)."</i></p> <p>The MMO agrees with this statement on a national scale, though on a local scale, during, for example, the construction phase, fishers would not have the option of fishing in areas such as the English Channel, Irish Sea, and off coasts of Scotland.</p> <p>The MMO believes these sections should be re-worded for clarity on the scale of the assessments.</p>	<p>The Applicant highlights that as stated within paragraph 6.11.1.27 of Volume A2, Chapter 6: Commercial Fisheries (APP-018), on a local scale, dredging fleets target scallops within established grounds across that run parallel to Holderness Coast between 6 to 12 Nautical Miles (NM) from the coast. As evidenced by Vessel Monitoring System (VMS) data and fishery consultations, the most productive scallop grounds are targeted north of the offshore ECC and north of Flamborough Head. Therefore, whilst the proposed Hornsea Four ECC overlaps with a large scallop ground, the Applicant does not consider that the area is a key area of high scallop productivity for local fisheries.</p>
RR-020-3.5.7	<p>3.5.7: The MMO believes the appropriate evidence base has been used to some extent. Table 1 of the Commercial Fisheries Technical Report details the evidence bases used. The MMO considers these to be reputable and comprehensive, though do urge caution around species resolution for some sources. For example, MMO landings data are likely to name squid species simply as 'squids', often without differentiating species.</p>	<p>The Applicant welcomes the agreement on the adequacy of some of the data sources and notes that the uncertainties associated with these are acknowledged. The limitations with these data are identified in Section 6.7.4 of Volume A2, Chapter 6: Commercial Fisheries (APP-018). As noted in paragraph 6.7.4.6 of Volume A2, Chapter 6: Commercial Fisheries (APP-018), these data limitations were managed by ensuring accurate interpretation of the data and clear understanding of its scope, together with cross-referencing between data sources and consultation with the fishing industry. Therefore, the Applicant considers that the baseline</p>

		characterisation for commercial fisheries is adequate for the purposes of EIA.
RR-O20-3.5.8	3.5.8: Further, commercial fishing activity density mapping across the former Hornsea Zone for beam trawl and demersal otter trawl has been conducted using data from 2010. Please could the Applicant explain why these gear types were selected for activity density mapping whilst the potting sector was excluded? The MMO would have expected this sector to have been included in such mapping given the high tonnage of crab, scallop, lobster, and whelk fished from the study area. That being said, the MMO does acknowledge that organisations like the HFIG have been consulted on local shellfish.	Fishing activity density data from the Crown Estate UK Fisheries Information Mapping (FIM) Project was provided for the former Hornsea Zone for the following gear types: beam trawl and otter trawl. The Crown Estate sourced FIM data from vessel plotter data, and amalgamated this into density mapping across approximately 20 years. The Applicant does not have access to density mapping data for non-mobile sector, including the potting vessels."
RR-O20-3.5.9	3.5.9: Section 3.11.1.16 of the Fish and Shellfish Ecology report states: <p>"The magnitude of impact on shellfish receptors was assessed as being minor, and the sensitivities of brown crab, scallop, Nephrops and common whelk were all assessed as medium. The medium sensitivities and minor magnitude of the impact could result in either a slight or moderate effect (as per the matrix in Table 3.13). Taking into account the extensive distribution of these species along the coasts of the UK, the small degree of overlap of Hornsea Four with identified shellfish resources and spawning grounds, and the short-term nature of the impact, it is concluded that the impact will be of slight significance, which is not significant in EIA terms."</p> <p>Similar to the previous point above, this, reads as though fishers have the option of fishing in grounds much further away which is neither practical nor economically viable for small vessels. In the first instance, the MMO recommends continued liaison with HFIG and the local IFCA to determine exact locations of shellfish vessels in the proposed area.</p>	The Applicant notes that as presented in Figures 29 to 32 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) , the overlap of the Hornsea Four Order Limits with key shellfish resource areas and spawning areas is slight, with additional shellfish resource/spawning areas also located outside of the Hornsea Four Order Limits. In addition to this, as stated in paragraph 3.11.1.16 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-018) these species are extensively distributed along the coast, and therefore from an ecological perspective there will be minimal effect on shellfish receptors within the vicinity of Hornsea Four. Regarding the potential for disruption to fishing activities, paragraph 6.11.1.7 of Volume A2, Chapter 6: Commercial Fisheries (APP-018) states that during construction potting vessels would be required to remove pots from areas under construction and relocate them. However, as stated within paragraph 6.11.1.7 of Volume A2, Chapter 6: Commercial Fisheries (APP-018) , potting typically involves a number of fleets of pots being deployed across a range of areas, and therefore it is unlikely that all pots deployed by a single vessel will be impacted at any one time. Regarding the dredging of scallops, as stated within paragraph 6.11.1.27 of Volume A2, Chapter 6: Commercial Fisheries (APP-018) , the most productive scallop grounds are targeted north of

		<p>the offshore ECC and north of Flamborough Head, and therefore the area is not considered a key area of high scallop productivity for local fisheries.</p> <p>As presented in Section 3 of F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244), the Applicant has detailed a proposed procedure for communicating with fisherman to minimise impacts. The Applicant has contracted a Fishing Industry Representative (FIR) and a Commercial Fisheries Advisor (CFA) to assist with fisheries liaison and to maintain a positive and open working relationship with the fishing industry. This process is secured via the DMLs (C1.1 Draft DCO including Draft DML), which requires final fisheries coexistence and liaison plans to be approved by the MMO prior to commencement of works (Part 2 - Condition 13(7) of DCO Schedules 11 and 12). These final plans will describe the approach to liaison and consultation with the fishing industry (including Holderness Fishing Industry Group (HFIG) and the local Inshore Fisheries and Conservation Authorities (IFCA)) throughout the lifetime of Hornsea Four.</p>
RR-020-3.5.10	3.5.10: The MMO is satisfied that the potential cumulative and inter-related impacts and effects on shellfish ecology have been identified and an appropriate assessment has been carried out.	The Applicant welcomes agreement on the scope and assessment of cumulative and inter-related impacts on shellfish ecology.
RR-020-3.5.11	3.5.11: Mitigation measures “beyond existing commitments” are not given for shellfish receptors. The MMO is content with this, given the scale of proposed works versus the area of shellfish grounds, however, the MMO would urge closer liaison with HFIG to determine exact locations of shell fishing activity.	The Applicant welcomes the MMO’s point in relation to mitigation. In relation to liaison with HFIG, the Applicant intends to secure, via the DMLs (C1.1: Draft DCO including Draft DML (APP-203)), a fisheries coexistence and liaison plan which will describe the approach to liaison and consultation with the fishing industry throughout the lifetime of Hornsea Four. This will be approved by the MMO prior to commencement of works (Condition 13(7) of Schedule 11 and Condition 13(6) of Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203) . An outline of this plan, which the final plans must accord with, was submitted as part of the DCO Application (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)).

RR-020-3.6.1	<p>3.6.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Chapter 3 Fish and Shellfish Ecology:</p> <ul style="list-style-type: none"> a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology d) EN010098-000705-A2.3 ES Volume A2 Chapter 3 Fish and Shellfish Ecology e) EN010098-000759-A5.3.1 ES Volume A5 Annex 3.1 Fish and Shellfish Ecology Technical Report f) EN010098-000708-A2.6 ES Volume A2 Chapter 6 Commercial Fisheries g) EN010098-000647-A5.6.1 ES Volume 5 Annex 6.1 Commercial Fisheries Technical Report h) EN010098-000741-A4.5.2 ES Volume A4 Annex 5.2 Commitments Register i) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and Transboundary Effects Offshore Summary j) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects 	This is welcomed and noted by the Applicant.
RR-020-3.6.2	<p>3.6.2: A clear and detailed project description has been presented within Chapter 4. There are a number of elements of the infrastructure that have yet to be determined as the project design is still evolving, however, the options for the various infrastructure appear to have been appropriately considered in the EIA process, for example, maximum design scenarios, depending on the different infrastructure or different construction methods being selected for the project.</p>	The Applicant welcomes the MMO's comment regarding the appropriate translation of the project design, via maximum design scenarios, within the EIA.
RR-020-3.6.3	<p>3.6.3: The MMO notes the Applicant's commitment to using GBS foundations for some of the WTGs. According to Commitment Co201 of the commitments register "Primary: Gravity Base Structure (GBS) foundations (WTG type) will be utilised at a maximum of 110 of the 180 WTG foundation locations. The location of GBS foundations, if used for WTG, will be confirmed through a construction method statement which will include details of foundation installation methodology."</p>	The Applicant welcomes agreement on the translations of the maximum design scenarios for foundation designs into the assessment presented in Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) .

	<p>There are pros and cons with the use of GBS foundations, with the main advantage being that there will be a reduced number of piles required for WTC installation, and thus the potential to reduce the duration of underwater noise from piling. Conversely, GBS foundations will result in a larger area of long-term habitat loss. The maximum design scenarios for impacts to fish associated with GBS foundations and monopiles have been appropriately considered in the EIA.</p>	
RR-020-3.6.4	<p>3.6.4: The MMO also notes that the requirement for the High Voltage Alternating Current ("HVAC") booster station along the ECC is dependent on the type of transmission technology (HVAC or High Voltage Direct Current ("HVDC")) selected for the project.</p>	<p>This is noted by the Applicant.</p>
RR-020-3.6.5	<p>3.6.5: The MMO believes an appropriate characterisation of the environment for fisheries and fish ecology has been presented. Fish species found within the project study area have been correctly identified using desk-based resources, and the spawning and nursery grounds of fish that occur within or near to the project study area have been mapped.</p>	<p>The confirmation of the sufficiency of the baseline characterisation for fish species is welcomed by the Applicant.</p>
RR-020-3.6.6	<p>3.6.6: The ES has identified herring and sandeel as the key species of concern that require species-specific assessments, owing to their close affiliation with seabed sediments within the project boundary.</p>	<p>This is noted by the Applicant.</p>
RR-020-3.6.7	<p>3.6.7: All other species of conservation importance that are known to be present in the project study area have been correctly identified in Table 9 of the Fish and Shellfish Ecology Technical Report.</p>	<p>The agreement on the identification of species of conservation importance in the study area is welcomed by the Applicant.</p>
RR-020-3.6.8	<p>3.6.8: The impacts associated with the construction, operation and decommissioning phases of the project have been accurately identified for fisheries.</p>	<p>The Applicant welcomes agreement on the scope of the fish ecology assessment.</p>
RR-020-3.6.9	<p>3.6.9: The MMO notes that the effects of EMF on fish receptors during the operation phase has been scoped out of further assessment. The MMO agrees with this decision at this stage, as sufficient justification had been provided during the scoping phase, based on the evidence available at the time.</p>	<p>The Applicant welcomes agreement on the scoping out of the effects of EMF on fish receptors.</p>
RR-020-3.6.10	<p>3.6.10: The MMO is satisfied that the potential cumulative and inter-related impacts and effects on fisheries and fish ecology have been identified and an appropriate assessment has been carried out. The Applicant has recognised</p>	<p>The Applicant welcomes agreement on the scope and assessment of cumulative and inter-related impacts on fish ecology.</p>

	that the activity with the greatest potential for cumulative impact to fisheries and fish ecology is piling due to the far-reaching effects of noise and vibration which may overlap with piling and other construction noise from other offshore developments, particularly other OWFs. The MMO acknowledges cumulative impact assessments for noise are challenging due to the lack of detailed information available on the various piling schedules for all projects in the area.	
RR-020-3.6.11	3.6.11: The MMO is currently unable to agree with the conclusions reached on cumulative impacts of noise on fish. This is primarily due to the lack of appropriate modelling to assess the extent of behavioural effects of piling on fish, and because the mitigation currently proposed (a temporal piling restriction for the HVAC booster station) is not considered adequate mitigation to protect spawning herring and their eggs and larvae. Please see detailed comments in sections 3.7.21 to 3.7.24 regarding modelling of behavioural effects and sections 3.7.25 to 3.7.25 regarding the timing of the Banks herring spawning season.	Noted. Applicant responses to the detailed comments are addressed within the relevant points below.
RR-020-3.6.12	3.6.12: Transboundary impacts on fish receptors have been considered in Section 3.13. The MMO supports the potential transboundary impacts that have been scoped into the assessment, namely, direct effects as a result of underwater noise from piling operations, and indirect effects occurring in relation to fish habitat or disturbance to habitat due to increased suspended sediment concentrations and deposition from the placement/removal of foundations and cables in or on the seabed. Effects of increases in SSC are predicted to occur up to 14 km from Hornsea Four and are therefore not predicted to extend into the waters of other EEA states, so the MMO agrees that transboundary impacts arising from this effect will not be significant.	The Applicant welcomes the agreement on the scope and assessment findings for transboundary effects on fish ecology.
RR-020-3.6.13	3.6.13: Regarding the effects of underwater noise, the report acknowledges that behavioural responses in certain fish species are predicted to extend to several 10s of kilometres beyond the Project and therefore have the potential to affect fish (and shellfish) habitats of the Netherlands during the construction period. However, noise impact range contours for behavioural responses in fish have not been presented in the ES so it is not possible to determine the extent of this transboundary impact or determine whether	Paragraph 3.13.1.2 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) considers the transboundary effects on the Netherlands and found them to be not significant in EIA terms. Therefore, it is the Applicant's position that transboundary effects on fish and shellfish receptors within the Netherlands have been adequately assessed within the EIA.

	there will be any spatial overlap of noise with spawning and nursery grounds of fish in the Netherlands or any other neighbouring countries. Please see sections 3.7.21 to 3.7.24 for further comments regarding the requirement for behavioural response impact range noise contours to be mapped.	Please see the Applicant response to RR-020-3.7.23 which provides the Applicant's justification as to why it is not appropriate to present the impact range contour for behavioural responses.
RR-020-3.6.14	3.6.14: The MMO does not agree with the conclusions reached for herring relating to the impacts of noise and vibration, the impacts of direct damage and disturbance from construction activities, and the impacts of temporary localised increases in SSC and smothering. Noise impacts have been covered in sections 3.7.21 to 3.7.29.	Noted. Applicant responses to the detailed comments are addressed within the relevant points below.
RR-020-3.6.15	Impacts of direct damage and disturbance and temporary localised increases in SSC and smothering on herring: 3.6.15: The inshore section of the ECC crosses through the Banks herring spawning ground. Seabed preparation work associated with the ECC installation activities such as sandwave clearance, pre-lay grapnel run, jetting and trenching are likely to result in disturbances to herring spawning grounds by way of direct damage to the gravel beds on which herring lay their eggs, and through temporary localised increases in SSC and smothering of eggs and newly hatched larvae during their development.	The Applicant notes that the Hornsea Four ECC crosses the Banks spawning ground, and both the direct damage and indirect effects from increased SSC and deposition were assessed within Section 3.11 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) . The assessment concluded no significant effects from direct disturbance on spawning herring (see paragraph 3.11.1.15 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)), on the basis that impacts from direct disturbance will be localised and short-term nature. In addition, there is no direct overlap of the ECC with core highest density herring spawning areas (as presented in Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)), and PSA data also showed a lack of suitable spawning habitats for herring along much of the ECC (see paragraph 3.11.1.15 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)). The assessment also concluded no significant effects from increased SSC and deposition on spawning herring (see paragraph 3.11.1.37 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)), on the basis that herring eggs are tolerant of high levels of SSC (Kiorboe <i>et al.</i> , 1981), and the nature of the construction works (and therefore impacts) are both spatially and temporally intermittent.
RR-020-3.6.16	3.6.16: Herring require a specific substrate on which to spawn, consisting of gravel and similar habitats where there is a low proportion of fine sediment	This is agreed. Herring spawning areas were identified by the Applicant using the International Herring Larvae Survey (IHLS) dataset (International Council for the Exploration of the Sea (ICES)

	<p>and well-oxygenated water. Herring eggs and larvae can be put at risk if the spawning beds are smothered e.g., from dredging activity.</p>	<p>2007-2021), showing areas of high intensity spawning activity within the region (Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)). This data largely reflects patterns shown by PSA data (data from EUNIS and Folk (1954) and Stephens and Diesing (2015)) and from site specific PSA data across the array and along the ECC (Appendix A and Appendix D of Volume A5, Annex 2.1: Benthic and Intertidal Ecology Technical Report (APP-071), respectively).</p>
RR-O20-3.6.17	<p>3.6.17: If there is a large proportion of fine material (<63 micron) in the sample, then it is unlikely to allow sufficient water circulation and it will not be suitable as a herring spawning ground (Rogers 2000). Accordingly, it is important to manage herring spawning areas by ensuring that the physical properties of the substrate remain the same, and by preventing disturbance to seabed substrates during the period in which eggs are laid, during egg development and during the period of development of newly hatched larvae where the larvae remain close to the seabed.</p>	<p>The Applicant has undertaken a semi-quantitative assessment of the predicted depths of sediment deposition and predicted SSC from a range of activities (see Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)). The findings of this assessment informed the fish and shellfish ecology assessment. As noted in paragraph 3.11.1.37 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), the nature of the works and therefore the impacts of increased SSC and deposition are both spatially and temporally intermittent, and as such the likelihood of a sediment plume from the works overlapping with very recently fertilised eggs or actively spawning herring is very low. In addition, as noted in paragraph 3.11.1.28 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), herring eggs are tolerant of very high levels of SSC (Kiorboe et al. 1981). Furthermore, the majority of the ECC was identified as being of unsuitable habitat for herring spawning (as per the PSA data as presented in Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) and Figure 3.6), with the centre of the IHLS hotspot data suggesting spawning primarily occurs within the sub-prime and suitable sediments to the north of the ECC and therefore outwith any areas affected by high levels of SSC and sediment deposition from construction works. Therefore based on the assessment undertaken within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), the Applicant considers that there will not be any significant changes to the physical properties of the herring spawning substrates.</p>

RR-020-3.6.18	3.6.18: Herring sensitivity for the effects of direct damage and disturbance and temporary localised increases in SSC and smothering is assessed as “high” in the ES, which is appropriate.	Agreement on the sensitivity of herring to Temporary localised increases in SSC and smothering (FSE-C-2) is welcomed by the Applicant.
RR-020-3.6.19	3.6.19: The MMO notes the magnitude of impact has been assessed as “minor” (adverse) for both of these impacts, due to the “relatively small overlap from the works on this spawning ground, the lack of overlap with the core highest density spawning areas to the north of Flamborough Head, and the localised and short-term nature of the impact”.	See the Applicant response to RR-020-3.6.20 below.
RR-020-3.6.20	3.6.20: However, the heat maps of The International Herring Larvae Surveys (“IHLS”) data presented in the Fish and Shellfish Ecology Technical Report (Figures 24 – 26) contradict this statement as they demonstrate the inter-annual variation in the location of herring spawning activity and show that high larval densities occurred in the ECC in the years 2011-2012, 2019-2020 and especially in 2020-2021.	Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) , shows the core high intensity spawning areas utilised from 2007 – 2021. As detailed in paragraph 3.7.1.7 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) , whilst the 2019/2020 and 2020/2021 spawning seasons, as presented in Figure 26 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) , show high densities of herring spawning partially overlapping the ECC, this represents a minor overlap with the high density area which extends over a wide region. In addition, the 2019/2020 and 2020/2021 seasons also present generally high values across the survey area, giving a somewhat exaggerated appearance due to the standardised scaling of the IHLS data year to year of the relative importance of the ECC to the spawning grounds for herring on the fixed scale used in the figures (i.e., the fixed scale between years shows the relative change in abundance recorded year to year but can result in a loss of detail regarding “hot spot” locations if wider areas have high abundances in that year). Therefore, despite the interannual variations shown in Figures 24 to 26 of the Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) , the core high intensity spawning area is located to the north of the ECC, as presented within Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) .
RR-020-3.6.21	3.6.21: Furthermore, at this stage, the duration of seabed preparation and cable installation works is unknown but according to Figure 4.4 “Indicative	The Applicant considers that impacts associated with seabed preparation and cable installation works will be short term, as the

