The Planning Inspectorate
Yr Arolygiaeth Gynllunio

The Planning Act 2008

Hornsea Project Four Offshore Wind Farm

Examining Authority's Report
of Findings and Conclusions

and

Recommendation to the Secretary of State for
Business, Energy & Industrial Strategy

VOLUME 2

Examining Authority

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7. FINDINGS AND CONCLUSIONS IN RELATION TO MARINE AND COASTAL PROCESSES AND SEDIMENTS

7.1. INTRODUCTION

7.1.1. This Chapter covers the aspects of the marine and coastal environment considered in the Applicant's Environmental Statement (ES) in relation to coastal and marine processes, oceanography, bathymetry, marine geology, and the quality and nature of marine water and benthic sediments.

7.1.2. The Examining Authority's (ExA) Initial Assessment of Principal Issues [PD-005] included Marine and Coastal Geology, Oceanography and Physical Processes:

- adequacy of the geophysical, bathymetry and coastal processes baseline;
- marine and intertidal process modelling and impact predictions, including identification of receptors, scour prediction and protection, sand wave effects and sediment transport and deposition;
- location, extent and impact assessment of cable protection during the operational and post-decommissioning phases;
- assessment and mitigation of cable crossings;
- marine and intertidal process assessment implications for coastal erosion;
- assessment of effects on the Flamborough Front;
- analysis and assessment of dredged sediments and their disposal; and
- effects of marine infrastructure retained post-decommissioning including the potential exposure of buried infrastructure in the long term.

7.1.3. Matters relating to coastal and marine ornithology are considered in Chapter 8, to other marine ecology in Chapter 9, to seascapes in Section 11.7, the historic environment offshore in Section 11.4, to shipping and navigation in Section 11.6, and to commercial fisheries and fishing in Section 11.3.

7.1.4. The matters associated with European sites and the Habitats Regulations Assessment (HRA) in Chapter 13 are not repeated here, though both sections should be read together for completeness.

7.1.5. Matters relating to draft DCO Articles and the deemed marine licences (DMLs) are considered in Chapter 16 of this Report, cross-referenced here to the topic and issues they refer to.

7.2. POLICY CONSIDERATIONS

7.2.1. The marine part of the Proposed Development (ie that below mean high water at spring tides) is subject to the Marine and Coastal Access Act 2009 (MCAA), which introduced the need to obtain marine licences for specified activities, including many of those involved in the construction, operation and decommissioning of the Proposed Development. In this case, the Applicant seeks two DMLs through the draft Order [REP7-039]. These are at Schedule 11 of the draft DCO for the proposed generation assets, and Schedule 12 of the draft DCO for the proposed transmission assets.

7.2.2. The UK Marine Policy Statement (MPS) is relevant and important to the marine section of the Proposed Development. It reflects the National Policy Statements (NPSs) in its approach to Nationally Significant Infrastructure Projects and cross-refers to the Overarching National Policy Statement for Energy (NPS EN-1) and the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3), noting that decision makers should take account of the national need for the energy infrastructure it describes.

7.2.3. The MCAA introduced a system of marine planning in England with the MPS as the framework. The Marine Management Organisation (MMO) has developed the regional marine plans that form the system in English waters. The offshore elements of the Proposed Development would be located in areas covered by the East Offshore and East Inshore Marine Plans (EOEIMP). These list amongst their objectives:

- Objective 6: To have a healthy, resilient and adaptable marine ecosystem in the East Marine Plan Areas.
- Objective 7: To protect, conserve and, where appropriate, recover biodiversity that is in or dependent upon the East Marine Plan Areas.
- Objective 8: To support the objectives of Marine Protected Areas (and other designated sites around the coast that overlap with, or are adjacent to, the East Marine Plan Areas), individually and as part of an ecologically coherent network.

7.2.4. They include a section on 'Offshore Wind Renewable Energy Infrastructure', with two specific wind-related policies. WIND 1 notes that projects that are in, or could affect, sites held under a lease or an agreement for lease that has been granted by The Crown Estate for development of an offshore wind farm should not be authorised, unless certain conditions are met. WIND 2 encourages the pursuit of offshore wind farms in the East Marine Plan area to help realise UK Government ambitions for renewable energy.

7.2.5. The Marine Plans also include relevant policies relating to cumulative effects (ECO1) and consideration of Marine Protected Areas (MPA1).