	<p>construction programme for Hornsea Four" in the Project Description Chapter, cable installation is expected to take approximately 2 years, though it is unclear if this period covers both seabed preparation and cable installation. This would result in the potential disturbance to herring spawning habitat over two consecutive spawning years so cannot be considered as a short-term impact.</p>	<p>works are mobile and as such, any impact on a specific area will be infrequent. In addition, any sediment plumes caused by the works will primarily follow the tidal axis which is variable between tides, therefore it is unlikely that the same area of seabed will be affected by higher SSC for more than one or two consecutive tides (Appendix C of Volume A5, Annex 1.1: Marine Processes Technical Report (APP-067)).</p>
RR-020-3.6.22	<p>3.6.22: The potential requirement for mitigation for increases in SSC and smothering during the herring spawning season was raised by the MMO in response to the PEIR and given the concerns relating to the effects of direct damage and disturbance to herring spawning habitat around the inshore section of the ECC, combined with increases of SSCs and smothering affecting spawning herring and their eggs and larvae, the MMO recommends that a seasonal restriction is applied to ECC works during the Banks herring spawning season. The MMO believes this should be included in the DML and has amended the wording on this condition in sections 3.7.32 to 3.7.36.</p>	<p>The Applicant considers that a seasonal restriction for the cable installation activities during the herring spawning season is excessive and unwarranted due to the expected very minor impacts on the herring spawning grounds from cable installation and the previously stated short-term impacts at any one point which would arise from the cable installation works (as described above) and the clear evidence of no overlap with the core Banks herring spawning grounds with Hornsea Four. The Applicant considers that the assessment undertaken is robust and that no significant effects were identified. It is therefore not considered appropriate to introduce cable installation seasonal restrictions.</p>
RR-020-3.6.23	<p>3.6.23: The MMO believes that there is potential for the duration of the seasonal restriction to be refined temporally, if based on an appropriate 'peak' spawning period, as per sections 3.7.25 to 3.7.29, as well as spatially (e.g., by kilometre point distance along the ECC route), as is the case for Dogger Bank A and B ECC, which has restrictions applied to construction works in the ECC owing to a similar inshore route that transects the Banks herring spawning ground.</p>	<p>The Applicant also notes the MMO's observation that the ECC overlaps the core high intensity spawning areas. As noted in the response to paragraph 3.6.20 above, and detailed in paragraph 3.7.1.7 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015), this overlap only occurs in years with high larval densities. The 2019/2020 and 2020/2021 seasons present generally high values across the survey area, giving a somewhat exaggerated appearance of the relative importance of the ECC to the spawning grounds for herring due to the standardised scaling of the IHLS data year to year (i.e. the fixed scale between years shows the relative change in abundance recorded year to year but can result in a loss of detail regarding "hot spot" locations if wider areas have high abundances in that year). Therefore, despite the interannual variations shown in Figures 24 to 26 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), the core high</p>

		<p>intensity spawning area is located to the north of the ECC, as presented within Figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015). Therefore, due to the lack of overlap between the ECC and core high herring spawning areas, the Applicant does not agree that a spatial restriction on construction works in the ECC is appropriate.</p> <p>Furthermore, the Applicant notes that the offshore ECC for Dogger Bank A and B runs directly through the core Banks herring spawning ground, whilst the Hornsea Four offshore ECC has no overlap with core spawning grounds (as presented in figure 3.4 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015)), therefore the magnitude of impact for Hornsea Four is not directly comparable to that of the Dogger Bank A and B cable installation as presented.</p>
RR-020-3.6.24	<p>3.6.24: The MMO would highlight at this stage it's increasing concerns with the outstanding issues that have been raised several times during previous consultations and meetings held between the Applicant, the MMO and our technical advisors the Centre for Environment, Fisheries and Aquaculture Science (Cefas) during the EPP and pre-application stage. Whilst the MMO appreciates that there could be a variety of reasons why the Applicant has been unable to address these issues at ES stage, it has resulted in the MMO recommending piling restrictions for piling within the ECC, array area and the HVAC booster station for the entire duration of the Banks herring spawning season as well as restrictions on construction activities along the ECC. Such restrictions are likely to be onerous for the developer, but in the absence of the evidence requested, uncertainty remains regarding the likely extent of significant impacts to herring and their eggs and larvae, and on this basis, a precautionary approach has been taken in the form of temporal and spatial mitigation.</p>	<p>The Applicant has prepared a clarification note (G1.10 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction) to provide further analysis and justification of the "peak" spawning period for herring, using the methodology proposed by Cefas as part of the Hornsea Four Evidence Plan process. The aim of this note is to agree the timing of this "peak" spawning period and the duration of any associated piling restriction timing. The clarification note is submitted as part of the Applicant's response to Deadline 1. The Applicant welcomes further discussion with the MMO and Cefas in relation to this note as part of the SoCC process</p>
RR-020-3.6.25	<p>3.6.25: The MMO understands mitigation for underwater noise has been proposed and has commented specifically throughout section 3.7.</p>	<p>Noted. Applicant responses to the detailed comments are addressed within the relevant points below.</p>
RR-020-3.7.1	<p>3.7.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Subsea Noise Technical Report Part 1 & 2:</p>	<p>Noted.</p>

	<p>a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction</p> <p>b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description</p> <p>c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology</p> <p>d) EN010098-000706-A2.4 ES Volume A2 Chapter 4 Marine Mammals</p> <p>e) EN010098-000705-A2.3 ES Volume A2 Chapter 3 Fish and Shellfish Ecology</p> <p>f) EN010098-000759-A5.3.1 ES Volume A5 Annex 3.1 Fish and Shellfish Ecology Technical Report</p> <p>g) EN010098-000733/34-A4.4.5 ES Volume A4 Annex 4.5 Subsea Noise Technical Report Part 1 & 2</p> <p>h) EN010098-000565-F2.11 AAI Volume F2.11 Outline Southern North Sea Special Area of Conservation Site Integrity Plan</p> <p>i) EN010098-000559-F2.5 AAI Volume F2.5 Outline Marine Mammal Mitigation Protocol</p> <p>j) EN010098-000714-A2.12 ES Volume 2 Chapter 12 Cumulative and Transboundary Effects Offshore Summary</p> <p>k) EN010098-000743-A4.5.3 ES Volume A4 Annex 5.3 Offshore Cumulative Effects</p>	
RR-020-3.7.2	<p>3.7.2: In relation to Chapter 4 Marine Mammals the MMO defers to Natural England on if the existing environment (baseline) has been characterised appropriately. The MMO notes the following species of marine mammals have been identified as most likely to be present within the Project site and as such were the focus of the baseline characterisation and the impact assessment: Harbour porpoise, minke whale, white-beaked dolphin, bottlenose dolphin, harbour seal and grey seal.</p>	Noted.
RR-020-3.7.3	<p>3.7.3: In relation to marine mammal sensitivity, the information presented in section 4.10.4 (Chapter 4 Marine Mammals) only demonstrates what is not known about the significance of temporary threshold shift ("TTS"), there is no evidence presented to confirm that it isn't significant, only conjecture. One could equally argue that at lower received sound levels, animals are less likely to flee (see Figure 4.1 on page 47), and so proportionally more likely to induce TTS than this assessment suggests. The TTS/PTS ("Permanent</p>	<p>The Applicant notes that the approach, to not assess the magnitude/ sensitivity/ significance of TTS-onset, was agreed through the Evidence Plan process (agreement OFF-MM-2.2 – as set out in Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (B1.1.1: Evidence Plan)). Additionally, this approach is in line with the latest guidance from Natural England (2020) (Offshore Wind Marine Environmental Assessments: Best</p>

	<p>Threshold Shift") assessment seems to consider only an animal fleeing directly away from the source, whereas Figure 4.1 demonstrates that even at received SELs (single strike sound exposure level) of 160 dB, around 10% of animals will not flee, so there are uncertainties which tend toward underestimation of risk here too.</p>	<p>Practice Advice for Evidence and Data Standards, Phase III: Expectations for data analysis and presentation at examination for offshore wind applications) which states that: "TTS onset thresholds and the biological consequences of TTS are not currently understood (Faulkner et al.,2018), so there is not a requirement to assess the potential significance of this impact. This advice may be updated if additional evidence becomes available on the level and duration of TTS that may have a significant ecological effect on individuals. The assessment of TTS should be presented for context."</p>
RR-O20-3.7.4	<p>3.7.4: Cetacean sensitivity to PTS (Chapter 4 Marine Mammals, Section 4.10.4.4): The MMO notes that the kind of anthropomorphising within the text is misguided and unhelpful. Marine mammals rely on sound as their primary sensory modality, whereas humans are primarily visual creatures. While audiometric data from humans can be useful to make quantitative extrapolations for marine mammals (since they share a similar inner ear structure), it would be unwise to state that what is considered 'mild' hearing loss in humans has any relevance to the severity of consequences of hearing loss in marine mammals. This section should therefore be updated.</p>	<p>The Applicant acknowledges the MMO's comment, and confirms that this paragraph will be removed from future impact assessments. The Applicant stresses that the removal of this paragraph makes no change to the impact assessment result.</p>
RR-O20-3.7.5	<p>3.7.5: Cetacean sensitivity to PTS (Chapter 4 Marine Mammals, Section 4.10.4.7): All cetaceans have been assessed as having a Medium sensitivity to PTS. The Applicant has not demonstrated that PTS would have merely a medium risk, only that there is uncertainty about how significant PTS may be for individual animals. Until and unless empirical evidence can shed light on whether this opinion is reasonable, the precautionary principle should continue to apply, and MMO believes that cetaceans should be assessed as having a high sensitivity to PTS</p>	<p>While the Applicant acknowledges that there is uncertainty on how significant PTS may be for individual animals, the latest opinions of the experts in this field are provided in Booth et al. (2018) (Updating the Interim PCoD Model: Workshop Report – New transfer functions for the effects of permanent threshold shifts on vital rates in marine mammal species). Booth et al. (2018) highlight that the experts agreed any threshold shifts as a result of pile driving would manifest themselves in the 2-10 kHz range (Kastelein et al. 2017), and that a PTS 'notch' of 6–18 dB in a narrow frequency band in the 2-10 kHz region is unlikely to significantly affect the fitness of individuals (ability to survive and reproduce). Irrespective of the sensitivity of the receptor to PTS, the significance of the impact on marine mammals is not significant, as defined in the assessment of significance matrix (Table 4.13 of Volume A2,</p>

		Chapter 4: Marine Mammals (APP-016)), since the assessment concludes a negligible magnitude given the use of embedded mitigation methods (Commitment Co110 (Volume A4, Annex 5.2: Commitments Register (APP-050))) and outlined in F25: Outline Marine Mammal Mitigation Protocol (APP-240)).
RR-020-3.7.6	3.7.6: The Subsea Noise Technical Report presents predictions of the underwater noise levels and impact ranges for the percussive piling of monopile and pin pile foundations for marine mammals and fish species. The assessment considers a single monopile or pin pile installed in a 24-hour period (for both maximum hammer energy and initial piling strike), as well as impact ranges for three pin piles installed consecutively in a single 24-hour period (at the North West location). Additional modelling has also been carried out to investigate the potential impacts of two piling installations occurring simultaneously at separated foundations (North West and East locations) (Section 5.3).	Noted.
RR-020-3.7.7	3.7.7: Other noise sources such as dredging, cable laying, rock placement and operational WTC noise (Table 73) have been assessed using a simple modelling approach based on measured data from Subacoustech's noise measurement database, using an N.log R - α R principle, fitted to the data. The MMO agrees that the impacts from percussive piling operations at the Project site pose the greatest risk to marine species.	Noted.
RR-020-3.7.8	3.7.8: Noise from Unexploded Ordnance clearance is also expected, however, an assessment of this has not been undertaken at this stage. The report confirms that a detailed assessment will be developed for a separate marine licence at a later stage, which the MMO supports.	Noted.
RR-020-3.7.9	3.7.9: The Subsea Noise Report is informative and provides relevant details on the modelling methodology and parameters input into the model. Reference is made to appropriate noise exposure criteria for marine mammals and fish species. The worst-case scenario (i.e. maximum hammer energy) has been assessed for monopiles and pin piles alongside the most likely scenario. The modelling also considers both a stationary and fleeing receptor for fish (primarily fleeing for marine mammals).	Noted.

RR-020-3.7.10	<p>3.7.10: The MMO presumes that based on the modelling presented, only a single monopile will be installed in a 24-hour period, although up to three pin piles could be installed in a 24-hour period. The MMO requests that this is clarified and the modelling is updated if more than one monopile is installed. The reason the MMO raises this is that the Fish and Shellfish Chapter refers to sequential piling in the HVAC booster station search area (hammer energy 5,000 kJ), representing the spatial MDS for noise impacts from a single piling event. However, the effect of sequential monopiles has not been assessed in the Subsea Noise Report.</p>	<p>Under consideration by the Applicant. The Applicant will prepare a response on this matter and will submit this into Examination by Deadline 3.</p>
RR-020-3.7.11	<p>3.7.11: The MMO notes that although piling issues are the greater concern, Section 6 of the Subsea Noise Report considers other continuous sources such as dredging, cable laying, vessel noise etc. As per the report:</p> <p>“These sources have been assessed using a simple modelling approach based on measured data from Subacoustech Environmental’s own underwater noise measurement database, scaled to relevant parameters for the site and specific noise sources to be used at the site. The calculation of underwater noise transmission loss (TL) for the non - impulsive sources is based on an empirical analysis of the noise measurements taken on transects around these sources by Subacoustech...It uses an $N \cdot \log R - \alpha R$ principle, fitted to the data”.</p> <p>Subsequently, Table 74 shows the approximate TL for each source type. It is recognised by the MMO that the approach is conservative. In fact, in some cases the degree of conservatism seems rather excessive. For example, in the case of the TL for vessel noise, the formula $12 \log R - 0.0021 R$ would predict increasing propagation losses up to a distance of about 3 km from the source, where a maximum of about 35 dB loss is reached, and thereafter the propagation loss drops with increasing range (and becomes negative beyond 25 km). This is obviously unrealistic (and arguably unduly conservative), to the degree that we wonder if such a formula is even practical for the implied modelled scenarios (which would involve fleeing animals over considerable</p>	<p>The MMO is correct to note that the noise levels at long range from the ‘other noise sources’ are likely to be highly conservative. The practicalities of these calculated noise levels at long range are largely immaterial though, as by these ranges the noise from these sources will have fallen well below any level of concern.</p>

	lengths of time, and thus presumably reaching distances comparable to the ranges exemplified above). The MMO requests further clarity on this matter.	
RR-020-3.7.12	3.7.12: Section 6.3.1.7 states that the cumulative sound exposure level (SELcum) calculations have assumed that the operational WTG noise is present 24-hours a day (which is appropriate). The MMO requests confirmation on what exposure duration has been assumed for the other sources as this is not clear in the report. Nevertheless, the calculations assume a fleeing receptor, and on that basis, we can expect to see small impact ranges.	The Applicant can confirm that other continuous-type noise sources have been modelled to operate for a 12-hour period in a day. The Applicant notes that exposure impact ranges are so low though that even if the sources were to operate for longer the noise exposures would remain of low concern even if a receptor was to remain in the vicinity for the duration, which is highly unlikely.
RR-020-3.7.13	3.7.13: The Subsea Noise Report concludes that percussive piling of monopiles and pin piles at the Project site is recognised to have the greatest potential underwater noise levels (and therefore presents the greatest risk to marine species), the MMO agrees with this conclusion. The maximum predicted impact ranges for marine mammals (at the East location) are shown in Table 82. For the monopile scenario, significant PTS and TTS ranges of 11 km and 42 km respectively are predicted for low frequency cetaceans. For the pin pile scenario, significant PTS and TTS ranges of 12 km and 42 km respectively are predicted for very high frequency cetaceans.	Noted.
RR-020-3.7.14	3.7.14: For maximum design monopile scenario, TTS SELcum impact ranges of up to 38 km (stationary animal) have been predicted for fish species; 34 km for the maximum pin pile scenario.	Noted.
RR-020-3.7.15	3.7.15: Impact ranges (SPLpeak and SELcum) for all the various scenarios are reported in the Subsea Noise Report including ranges for the maximum hammer energy scenarios as well as the initial strike. Significant effects are predicted (which is unsurprising given the sustained high hammer energies (i.e. 5,000 kJ) and anticipated piling profile (over 4 hours of piling)). Furthermore, it appears that the modelling is not overly conservative in terms of the source level estimates*, yet significant ranges are predicted. *As an example, Subacoustech have previously reported SELss monopile source levels of 223.6 dB for a 5,000 kJ hammer energy and a SELss pin pile source level of 221.3 dB for a 3,000 kJ hammer energy (Norfolk Vanguard OWF in 2018).	In relation to the Marine Mammal Mitigation Protocol (MMMP) the Applicant confirms that the specific mitigation measure (or suite of measures) (as outlined in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240)) to be implemented during construction of Hornsea Four will be determined, in consultation with the relevant Statutory Nature Conservation Bodies (SNCBs), following confirmation of final hammer energies and foundation types, collection of additional geological data, acquisition of noise monitoring data and/or information on maturation of emerging technologies. This additional data and information will allow the noise modelling to be updated to feed into the final MMMP and

	<p>On that basis, it will be important to ensure that appropriate mitigation is put in place to reduce the risk of potential impact of underwater noise on marine receptors, and the MMO supports the commitment by the Project to using at-source noise reduction measures.</p>	<p>discussions on the appropriate mitigation measure(s). This process includes provision for at-source mitigation, if required.</p> <p>Additionally, F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) sets out the available mitigation and management measures that could be brought forward during the development of the final SNS SAC SIP prior to the construction of Hornsea Four, to ensure that a conclusion of no AEol (with respect to significant disturbance of harbour porpoise in relation to the conservation objectives of the SNS SAC) can be maintained. As with the MMMP, the SIP process includes provision for at-source mitigation, if required.</p>
RR-020-3.7.16	<p>3.7.16: The MMO notes the maximum design pin pile (3,000 kJ) values in Table 82 for Phocids should be <100 m for PTS not 42 km.</p>	<p>It is understood that the figure cited by the MMO is a typographical error and should be <100 m. This amendment will be captured in the Schedule of Change process for Volume A4, Annex 4.5: Subsea Noise Technical Report (Part 2) (APP-044).</p>
RR-020-3.7.17	<p>3.7.17: Cumulative effects are considered in Volume 2 Chapter 12 with Annex 5.3 providing the detailed list of projects, plans and activities that have been considered within Hornsea Four offshore Cumulative Effects Assessment. The cumulative impact significance has been assessed as slight for the effects of underwater noise on fish, and slight to moderate for harbour porpoise (slight for other marine mammal species) during construction.</p>	<p>Noted.</p>
RR-020-3.7.18	<p>3.7.18: Transboundary impacts have been considered in Volume 2 Chapter 12. In terms of underwater noise, the assessment does not identify any significant transboundary effects for fish or marine mammal receptors. The assessment does acknowledge that behavioural disturbance resulting from noise during the construction phase could occur over large ranges, and therefore there is the potential for transboundary effects to occur, where subsea noise arising from the Project could extend into waters of other EEA states (such as the Netherlands whose marine border is located approximately 87 km from the Project). Given these distances, the MMO agree that the risk of significant impact of potential transboundary effects is likely to be low.</p>	<p>Noted.</p>

RR-020-3.7.19	<p>3.7.19: There were a couple of outstanding comments that were raised during the EPP and PEIR which have not yet been addressed. These are summarised in the comments below:</p> <p>a) For the other (continuous) sources, please could the Applicant confirm the duration of the activity/exposure period, as this is not clear in the report?</p> <p>b) In relation to the previous point, the effect ranges for these “other noise sources” (based on the SEL_{cum}) are predicted to be <100 m for all marine mammal species, for all activities with one exception. Predicted impact ranges are < 50 m for fish species. Please provide more context to explain these results.</p>	<p>As noted in the Applicant response to RR-020-3.7.12, the duration of the activity/exposure period is 12 hours, although the actual duration will not significantly affect any resultant impact range at these noise levels.</p> <p>In relation to context of ‘other noise sources’, the Applicant notes that all marine mammal criteria are based on exposure (SEL_{cum}) for these noise sources. Fish use a different SPL_{RMS} metric. Based on the difference between these metrics and how they are calculated, INSPIRE can work to a minimum range of 100 m for SEL_{cum} and 50 m for SPL_{RMS}. It is expected that the real impact range when these “less than” ranges are predicted will be much lower than these distances, in reality.</p>
RR-020-3.7.20	<p>3.7.20: The MMO does not agree with the conclusions reached for herring within Chapter 3 Fish and Shellfish Ecology relating to the impacts of noise and vibration and has provided further information regarding these conclusions below.</p>	<p>Noted.</p>
RR-020-3.7.21	<p>Impacts of noise and vibration on herring</p> <p>3.7.21: Noise modelling for the impacts of piling noise on fish has been carried out for a variety of different piling scenarios, including pin piles, monopiles and concurrent piling. The maximum design scenarios for pin piles and monopiles, using maximum pile size (1.5m diameter) and maximum hammer energy (up to 5000kJ) have been included in the modelling, and have been based a stationary (and fleeing) receptor, which is appropriate.</p>	<p>Noted.</p>
RR-020-3.7.22	<p>3.7.22: The MMO believes the modelling presented in the Fish and Shellfish Ecology Report and Subsea Noise Technical Report is appropriate for determining the likely extent of impact for mortality and potentially mortal injury, recoverable injury and TTS. However, the behavioural effects of piling noise on fish have do not appear to have been modelled or presented in the Fish and Shellfish Ecology Report or Subsea Noise Technical Report.</p>	<p>The assessment of behavioural impacts to fish from underwater noise have been assessed in line with the guidance outlined by Popper <i>et al.</i> (2014) (the only recommended guidance source for underwater noise assessments on fish in the scientific literature (e.g. Popper & Hawkins, 2019). The Popper <i>et al.</i> (2014) recommends that behavioural impacts from underwater noise on fish should be assessed in a qualitative manner, based on the relative proximity of the individual to the sound source. This is the approach which has been presented in Section 3.11.1.126 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015).</p>

		The Applicant considers that the assessment undertaken is robust and that further modelling would not alter the outcomes of the assessment. No significant effects were identified.
RR-020-3.7.23	3.7.23: The MMO has previously provided advice in relation to the draft Fish and Shellfish Ecology Chapter and Report and the draft Subsea Noise Technical Report. This advice requested that the Applicant presented noise modelling for the received levels of single strike sound exposure levels (SELs) at the herring spawning grounds based on 135dB. This was requested to determine the likely range over which behavioural responses in herring could occur, in order to consider whether spawning herring around Flamborough Head would be disturbed by piling noise, and to consider the likelihood and significance of disturbance from piling on herring migrating in a southerly direction past the Hornsea Four array site.	The Applicant acknowledges the behavioural effects, as defined by the 135dB SEL threshold, have not been presented within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) . This is due to the use of the 135dB SEL threshold (which is based on a study within a quiet loch) being expressly not recommended by the authors of the paper (Hawkins <i>et al.</i> 2014), as it is not appropriate for use in determining impacts from underwater noise on fish. Notwithstanding the above, it would not be considered appropriate to use a threshold based on study from a quiet loch within a much noisier area such as the southern North Sea (which is subject to high levels of anthropogenic activity) as the fish within this area will be acclimated and expected to have a correspondingly lesser sensitivity to noise levels.
RR-020-3.7.24	3.7.24: Unfortunately, despite these requests, the 135dB noise contours have not been presented for review in any of the ES reports reviewed. Without this evidence, there are uncertainties regarding the full extent and significance of behavioural impacts on herring, and in the absence of suitable evidence, the MMO requests a precautionary approach to mitigation in the form of a temporal piling restriction for piling in the array area during the Banks herring spawning season (1st August to 31st October).	The Applicant acknowledges the behavioural effects, as defined by the 135dB SEL threshold, have not been presented within Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) . See Applicant response to RR-020-3.7.23. Furthermore, there are no significant impacts anticipated on spawning herring from piling within the array area; this is presented in Figure 3.9 of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) which shows no overlap of noise contours with high intensity herring spawning grounds. In addition, as assessed in Section 3.11.1.129 <i>et seq.</i> of Volume A2, Chapter 3: Fish and Shellfish Ecology (APP-015) , due to the distance of the array from areas of high intensity herring spawning, and the low levels of noise anticipated at that distance, no significant behavioural effects are expected on spawning herring from piling within in the array area. Therefore, due to the lack of significant effects determined on spawning herring, no piling restriction is considered appropriate for piling within the array area.

RR-020-3.7.25	<p>3.7.25: The Applicant’s noise modelling for piling at the HVAC booster station on the ECC (Figures 3.10, 3.11, 3.14, 3.15, 3.18 and 3.19 of the Fish and Shellfish Ecology Report) shows that impact ranges for TTS for a fleeing and stationary receptor overlap with areas of high larval densities. The Applicant has therefore acknowledged the likelihood of significant adverse impacts to spawning herring and has proposed temporal mitigation in the form of a season piling restriction between 1st September and 16th October based on a ‘peak’ of herring spawning activity. However, the dates selected for this ‘peak’ are not based on any site-specific data in relation to the Hornsea Four project site.</p>	<p>The Applicant has prepared a clarification note (G1.10 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction) to provide further analysis and justification of the “peak” spawning period for herring, using the methodology proposed by Cefas as part of the Hornsea Four Evidence Plan process. The aim of this note is to agree the timing of this “peak” spawning period and the associated piling restriction timing. The clarification note is submitted as part of the Applicant’s response to Deadline 1.</p> <p>It is important to note that IHLS data has been used to calculate the “peak” spawning period as this data provides full coverage of the area of interest. As such, the Applicant considers that site-specific data is not required.</p>
RR-020-3.7.26	<p>3.7.26: The matter of determining the months/weeks in which the ‘peak’ of herring spawning activity occurs for the project area have been discussed in the EPP and pre-application stage. The MMO has attached comments made to the Applicant during this process in Appendix B. This advice presented clear information on the herring spawning season for the Banks stock and explained why using a peak spawning season of 1st September and 16th October was not appropriate as it was based on a piling restriction used for Triton Knoll OWF which is situated further south in the North Sea, and the evidence used to refine the dates for this restriction were based on data and evidence gathered during the planning and consenting stages for that particular project.</p>	<p>The Applicant has prepared a clarification note (G1.10 Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction). Following an interrogation of the IHLS data and available literature to identify the key timings and durations for herring larval development, a back-calculation based on the IHLS survey dates and larval lengths at survey has been undertaken to estimate the start of the “peak” spawning season. Based on the variable information in the literature regarding larval hatch sizes, this back-calculation indicates, with suitably precautionary assumptions, that the mean start of the “peak” spawning season is between approximately the 5th and 8th of September, with this considered to be a conservative estimate. Therefore, the Applicant considers it appropriate to conclude that the proposed seasonal restriction for Hornsea Four (1st September – 16th October) acts to effectively cover the “peak” of the spawning season, with additional conservatism incorporated into the proposed dates beyond that required based on the back-calculations as informed by available literature, and as a result provides a robust mitigation of the potential effects of piling of the HVAC booster station on herring spawning.</p>
RR-020-3.7.27	<p>3.7.27: Alongside these comments, the MMO provided the Applicant with additional information on how they could explore larval survey data and sea temperature data in order to explore what the ‘peak’ of herring spawning activity might be for the Hornsea Four project area. Please review Appendix B for the details.</p>	
RR-020-3.7.28	<p>3.7.28: Within later discussions on this approach and the Applicant presented a provisional back-calculation estimate of the ‘peak’ herring spawning season and the MMO provided follow up comments to assist the Applicant with their methods and approach.</p>	

RR-020-3.7.29	<p>3.7.29: Unfortunately, the Applicant does not appear to have made any further progress with exploring the 'peak' of spawning activity for the project and no new evidence has been presented in the ES documents which would support the Applicant's proposed restriction dates of 1st September and 16th October. Therefore, in the absence of robust evidence, the MMO requests that the dates of the piling restriction for the HVAC booster station should be consistent with the Banks herring spawning season of 1st August to 31st October.</p>	
RR-020-3.7.30	<p>3.7.30: The MMO believes measures to reduce significant adverse effects are clearly presented and justified, although the documents presented at this stage are primarily outline plans and protocols and therefore not final. Final plans will be agreed with the MMO and relevant Statutory Nature Conservation Bodies (SNCB).</p>	Noted.
RR-020-3.7.31	<p>3.7.31: For example, the Project has produced an Outline Southern North Sea Special Area of Conservation Site Integrity Plan, setting out the approach for the Project to deliver relevant project mitigation or management measures in relation to the Southern North Sea SAC (designated for harbour porpoise) in the event that driven or part-driven foundations are to be used.</p>	Noted.
RR-020-3.7.32	<p>3.7.32: The Applicant will also avoid piling the foundations for the offshore substations located along the offshore export cable corridor during the herring spawning season. This commitment is captured in the DML as follows: "Piling restriction DCO Schedule 12, Part 2 - Condition 23. In the event that driven or part driven pile foundations are to be used to install Work No.3, no impact piling may be undertaken between 1st September and 16th October each year within the area of Work No. 3* as shown on the offshore works plans unless otherwise agreed in writing by the MMO after consultation with the relevant statutory nature conservation body. *Work No. 3— in the event that the mode of transmission is HVAC— up to three offshore HVAC booster stations."</p>	Noted.
RR-020-3.7.33	<p>3.7.33: In principal, the MMO supports the proposed piling restriction as a form of mitigation to protect spawning herring and their eggs and larvae from the impacts of noise and vibration.</p>	Noted.

RR-020-3.7.34	<p>3.7.34: However, the MMO does not agree with the proposed dates of the restriction (1st September and 16th October). The MMO provided advice previously highlighting that we did not support the proposed implementation of a seasonal piling restriction for piling of the HVAC booster station during the 'peak' herring spawning period as there was no data presented which could reasonably determine what the 'peak' weeks/months of spawning are for the Project area.</p>	See Applicant response to comments RR-020-3.7.26 – RR-020-3.7.29 above.
RR-020-3.7.35	<p>3.7.35: The proposed dates of 1st September to 16th October are based on a refinement of a seasonal piling restriction that was agreed in the past for a different offshore windfarm development (Triton Knoll) which is located further south, and these refined dates were based on evidence presented at that time, specifically in relation to that development.</p>	See Applicant response to comments RR-020-3.7.26 – RR-020-3.7.29 above.
RR-020-3.7.36	<p>3.7.36: The MMO provided advice on this matter in the pre-application stage (Appendix B is an extract of the more detailed comments provided to the Applicant 2 December 2020 on the draft Fish and Shellfish chapter in relation to this matter). This advice also outlined how the Applicant could acquire further data and evidence which could be used to determine more accurately what the 'peak' spawning season is likely to be for the Project area. The ES does not appear to have taken these suggestions on board and therefore there is no new evidence to support the proposed restriction dates of 1st September and 16th October. On this basis, the MMO requests the wording for the seasonal piling restriction for the HVAC booster station takes into account the whole Banks herring spawning season and is updated to the below wording:</p> <p>"Piling restriction DCO Schedule 12, Part 2 - Condition 23.</p> <p>In the event that driven or part driven pile foundations are to be used to install Work No.3, no impact piling may be undertaken between 1st August and 31st October each year within the area of Work No. 3* as shown on the offshore works plans unless otherwise agreed in writing by the MMO after consultation with the relevant statutory nature conservation body.</p> <p>*Work No. 3— in the event that the mode of transmission is HVAC— up to three offshore HVAC booster stations."</p>	See Applicant response to comments RR-020-3.7.26 – RR-020-3.7.29 above.

RR-020-3.7.37	<p>3.7.37: In order to reduce underwater noise impacts on sensitive marine receptors, the Applicant has committed to installing a maximum of two piles simultaneously. This commitment has been adequately captured in Condition 13 of Schedule 11 and 12 as follows:</p> <p>"Pre-construction plans and documentation Schedule 11 & 12 Condition 13 (5) No more than two vessels may be engaged at any time in activities related to piling for the licenced activities. (6) When combined with the licenced activities permitted under the licence granted under Schedule 11/12 of the Order, no more than two piles in total may be piled simultaneously."</p>	Noted.
RR-020-3.7.38	<p>3.7.38: Whilst it appears that the 135db noise contour has been modelled in the Subsea Noise Technical Report, it has not been mapped as a noise contour impact range over the IHLS data in heat map form and the herring spawning grounds (using Coull et al. (1998)).</p>	See Applicant response to comments RR-020-3.7.23 above.
RR-020-3.7.39	<p>3.7.39: The MMO is aware that the potential for additional noise abatement measures has been explored in the Outline Marine Mammal Mitigation Protocol and that additional modelling of underwater noise from impact piling using a bubble curtain and double bubble curtain has been carried out for marine mammals. It is unclear why these forms of noise abatement have not been considered as potential options for reducing the impacts of piling noise on herring.</p>	The Applicant notes that it is important to consider that any underwater noise mitigation measures secured within the final MMMP and the final SNS SAC SIP and implemented by Hornsea Four would equally serve to mitigate and reduce impacts to herring.
RR-020-3.8.1	<p>3.8.1: The MMO defers to Natural England as the SNCB on matters of ornithology. The MMO will continue to be part of the discussions relating to securing any mitigation and monitoring or development of any plans.</p>	Noted.
RR-020-3.9.1	<p>3.9.1: In providing this response the MMO has reviewed the following documents, unless otherwise stated all comments relate to Chapter 6 Commercial Fisheries:</p> <ul style="list-style-type: none"> a) EN010098-000697-A1.1 ES Volume A1 Chapter 1 Introduction b) EN010098-000700-A1.4 ES Volume A1 Chapter 4 Project Description c) EN010098-000701-A1.5 ES Volume A1 Chapter 5 Environmental Impact Assessment Methodology 	Noted.

	d) EN010098-000708-A2.6 ES Volume A2 Chapter 6 Commercial Fisheries e) EN010098-000563-F2.9 AAI Volume F2.9 Outline Fisheries Coexistence and Liaison Plan.	
RR-020-3.9.2	3.9.2: As highlighted within Chapter 6 proposed works are likely to have an impact on the fish and shellfish stocks within the area through seabed construction disturbance and suspended sediment concentrations. Other than what has been raised in the Shellfish and Fish sections above (3.5 & 3.6) the MMO defers to the NFFO, Eastern IFCA and other local fishing bodies on the impacts identified to commercial fisheries.	Noted.
RR-020-3.9.3	3.9.3: However, the MMO does have a few general comments that have been discussed with MMO coastal officers. These have been set out below.	Noted.
RR-020-3.9.4	3.9.4: The MMO stresses the importance of consultation with all fishermen, local to this area regarding proposed works, in order to determine whether or not any key fishing grounds are likely to be affected.	The Applicant is committed to working closely with commercial fisheries stakeholders. The appropriate liaison will be undertaken with all relevant fishing interests to ensure they are fully informed of all construction, maintenance and decommissioning activities. In line with Co90 (Volume A4, Annex 5.2 Commitments Register (APP-050)) and Condition 13(1)(d)(vi) of Schedule 11 and 12 (C1.1: Draft DCO including Draft DML (APP-203)), the Applicant has contracted FIR and a CFA to assist with fisheries liaison and to maintain a positive and open working relationship with the fishing industry. The FIR and CFA have and will continue to maintain regular communications with the fishing industry via Notices to Mariners (NtMs), Kingfisher bulletins (Co89 and Condition 7 of Schedule 11 and 12 (C1.1: Draft DCO including Draft DML (APP-203)), project update emails and meetings with individual fishermen and fisheries' representatives such as the NFFO, HFIG and European fisheries stakeholders. This will continue throughout the pre-construction and construction phase of Hornsea Four. The FIR and CFA are and will continue to be the key points of routine contact for fisheries stakeholders. The duties of the FIR and CFA are specifically to liaise with the local fishing community in order to minimise any potential for conflict. The FIR and CFA maintain relations with the fisheries stakeholders, communicate
RR-020-3.9.5	3.9.5: Potting for lobster and crab predominantly takes place during summer and autumn seasons, however the potting seasons have been extended year round in the past few years, with vessels continuing to fish during winter months, on days when the weather is good. Inshore vessels north of the Humber will mainly pot for crab and lobster, whereas vessels south of the Humber tend to pot for whelk, crab, and lobster. At certain times of the year, the removal of fixed fishing gear can take longer due to adverse weather conditions. It is recommended that the Fisheries Liaison Officer ("FLO") notify fishers of the intended works as early as possible to ensure gear can be moved and does not cause an obstruction to the works or loss / damage to the fishing gear.	
RR-020-3.9.6	3.9.6: In addition to this advice should be sought via the FLO when the timetable of works is known so that the local industry can provide real-time advice.	

		<p>any concerns to the Company Fisheries Liaison Officer (CFLO), advise on survey works, timings and locations of Hornsea Four activities.</p> <p>In addition, the Applicant intends to secure, via the DMLs (C1.1: Draft DCO including Draft DML (APP-203)), a fisheries coexistence and liaison plan, which will describe the approach to liaison and consultation with the fishing industry throughout the lifetime of Hornsea Four. This will be approved by the MMO prior to commencement of works (Condition 13(7) of Schedule 11 and Condition 13(6) of Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203)). An outline of this plan, which the final plans must accord with, was submitted as part of the DCO Application (F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244)).</p>
RR-020-3.9.7	3.9.7: The MMO recommends routine checks of equipment should take place in order to decrease the potential for equipment failure and a record should be maintained for inspection by the MMO.	The Applicant will follow best practice guidelines on checks and maintenance of equipment.
RR-020-3.9.8	3.9.8: The MMO believes that a commitment should be made now to limit the use of rock protection. Alternative cable protection methods e.g. concrete mattresses should be utilised in areas where fishing activity previously took place.	The Applicant can confirm that as far as possible, cable burial will be the preferred option for cable protection (Co83 of Volume A4, Annex 5.2 Commitments Register (APP-050)). Where cable protection is required (e.g. at cable crossings or areas of hard ground), their locations will be made available to fishing stakeholders. In line with standard practice in the North Sea oil and gas industry, measures would be undertaken to ensure that where cable protection is required, the protection methods used are compatible with fishing activities where feasible and practical.
RR-020-3.9.9	3.9.9: The rock armour size and grade must be specified and approved by the MMO before use in any areas. Maximum recommended size is 200mm. Documentation from the purchase of rock armour, which specifies the size and grade, should be submitted to the MMO. The MMO believes that this could be included in the cable specification and installation plan as required by Schedule 11 & 12 Condition 13(1)(h). However the MMO would need to review an outline plan at this stage or have this clearly specified within the condition.	The Applicant confirms that F2.15: Outline Offshore Cable Installation Plan (APP-250) was submitted as part of the DCO Application and serves as an outline of the Cable Specification and Installation Plan which is secured under Condition 13(h) of Schedule 11 and 12 (C1.1: Draft DCO including Draft DML (APP-203)). This outline plan confirms that a Cable Protection Plan will form part of the final Cable Specification and Installation Plan which will include details on the cable protection that is proposed. The final Cable

		Specification and Installation Plan will be submitted to and approved by the MMO. As such, the Applicant considers that the mechanism to provide the information requested by the MMO already exists.
RR-020-3.9.10	3.9.10: The MMO notes there are notice to mariners conditions within the DMLs with a five day turnaround. The MMO recommends that the FLO notify fishers of the intended works as early as possible to ensure gear can be moved and does not cause an obstruction to the works or loss / damage to the fishing gear, especially during winter when the vessels are more likely to be affected by adverse weather conditions.	The Applicant is committed to working closely with commercial fisheries stakeholders. The appropriate liaison will be undertaken with all relevant fishing interests as early as possible to ensure they are fully informed of all construction, maintenance and decommissioning activities. See Applicant responses to comments RR-020-3.9.4 – RR-020-3.9.6 in relation to commitments in place in relation to commercial fisheries liaison.
RR-020-3.9.11	3.9.11: There are a significant number of under 15m fishing vessels working out of the nearby ports of Hornsea, Withernsea, Grimsby and Bridlington, which do not use the automatic identification system (“AIS”) and may not have been considered during the data assessment. When vessels are working offshore, AIS signals can be sent intermittently and the data gathered can therefore be inaccurate and should not be solely used as a representative survey of vessels fishing within the area.	The Applicant has taken this into consideration within the assessment presented in Volume A2, Chapter 6: Commercial Fisheries (APP-018) . Data for under 15 m vessels, which are not represented in the VMS dataset, was sourced from landing statistics (which includes data from all vessel lengths, including the under 10 m fleet via the Registration of Buyers and Sellers legislation), IFCA shellfish returns data and consultation with the industry.
RR-020-3.10.1	3.10.1: The MMO defers to the Maritime and Coastguard Agency and Trinity House on matters of shipping and navigation. The MMO will continue to be part of the discussions relating to securing any mitigation, monitoring or other conditions.	Noted.
RR-020-3.11.1	3.11.1: The MMO defers to the Historic England on matters of shipping and navigation. The MMO will continue to be part of the discussions relating to securing any mitigation, monitoring or other conditions.	Noted.
RR-020-3.12.1	3.12.1: The MMO defers to Natural England as the SNCB on matters of Seascape, Landscape and Visual Resources. The MMO will continue to be part of the discussions relating to securing any mitigation and monitoring or development of any plans/conditions on this matter.	Noted