7.2.6. Some of the coastal protection policies in the East Riding Local Plan Strategy Document 2012 to 2029 have limited relevance to the landfall works and these have been considered alongside marine planning policy. Policy ENV6, managing environmental hazards, has a Coastal Change

section, while Policy A2 is an area-based policy for the Bridlington Coastal sub area. There is an emphasis on avoiding development that would have a detrimental impact on Flamborough Head and Bempton Cliffs, and on the maintenance of coastal defences at Bridlington.

7.2.7. The overarching policy context for the ExA's consideration of the marine matters has been provided by this framework.

7.3. THE APPLICANT'S CASE

7.3.1. Several chapters of the Applicant's ES and associated application documents set out the Applicant's case for the marine element of the Proposed Development. Those most relevant to this Chapter of the Report comprised:

- ES chapter on Marine Geology, Oceanography and Physical Processes [APP-013];
- ES chapter on Benthic and Intertidal Ecology [APP-014, amended by AS-009];
- ES Annex: Marine Processes Technical Report [APP-067];
- ES Annex on Dredging and Disposal Site Characterisation [APP-042];
- ES Annex: Benthic and Intertidal Ecology Technical Report [APP-068], as amended by [AS-009];
- ES Water Framework Directive Assessment [APP-069];
- ES Marine Conservation Zone Assessment [APP-070];
- Outline Marine Monitoring Plan [APP-242];
- Outline Offshore Cable Installation Plan [APP-250].

7.3.2. The following were updated during the Examination:

- ES chapter on Benthic and Intertidal Ecology [REP7-004];
- ES Annex on Dredging and Disposal Site Characterisation [REP8-002];
- ES Annex: Benthic and Intertidal Ecology Technical Report [REP7-013];
- Outline Marine Monitoring Plan [REP7-058];
- Outline Offshore Cable Installation Plan, retitled as the Outline Cable Specification and Installation Plan [REP7-056].

7.3.3. Further relevant documents submitted during the Examination included:

- Clarification Note on Marine Sediment Contaminants [REP1-066] and [REP4-032];
- Clarification Note on Marine Processes Supplementary Work Scope of Works [REP1-068];
- Clarification Note on Marine Processes Supplementary Work [REP3-038];
- Marine Processes Supplementary Report [REP4-043];
- Clarification Note on Drill Arisings and Deposited Sediments [REP5-083];
- Professor Mike Elliot's Marine Processes Report Review [REP5-066];
- Clarification Note on Marine Processes Mitigation and Monitoring [REP5a-017];
- Sediment Sampling MMO Template [REP8-018].

7.3.4. The location of the marine element of the Proposed Development was shown on the Offshore Location Plan [APP-206], with greater detail for the proposed landfall provided in the Onshore Location Plan [APP-207].

7.3.5. The Applicant's assessment was set out in detail in the ES documents listed above. The general approach was similar for each topic, covering the relevant policy context, a summary of consultation, the study area, a description of the baseline, the relevant maximum design scenario for the Proposed Development, project alone and cumulative impact assessments (including mitigation and residual effects), and conclusions.

7.3.6. The ES Vol 1 Chapter 1 [APP-013] considered activities in the marine and intertidal environments related to the pre-construction, construction, operational and decommissioning phases of the Proposed Development on geology and ground conditions, coastal erosion, sediment dynamics and transport, bathymetry, tidal flows, and waves. Climate change and sea level rise were considered.

7.3.7. The activities associated with the Proposed Development that might cause effects on the identified sensitive receptors included: seabed preparation; the installation, maintenance and removal of cables, protection and structure foundations; and any resultant wakes and scour.

7.3.8. Table 1.21 [APP-013] listed the findings of the assessment. Only two effects were considered to be of greater than negligible significance. Changes to nearshore sediment pathways (which have the potential to affect the Holderness coast and Smithic Bank) were said to be slightly significant, whilst the suspension and resettlement of sediments from cable trenching was considered to have a potential effect of slight significance for the bathymetry of Bridlington Harbour. Neither residual impact was considered to be significant in the context of the environmental impact assessment (EIA).

7.3.9. The baseline and potential effects associated with marine sediments were largely covered in the ES chapter on Benthic and Intertidal Ecology [APP-014] and its associated technical report [APP-068], as amended by [AS-009]. In terms of sediment-related matters, the ES described: the desktop and sampling studies that were undertaken; the baseline sediment composition and seabed features; contamination levels; primary design commitments to eliminate or reduce likely significant effects; the maximum design scenario adopted for the assessment; and the residual potential effects.