1.4 Other Application Documents

Reference	Relevant Representation Comment	Applicant's Response
RR-020-4.1.1	4.1.1: The MMO would like to see an Outline Operation and Maintenance Plan to have all the maintenance activities outlined in one place.	The Applicant is considering this request with the intention of preparing an Outline O&M plan. Once the Outline O&M Plan is prepared, the interpretations and the deemed marine licence conditions will be updated accordingly and the Outline O&M Plan submitted into Examination (currently anticipated for Deadline 2.
RR-020-4.2.1	4.2.1: The MMO defers to Natural England on matters relating to the Habitats Regulation Assessment conclusions but highlights that the MMO has been part of some of the discussions on the derogation case and required compensation measures. The MMO will continue to review the documents and provide comments where required.	Noted.
RR-020-4.3.1	4.3.1: The ES is appropriately supported by an Outline MMMP, the aim of which is to reduce to negligible the risk of PTS for marine mammal species in relation to pile driving for the installation of the Project's foundation structures.	Noted.
RR-020-4.3.2	4.3.2: The final plan will be agreed with the MMO and relevant SNCBs (and will be determined based on the final confirmed foundation options and hammer energies), but mitigation measures may include pre-piling deployment of Acoustic Deterrent Devices ("ADDs"), marine mammal observation and soft start procedures.	Noted.
RR-020-4.3.3	4.3.3: Section 2.1.1.3 states: <i>"There will be a maximum of four piling vessels on site at the same time (two vessels for WTC foundation installation and two vessels for OSS and HVAC booster station foundation installation) with a maximum of two piling operations at any one time. There will, however, be no concurrent piling operations between the Hornsea Four array area and the HVAC booster stations located in offshore ECC."</i> The MMO notes that commitment Co85 sets out that 'No more than a maximum of two foundations are to be installed simultaneously' and that this is captured within the DMLs (Schedule 11 & 12, Part 2, Condition 13 (5) and	The Applicant confirms that the associated Conditions within C1.1: Draft DCO including Draft DMLs (APP-203) have been updated to provide clarity on the concurrent and simultaneous piling scenarios permitted. Please see C1.1.1 Draft DCO including Draft DML to be submitted at Deadline 1.

	welcomes this. However, the MMO notes that it is not made clear within the commitment/condition that there will be no concurrent piling operations between the Array area and the HVAC booster stations. This should be clearly set out.	
RR-O20-4.3.4	<p>4.3.4: Section 4.2.1.3 states: <i>"It is important to note that this Outline MMMP focuses on mitigating only the "instantaneous" SPL_{peak} PTS-onset impact ranges"</i>.</p> <p>The MMO disagrees with this approach. As advised previously during the EPP, the MMMP should focus on mitigating both the predicted SPL_{peak} and SEL_{cum} impact ranges. This is discussed further under comments in relation to Appendix A of the MMMP below. Nevertheless, this same section then states:</p> <p><i>"One of the potential mitigation measures that will be considered at this point, will be the use of at-source noise reduction measures in order to reduce the potential for cumulative PTS-onset risk to negligible levels"</i>.</p>	<p>As stated in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) Appendix A: Mitigation for PTS-Onset SPL_{peak} and SEL_{cum} Thresholds, the Applicant considers that the calculated SEL_{cum} PTS-onset impact ranges are highly over-precautionary and unrealistic. Therefore, the outline piling MMMP focuses on mitigating only the "instantaneous" SPL_{peak} PTS-onset impact ranges.</p> <p>The Applicant notes that the recommendation to consider and mitigate the dual metrics will be carried forward in the development of the final MMMP once the final design parameters are known. The final MMMP will give consideration to the best available information at the time on the level of precaution in SEL_{cum} impact ranges and will include methods to mitigate SEL_{cum} as required.</p>
RR-O20-4.3.5	<p>4.3.5: Cumulative PTS is later discussed in more detail specifically in section 4.4.3. The document acknowledges that in order to mitigate the large SEL_{cum} PTS ranges (i.e. up to 12 km for harbour porpoise and 11 km for minke whale), this would require extended duration of ADD activation which is likely to cause significant levels of disturbance and is therefore not considered to be a feasible mitigation option, which the MMO agrees. Therefore, the Project will commit to providing at-source noise reduction measures (for example bubble curtains and double bubble curtains) in order to reduce the potential for cumulative PTS risk to negligible levels. The choice of at-source noise reduction method will be confirmed in the final MMMP and the need for any ADD activation periods will be confirmed (see section 4.4.3.3). The MMO fully supports this proposal and welcomes that the Project will commit to providing at source mitigation.</p>	<p>In relation to the MMMP the Applicant confirms that the specific mitigation measure (or suite of measures) (as outlined in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240)) to be implemented during construction of Hornsea Four will be determined, in consultation with the relevant SNCBs, following confirmation of final hammer energies and foundation types, collection of additional geological data, acquisition of noise monitoring data and/or information on maturation of emerging technologies. This additional data and information will allow the noise modelling to be updated to feed into the final MMMP and discussions on the appropriate mitigation measure(s). This process includes provision for at-source mitigation, if required.</p> <p>Additionally, F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) sets out the available mitigation and management measures that could be brought forward during the development of the final SNS SAC SIP prior to the construction of Hornsea Four, to ensure that a conclusion</p>

		of no AEol (with respect to significant disturbance of harbour porpoise in relation to the conservation objectives of the SNS SAC) can be maintained. As with the MMMP, the SIP process includes provision for at-source mitigation, if required.
RR-020-4.3.6	4.3.6: The MMO would expect the commitment to providing at source reduction measures to be included within the Commitment Register but was unable to find this mentioned specifically. The MMO requests that this is updated to reflect this commitment and that this is captured within the DML. The MMO also highlights that such measures will also help to reduce the risk of potential impact on other (non-marine mammal) species.	As outlined in the Applicant response to RR-020-4.3.5, both the F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) and F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) finalisation processes include provision for at source mitigation, if required. As such, the Applicant does not consider it appropriate to include such commitments within the DML at this stage.
RR-020-4.4.1	4.4.1: The Project highlights the primary reasons why there is much more uncertainty associated with the prediction of levels of cumulative exposure, leading to the resulting predictions being very precautionary and very unlikely to be realised. This was previously discussed during the EPP. The MMO has included the summary of the main points below.	Noted.
RR-020-4.4.2A	4.4.2: The Applicant highlighted the primary reasons why there is much more uncertainty associated with the prediction of levels of cumulative exposure, leading to the resulting predictions being very precautionary and very unlikely to be realised during the EPP. In summary, the Project provided the following four main points: a) Equal energy hypothesis: The equal energy hypothesis assumption behind the SELcum threshold is not valid, and as such, models will overestimate the level of threshold shift experienced from intermittent noise exposures. Intermittent noise allows for some recovery of the threshold shift in between exposures, and therefore recovery can occur in the gaps between individual pile strikes and in the breaks in piling activity, resulting in a lower overall threshold shift compared to continuous exposure at the same SEL.	Noted.

RR-020-4.4.2B	b) Impulsive characteristics: The SEL thresholds assume the sound keeps its impulsive character, regardless of the distance to the sound source. Therefore, predicted PTS-onset impact ranges based on the impulsive noise thresholds will overestimate the risk of PTS-onset in cases and at ranges where the likelihood increases that an animal is exposed to non-impulsive sound.	Noted.
RR-020-4.4.2C	c) Swimming speed: Recent studies have demonstrated porpoise and minke whale fleeing swim speeds that are greater than that used in the Hornsea Four fleeing model here, which makes the modelled speeds used in this assessment precautionary.	Noted.
RR-020-4.4.2D	d) Animal depth: The limitations of modelling exposure using depth averaged sound levels means that the acoustic model can overpredict exposure at the surface. This is important to note since animals may conduct shorter and shallower dives when fleeing.	Noted.
RR-020-4.4.2E	Although these were acknowledged as valid points and the MMO agrees that there are uncertainties associated with predicting the true levels of sound exposure over long periods of time, as a result of uncertainties about responsive movement, the position of animals in the water column, extent of recovery between pulses or in breaks in piling and the extent to which pulsed sound loses its impulsive characteristics over time.	Noted.
RR-020-4.4.2F	In general, there are many uncertainties regarding, and in assessing, the potential effects and impacts of underwater noise on marine life, and our recommendation is to utilise the most recent, peer-reviewed literature and guidance available to underpin assessments and assess the potential risks.	Noted.
RR-020-4.4.2G	The Project noise assessment presents predicted PTS ranges for piling, using the latest Southall et al. (2019) thresholds for all species, which is appropriate. As noted in the EPP, "the thresholds are based on a dual criteria approach	Please see F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) Appendix A: Mitigation for PTS-Onset SPL _{peak} and SEL _{cum}

	<p>whereby both should be evaluated and that predicting the largest range of impact, should be considered for the impact assessment". The MMO endorses the application of the dual criteria, as recommended by Southall et al. (2019) and National Marine Fisheries Service (NOAA) (2018), since this covers not only instantaneous auditory injury, but also auditory injury from accumulated exposure to noise pollution from pile driving, which tends to present a larger scale risk. Therefore, in the first instance, The MMO questioned the logic to not appropriately apply the criteria (e.g. by proposing only to mitigate one of the criteria, the smaller SPL_{peak} ranges).</p>	<p>Thresholds for the logic presented to justify not mitigating mitigate cumulative PTS.</p> <p>As stated in this Appendix, the Applicant considers that the calculated SEL_{cum} PTS-onset impact ranges are highly over-precautionary and unrealistic. Therefore, F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) focuses on mitigating only the "instantaneous" SPL_{peak} PTS-onset impact ranges. The recommendation to consider and mitigate the dual metrics will be carried forward in the development of the final MMMP once the final design parameters are known. The final MMMP will give consideration to the best available information at the time on the level of precaution in SEL_{cum} impact ranges and will include methods to mitigate SEL_{cum} if required.</p>
RR-O20-4.4.2H	<p>Regarding the uncertainties, specifically the point about the precautionary swimming speeds, it should be noted that the actual concept of fleeing is not precautionary. Essentially, a fleeing receptor model generally assumes that an animal flees directly and continually away from the source, which may, of course, not reflect reality.</p> <p>Furthermore, assumptions of fleeing animal behaviour in the estimation of effect zones are controversial since animals may be motivated to remain in the affected area (e.g. due to prey availability or mating opportunities) despite harmful noise exposure. However, assuming that animals remain stationary, including close to the source, for extended periods may also be considered unrealistic.</p>	<p>The Applicant acknowledges uncertainties regarding fleeing direction and that animals may not flee directly away from the source. This uncertainty will be acknowledged and communicated in future impact assessments. The key issue with the calculation of cumulative PTS is the assumptions regarding the equal energy hypothesis (as discussed in F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) Appendix A: Mitigation for PTS-Onset SPL_{peak} and SEL_{cum}).</p>
RR-O20-4.4.2I	<p>Regarding the point that the SEL thresholds assume the sound keeps its impulsive character regardless of the distance to the sound source, it is indeed recognised that an impulsive sound is likely to lose its impulsive characteristics as a result of propagation, although no explicit guidance has been published on this. However, this is why it is important to consider the SEL_{cum}, and not just the SPL_{peak}, because the impulsive nature of the noise signal is more relevant to the instantaneous injury assessed by the SPL_{peak}. Auditory injury caused by longer (cumulative) exposure and assessed through the SEL_{cum} criteria is less dependent on the impulsive characteristics of the noise.</p>	<p>The Applicant agrees that it is important to consider SEL_{cum}. The issue with assessing cumulative PTS using SEL_{cum} is related to the way in which it is modelled, which makes the resulting ranges overly precautionary and unrealistic. If the models were better able to account for gaps in the piling sequence and the loss of impulsive characteristics with distance, then the resulting impact ranges would be considered more realistic and therefore more appropriate to consider when applying mitigation.</p>

	<p>It is also worth noting that the fact that the noise signal transitions into something less impulsive, does not preclude the injurious effects caused by accumulation of exposure. Auditory injury from cumulative exposure may also be caused from non-impulsive sources.</p>	<p>The Applicant acknowledges that the accumulation of exposure can result in auditory injury regardless of the level of ‘impulsiveness’ of the exposure; however, PTS thresholds for exposure to non-impulsive noise are higher (i.e. greater exposure required to cause PTS-onset). As such, impact ranges based on the lower impulsive thresholds, but where the accumulated exposure is likely a combination of more injurious impulsive noise and less injurious non-impulsive noise, will be over-estimates.</p>
RR-O20-4.4.3	<p>4.4.3: The MMO notes that despite the arguments put forward by the Project, it does appear that they are committed to reducing the risk of cumulative PTS and this will be appropriately considered within the MMMP. As above the MMO welcomes this.</p>	<p>Noted.</p>
RR-O20-4.5.1	<p>4.5.1: The MMO notes the name of this document is different to the standard name used in Development Consent Order applications. The MMO would like to understand why this name is different to the established name “In Principle Monitoring Plan (IPMP)”? The MMO notes that the abbreviation of this document is OMMP and this could potentially be confused with the MMMP (“Marine Mammal Mitigation Plan”), MMop (“Marine Mammal Monitoring Plan”) or the OOMP (Outline Ornithological Monitoring Plan) and the OOOMP (“Outline Offshore Operation and Maintenance Plan”).</p>	<p>The Applicant confirms that the terminology Outline Marine Monitoring Plan (OMMP) is preferred at this stage and will be retained for consistency with other outline plans included within the Hornsea Four DCO Application.</p>
RR-O20-4.5.2	<p>4.5.2: Section 1.1.1.4 states: <i>“It is important to note that this OMMP relates to EIA-related monitoring only. Any monitoring related to the potential compensation associated with a Regulation 64 derogation under the provisions of the Habitats Regulations will be considered separately.”</i></p> <p>The MMO believes the outline monitoring plan should include all monitoring, and if any monitoring will be captured in a separate plan then it should be referenced within this plan.</p>	<p>Given the different focus of and legal underpinning for the two monitoring plans referred to, the Applicant intends to maintain these as separate documents.</p> <p>The Applicant also notes that the monitoring plans associated with potential compensation measures have been prepared and will be developed by the Applicant, should consent for Hornsea Four be granted and compensation for particular species be required. Due to the ‘without prejudice’ basis of the provision of these plans at this stage, the Applicant does not consider it appropriate to include compensation monitoring within the OMMP.</p>
RR-O20-4.5.3	<p>Marine Geology, Oceanography and Physical Processes</p> <p>4.5.3: As set out above in the section 3.2 the region between off just offshore of the export cable crossing with Dogger Bank A+B and the Holderness</p>	<p>As presented in Section 3.3.2 of F2.7: Outline Marine Monitoring Plan (APP-242), when taking account of the precautionary approach to assessment, there are considered to be no significant</p>

	<p>coastline is both particularly sensitive to changes in the regional sediment transport pathways due to the cumulative nature of the cable burial and cable protection and the distance to the receptors. After the sediment transport assessment, it is suggested that annual swath bathymetry surveys (with recording of the backscatter for sediment composition) would identify sediment transport features (sand waves, ripples) and differences between years which should be included in section 3.3 of the OMMP.</p>	<p>uncertainties in the assessment conclusions and therefore no monitoring requirements specifically related to marine processes have been identified, beyond standard geophysical surveys. These surveys will inform a wide range of engineering elements relevant to the marine processes assessment, including changes in seabed topography and scour around foundations. Where these surveys are being undertaken as part of the standard pre-construction geophysical monitoring campaign, the specification of the surveys will be agreed with the MMO and its advisors during consultation in the post-consent phase.</p> <p>All of the assessments of the potential impacts of Hornsea Four set out in Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes (APP-013) were concluded to be likely to result in effects of negligible or slight adverse significance (not significant in EIA terms). This is, in part, due to the commitments made as described in Volume A4, Annex 5.2: Commitments Register (APP-050) and the present assumptions in the assessment being considered to offer a conservative assessment to offset uncertainties. Therefore, it is the Applicant's position that no additional monitoring, such as annual bathymetric surveys, are required and are considered disproportionate to the findings of the assessment and uncertainties. Furthermore, bathymetric changes can occur from natural events as well as human activity within the marine environment and any changes observed would not be able to be directly attributed to the presence and activities associated within Hornsea Four. As such, the monitoring would be of no or little value.</p>
RR-O20-4.5.4	<p>Dredge and Disposal</p> <p>4.5.4: The MMO notes that no monitoring is proposed for dredge and disposal activities. The MMO recommends that sediment from within the proposed dredge area be sampled and analysed every 5 years in line with OSPAR guidelines, with the first sampling regime to take place in 2024, to ensure material remains suitable for disposal at sea and this should be included within</p>	<p>The Applicant can confirm the earliest possible date that onshore construction could commence is January 2024. Offshore construction works and associated dredge activities are scheduled to start 2026. It is currently planned that all offshore construction will be completed by 2029 within 5 years from the commencement of offshore works (~3 years) and as such, sampling of the dredge</p>

	<p>the OMMP. If all dredging and disposal activities have completed by this time, the sampling will not be necessary.</p>	<p>area is unlikely to be required. Details of the dredge and disposal activities is required to be provided in both the Construction Method Statement and the Construction Project Environmental Management and Monitoring Plan (Condition 13(c) and 13(d), respectively, of Schedules 11 and 12 of C1.1: Draft DCO including draft DMLs(APP-203)). The Applicant considers that this mechanism will ensure Regulators can approve details in relation to the dredge and disposal activities.</p>
RR-O20-4.5.5	<p>Benthic Subtidal and Intertidal Ecology</p> <p>4.5.5: The MMO notes Table 4 highlights that there is a commitment to monitor any biogenic or geogenic reef habitats identified via full sea floor coverage swath bathymetry within the areas which construction is to take place. If potential habitats are identified, follow up drop down video surveys will be undertaken. The MMO would like to know if a high resolution side scan sonar survey will also be undertaken. This gear is normally used to determine reef signatures, as opposed to multibeam bathymetry.</p>	<p>The Applicant can confirm that a high-resolution side scan sonar survey will be undertaken as part of the pre-construction monitoring secured by Condition 17 of Schedules 11 and Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203).</p>
RR-O20-4.5.6	<p>4.5.6: The MMO provided previous advice on the draft OMMP advised inclusion of monitoring GBS if included in the design due to the lack of knowledge on the impacts of these in UK waters. The OMMP submitted with the ES has provided further information on monitoring undertaken at Thornton Bank in Belgian waters and a Danish GBS study. The results showed that changes to the sediments and fauna occurred up to 50m from the turbines four years after construction.</p>	<p>From pre-application discussions with MMO on the proposed monitoring to be included within F2.7: Outline Marine Monitoring Plan (APP-242), the Applicant understands that the MMO consider that there is a degree of uncertainty in respect of the potential impacts of larger turbines and the scale of larger windfarms in comparison to the Round 1 and Round 2 windfarms at which much of the monitoring of benthic communities has been undertaken, noting that the wider industry would benefit from a strategic monitoring programme to address this data gap. Having considered this point, the Applicant's position is that project-specific monitoring of benthic organisms (other than that already proposed for biogenic and geogenic reef), is unwarranted given the low sensitivity of organisms to disturbance in the region and the low risk that Hornsea Four presents. Moreover, programmes such as The Crown Estate Enabling Programme and the Department for Business, Energy and Industrial Strategy (BEIS) Strategic</p>
RR-O20-4.5.7	<p>4.5.7: The Applicant states that a site-specific assessment at the Project based on evidence-base, expert opinion and project-specific modelling determined that similar amounts of scour would be likely at the Project to that found at Thornton Bank and that benthic communities may exhibit similar effects to those observed at Thornton Bank. However, it is not clear how the size and number of the GBS proposed for Project compare to those of Thornton Bank. Also, it is not clear how similar the sediments and benthic communities are between the sites. The MMO requests the inclusion of benthic monitoring around a selection of GBS foundations to confirm the predictions in the ES, if this foundation type is to be used.</p>	

		<p>Environmental Assessment (SEA) Research Programme are more appropriate vehicles for consideration of strategic monitoring. Notwithstanding the above, standard engineering and design surveys which will be carried out pre- and post-construction, irrespective of foundation type, and as summarised in Table 2, of F2.7: Outline Marine Monitoring Plan (APP-242), will provide data on the impacts of GBSs on the seabed environment (if used), with various acoustic surveys capable of being interpreted for the purposes of monitoring seabed changes, which would reveal changes in sediment transport associated with the presence of GBSs which may be interpreted to predict associated changes in the benthic communities.</p>
RR-020-4.5.8	<p>4.5.8: The MMO believes that there should be monitoring of NIS as any management measures put in place would not prevent the colonisation of turbine foundations (and scour protection) by NIS and that this should be updated within the OMMP.</p>	<p>The Applicant and its contractors are committed to applying best practice techniques including appropriate vessel maintenance as outlined in the International Convention for the Prevention of Pollution from Ships (MARPOL). Additionally, designed-in measures including a Construction Project Environmental Management and Mitigation Plan with a marine biosecurity plan (see Co.1.1.1 of Volume A4, Annex 5.2: Commitments Register (APP-050)) will ensure that the risk of potential introduction and spread of marine invasive non-native species (MINNS) will be minimised. Given that the majority of other vessels operating in this region of the North Sea are also likely to be complying with MARPOL, then the potential for MINNS to spread and colonise windfarm infrastructure is limited.</p> <p>The Applicant notes that the relatively large distances between individual wind turbines and potential scour infrastructure within Hornsea Four would not represent any form of linked reef-like feature. Specific monitoring for MINNS is not proposed.</p> <p>Additionally, the Applicant does not consider Hornsea Four to represent a new potential vector for MINNS, due to the presence of other existing offshore wind farms and the presence of oil and gas infrastructure and hard infrastructure within the immediate area.</p>

		Considering the above, it is the Applicant's view that monitoring of MINNS is not appropriate.
RR-020-4.5.9	<p>Fish and Shellfish Ecology</p> <p>4.5.9: Table 5 provides high level information on the pre- and post-construction monitoring proposed for herring and sandeel habitats. The Applicant is proposing to undertake a targeted PSA survey within the export cable corridor along planned cable routes and adjacent areas, focused on cable sections where it is thought that flow tools may be required (e.g. sandwaves or more challenging ground conditions) to provide a baseline of the sediment suitability within the cable corridor for herring and sandeel spawning (as defined by Reach et al. (2013) and Latto et al. (2013) for herring and sandeel, respectively). The aim of this survey is to provide a baseline of the suitability of the sediment in these areas for herring and sandeel.</p>	Noted.
RR-020-4.5.10	<p>4.5.10: Post-construction monitoring is proposed in the form of a targeted PSA survey using the same survey locations as for the pre-construction survey to enable any changes in sediment suitability for spawning for herring and sandeel to be determined. This is to enable identification of any areas where construction activities have altered the sediment characteristics and to allow an assessment of suitability for continued spawning activity.</p>	Noted.
RR-020-4.5.11	<p>4.5.11: The MMO supports the proposal to undertake pre- and post-construction PSA monitoring to determine any changes in habitat suitability along the ECC and adjacent areas for herring using the method described by Reach et al. (2013). PSA data presented in Figure 28 of the Fish and Shellfish Ecology Technical Report show that sediments in the nearshore/western section of the ECC are comprised of coarse, gravelly sediments that have been classified as 'prime/preferred', 'sub-prime/preferred' and 'suitable/marginal' for herring spawning. The IHLS data supports this further by showing evidence that herring larvae are consistently caught in the ECC area</p>	Noted.
RR-020-4.5.12	<p>4.5.12: The MMO requests the proposed pre- and post-construction monitoring of sandeel habitat, is extended to include the windfarm array and adjacent areas because the PSA data presented in Figure 28 of the Fish and</p>	The Applicant recognises that species of sandeel were recorded in the scientific beam trawl surveys undertaken in the former Hornsea Zone. It is recognised that species of sandeel were recorded in the

	<p>Shellfish Ecology Technical Report show that the offshore section of the ECC and array area are comprised of sandy sediments that have been classified as 'prime/preferred' and 'sub-prime/preferred' sandeel habitat. Further evidence that the array area is a sandeel habitat can also be found in the historic otter and epibenthic beam trawl survey data for the former Hornsea Zone, in which sandeel were caught (despite these methods being unsuitable for targeting sandeel). (Ellis et al., 2012) also shows that the array is situated within broadscale high intensity sandeel spawning ground, and the majority of the ECC is within low intensity spawning grounds.</p>	<p>scientific beam trawl surveys undertaken in the former Hornsea Zone, however as shown in Figure 17 and detailed in paragraph 3.1.2.33 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071), these sandeels were recorded at highest abundances along the eastern boundary of the Hornsea Four array area and in the central part of the former Hornsea Zone. The Applicant confirms that the use of these scientific beam trawl surveys data was used to infer the presence of sandeel within the study area. PSA data presented in Figure 28 of Volume A5, Annex 3.1: Fish and Shellfish Ecology Technical Report (APP-071) is used to provide an indication of the suitability of the study area in terms of potential for provision of habitat for sandeel. It should be noted, however, that the habitat classification on which this analysis is based (Marine Space 2013) relies on sediment composition rather than evidence of sandeel usage of the area. The presence of suitable sediment does not necessarily imply that sandeels are present in a particular area. Similarly, the presence of suitable sediment does not imply that a given area would ever be colonised by sandeel.</p> <p>Furthermore, studies of fish assemblages in operational wind farms (Stenberg et al., 2011; 2015) have not detected significant changes to sandeel populations. It has been suggested (Stenberg et al., 2015) that direct loss of habitat associated with offshore wind farm infrastructure and indirect effects (i.e. changes to sediment composition) are too low in magnitude to influence the abundance of sand-dwelling species such as sandeels.</p> <p>Considering the above, it is the Applicant's view that further investigation and monitoring of sandeel habitat, over and above the targeted PSA surveys as set out in Table 5 of F2.7: Outline Marine Monitoring Plan (APP-242), is not appropriate.</p>
RR-O20-4.5.13	<p>Marine Mammals 4.5.13: The OMMP confirms that construction noise monitoring will be undertaken to validate the underwater noise modelling predictions made in</p>	<p>Noted.</p>

	<p>the ES. Specifically, measurements of noise generated by the installation of the first 4 foundations of each driven or part-driven pile foundations will be obtained. The transects monitored will be informed by the predictions for noise propagation within the ES. This is in keeping with previous developments, and the MMO supports that transects will be planned to ensure validation of noise over deeper waters (see Table 6 in the OMMP).</p>	
RR-O20-4.5.14	<p>4.5.14: Although this monitoring approach is listed under 'marine mammals', it will also validate the ES predictions for fish species and should be highlighted within the fish and shellfish section.</p>	Noted.
RR-O20-4.5.15	<p>4.5.15: Table 6 also confirms that monitoring by marine mammal observers will be undertaken prior to the commencement of the soft start of piling.</p>	Noted.
RR-O20-4.5.16	<p>4.5.16: Section 3.6.22 notes that additional monitoring may be required for marine mammals within the Southern North Sea SAC depending on the further assessments provided during the development of the Site Integrity Plan for the Southern North Sea. However, there is no indication as to what this additional monitoring might involve at this stage. The MMO believes that this should be included within Table 6.</p>	<p>The Applicant notes that F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) provides for monitoring if required.</p> <p>The final Site Integrity Plan will be submitted to the MMO for approval prior to piling activities being carried out. This is secured by Condition 13(j) of Schedules 11 and Schedule 12 of C1.1: Draft DCO including Draft DML (APP-203).</p> <p>The final Site Integrity Plan will set out would include details on the timescale for the delivery of any mitigation measures, an implementation plan for any measures, and any monitoring or reporting requirements. It is not possible to confirm what these mitigation measures (and any associated monitoring) at this stage in the project development. The most appropriate mitigation measures will be considered alongside other relevant technologies or methodologies, based on technical feasibility and commercial availability considerations and assessments, alongside cost benefit analysis, during the final design of the project. This would be informed by post-consent site investigation and technology developments.</p>
RR-O20-4.5.17	<p>4.5.17: The MMO notes that various geophysical surveys may be required to inform engineering and design related studies, as per Table 2 of the OMMP. This would involve various noise generating activities such as Multibeam</p>	<p>At the time of assessment, the timing, scope and scale of geophysical surveys associated with Hornsea Four were not known. The Applicant can confirm that once these details are known,</p>

	Echosounders and Sub-bottom profilers, which may also impact marine wildlife and should be appropriately considered within the ES.	appropriate consideration will be given to these surveys in the context of the Marine and Coastal Access Act (MCAA) 2009, the Habitat Regulations, current guidance, and best practice.				
RR-020-4.5.18	Offshore Ornithology 4.5.18: The MMO defers to and supports Natural England on the required ornithological monitoring noting the MMO will be part of any further discussions to secure this monitoring, including that of a strategic nature which may also help to validate the findings of the ES.	Noted.				
RR-020-4.5.19	Commercial Fishing 4.5.19: The MMO welcomes the addition of this section and has no comments to add at this time.	Noted.				
RR-020-4.5.20	Shipping and Navigation 4.5.20: The MMO defers to and supports Maritime and Coastal Agency and Trinity House on the required shipping and navigational monitoring noting the MMO will be part of any further discussions to secure this monitoring.	Noted.				
RR-020-4.5.21	Marine Archaeology 4.5.21: The MMO defers to and supports Historic England on the required marine archaeology monitoring noting the MMO will be part of any further discussions to secure this monitoring.	Noted.				
RR-020-4.6.1	4.6.1: The MMO notes the Outline Fisheries Liaison and Coexistence Plan will be developed further at the post consent stage, however, the MMO believes the Applicant can provide further detail at this stage.	Noted.				
RR-020-4.6.2	4.6.2: The MMO believes there is enough information available to include more descriptive roles and responsibilities. A Fisheries Liaison and Coexistence Plan has been used on multiple OWF projects. Therefore, the MMO requests that this section can be expanded with at least the expected roles and responsibilities – this can be amended at post consent if required.	The Applicant has made the requested amendments which are captured in the Schedule of Change process for F2.9: Outline Fisheries Coexistence and Liaison Plan (APP-244) .				
RR-020-4.6.3	4.6.3: The MMO believes that this plan should include timescales will be added at the post consent stage. The MMO believes that as a minimum a table should be included to advise when information will be shared at the construction, operation and maintenance stages. The MMO notes this information is readily available similar to the table below: <table border="1" data-bbox="367 1358 1093 1396"> <thead> <tr> <th>Activity</th> <th>Timing</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table>	Activity	Timing			See Applicant response to RR-020-4.6.2.
Activity	Timing					

	<table border="1"> <tr> <td>Construction activities</td> <td>Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.</td> </tr> <tr> <td>Pre and post construction surveys</td> <td>Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.</td> </tr> <tr> <td>Operation and Maintenance (O&M) activities</td> <td>Notices and information distribution not less than 2 weeks prior to the commencement of offshore O&M activities.</td> </tr> <tr> <td>Meetings</td> <td>Consultation meetings as required throughout the project development.</td> </tr> <tr> <td>Unscheduled liaison</td> <td>Additional unscheduled liaison and consultation will be undertaken by either the FLO or the FIR as required to address issues or fishermen's concerns as they arise.</td> </tr> </table>	Construction activities	Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.	Pre and post construction surveys	Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.	Operation and Maintenance (O&M) activities	Notices and information distribution not less than 2 weeks prior to the commencement of offshore O&M activities.	Meetings	Consultation meetings as required throughout the project development.	Unscheduled liaison	Additional unscheduled liaison and consultation will be undertaken by either the FLO or the FIR as required to address issues or fishermen's concerns as they arise.	
Construction activities	Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.											
Pre and post construction surveys	Notices and information distribution not less than 2 weeks prior to the commencement of offshore construction activities.											
Operation and Maintenance (O&M) activities	Notices and information distribution not less than 2 weeks prior to the commencement of offshore O&M activities.											
Meetings	Consultation meetings as required throughout the project development.											
Unscheduled liaison	Additional unscheduled liaison and consultation will be undertaken by either the FLO or the FIR as required to address issues or fishermen's concerns as they arise.											
RR-020-4.6.4	4.6.4: In addition to the above comments the MMO requests it is made clear within the document that "the MMO will not act as arbitrator and will not be involved in discussions on the need for, or amount of, compensation being issued". The MMO believes this should be made clear at this stage to ensure all parties are aware that the MMO will not be part of this process.	See Applicant response to RR-020-4.6.2.										
RR-020-4.6.5	4.6.5: The MMO welcomes that a FLO is already appointed and has ongoing communication with the industry. The FLO should be utilised to maximise effective communication between affected parties especially with any trawlers and any activities in this area, could have significantly increased	Noted.										

	health and safety risks to the crew and the vessels, due to the snagging of nets if rock armour is deposited within areas historical fishing activity.	
RR-020-4.6.6	4.6.6: At certain times of the year, the removal of fixed fishing gear can take longer due to adverse weather conditions. It is recommended that the FLO notify fishers of the intended works as early as possible to ensure gear can be moved and does not cause and obstruction to the works or loss / damage to the fishing gear.	Noted.
RR-020-4.6.7	4.6.7: Advice should be sought via the FLO when the timetable of works is known so that the local industry can provide real-time advice.	Noted.
RR-020-4.7.1	4.7.1: The MMO defers to Natural England on mitigation matters in relation to Habitats regulation assessment but has concerns that there is strong reliance on the Site Integrity Plan and that mitigation will be discussed at the pre-construction stage. The MMO believes that the Applicant should be committing to reduce the noise at source as much as possible in the first instance rather than including mitigation in the instance that there is an Adverse Effect on Integrity.	In relation to the Site Integrity Plan, the Applicant confirms that the specific mitigation measure (or suite of measures) (as outlined in F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246)) that will be implemented during the construction of Hornsea Four will be determined, in consultation with the relevant SNCBs, following confirmation of final hammer energies and foundation types, collection of additional survey data (noise or geophysical data), and/or acquisition of noise monitoring data, and/or information on maturation of emerging technologies. This additional data and information will allow the noise modelling to be updated to feed into the final SIP and discussions on the appropriate mitigation measure(s). This process includes provision for at-source mitigation, if required, and will ensure that a conclusion of no AEoI (with respect to significant disturbance of harbour porpoise in relation to the conservation objectives of the SNS SAC) can be maintained. As outlined in the Applicant response to comment 4.3.5, both the F2.5: Outline Marine Mammal Mitigation Protocol (APP-240) and F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan (SNS SAC SIP) (APP-246) finalisation processes include provision for at source mitigation, if required. As such, the Applicant does not consider it appropriate to include such commitments on the face of the DCO.

RR-020-4.7.2	4.7.2: Section 1.3.1.1 to be updated to include the updated condition as per the wording as set out in section 2.5.38.	The Applicant does not consider that the proposed condition adds anything further to the existing wording. Under condition 13(1)(j) as currently drafted, the Applicant cannot commence licensed activities (or any stage of those activities) until the MMO is satisfied that the site integrity plan provides adequate mitigation to avoid adverse effects on integrity. The Applicant does not see the benefit of dictating that the site integrity plan must repeat guidance and objectives readily accessible elsewhere which the Applicant will need to comply with in any event. The Applicant notes that the MMO's proposed condition has not been included for Hornsea Project Three, Norfolk Vanguard or Norfolk Boreas.
RR-020-4.7.3	4.7.3: The MMO defers to Natural England at this stage on what should be included within the Outline SIP document.	Noted.
RR-020-4.7.4	4.7.4: However, the MMO highlights that if consented the MMO would require further information within the SIP document to include in-combination management measures. This would include any potential additional requirements the MMO believes are necessary to enable the guidance to be followed and could include additional reporting requirements.	Noted.

9 Annex 7 – Full response to Royal Society of Protection of Birds (RSPB) (RR-033)

Annex 7 – Full Response to RSPB (RR-033)

1.1 Introduction comments

Reference	Relevant Representation Comment	Applicant's Response
RR-033-A	The RSPB supports the deployment of renewable energy projects, providing that they are sited in appropriate places and designed to avoid potential adverse impacts on wildlife. We are grateful for the constructive pre-application discussions that have taken place with Orsted in respect of this proposal, particularly through the Evidence Plan process. While major methodological concerns remain, progress towards resolving a number of issues was made during the pre-application discussions for this project. We continue to have significant concerns relating to the project's in-combination and cumulative collision risk and displacement impacts including their assessment. In respect of the Applicant's derogation case, there is particular concern regarding the compensation measure proposals.	<p>The Applicant notes the RSPB representation</p> <p>The Applicant continues to engage with the RSPB through the Statement of Common Ground (SoCG) process in relation to the issues raised in the representation.</p> <p>Applicant responses in relation to RSPB's concerns are addressed within the relevant points below.</p>

1.2 Ornithology Impacts – Summary of RSPB Position

Reference	Relevant Representation Comment	Applicant's Response
RR-033-B	<p>We have significant concerns regarding the findings of some of the impact assessments.</p> <p>As a result of the methodological concerns, set out below, the RSPB considers that the impacts have not been adequately assessed and, as such consider that an adverse effect on the integrity (AEOI) on the following qualifying features of the Flamborough and Filey Coast Special Protection Area (SPA) cannot be ruled out:</p>	The Applicant notes the RSPB representation.
RR-033-C	<p>Project alone – RSPB AEOI conclusions Impacts on the following features of the Flamborough and Filey Coast SPA:</p> <p>Project alone – RSPB AEOI conclusions Impacts on the following features of the Flamborough and Filey Coast SPA:</p>	After considering the Secretary of State's decision for Norfolk Boreas and the associated Habitats Regulations Assessment (HRA), which follows from the decision made for Hornsea Three, the Applicant has revisited its conclusion of no potential for adverse effects on integrity (AEOI) in respect

<ul style="list-style-type: none"> • The impact of collision mortality on the kittiwake population • The impact of combined collision and displacement mortality on the gannet population • The impact of displacement mortality on the guillemot population • The impact of displacement mortality on the razorbill population <p>The impact of combined collision and displacement mortality on the seabird assemblage.</p>	<p>of the black-legged kittiwake feature of the FFC SPA from Hornsea Four in-combination with other plans and projects. On that basis, the Applicant will present an update to the RIAA (B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178)) and its derogation case based on an overall conclusion that there is potential for an AEol on kittiwake at the FFC SPA from Hornsea Four in-combination with other projects. Consequently, to that extent only, compensatory measures for kittiwake will be necessary should the Secretary of State be minded to grant development consent. These changes will be captured in B2.2.1.2 Report to Inform Appropriate Assessment Part 2 (APP-167) and B2.5.1: Without Prejudice Derogation Case (APP-182) and subsequently updated upon request from the Examining Authority (ExA). For the avoidance of doubt, the Applicant’s position remains that there will be no AEol from Hornsea Four alone on the kittiwake feature and, aside from the overall (in-combination) conclusion on integrity noted above, the Applicant maintains its position in all other respects in regards to its methodology and assessment of the effects on the FFC SPA features. The Applicant also maintains its position of no AEol alone or in-combination for all other qualifying species or seabird assemblage of the FFC SPA and for all other sites.</p>
---	--

1.3 Impact Assessment- Methodological Concerns

Reference	Relevant Representation Comment	Applicant’s Response
RR-033-D	The RSPB’s key concerns with the impact assessment relate to modelling of baseline abundance and the presentation of outputs of population modelling. Without resolution of these it is impossible to reach any conclusions with regard to the significance of impact.	The Applicant notes the RSPB representation Applicant responses in relation to RSPB’s concerns are addressed within the relevant points below.
RR-033-E	Baseline abundance A key issue that underpins the whole of the assessment is the manner in which the spatial modelling of survey data has been carried out to obtain baseline densities	Please refer to the Applicant’s response to RR-029-5.1 regarding the baseline and use of MRSea.