7.3.10. Activities that were considered to have the potential to cause effects included: seabed preparation for structure foundations and cables; their installation, maintenance and decommissioning; the resultant scour and erosion; and drilling arisings and possible losses of fluids. The receptors of sediment-related effects addressed in the ES were all associated with marine habitats and wildlife, so the impacts are considered in Chapter 9 of this Report.

7.4. PLANNING ISSUES

Local Impact Report

7.4.1. The East Riding of Yorkshire Council's Local Impact Report (LIR) [REP1-074, section 4.7] addressed coastal erosion matters, including the possible effect of the Proposed Development. It noted that the Applicant's ES included a study of the effects of coastal erosion that took into account existing and approved projects and a description of the beach and cliffs at the proposed landfall.

7.4.2. The LIR acknowledged that the landfall would involve considerable works, including temporary access tracks and works compounds, but the Council was content that the use of horizontal directional drilling (HDD) would ensure that the cliffs and beach were not unduly disturbed.

7.4.3. It went on to note the need for cofferdams to enclose the HDD entry pits. It suggested that these would have the potential for localised effects, but only for a short period and they would be fully reversible.

7.4.4. The LIR confirmed that the effect of changes to waves and wave energy had also been considered and that, despite the high environmental sensitivity of sediment transfer along the east coast of England, the impact was considered to be negligible as there would be no measurable change in wave conditions.

7.4.5. Whilst noting that some assessment work was ongoing, in principle the Council considered that the Proposed Development would not lead to an unacceptable impact on coastal processes.

Scope of marine process receptors in the ES

7.4.6. Natural England's (NE) Relevant Representation (RR) [RR-029] noted disagreement with the Applicant's scope of marine process receptors and expressed concern that some protected sites may not have been considered in the ES. In response [REP1-038], the Applicant noted that a standard approach had been used and that, pre-application, the study area had been presented to a Technical Panel that included NE.

7.4.7. The ExA explored this through its first written questions (ExQ1) [PD-006], and the Applicant [REP2-038] agreed to undertake a reanalysis of the marine processes information through a Clarification Note on Marine Processes Supplementary Work Scope of Works [REP1-068] and subsequently a Marine Processes Supplementary Report [REP4-043]. This additional work concluded that all relevant receptors had been identified and assessed.

7.4.8. One of the protected sites under discussion was the Dimlington Cliffs Site of Special Scientific Interest (SSSI), which lies on the Holderness coast approximately 40 kilometres (km) south of the proposed landfall. The Marine Processes Supplementary Report [REP4-043] applied a source-pathway-receptor approach to identifying any potential effects of the Proposed Development here. It looked in detail at baseline erosion and

the potential sources of impact, including consideration of climate change and sea level rise.

7.4.9. The Marine Processes Supplementary Report [REP4-043] provided an analysis of the potential impacts of cable installation activities across Smithic Bank. It highlighted the material and process drivers of future trends in cliff erosion. The material drivers included cliff and shore platform geology, and the process drivers included variability in wave energy and direction, sediment supply and transport of sediment by waves, and sea-level rise. It suggested that the only factors that could be affected by cable installation activities would be sediment supply and transport and concluded that cable installation would not lead to changes. Geology and sea-level rise were said to have no relationship to cable installation activities, so there could be no cause and effect related to them. Overall, it did not find any potential for a material effect.

7.4.10. NE had also expressed concern [RR-029] that the Holderness Inshore Marine Conservation Zone (MCZ) and the Holderness Offshore MCZ had not been properly considered in the assessment of potential indirect effects. It noted that the MCAA requires the decision-making authority to be satisfied that there is no significant risk of hindering the achievement of the conservation objectives of an MCZ.

7.4.11. The Applicant's MCZ assessment [APP-070] was said to follow the relevant MMO guidance for marine licensing applications. This guidance advocates a three-stage approach. Stage 1 (screening) identified the Holderness Inshore MCZ and the Holderness Offshore MCZ as being within one tidal excursion (up to 14km) of the Proposed Development and potentially affected (Table 4). A stage 1 MCZ assessment was therefore carried out for these two sites. It concluded that the construction, operation, maintenance and decommissioning activities associated with the Proposed Development would not hinder the achievement of the conservation objectives of either MCZ, either alone or cumulatively, and a stage 2 MCZ assessment was therefore considered unnecessary.