	<p>to input into predictive modelling of collision and displacement impact mortalities.</p> <p>The Applicant has used the MRSea statistical package, developed by the Centre for Research into Ecological & Environmental Modelling, in order to derive density and abundance estimates from the data obtained during digital aerial survey. The RSPB is content that this is a robust method if used correctly and transparently. However, there are a number of concerns with how the Applicant has applied the methods and a lack of clarity as to how data has been treated or consideration of model performance. We understand, through our participation in the Expert Topic Groups, that Natural England also have a number of related concerns and anticipate that we will be involved in efforts to resolve them. This is to be welcomed. However, as this modelling is fundamental to the whole assessment, it is impossible to reach any conclusions with regard to significance of impacts without reassurance that it has been done correctly. As such all the conclusions on AEOI given above can only be considered tentative.</p>	
RR-033-F	<p>Population Modelling</p> <p>Despite advice from both Natural England and the RSPB the Applicant has only presented a single output metric of Population Viability Analysis (PVA), the Counterfactual of Population Growth Rate (CPGR) and omitted the Counterfactual of Population Size (CPS) with inadequate justification. That the two metrics are best presented in combination was a specific recommendation of a review of output metrics commissioned by Joint Nature Conservation Committee (JNCC) and carried out by the British Trust for Ornithology (BTO). That review recommended the ratio of growth rates are presented to quantify the consequence of impacts at a population level and the ratio of population sizes to present these impacts in an easily understandable context. The ease of understanding of the CPS is crucial; the numbers given by the CPGR are less understandable outwith a population modelling context. To use the theoretical example quoted by the BTO, a CPS of 0.515 means the population size of a Breeding Colony is expected to be 51.5% (i.e. half) of what it would have been in the absence of the development after 25 years, which is easy to understand. Whereas the corresponding CPGR, 0.973, means that the annual population</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-18 with regards to the presentation and use of the CPGR and CFPS from PVAs.</p>

	<p>growth rate at the breeding colony declines from 0.994 to 0.967. The actual scale of the consequence of this is hard for a non-specialist to comprehend, that of the CPS is not.</p>	
RR-033-G	<p>Population Modelling</p> <p>As such, it is wrong to disassociate the two metrics; aside from the question of comprehension, they are very similar, the only key difference is that CPGR does not include the length of time that the wind farm will be operational. This is crucial as there is considerable uncertainty surrounding most of the aspects of an assessment of the potential impacts of an offshore wind farm. However, the length of time that the development is operational is one of the few aspects not subject to this uncertainty as it is legally fixed. It is also a crucial consideration into the scale of impact. Therefore, the effect of using CPGR in isolation is to remove important contextual information, operational time, complicating the interpretation of impact, thereby increasing uncertainty and the need for precaution.</p>	<p>Please refer to the Applicant's response to RR-029-APDX:B-18 with regards to the presentation and use of the CPGR and CFPS from PVAs.</p>
RR-033-H	<p>Population Modelling</p> <p>Furthermore, the RSPB has run some PVA scenarios using the same methods (the Natural England PVA tool) and parameters, as provided by the Applicant, and found inconsistencies in the model outputs reported by the Applicant. These inconsistencies are indicative of the impacts not having been adequately assessed. While the overarching issues of baseline data and population modelling mean that the assessment is inadequate, and therefore insufficient for a robust assessment and proper understanding of the likely impacts of the scheme, there are a number of other issues with the assessment which include those below. However, the RSPB reserves the right to add to and/or amend its position on these and other aspects of the assessment in light of changes to, or any new, information submitted by the Applicant.</p>	<p>The Applicant notes the RSPBs comment. The inability of RSPB to reproduce the Applicant's model outputs does not mean that the Applicant's model outputs are incorrect, nor does it follow that the impacts have not been adequately assessed.</p> <p>The Applicant shall seek clarification from the RSPB and provide any update to the PVA as deemed necessary.</p>
RR-033-I	<p>Apportioning</p> <p>The RSPB has outstanding issues with the manner in which apportioning of predicted mortalities to relevant SPAs has been carried out, for example, the Applicant has used stable age structures from population models. The RSPB</p>	<p>Please refer to the Applicant's responses to RR-029-APDX:B-82 with regards to apportionment and RR-029-APDX:B-44 with regards to age structure.</p>

	<p>would prefer that these are presented alongside site specific data on the age of birds recorded during survey.</p>	<p>The age classification (structure) of key species is presented in Appendix D of A5.5.1 ES Volume A5 Annex 5.1 Offshore and Intertidal Ornithology Baseline Characterisation Report (APP-074).</p>
<p>RR-033-J</p>	<p>“Worse Case Scenario” and “Evidence Led” parameters. The RSPB’s concern is the prejudicial use of language throughout the assessment, whereby recommended methods and parameters are described as, for example, “overly precautionary”. Where this language has been used, it is in cases that the assessment has been carried out using the SNCB recommended methods and parameters and these parameters are described as “worse case scenario”. These have been drawn up in consultation with leading experts and we consider it inappropriate to constantly undermine and challenge these recommendations while presenting the Applicant’s own preferred methods as the most accurate and as “evidence led”. The SNCB guidance is designed to be suitably precautionary, particularly in the context of the huge amount of uncertainty inherent in the assessment process; it is not set out to be overly precautionary and is revised considering any new evidence. The Applicant does not present any new evidence that has not been considered by the SNCBs or the Secretary of State in recent decisions.</p>	<p>The Applicant has since discussed the use of the term evidence-led with Natural England, and it is not our intention to be antagonistic. We shall consider the use of such language in future, though note that the use of the term, when used, reflect’s the Applicant’s interpretation of the evidence presented.</p> <p>The Applicant remains of the opinion that new evidence with regards to the assessment process was included within the impact assessments for ornithology.</p>
<p>RR-033-K</p>	<p>Gannet Avoidance Rates Whilst the RSPB agrees with almost all of the SNCB’s avoidance rates (JNCC et al, 2014), we differ with regard to gannet. We are content that 98.9% is suitable for non-breeding birds, but do not agree that this figure should be applied to the breeding season due to the lack of available evidence relating to breeding birds. GPS tracking of gannets breeding on the Bass Rock between 2010 and 2021 has shown variation in the two-dimensional foraging behaviour of birds across the breeding season (prior to chick-rearing, and during chick-rearing), between sexes, and between years (Cleasby et al. 2015a, Lane et al. 2020, Lane and Hamer 2021). Three-dimensional tracking of gannets during chick-rearing has revealed that flight height and flight speed both vary according to behaviour, sex and wind conditions (Cleasby et al. 2015b, Lane et al. 2019, Lane et al. 2020,) and similar patterns have been recorded in other seabirds (Masden et al. 2021). As the misspecification of these parameters contributes to the model error component of avoidance rate (Johnston et al., 2021) such variability should result in differential avoidance rates.</p>	<p>The Applicant undertook consultation on the input parameters to be used for collision risk modelling and provided both an Applicant’s and SNCBs set of outputs.</p> <p>The Applicant notes the RSPB’s additional submission of ideas regarding future modelling of collision risk and also awaits any updates from Natural England on their updated report on avoidance rates before considering whether further modelling should be undertaken and submitted to the ExA during the examination.</p>

RR-033-L	<p>Displacement analysis</p> <p>The RSPB has outstanding issues with manner in which displacement impacts have been considered, for example, the analysis only considers auks recorded on the water and not those in flight.</p>	<p>Please refer to the Applicant’s response to RR-029-5.9 with regards to flying and sitting auks being considered within displacement assessments.</p>
RR-033-M	<p>Seasons definitions</p> <p>The RSPB has outstanding issues with manner in which the bio-seasons have been defined, for example the kittiwake breeding season is defined as May to July, when evidence from colony monitoring shows birds are present April to September.</p>	<p>Please refer to the Applicant’s response to RR-029-APDX:B-82 with regards to the make-up of bio-seasons for assessment in B2.2: Report to Inform Appropriate Assessment (APP-167-APP-178).</p>

1.4 Derogation Case

Reference	Relevant Representation Comment	Applicant’s Response
RR-033-N	<p>Based on the RSPB’s conclusions on adverse effect on integrity, the RSPB considers a derogation case is required if the Secretary of State for Business, Energy and Industrial Strategy (BEIS) is to consider consenting a damaging project. The RSPB welcomes the information provided by the Applicant to enable its derogation case to be reviewed.</p>	<p>The Applicant welcomes the RSPB’s support for the information provided in the ‘without prejudice’ derogation case submitted alongside the DCO application.</p>
RR-033-O	<p>As part of any derogation case, the RSPB considers compensation measures would be required for the following species: gannet; kittiwake; guillemot and razorbill should the Secretary of State decide to consent the Application as it is currently proposed. The RSPB welcomes the constructive dialogue by the Applicant with stakeholders to explore potential compensation measures for these species. The RSPB also welcomed the informal consultation by the Applicant during August 2021, just prior to the submission of the application documents.</p>	<p>The Applicant considers that, despite its confidence that there is no potential for AEol on kittiwake from Hornsea Four in-combination with other plans and projects as evidenced in its original DCO application, it is not a point that it wishes to pursue during Examination. The Applicant’s position remains that there will be no AEol from Hornsea Four alone on the kittiwake feature and, aside from the overall (in-combination) conclusion of AEol on kittiwake the Applicant maintains its position in all other respects as regards its methodology and assessment of the effects on the FFC SPA features. The Applicant also maintains its position of no AEol alone or in-combination for all other qualifying species or seabird assemblage of the FFC SPA and for all other European sites.</p>

		<p>The Applicant appreciates the advice from RSPB throughout the stakeholder engagement and evidence process for compensation and attending numerous workshops specifically on compensation measures since early summer 2020.</p> <p>Derogation is presented in B2.5: Without Prejudice Derogation Case (APP-182) and supported by Compensation plans for the respective species outline in the representation:</p> <ul style="list-style-type: none"> • B2.7: FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186); • B2.8: FFC SPA: Gannet, Guillemot & Razorbill Compensation Plan (APP193).
RR-O33-P	<p>We note that there appear to have been relatively minor changes to the compensation proposals since that consultation. We set out below how we will approach our assessment of the Applicant’s compensation proposals, the level of detail we expect to see and an outline of our concerns with each of the compensation measures as they are currently presented. We will set out fuller comments on these and other issues relating to the Applicant’s derogation submissions in our main written submission.</p>	<p>The Applicant acknowledges RSPB comments and will address responses in the relevant section.</p>

1.5 RSPB Approach to Assessing Compensation Proposals

Reference	Relevant Representation Comment	Applicant’s Response
RR-O33-Q	<p>The RSPB has reviewed both the EC (2018) and previous Defra (2012) guidance on compensatory measures. Both are in broad alignment as to the principles to adopt when considering compensatory measures. We supplement this based on the RSPB’s practical experience of applying the principles when assessing compensatory measures. We will use the combination of the EC guidance and the RSPB’s experience in this field to assess the Applicant’s compensatory measures.</p>	<p>The Applicant acknowledges RSPB representation and confirms that B2.5: Without Prejudice Derogation Case, B2.7: FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186) and B2.8: FFC SPA: Gannet, Guillemot & Razorbill Compensation Plan (APP- 193) presented the position on these matters at application.</p>

		<p>As set out in the respective Roadmaps for each compensation measure, these continue to mature and develop.</p>
<p>RR-033-R</p>	<p>Below, we summarise some of the key elements of that approach before setting out our initial comments on the Applicant’s compensation proposals. These are necessarily initial comments as it is the RSPB’s view that there is still substantive work to be done with regards to the compensation proposals, based on agreement of the nature and scale of predicted adverse effects on integrity.</p>	<p>The Applicant acknowledges RSPB comments. The Applicant has presented a detailed review of evidence, demonstrating the ecological efficacy for each of the compensation measures and resilience measure for each seabird species with the relevant ecological evidence reports:</p> <ul style="list-style-type: none"> • 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); • B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP194); • B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196); and • B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence (APP-198). <p>The Applicant has demonstrated through the package of compensation measures the compensation is viable, effective and can be secured and delivered.</p>
<p>RR-033-S</p>	<p>This is critical to inform discussions on:</p> <ul style="list-style-type: none"> - What ecologically effective compensation for those impacts could comprise; - The options to be considered to provide such compensation; and - The detailed consideration of possible locations and designs to implement ecologically effective compensation with a reasonable guarantee of success. <p>In summary, the criteria for designing compensatory measures include:</p> <ul style="list-style-type: none"> - Targeted – appropriate to the impact(s) predicted; - Effective – based on best scientific knowledge. Measures where there is no reasonable guarantee of success should not be considered; - Technical feasibility –taking into account the specific requirements of the ecological features to be reinstated; - Extent – directly related to quantitative and qualitative aspects of the elements of integrity likely to be impaired and estimated effectiveness of the measure(s); 	<p>The Applicant acknowledges RSPB comments. The Applicant has demonstrated through the package of compensation measures the compensation is viable, effective and can be secured and delivered.</p>

	<ul style="list-style-type: none"> - Location – located in areas where they will be most effective in maintaining the overall coherence of the National Site Network for the impacted species; - Timing - must provide continuity in the ecological processes essential to maintain the structure and functions that contribute to the National Site Network. 	
RR-033-T	<p>Each compensation measure should be fully functional before any damage occurs;</p> <ul style="list-style-type: none"> - Long-term implementation – legal and financial security required for long term implementation. Must be in place prior to consent being granted. The length of time the compensation measures should be secured for must be based on the combination of the lifetime of the development plus the time it will take the affected seabird population to recover from the impacts. 	<p>The indicative timescales for delivery and implementation for the suite of the compensation measures is illustrated in the roadmaps:</p> <ul style="list-style-type: none"> • B2.7.2 Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188); • B2.7.4 Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap (APP-190); • B2.8.2 Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap (APP-195); • B2.8.4 Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197); and • B2.8.6 Volume B2, Annex 8.6: Compensation measures for FFCSPA: Fish Habitat Enhancement: Roadmap (APP-199). <p>The Applicant has considered the timescale for the construction of an artificial nesting structure and the indicative timescale for delivery and implementation that the Applicant is aiming for is illustrated in Revision 2 of B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188).</p> <p>The Applicant has carefully considered the ecological evidence, technical delivery and held discussions with Natural England in recognition of Natural England’s concerns regarding the commitment to allow for one breeding season prior to operation if there is an existing colony or two years if there is no existing colony. The Applicant has considered Natural England’s comment regarding lead-in timescales for artificial nesting and as set out in Response RR-029-APDX:A-22 the Applicant now makes a commitment to implement the nesting structure three breeding seasons ahead of operation of the windfarm. The relevant documents (including the dDCO for</p>

		kittiwake) have been updated accordingly to reflect this. Please see C1.1.1 Draft DCO including Draft DML Schedule of Changes to be submitted at Deadline 1.
RR-033-U	Compensatory measures must be additional to existing obligations e.g. measures necessary to site management of an SPA or SAC to restore or maintain a designated feature to favourable status.	The Applicant acknowledges RSPB comments and has demonstrated the additionality provided by the suite of compensation measures detailed in the documents submitted with the DCO application, including Letters of Comfort from key stakeholders.
RR-033-V	We also consider that there must be an appropriate level of detail on the proposed compensation measures provided sufficiently in advance of the start of the examination to enable interested parties to assess it fully. This is critical to enable proper scrutiny of any compensation proposals by interested parties and the Examining Authority. This is summarised below. At this stage, despite the significant amount of work carried out by the Applicant and the volume of material presented, we do not consider the necessary detail has been provided to enable proper scrutiny of the compensation measures.	<p>The Applicant has presented a detailed review of evidence, demonstrating the ecological efficacy for each of the compensation measures and resilience measure for each seabird species with the relevant ecological evidence reports:</p> <ul style="list-style-type: none"> • B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence; • B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence; • B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence; • B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence; and • B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence. <p>The Roadmaps have set out the implementation studies and bycatch reduction selection phase. Further updates on the implementation study progress, site selection and securing agreements will be submitted to the Examination at Deadline 1 in G.1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement and at Deadline 5. Preliminary findings from the implementation studies are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase and initial findings in the predator eradication being even more promising than expected at this stage. The significance of the bycatch reduction will be fully analysed following completion of the bycatch reduction selection phase. The Applicant has</p>

		<p>continued to strengthen relationships with key stakeholders to support implementation for all compensation measures.</p> <p>The Applicant is confident that the package of compensation measures proposed means the compensation is viable, effective and can be secured and delivered.</p>
--	--	--

1.6 Level of Detail Required

Reference	Relevant Representation Comment	Applicant's Response
RR-033-W	<p>The RSPB does not consider "in principle" equates to "outline" proposals, as this leaves all/most of the critical issues to be addressed post-DCO consent. The RSPB considers that detail about the location, design, implementation, monitoring and review of any proposed compensatory measures is needed to: inform the application and examination process and enable proper public scrutiny, including relevant agreements, consents, and permissions. This should provide the Secretary of State with the necessary confidence as to whether those measures can be secured and implemented with a reasonable guarantee of success, thereby protecting the coherence of the National Site Network. We note that these details should be settled before DCO consent is decided, and be available as part of the application documentation. This will enable potential interested parties the opportunity to fully review and assess the adequacy of the compensation measures before deciding whether to formally register as an interested party and submit a relevant representation.</p>	<p>Please see the response detailed above in RR-033-T and RR-033-V.</p>
RR-033-X	<p>The required details include:</p> <ul style="list-style-type: none"> - Nature/magnitude of compensation: sufficient detail to enable agreement on the scale of compensation required in relation to the predicted impacts, including the detailed compensation objectives, associated success criteria and timeline; - Location: legal securing of proposed compensation sites with ability to scrutinise design, evidence of relevant consents and relevant legal agreements to secure land; 	<p>Please see the previous response above and the introductory section on compensation progress made by the Applicant (RR-033-T and RR-033-V and responses to Natural England for example RR-029-APDX:C-A, RR-029-APDX:C-DDD, RR-029-APDX:C-P, RR-029-APDX:C-10).</p> <p>A detailed overview of the calculations and evidence supporting the compensation population estimates are provided within: G1.41 Calculation</p>

	<ul style="list-style-type: none"> - Monitoring and review: detailed monitoring and review packages agreed in advance including terms of reference and ways of working for any “regulators group” to oversee implementation of measure; -Compliance and enforcement: details and evidence of how the proposed compensation measures will be reviewed by the relevant regulator and the legal mechanisms available to those regulators to review and enforce any approved compensation plans. This is especially important if the proposed measures lie outside the jurisdiction of the decision-making authority (as is the case with some of the measures suggested by the Applicant). 	<p>Methods of Hornsea Four’s Proposed Compensation Measures for Features of the FFC SPA which has been scrutinised by Natural England, and discussed during Workshops held 3rd and 14th February 2022</p> <p>The Applicant has continued to strengthen relationships with key stakeholders to support implementation for all compensation measures. The Compensation Plans and Roadmaps set out the process for securing, delivering and monitoring the suite of compensation measures in addition to the Letters of Comfort from Alderney Wildlife Trust and States of Guernsey and letter in response to the compensation consultation from the States of Alderney.</p>
RR-033-Y	<p>We consider it is unsafe to assume an outline compensation measure can be translated in to a detailed and workable measure “on the ground” at a later date and all the necessary consents and agreements successfully secured.</p> <p>By providing these details it should ensure these issues are properly addressed before the Secretary of State is required to make a decision on whether to grant DCO consent and ensure, among other things, that it is possible to:</p> <ul style="list-style-type: none"> - Identify the detailed location and mechanism(s) of the proposed compensation measure; - Identify the relevant consenting and/or licensing mechanisms required; - Identify any potential impacts of the proposed measure on the receptor site(s) and surrounding environment and carry out appropriate screening; - Identify any particular impact assessment requirements necessary which might arise from likely direct and indirect effects of the compensation measure on other receptors; - Be satisfied that the relevant legal consents are secured before any decision on DCO consent. 	<p>Please see the detailed response above to RR-033-V and RR-033-X.</p>
RR-033-Z	<p>If consent has not been granted, the Examining Authority and Secretary of State would know in advance. The criteria, guidance and associated requirements set out above will guide how the RSPB assesses the Hornsea Project Four compensation measure proposals submitted as part of the application.</p>	<p>The Applicant is confident that either consents are not required (for example for bycatch reduction compensation measure) or there is no impediment to them being granted (for example marine licence(s) for offshore structures. Please see responses to RR-033-T and RR-033-V.</p>

		<p>The Applicant will obtain any additional consents required at the earliest opportunity so that the measure is implemented to ensure the stipulated lead in times for each measure. Early consultation with stakeholders is imperative and has been initiated for seagrass, offshore nesting and predator eradication so that the Applicant is fully aware of any concerns associated with the consenting of the measures.</p>
--	--	--

1.7 Comments on Various Compensation Proposals

Reference	Relevant Representation Comment	Applicant's Response
RR-033-AA	<p>The RSPB's overarching comment is that the Applicant has failed to put forward detailed and location specific compensation measures for any impacted species. Neither have any been secured. It is therefore not possible at this stage for the RSPB to assess any of the compensation measures properly and provide advice to the Examining Authority on whether each has a reasonable guarantee of success in meeting specific, agreed compensation objectives. However, we are able to provide high level comments on each of the broad measures based on the information provided.</p>	<p>The Applicant acknowledges RSPB comments. The Applicant has presented a detailed review of evidence, demonstrating the ecological efficacy for each of the compensation measures and resilience measure for each seabird species with the relevant ecological evidence reports:</p> <ul style="list-style-type: none"> • B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence; • B2.7.3 Compensation measures for FFC SPA: Onshore Artificial Nesting: Ecological Evidence; • B2.8.1 Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence; • B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence; and • B2.8.5 Compensation measures for FFC SPA: Fish Habitat Enhancement: Ecological Evidence. <p>The Applicant has provided details of the Compensation Plans and Roadmaps to delivery including refinement of locations in the following detailed documents:</p> <ul style="list-style-type: none"> • B.2.7: FFC SPA: Gannet and Kittiwake Compensation Plan (APP-186);

		<ul style="list-style-type: none"> • B.8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan (APP 193); • B2.7.2 Volume B2, Annex 7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188); • B2.7.4 Volume B2, Annex 7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap (APP-190); • B2.8.2 Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap (APP-195); • B2.8.4 Volume B2, Annex 8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197); and • B2.8.6 Volume B2, Annex 8.6: Compensation measures for FFCSPA: Fish Habitat Enhancement: Roadmap (APP-199). <p>The Roadmaps have set out the implementation studies and bycatch reduction selection phase for the compensation measures. Further updates on the implementation study progress, site selection and securing agreements will be submitted to the Examination at Deadline 1 in G.1.50 Compensation measures for FFC SPA: Derogation and Compensation Update Position Statement and at Deadline 5. Preliminary findings from the implementation studies are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase.. The significance of the bycatch reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase. The Applicant has continued to strengthen relationships with key stakeholders to support implementation for all compensation measures. Please also see response RR-033-X.</p> <p>The Applicant is confident that the package of compensation measures proposed means the compensation is viable, effective and can be secured and delivered.</p>
RR-033-BB	<p>Predator Eradication (Guillemot, Razorbill)</p> <p>In our response to the August 2021 informal consultation (Applicant ref: Vol B1, Annex 1.37 – Non Statutory Targeted Compensation Measures Consultation</p>	<p>The Applicant is aware of the potential complexity associated with predator eradication and has undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator</p>

	<p>Responses, pages 25-32), the RSPB advised the Applicant that island restoration (to eradicate invasive non-native predators of breeding seabirds) is a complex and highly specialised conservation measure. We stated that before such a proposed compensation measure for a specific seabird species can be properly assessed critical work is required to determine if it will have a “reasonable guarantee of success” (in line with Defra and EC guidance on compensation): a “full scale Feasibility Study carried out by a suitable eradication expert contractor to international best practice standards in order to firmly establish that the removal of Invasive Non-Native Species (INNS) for each island to be restored is feasible...against the 7 feasibility criteria set out in Table 1 on page 18 of the Manual of the UK Rodent Eradication Best Practice Toolkit (2018)”. This is essential to understand whether the chosen locations are suitable from both a technical eradication perspective and whether that eradication will (rather than might) benefit the two seabird species: guillemot and razorbill. Among other things we stated that such a study must include detailed biosecurity and emergency response plans, based on a proper understanding of the risk of reinvasion by the target INNS.</p>	<p>Eradication: Ecological Evidence (APP-196)). The Applicant has already undertaken site visits to the Isles of Scilly and Guernsey (including Herm and Sark) (August 2021) and is working with the Alderney Wildlife Trust identify at an early stage to identify potential issues and solutions which would increase the success of a potential eradication.</p> <p>The Applicant has furthermore employed international eradication and island restoration experts to undertake a detailed implementation study (as described within Revision 2 of B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that they have undertaken, or have secured plans to undertake, actions to ensure success of the measure.</p>
RR-033-CC	<p>Predator Eradication (Guillemot, Razorbill)</p> <p>Further, securing the support of the affected human communities was a prerequisite and encompassed not just the main landowners, but all property owners and occupiers, and operators at boat launch and flight locations.</p>	<p>The Applicant has been in contact with specialists who have been involved in previous eradication programmes to specifically discuss the lessons learnt regarding community engagement and undertaken a detailed review of predator eradication (B2.8.3 Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence (APP-196)). In addition, the</p>

		<p>Applicant has employed international eradication and island restoration experts to undertake a detailed implementation study (as described within Revision 2 of B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap) of Herm, The Humps, Jethou, Sark and the surrounding islands and islets. The implementation study will ascertain:</p> <ul style="list-style-type: none"> • Predator presence and predation pressure; • Comprehensive potential nest habitat assessment; and • Seabird colony census. <p>The eradication implementation assessment will include consideration of:</p> <ul style="list-style-type: none"> • Technical feasibility; • Sustainability; • Social acceptability; • Political and legal acceptability; • Environmental acceptability; • Capacity; and • Affordability. <p>In addition to engagement with landowners, community engagement will be undertaken lead by a social scientist. The Applicant is therefore confident that they have undertaken, or have secured plans to undertake, actions ensure the success of the measure.</p>
RR-033-DD	<p>Predator Eradication (Guillemot, Razorbill)</p> <p>We further stated that the possible location of Rathlin Island should be removed as the EU LIFE, NLHF and DAERA funded partnership project was funded and going ahead, and therefore cannot be carried out by the developer. Unfortunately, the Applicant has continued to include Rathlin Island as one of four possible locations for island restoration.</p>	<p>Since the submission of these documents, it has been publicly announced and confirmed that Rathlin Island has secured funding. Therefore, Rathlin Island will no longer be considered as part of the shortlist by the Applicant.</p>
RR-033-EE	<p>Predator Eradication (Guillemot, Razorbill)</p> <p>Having reviewed the Applicant's submission we are concerned that none of this work has been submitted with the Application documents. Nor is any specific location for INNS removal identified. Therefore, it is not possible to properly evaluate the Applicant's proposals at this stage and we are concerned that they</p>	<p>Please see the response regarding the implementation studies above. The Applicant presented within the B2.8 FFC SPA: Gannet Guillemot and Razorbill Compensation Plan a shortlist of potential islands suitable for an eradication programme. Further site selection work which has identified the islands within the Bailiwick of Guernsey (including Alderney, Herm and Sark</p>

	<p>do not demonstrate a good understanding of the requirements to achieve successful INNS eradication.</p>	<p>(along with the relevant islands/islets around the main islands)) as highly suitable for predator eradication to provide sufficient compensation for guillemot and razorbill. The Applicant has been working in conjunction with Alderney Wildlife Trust to collect evidence of rat predation to nesting guillemot and razorbill. The Applicant has also secured external eradication experts to undertake an implementation study for a potential island eradication on multiple islands within the Guernsey Bailiwick (including but not limited to: Herm, Jethou and Sark). The refined locations have been discussed in detail during the workshop held on 14th February 2022. The preliminary results of the habitat suitability analysis will be submitted at Deadline 1 (G1.33 Predator Eradication Island Suitability Assessment Bailiwick of Guernsey).</p>
<p>RR-O33-FF</p>	<p>Predator Eradication (Guillemot, Razorbill)</p> <p>We will set out our detailed concerns with the proposals at a later stage but note the following now:</p> <ul style="list-style-type: none"> - The Applicant is now including “predator control” under the umbrella term of “predator eradication”. This is not acceptable as the two are fundamentally different. Control is almost always a worse option and, in addition, inherently requires more poisoned bait to be placed in the environment and over a longer time period. We do not consider a “control” approach acceptable in conservation and compensation terms unless there is overwhelming benefit (for the seabird species) to be had, which has not been shown for any of the four areas identified. Moreover, control operations may hinder a future eradication attempt at a site e.g. the target INNS develops bait shyness or resistance. - Many of the islets hinted at in the list of possible locations will be at high risk of reinvasion given their proximity to potential sources of INNS (e.g. off Torquay, off Sark), thereby rendering them unfeasible from an island eradication point of view. Many islands in the four identified areas have already been invaded after a successful removal of rodents; - At paragraph 7.2.1.1 (Volume B2, Annex 8.4 Compensation Measures for FFC SPA: Predator Eradication Roadmap) the Applicant states it “may” be necessary 	<p>Predator control was suggested by the Applicant for some of the shortlisted islands being considered for island eradication and or control as a compensation measure. Islands where control was being considered were small islands and islets along the south Devon coast and certain locations within the Isle of Scilly archipelago.</p> <p>Due to a lack of information available in support of delivering compensation for guillemot and razorbill (via predator control/ eradication) on the south coast of Devon and within the Isles of Scilly at this stage, the Applicant is no longer pursuing either location. Potential sites within the Bailiwick of Guernsey are being considered further on a full eradication and biosecurity measures basis. Further information is presented within the Applicant’s Revision 2 of B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap.</p> <p>The Applicant is therefore confident that the current locations under consideration would result in long-term benefit at a sufficient level for guillemot and razorbill.</p> <p>The Applicant acknowledges the non-deliberate omission of grey seal (feature of Isles of Scilly Complex SAC) from the HRA of compensation</p>

	<p>to put in place biosecurity measures. The RSPB fundamentally disagrees. For any such scheme to be successful over the long-term, biosecurity is an integral and essential component of the scheme as a whole. This is well understood by those with experience of successful island restoration schemes. It also forms one of the seven feasibility criteria that must be addressed.</p> <p>- We note that in Table 15 of the HRA Compensation Measures Part 1 document, the Applicant has failed to include grey seal in the screening for the Isles of Scilly Complex SAC i.e. a known feature of the SAC has been omitted. This is an important omission and raises concerns regarding the Applicant’s HRA exercise with regard to its high level compensation measures. Grey seal is an SAC qualifying feature: any predator removal proposal for the Isles of Scilly needs to assess the impacts of both human disturbance and the risk of ingesting poison bait on it. This in turn requires a detailed plan in order to be able to assess properly the risks arising from implementation of any plan.</p>	<p>measures. The B2.2.2 RP Volume B2 Annex 2.2 Habitat Regulations Assessment Compensation Measures Part 1 (APP- 179) document will be revisited and updated accordingly, and any potential impacts on grey seal fully assessed.</p>
<p>RR-033-GG</p>	<p>Bycatch mitigation trial (guillemot, razorbill, gannet)</p> <p>In line with our comments on the August 2021 consultation (Applicant ref: Vol B1, Annex 1.37 – Non Statutory Targeted Compensation Measures Consultation Responses, pages 23-25) the RSPB does not accept that bycatch mitigation can be described as a primary compensation measure. The proposal, as it stands, is to conduct research trials during autumn and winter 2021 to gather evidence on the efficacy of each suggested trial bycatch mitigation method. The RSPB welcomes the Applicant’s work on this limited research trial and would request publication of the detailed methodology for review by interested parties. However, we consider this proposal is best described as experimental research and cannot yet be considered as a compensation measure, primary or otherwise. At this stage it is not possible to state whether there will be any benefit from the measure(s) being trialled nor where any potential benefit would accrue.</p>	<p>The Applicant acknowledges the concerns raised by RSPB regarding the uncertainties around success of a bycatch reduction technique. To address these uncertainties, the Applicant has begun the bycatch reduction selection phase (commenced in November 2021) to identify the success rate of the Looming Eyes Buoy (LEB) within the same fisheries which bycatch reduction has been evidenced to be highest risk for guillemot and razorbill (within the English Channel) (see bycatch risk mapping in Section 7 of B2.8.1. Compensation measures for FFC SPA: Bycatch Reduction: Ecological Evidence (APP-194)). The Applicant notes previous agreement of the target fishery and location by Natural England and RSPB during Hornsea Compensation Workshop (28th May 2021).</p> <p>The Applicant is undertaking the LEB selection phase with two companies:</p> <ul style="list-style-type: none"> • 1) FishTek Marine Ltd <ul style="list-style-type: none"> ○ FishTek are a global leader in developing bycatch reduction techniques, and have previously developed techniques which have successfully aided in reducing bycatch in fisheries (e.g., Hookpod, Lumo lead, pingers).

- 2) SeaScope Fisheries Research
 - SeaScope are an independent consultancy who specialise in fisheries monitoring and research.

Through collaborating with two companies which have both undertaken successful studies within fisheries science, the Applicant is confident with the progress of the testing of the LEB and that the measures required for a successful study have been undertaken. The Applicant has secured 10 fishers to take part in the technology selection phase, with all boats being fitted with a dual camera monitoring system to determine seabird bycatch when fishing with control and experimental nets (i.e. with the LEB deterrent attached). The technology selection phase will run from November 2021 until March 2022 with data being subsequently analysed by fisheries experts and ornithologists to determine efficiency as a compensation measure. If deemed beneficial to further support the study outcomes from the first year, a second year of technology selection will be undertaken by the Applicant or commence implementation. The preliminary findings indicate that the LEB has a positive impact on reducing bycatch of large auks, however the significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase. Due to contractual restrictions, the results of the bycatch reduction selection phase can only be disclosed as percentage reductions in bycatch i.e. not specific numbers of birds, without consent from the participating fishers.

The Applicant notes that as the bycatch reduction selection phase is being undertaken within the target fishery, the findings will quantify the level of bycatch reduction achieved through using the LEB, and can therefore directly indicate the scale of deployment that the Applicant would be required to deliver to fulfil compensation.

The Applicant is confident that each of the compensation measures predator eradication and bycatch reduction, on their own is robust and deliverable for both guillemot and razorbill, the inclusion of a number of

		<p>measures provides stakeholders with additional comfort on the level of compensation that can be provided. Additionally, the bycatch technology selection phase and predator eradication implementation assessments are currently being undertaken. This will provide more evidence to support the Applicants chosen compensatory measures.</p> <p>Nevertheless, the Applicant will deliver all relevant measures as a suite of compensation for all relevant species (i.e. predator eradication, bycatch reduction and fish habitat enhancement for guillemot and razorbill). Additionally, the Applicant is committed to providing overall compensation at a ratio of 1:2 (1:1 for bycatch reduction and 1:1 for predator eradication), thereby increasing the resilience and likelihood of success.</p>
RR-O33-HH	<p>Bycatch mitigation trial (guillemot, razorbill, gannet)</p> <p>We will await the outcome of the trial research before commenting further. Interested parties must be given sufficient time to review and respond to the research trial outputs before the examination commences, given that the Applicant appears to express a preference for this unproven compensation measure over that of predator eradication e.g. at paragraph 1.3.1.4 of Volume B, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan: "Should the bycatch measure deliver the scale of compensation required (to be established through monitoring of Bycatch technology selection phase at the levels presented in B2.6: Compensation measures for FFC SPA Overview) for guillemot and razorbill, then the predator eradication measure may not need to be progressed beyond the early implementation phase (2022-2023)".</p>	<p>The Applicant states that both guillemot and razorbill can be successfully compensated for using solely bycatch reduction as an individual compensation measure as both species have previously been identified as vulnerable to bycatch in static gillnets (Northridge <i>et al.</i>, 2020). Therefore, there is the potential for both species to be fully compensated for using solely bycatch reduction techniques.</p> <p>The bycatch technology selection phase will provide important information to address uncertainties, including bycatch reduction success in the proposed fishery for compensation. Even if the outcome of the bycatch reduction technology selection phase show that this measure could provide full compensation alone, a suite of measures will be delivered by the Applicant including both predator eradication and bycatch reduction at a combined 1:2 ratio.</p>
RR-O33-II	<p>Bycatch mitigation trial (guillemot, razorbill, gannet)</p> <p>We also note that the Applicant proposes bycatch reduction as a compensation measure for gannet on the basis that there are proven technologies for both longline and midwater trawl fisheries. The RSPB accepts that such technology is theoretically available and has been shown to work on fisheries and seabird species elsewhere in the world. However, this is distinct from the ability to demonstrate that the technology can and will be successfully and consistently</p>	<p>The Applicant is currently undertaking further in-depth analysis regarding gannet and bycatch within the UK. The findings of this analysis will aid in identifying the target fishery and location. From a preliminary analysis, most longline from UK fisheries occurs within either Scottish waters or off the southwest coast of England. Further analysis is currently ongoing into foreign vessels operating in UK waters. The Applicant is committed to contacting the relevant fisheries, both UK and foreign fisheries.</p>

	<p>applied to best practice standards on relevant fishing vessels in UK waters – indeed, in spite of the existence of such measures for decades, there is very limited implementation of seabird bycatch mitigation measures in the longline fleet. Overall, the Applicant has provided no detailed proposal to assess. Therefore, at this stage, the RSPB does not consider this is currently a viable compensation proposal.</p>	<p>The Applicant is also currently undertaking further analysis into gannet bycatch reduction through a bycatch reduction technique review. As more studies have been completed regarding longline bycatch, there is confidence regarding the success of bycatch reduction techniques. The Hookpod has been identified as a successful bycatch reduction technique in longline fisheries, with studies estimating a 95% reduction in seabirds bycaught. The Applicant is therefore confident that mitigation technology for gannet is available .</p>
<p>RR-O33-JJ</p>	<p>Onshore nesting/Offshore nesting platforms (kittiwake, gannet) In our comments on the August 2021 consultation (Applicant ref: Vol B1, Annex 1.37 – Non Statutory Targeted Compensation Measures Consultation Responses, pages 21-23), the RSPB agreed that artificial nesting structures are a possible compensation measure for kittiwake but with such substantial caveats that we considered they are unproven as a compensation measure. That remains the RSPB’s position.</p>	<p>The Applicant welcomes RSPBs comments that artificial nesting structures are a possible compensation measure for kittiwake.</p>
<p>RR-O33-KK</p>	<p>Onshore nesting/Offshore nesting platforms (kittiwake, gannet) The RSPB recognises the significant amount of work by the Applicant to explore and identify potential suitable offshore locations for putative kittiwake nesting structures. However, it is also apparent that a significant amount of further work is still required before detailed proposals can be brought forward in advance of the examination so that they can be fully scrutinised during the examination process. Similarly, more detailed discussions and proposals are required in respect of onshore nesting structures, in particular the areas of search suggested by the Applicant given the known challenges in identifying and securing locations. This is especially the case in Suffolk where several proposed offshore wind farm projects are competing with each other. In this context, it is even more important that the Applicant is able to demonstrate it has legally secured (land tenure and consents) a suitable site and provided detailed proposals before the examination commences, and certainly well in advance of the end of the examination.</p>	<p>The Applicant welcomes the RSPBs recognition of the significant amount of work by the Applicant to explore and identify potential suitable offshore locations for artificial nesting structures.</p> <p>The Applicant is cognisant of compensation measures for kittiwake being delivered by other projects. However, the Applicant notes that not all other developers have secured locations for their compensation. The Applicant is able to draw on knowledge gained from Hornsea Project Three, who have been successful in purchasing land for the purpose of artificial nesting structures and is therefore in a strong position to progress locations if an onshore nesting structure is progressed.</p> <p>The Applicant is closely following Hornsea Three’s progress on site selection. In addition, the search zone for Hornsea Four onshore nesting is wider than that of Hornsea Three extending further North to allow more flexibility and choice in the search for suitable land and the Applicant has received expressions interest from a number of landowners.</p>

		<p>The Applicant is closely following Hornsea Three’s progress on site selection. In addition, the search zone for Hornsea Four onshore nesting is wider than that of Hornsea Three extending further North to allow more flexibility and choice in the search for suitable land and the Applicant has received expressions interest from a number of landowners.</p>
<p>RR-O33-LL</p>	<p>Onshore nesting/Offshore nesting platforms (kittiwake, gannet) Overall, there remain significant unknowns at this stage in respect of the proposed artificial nesting structures for kittiwakes that need to be resolved before the Examining Authority and Secretary of State for BEIS can have confidence in an offshore or onshore nesting structure for kittiwakes. In respect of gannets and the use of artificial nesting structures as a compensation measure, this is a new proposal and did not feature in the August 2021 consultation. The RSPB accepts that there are examples where northern gannets have nested or attempted to nest on artificial structures (see Table 5, and paragraphs 4.2.1.3 – 4.2.1.6 in Vol. B2, Annex 7.1 Compensation measures for FFC SPA Offshore Artificial Nesting Ecological Evidence) but does not accept that this behaviour, observed in fewer than 20 individual birds out of an estimated population of 1.5-1.8 million birds, can be described as “compelling evidence” (paragraph 4.2.1.1). The Applicant has provided no evidence of a northern gannet colony establishing on an artificial structure, the evidence of such behaviour is limited to three case studies of Australasian gannets. Therefore, the RSPB considers the concept of artificial nesting structures is a wholly unproven compensation measure for northern gannets.</p>	<p>Please see the responses above regarding artificial nesting structures as a compensation measure for kittiwake.</p> <p>The evidence presented by the Applicant demonstrates that compensation can be delivered for gannet on either one new or one repurposed artificial nesting structure and is presented in support of each of the compensation measures: B2.7.1 Compensation measures for FFC SPA: Offshore Artificial Nesting: Ecological Evidence (APP-187).</p> <p>This report has reviewed the evidence of gannet nesting on artificial structures and the feasibility of establishing new gannet colonies. The numerous examples of Australasian and Northern Gannet colonising artificial structures (supports, jetties, boats, platforms) provides evidence, and suggests that gannet do not have a clear preference for natural habitat colonies. Furthermore, a recolonisation attempt at Young Nick’s Head deployed decoys and playback in 2008 and had two eggs reported in the 2010 breeding season, 11 chicks fledged in the 2011 breeding season and 28 chicks fledged in the 2012 breeding season (Sayer & Fogle 2013). This provides promising evidence that such techniques are viable in increasing colonisation chances at an artificial offshore nesting structure provided as compensation. It is also important to incorporate the lack of available nesting habitat for gannet offshore as offshore structures are unlikely to be suitable habitat for nesting gannet due to their specific design. A specially designed structure for gannet would, as presented for kittiwake, allow assess 360-degree access to prey, reduced competition from other species and reduced predation risk (due to lack of large gull species and corvids breeding offshore). As a result, there is a high likelihood that gannet</p>