7.4.12. The matter of receptors was explored further at Issue Specific Hearing (ISH) 10 [EV-034] and summarised in the Applicant's post-Hearing note [REP6-037]. The Applicant contended that it had gone as far as possible and that all appropriate receptors had been identified and assessed in the ES. The Applicant referred to an expert, peer review of the Marine Processes Supplementary Report that had been commissioned from Professor Mike Elliot [REP5-066] of the Department of Biological and Marine Sciences at the University of Hull. This agreed that appropriate receptors had been identified.

7.4.13. At the close of the Examination, NE's position [REP8-031] remained that not all relevant marine process receptors had been considered in the ES, though it was satisfied that the majority were covered through the MCZ assessment and HRA. The exceptions were the Humber Estuary SSSI and the Dimlington Cliffs SSSI. NE was content that any impacts on the former would be captured through the HRA, as it did not expect the

conclusions relating to the SSSI to be materially different from those for the Humber Estuary European sites. It continued to contend that potential impacts from the landfall works on the latter had not been addressed in the ES, though it accepted that the potential impacts of installing the offshore export cable on the Holderness coast had been addressed in supplementary information.

7.4.14. In relation to possible impacts associated with the array, NE [REP8-031] was content that supplementary information had addressed the Hills and Outer Silver Pits as receptors.

7.4.15. In July 2022, the Department for Environment, Food and Rural Affairs (Defra) issued a consultation on the potential designation of the Inner Silver Pit South as a Highly Protected Marine Area (HPMA). The ExA issued a request for further information under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010 (Rule 17 request) [PD-018] to ask the Applicant and NE if this had any implications for the Examination.

7.4.16. The Applicant [REP8-013] noted that the proposed Inner Silver Pit South HPMA is located to the south of Holderness Offshore MCZ and significantly further from the Proposed Development at its closest point. The closer northern section of Inner Silver Pit had already been considered in the Applicant's MCZ assessment [APP-070], and no significant effects had been found. The Applicant therefore considered there to be no material implications.

7.4.17. NE [REP8-027] noted that high-level conservation advice was being developed for HPMAs, and that, as they would be designated under the MCAA, they became a material consideration from the consultation launch. As NE considered the impacts of the Proposed Development on sediment transport and the Flamborough Front to be unclear, it considered the precise implications for the Inner Silver Pit South candidate HPMA to be difficult to quantify based on the available evidence. Therefore, it suggested that its general advice that the Applicant should reduce the potential for impact as far as possible, build in further opportunities for refinement post-consent, and include appropriate monitoring and trigger points for intervention should be extended to the potential Inner Silver Pit South HPMA.

Sediment sampling and analysis

7.4.18. The MMO raised questions [RR-020] and [REP3-052], about the sediment collection methods, the depth that samples were taken from, the laboratories used for the analysis, and the format in which the sediment sampling and analysis work had been presented. The matters were discussed throughout the Examination, including in ExQ1 [PD-006], the ExA's further written questions (ExQ2) [PD-012], and during ISH4 [EV-027] and ISH10 [EV-034].

7.4.19. Initially, the Applicant believed that the clarification needed by the MMO was already in the application and signposted the relevant information

during ISH4. It also confirmed that the laboratories used to undertake the sample analysis were accredited by the MMO.

7.4.20. To address ongoing confusion, the Applicant submitted an updated Clarification Note on Marine Sediment Contaminants [REP4-032]. This included the relevant laboratory analysis certificates and further assessment of the effects of sediment disposal on biota. The MMO [REP5-107] was content that this resolved its concern relating to the ambiguity of some of the analyses but continued to express concerns about sampling depths and whether the contracted laboratories were accredited.

7.4.21. The Applicant confirmed [REP5a-014] that all sediment samples collected for contaminant analysis were acquired from the seabed surface using a mini-Hamon grab. It updated the MMO results template with the sampling depth (0m) and continued to assert [REP6-037] that only accredited laboratories had been used. MMO confirmed [REP6-050] that this had addressed most of its comments. However, it remained concerned that the sub-contracted laboratory that carried out the particle size analysis was not validated.

7.4.22. Following discussions outside the Examination, the MMO reported [REP7-111] that it had agreed to review and comment on the particle size analysis on the provision that a condition was included in the DMLs that either the samples would be re-analysed by a validated laboratory or that the Applicant provided evidence that the laboratory that had undertaken the analysis had been validated, and that this was worded such that no works relevant to sediment disturbance would start until the condition had been discharged in consultation with the MMO.

7.4.23. The Applicant updated the Outline Marine Monitoring Plan [REP7-058] with:

"In the event that the pre-application Particle Size Analysis (PSA) results have not been approved by the MMO prior to DCO award, no disposal activities associated with Hornsea Four will take place until the MMO have provided this approval in writing."

7.4.24. At the close of the Examination, the Applicant reported [REP8-016] that the samples had been re-analysed by a laboratory validated by the MMO for particle size analysis and that the results had been made available to the MMO. Notwithstanding this, the Applicant retained the new requirement in the Outline Marine Monitoring Plan [REP7-058] to commit to the MMO's request. A copy of the completed MMO template spreadsheet was submitted into the Examination at Deadline (D) 8 [REP8-018]. Given the timing, there was no realistic opportunity for the MMO to indicate whether it was content with the re-analysis before the Examination closed.

Disposal of dredgings and drill arisings and associated monitoring

7.4.25. The MMO [RR-020] raised questions about the proposed dredgings disposal site. The Applicant [REP1-038] signposted the relevant information and, in response to a written question from the ExA [PD-006], confirmed [REP2-038] that its disposal areas would be along the proposed cable routes but avoiding the Dogger Bank A and B export cable corridor, to avoid cumulative effects. The Applicant submitted a plan to show the overlap between the Dogger Bank Creyke Beck Order limits and those proposed in the application [REP2-048].

7.4.26. Following clarification of some details around the plan and checking the co-ordinates used, the MMO indicated [REP4-052] that it was content. In response to a request from the ExA in ExQ2 [PD-012], the plan was resubmitted with minor amendments [REP5-061] to provide further clarity.

7.4.27. The Applicant also provided a Clarification Note on Drill Arisings and Deposited Sediments [REP5-083] to provide additional reassurance in relation to matters raised by the MMO and NE. Following review, the Applicant concluded that the findings of the assessments in the application remained valid, and that there would be no significant impact in relation to construction drilling and disposal activities.

7.4.28. Later, at ISH10 [EV-034], the MMO confirmed that the Dogger Bank A and B export cable corridor was no longer an open disposal site. As such, it advocated the re-implementation of this area as a disposal site for the Proposed Development. The Applicant facilitated this in an update to the draft DCO [REP5a-002].

7.4.29. Following further consideration, the MMO [REP7-111] noted that the Dredging and Disposal Site Characterisation document [REP6-004] had been updated based on earlier discussions on the potential disposal sites. This overcame its concerns about disposal sites on Smithic Bank, as the numerical modelling studies demonstrated that any disposals there would remain in the Bank system and thus not impact on its form or function. Therefore, it agreed with the Applicant that *in situ* disposal of dredged material would be the best option, and broadly agreed with the assessment of no significant impact on benthic receptors.

7.4.30. However, the MMO advised that pre-construction monitoring should be undertaken to identify areas of different particle sizes to allow dredged sediment to be deposited on similar sediments wherever possible. It also sought clarity on whether the dredged sediments would be disposed of in an even manner, or if a series of cells would be needed to manage the thickness. The MMO also noted the potential for chalk sediment plumes from any foundation drilling to travel considerable distance due to their low settling velocity, and requested that, if surface plumes were observed, photographs should be taken and reported to the MMO.

7.4.31. The Applicant's final Dredging and Disposal (Site Characterisation) document [REP8-002] was submitted a few days prior to the conclusion of the Examination. This reflected the suite of monitoring proposed by the Applicant in the Outline Marine Monitoring Plan [REP7-058]. Whilst this included a proposal for post-construction bathymetric monitoring, no other monitoring relating directly to the disposal of dredged material was proposed and the package therefore fell short of the request from the MMO. The Dredging and Disposal (Site Characterisation) document [REP8-002] notes the Applicant's reasoning for this:

- the ES finds no long-term impacts of spoil and dredgings disposal due to the limited increase in seabed level and the temporary nature of any sediment plumes that would be generated;
- the disposal of sediment is predicted to result in only short-term, localised impacts; and
- the seabed material to be disposed of *in situ* is not heavily contaminated.

7.4.32. The MMO [REP4-052] also requested ongoing monitoring of samples of sediment from the proposed dredge and disposal area until construction activities were complete. The suggestion was that this should take place every three or five years, depending on the results of the sediment sample analysis. The Applicant's view, given at ISH4 [EV-027], was that construction would last less than five years so such monitoring would be unnecessary.

7.4.33. The matter was not immediately resolved and was revisited in ExQ2 [PD-012] and at ISH10 [EV-034]. The Applicant [REP5-074] sought further information and justification from the MMO, but the MMO [REP5-107] and [REP6-050] was unable to comment until the matters around the analysis of samples and accreditation of the laboratories had been resolved.