		<p>productivity would be higher offshore. Therefore, the provision of optimal potential nesting habitat offshore will deliver compensation for gannet.</p>
<p>RR-033-MM</p>	<p>Fish habitat enhancement (seagrass restoration: kittiwake, gannet, guillemot, razorbill)</p> <p>This is described by the Applicant as “a compensation measure to support the resilience of the other compensation measures to form a package of measures” (paragraph 6.7.1.1, Vol. A4, Annex 6.1: Compensation Project Description). The RSPB remains of the view expressed during the August 2021 consultation that it cannot yet be considered even a supportive measure. This is due to a combination of the weak evidence base capable of linking this measure with measurable benefits to the target seabird species and the experimental nature of seagrass restoration itself such that its success as a habitat restoration measure per se cannot be guaranteed. As with bycatch mitigation, it too is also at the experimental research and trial stage.</p>	<p>The Applicant would like to clarify that the fish habitat enhancement (seagrass restoration) is a resilience measure (as described above) and will be used to support the full suite of proposed compensation measures for the target seabirds species, kittiwake guillemot, razorbill and gannet. The Applicant acknowledges that this resilience measure does not specifically contribute to the relevant metrics for quantifying compensation requirements, i.e. directly compensating for a set number of adult individuals. Instead, the resilience measure will aid in increasing the likelihood of success of the proposed compensation measures (artificial nesting, predator eradication, and bycatch reduction).</p> <p>The Applicant recognises the current limited data and supporting evidence available to support the direct link between target seabird species and seagrass habitats in coastal waters and the North Sea. However, the Applicant seeks to resolve these evidence gaps by conducting targeted research, including fish surveys and stable isotope analyses of key prey species within the Humber Estuary and the wider North Sea. The aim of this research will help to determine connectivity between juvenile forage fish species associated with seagrass meadows in the Humber Estuary and their potential distribution into the wider North Sea region. Such studies are being conducted by the University of Hull in conjunction with the pilot restoration project currently underway by the Yorkshire Wildlife Trust. In addition, the Applicant has contracted Ocean Ecology Limited and Project Seagrass to carry out a site implementation study of the UK to identify the optimal locations for future seagrass restoration sites including the Humber Estuary. Such research will also provide important baseline data contributing to knowledge gaps for the ecosystem role that UK seagrass meadows provide.</p> <p>To date the Applicant has undertaken pilot seagrass restoration in association with the Yorkshire Wildlife Trust, within initial planting of 2 ha of</p>

		<p>seagrass (<i>Zostera noltii</i>) seeds within the Humber Estuary in Q4 2021. An additional 2 ha is proposed to be planted in Q1 2022 as part of this pilot. Monitoring of the pilot study is being undertaken by the Yorkshire Wildlife Trust and the University of Hull. The success of the pilot study shall inform the large-scale delivery of a larger seagrass restoration project. The large-scale seagrass restoration will incorporate preparatory work and supporting research surveys and studies to inform project development.</p> <p>The preliminary findings of the bycatch reduction technology selection phase indicate that the LEB has a positive impact on reducing bycatch of large auks. The significance of this reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase.</p>
--	--	---

1.8 Conclusion on Compensation Measures

Reference	Relevant Representation Comment	Applicant's Response
RR-033-NN	<p>The RSPB is concerned at the lack of detail available for each compensation measure and lack of precise information on when any such detail will be available for scrutiny as part of the examination process. Despite the efforts of the Applicant, several of the compensation measures proposed are untested and/or unproven with respect to the seabird species they are claimed to benefit.</p>	<p>Please see the responses above regarding the substantial evidence, compensation plans and roadmaps including the implementation studies (e.g. RR-033-AA).</p> <p>The Applicant has presented sufficient detail to support the efficacy of each compensation measure provided (see Agreement Log in F3.4 Statement of Common Ground between Hornsea Project Four and Natural England: Derogation Matters) in front of the Examining Authority to enable it to have confidence in any of the compensation measures proposed.</p> <p>The Roadmap for each compensation measure set out how the uncertainties for each measure will be identified and regarded. The Applicant refers the RSPB to the respective roadmaps:</p>

		<ul style="list-style-type: none"> • B2.7.2: Compensation measures for FFC SPA: Offshore Artificial Nesting Roadmap (APP-188); • B2.7.4: Compensation measures for FFC SPA: Onshore Artificial Nesting Roadmap (APP-190); • B2.8.2 Volume B2, Annex 8.2: Compensation measures for FFC SPA: Bycatch Reduction: Roadmap (APP-195); • B2.8.4: Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197); and • B2.8.6: Compensation measures for FFCSPA: Fish Habitat Enhancement: Roadmap (APP-199).
RR-033-OO	<p>It appears that much of the detail necessary to evaluate the ecological, technical and legal/financial feasibility of each measure is to be left to the post consent stage. We consider this unacceptable especially given the technical challenges and uncertainties associated with most, if not all, of the compensation measures the Applicant is proposing.</p>	<p>Further updates on the implementation study progress and securing agreements will be submitted to the Examination. The Applicant's B2.8.4 Compensation measures for FFC SPA: Predator Eradication: Roadmap (APP-197) presents letters of comfort from the Alderney Wildlife Trust and the States of Guernsey in support of a predator eradication as compensation for Hornsea Four. States of Alderney and States of Guernsey are the landowners of the islands/islets where the rat eradication would be undertaken and permission has already been granted to Alderney Wildlife Trust to undertake predator eradication.</p> <p>Ten vessels were secured for the bycatch reduction technology selection phase within two months showing how rapidly fishers could be secured by the project. Furthermore, no permits or MMO or IFCA licences are required for bycatch mitigation delivery, only fisher agreements are needed.</p> <p>Preliminary findings from the implementation studies are promising, with an initial reduction in bycatch of auks identified from the bycatch reduction selection phase and initial findings in the predator eradication being even more promising than expected at this stage. The significance of the bycatch reduction will be fully analysed following completion of the 2021/22 bycatch reduction selection phase. The Applicant has continued to strengthen relationships with key stakeholders to support implementation for all compensation measures. The Derogation Funding Statement (B.2.10:</p>

		<p>Without Prejudice Derogation Funding Statement (APP-202)) clearly sets out the Applicants commitment, demonstrates the financial security of the measures and the considerable financial costing allocated to the compensation, which is such a large financial commitment to compensation for a single project.</p>
RR-033-PP	<p>The RSPB urges the Examining Authority to require the Applicant to submit firm proposals for each compensation measure well before the start of the examination and to allow interested parties sufficient time to evaluate such additional information before commencing the examination.</p>	<p>The Applicant notes RSPB’s response. The Applicant is confident that the package of compensation measures proposed means the compensation is viable, effective and can be secured and delivered.</p>
RR-033-QQ	<p>At this stage the RSPB does not consider there is sufficient detail in front of the Examining Authority to enable it to have confidence in any of the compensation measures proposed.</p>	<p>Please refer to the responses above (e.g. RR-033-AA) demonstrating the substantial information and detail provided in the DCO submission on the suite of compensation measures. Further updates on the implementation study progress and securing agreements will be submitted to the Examination.</p>
RR-033-RR	<p>Finally, the RSPB reserves the right to add to and/or amend its position in light of changes to or any new information submitted by the Applicant.</p>	<p>The Applicant acknowledges RSPB’s comments.</p>

10 References

Benhemma-Le Gall, A., I. Graham, N. Merchant, and P. Thompson, 2021. Broad-scale responses of harbor porpoises to pile-driving and vessel activities during offshore windfarm construction. *Frontiers in Marine Science*, 8, p.735.

Booth, C., and F. Heinis. 2018. Updating the Interim PCoD Model: Workshop Report - New transfer functions for the effects of permanent threshold shifts on vital rates in marine mammal species. Report Code SMRUC-UOA-2018-006, submitted to the University of Aberdeen and Department for Business, Energy and Industrial Strategy (BEIS), June 2018 (unpublished).

Bos, K., Chen, Z., Verheij, H., and Onderwater, M., 2002. Local scour and protection of F3 offshore GBS platform. 21st International Conference on Offshore Mechanics and Arctic Engineering

BERR, 2008. Review of cabling techniques and environmental effects applicable to the Offshore Wind Farm Industry. Technical Report.

Carotenuto, P., Meyer, P. J., Strøm, P. J., Cabarkapa, Z., St John, H., Jardine, R., Buckley, R., 2018. Installation and axial capacity of the Sheringham Shoal offshore wind farm monopiles – a case history. *Engineering in Chalk: Proceedings of the Chalk 2018 Conference*. doi:<https://doi.org/10.1680/eiccf.64072.117>

Cefas (2001). The impact of disposal of marine dredged material on the Thanet Coast and Sandwich Bay Candidate Special Areas of Conservation (cSACs). Cefas Contract ReportAA001.

COWRIE (ABPmer Ltd et al). (2010) A Further Review of Sediment Monitoring Data. Commissioned by COWRIE Ltd (project reference ScourSed-09)

DECC. (2008). Review of Round 1 sediment process monitoring data – lessons learnt. A report for the Research Advisory Group. Final Report.

Defra, 2016. Review of the Effectiveness of Natura 2000 Sites Compensation Measures in England Contract Reference: WC1076 Review of the Effectiveness of Natura 2000 Sites Compensation Measures in England.

Defra, 2021a. Best practice guidance for developing compensatory measures in relation to Marine Protected Areas Date: 22 July 2021 Version: For consultation

DONG Energy; Vattenfall (2006). Review Report 2005: The Danish Offshore Wind Farm Demonstration Project: Horns Rev and Nysted Offshore Wind Farms Environmental Impact Assessment and Monitoring. Report by Dong Energy.

English Nature (2004). The Southern North Sea Marine Natural Area. A contribution to regional planning and management of the seas around England.

European Commission 2012. Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC CLARIFICATION OF THE CONCEPTS OF: ALTERNATIVE SOLUTIONS, IMPERATIVE REASONS OF OVERRIDING PUBLIC INTEREST, COMPENSATORY MEASURES, OVERALL COHERENCE, OPINION OF THE COMMISSION.

Faulkner, RC, Farcas, A, Merchant, ND. Guiding principles for assessing the impact of underwater noise. *J Appl Ecol*. 2018; 55: 2531– 2536.

Folk, R.L., 1954. The distinction between grain size and mineral composition in sedimentary rock nomenclature. *Journal of Geology*, 62, pp.344-59.

Furness, R., Hallgrimsson, G., Montevecchi, W., Fifield, D., Kubetzki, U., Mendel, B. and Garthe, S., 2018. Adult Gannet migrations frequently loop clockwise around Britain and Ireland. *Ringling & Migration*, 33/1: 45-53.

Gubbay, S., 2007. Defining and managing Sabellaria spinulosa reefs: Report of an inter-agency workshop 1-2 May, 2007. JNCC Report, No405 44:22.

Hawkins, A.D., Roberts, L. and Cheesman, S., 2014. Responses of free-living coastal pelagic fish to impulsive sounds. *The Journal of the Acoustical Society of America*, 135(5), pp.3101-3116.

Irving, R., 2009. The identification of the main characteristics of stony reef habitats under the Habitats Directive (p. 44). Peterborough, UK: Joint Nature Conservation Committee.

JNCC, 2010. Statutory Nature Conservation Agency Protocol for minimising the risk of injury to marine mammals from piling noise. JNCC, Aberdeen.

JNCC, Natural England, SNH, and NRW. 2016. Joint Statutory Nature Conservation Bodies Position Statement: ORJIP Project 4, Stage1 of Phase 2 "The use of Acoustic Deterrents for the mitigation of injury to marine mammals during pile driving for offshore wind farm construction".

JNCC, 2020. Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). Report No. 654, JNCC, Peterborough.

JNCC, Natural England & the Northern Irish Department of Agriculture, Environment and Rural Affairs (DAERA) (2020). Guidance for Assessing the Significance of Noise Disturbance Against Conservation Objectives of Harbour Porpoise SACs (England, Wales and Northern Ireland). JNCC Report No. 654, JNCC, Peterborough, ISSN 0963-8091.

Jones, E.L., Hastie, G.D., Smout, S., Onoufriou, J., Merchant, N.D., Brookes, K.L. and Thompson, D., 2017. Seals and shipping: quantifying population risk and individual exposure to vessel noise. *Journal of applied ecology*, 54(6), pp.1930-1940.

Kastelein, R. A., L. Helder-Hoek, S. Van de Voorde, A. M. von Benda-Beckmann, F.-P. A. Lam, E. Jansen, C. A. de Jong, and M. A. Ainslie, 2017. Temporary hearing threshold shift in a harbor porpoise (*Phocoena phocoena*) after exposure to multiple airgun sounds. *The Journal of the Acoustical Society of America*, 142(4), pp.2430-2442.

Kiorboe, T.E. Frantsen, C. Sorensen, G. (1981) Effects of suspended sediment on development and hatching of herring (*Clupea harengus*) eggs. *Estuarine and Coastal Shelf Science*: 13.

Latto P. L., Reach I.S., Alexander D., Armstrong S., Backstrom J., Beagley E., Murphy K., Piper R. and Seiderer L.J., 2013. Screening Spatial Interactions between Marine Aggregate Application Areas and Sandeel Habitat. A Method Statement produced for BMAPA.

Linley, E.A.S., Wilding, T.A., Black, K., Hawkins, A.J.S. and Mangi, S., 2007. Review of the reef effects of offshore wind farm structures and their potential for enhancement and mitigation. Report to the Department for Business, Enterprise and Regulatory Reform. RFCA, 5.

Marine Space (Latto, P. L. Reach, I.S. Alexander, D. Armstrong, S. Backstrom, J. Beagley E. Murphy, K. Piper, R. and Seiderer, L.J.) (2013) Screening spatial interactions between marine aggregate application areas and sandeel habitat. A Method Statement produced for BMAPA.

McDougall, J., 2000. Section 5.1. The significance of hydrocarbons in surficial sediments from the Atlantic Margin regions. In Hydrocarbons in environmental surveys of the seafloor of the UK Atlantic Margin. Daventry, Northants NN11 5EA, UK.: Geotek Limited ISBN 09538399-0-7.

MMO (2014). Review of post-consent offshore wind farm monitoring data associated with licence conditions. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.

Nelson, B., 2010. The gannet. A&C Black.

Northridge, S., Kingston, A. and Coram, A. 2020. Preliminary estimates of seabird bycatch by UK vessels in UK and adjacent waters. Report prepared for the Department for Environment Food and Rural Affairs (Project Code ME6024).

Orsted, 2020. Hornsea Project Four Offshore Wind Farm - Evidence Plan. Marine Ecology & Processes Technical Panel. Technical Note - Marine Processes: Operational Wave Monitoring. Assessment. Doc. no. 01493919. Version B. The Planning Inspectorate (2018). Scoping Opinion: Proposed Hornsea Four Wind Farm.

Popper, A. N. Hawkins, A. D. Fay, R. R. Mann, D. Bartol, S. Carlson, Th. Coombs, S. Ellison, W. T., Gentry, R. Halvorsen, M. B. Lokkeborg, S. Rogers, P. Southall, B. L. Zeddies, D. G. and Tavolga, W. N., 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. Springer and ASA Press, Cham, Switzerland.

Popper, A.N. and Hawkins, A.D., 2019. An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. *Journal of fish biology*, 94(5), pp.692-713.

Reach I.S., Latto P., Alexander D., Armstrong S., Backstrom J., Beagley E., Murphy K., Piper R. and Seiderer L.J., 2013. Screening Spatial Interactions between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Areas. A Method Statement produced for BMAPA.

"Roach, M., Cohen, M., Forster, R., Reville, A.S. and Johnson, M., 2018. The effects of temporary exclusion of activity due to wind farm construction on a lobster (*Homarus gammarus*) fishery suggests a potential management approach. *ICES Journal of Marine Science*, 75(4), pp. 1416–1426."

Rouxel, Y., Crawford, R., Cleasby, I.R., Kibel, P., Owen, E., Volke, V., Schnell, A.K. and Oppel, S. 2021. Buoys with looming eyes deter seaducks and could potentially reduce seabird bycatch in gillnets. *Royal Society Open Science*, 8, 210225.

Sawyer, S.L. and Fogle, S.R. 2013. Establishment of a new breeding colony of Australasian gannets (*Morus serrator*) at Young Nick's Head Peninsula. *Notornis*, 60: 180-182.

Schoeman, R. P., C. Patterson-Abrolat, and S. Plön. 2020. A global review of vessel collisions with marine animals. *Frontiers in Marine Science*, 7, p.292.

Scott, K., Harsanyi, P. and Lyndon, A.R., 2018. Understanding the effects of electromagnetic field emissions from Marine Renewable Energy Devices (MREDS) on the commercially important edible crab, *Cancer pagurus* (L.). *Marine Pollution Bulletin*, 131, pp.580-588.

Scott, K., Harsanyi, P., Easton, B.A., Piper, A.J., Rochas, C. and Lyndon, A.R., 2021. Exposure to Electromagnetic Fields (EMF) from Submarine Power Cables Can Trigger Strength-Dependent Behavioural and Physiological Responses in Edible Crab, *Cancer pagurus* (L.). *Journal of Marine Science and Engineering*, 9(7), p.776.

Silvester, R., and Hsu, J., 1997. Coastal Stabilization. *Advanced Series on Ocean Engineering - Volume 14*.

Stenberg, C.; van Deurs, M.; Støttrup, J.; Mosegaard, H.; Grome, T.; Dinesen, G.; Christensen, A.; Jensen, H.; Kaspersen, M.; Berg, C.; Leonhard, S.; Skov, H.; Pedersen, J.; Hvidt, C.; Klastrup, M. (2011). Effect of the Horns Rev 1 Offshore Wind Farm on Fish Communities: Follow-up Seven Years after Construction (Report No. 246-2011). Report by DTU Aqua (National Institute of Aquatic Resources). Report for Danish Energy Agency.

Stenberg, Claus & Støttrup, J.G. & Deurs, Mikael & Berg, C.W. & Dinesen, Grete & Mosegaard, Henrik & Grome, T. & Leonhard, S. (2015). Long-term effects of an offshore wind farm in the North Sea on fish communities. *Marine Ecology Progress Series*. 528. 257–265. 10.3354/meps11261.

Stephens, D. and Diesing, M., 2015. Towards Quantitative Spatial Models of Seabed Sediment Composition. *PLoS One* 10(11): 30142502. Doi: 10.1371/journal.pone.0142502

Stöber, U. & Thomsen, F (2021). How could operational underwater sound from future offshore wind turbines impact marine life? *The Journal of the Acoustical Society of America* 149, 1791-1795 (2021)

Stone, C. J., K. Hall, S. Mendes, and M. L. Tasker. 2017. The effects of seismic operations in UK waters: analysis of Marine Mammal Observer data. *Journal of Cetacean Research and Management*, 16, pp.71-85.

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.

UKOOA, 2001. An Analysis of U.K. Offshore Oil and Gas Environmental Surveys 1975-95. Heriot-University.

"Whitehouse, R.J.S., Sutherland, J., and Harris, J.M., 2011. Evaluating scour at marine gravity structures. *Proceedings of the Institution of Civil Engineers, Maritime Engineering*, 164, December, Issue MA4, pp. 143 - 157"

Wright, L. J., Ross-Smith, V. H., Austin, G. E., Massimino, D., Dadam, D., Cook, A. S. C. P., Calbrade, N. A. and Burton, N. H. K. 2012. Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas. BTO Research Report No. 592.