7.4.34. In the Written Summary of the Applicant's Oral Case ISH10 [REP6-037], the Applicant had researched earlier offshore wind farm applications, and contended that it was commonplace for sediment samples to be collected between five and eight years prior to construction with no validity period imposed, nor any requirement to re-sample on an ongoing basis, except where there were known high levels of contaminants. It noted that there was no evidence here to suggest high levels of contaminants that might lead to significant concern. As such, the Applicant did not consider ongoing sampling of sediment to be necessary.

7.4.35. The Applicant also noted that, at ISH10, the MMO had drawn comparisons with the East Anglia ONE North and East Anglia TWO offshore wind farms, where conditions were included in the DMLs in relation to ongoing monitoring. However, the Applicant's review had shown that this was specifically related to disagreements about the methodology used to collect and analyse the samples to inform the EIA. The disagreement appeared to have been resolved through an agreement to re-survey pre-construction. As such, the Applicant continued to maintain that no further sediment sampling would be required.

Backfilling of HDD exit pits

7.4.36. The ExA noted from the ES [APP-013] that additional material could be required to backfill the eight HDD exit pits in the landfall area to make up for any loss in excavated sediment volume, and that rocks may be used. It asked the MMO and NE whether this was acceptable in ExQ1 [PD-006].

7.4.37. NE [REP2-082, superseded by AS-028 and AS-029] did not believe that rock should be used and added further concerns about a lack of detail on how the seabed profile would be reinstated. The MMO [REP2-077] advised that material resulting from the works should be used in reinstatement to reduce the risks that could arise from new material being introduced to the habitat.

7.4.38. In response, the Applicant said [REP3-046] that the preferred option would be to side-cast the excavated material onto the adjacent seabed as a temporary spoil mound for later backfilling. Whilst not its preferred option, the Applicant retained a fallback to use additional materials to ensure that the original seabed profile could be reinstated. The use of rock was not discounted. It intended to provide an updated Cable Specification and Installation Plan, which is conditioned in the DML, to provide the details requested by NE in relation to the restoration of the seabed profile.

7.4.39. In the absence of any obvious progress, the ExA pursued this further at ISH10 [EV-034]. Following that Hearing, NE [AS-048] expressed reassurance that the matter could be dealt with through the Cable Specification and Installation Plan process, but only if the Outline Plan was updated specifically to mention the HDD exit pits. MMO confirmed similar concerns relating to the import of materials at the Hearing and considered it improbable that there would be any such requirement as the pits would most likely recover through natural restoration methods.

7.4.40. The Applicant updated the Cable Specification and Installation Plan [REP6-013] with a new section 8 that addressed the matter. Should the material excavated from the HDD exit pits be winnowed by hydrodynamic processes, necessitating the use of additional material for infilling, section 8 restricts the area of sediment winning to the local area, as defined on a map. A further update to the Plan [REP7-056] clarified that the material from the excavation of the HDD exit pits would be utilised in the first instance for backfilling.

Impacts on Smithic Bank and the Holderness coast

7.4.41. NE's [RR-029] and the MMO's [RR-020] RRs raised concerns about the baseline information and impact assessment relating to the geomorphology and evolution of Smithic Bank, an offshore sand bank that has formed in the centre of gyre[1] generated as the tidal flow curves

[1] A gyre is a system of rotating ocean currents

around Flamborough Head. It stretches some 12km southwards from just south of Flamborough Head.

7.4.42. The concerns related particularly to the proposed installation of the export cable across the southern part of Smithic Bank and the potential for this and the associated rock protection to result in the lowering of the Bank or the alteration of its morphology. Additionally, it was noted that the crossing of the Dogger Bank A and B offshore wind farm export cables in this area would also require a substantial amount of rock protection.

7.4.43. In turn, there were concerns about potential secondary effects on other marine process receptors such as the Holderness coast, the Holderness Inshore MCZ, the Dimlington Cliffs SSSI, the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and SSSI, and the Flamborough Head SAC and SSSI.

7.4.44. The Applicant's Marine Processes Supplementary Report [REP4-043] addressed the coastal process issues that had been raised by NE and the MMO. The potential impacts of any change in the form and function of Smithic Bank on wave energy at the coast as a result of the installation of the export cable had not been addressed in the ES [APP-013]. This meant that effects on coastal morphology and nearshore sediment transport pathways, and any consequent implications for erosion along the Holderness coast, might not have been fully addressed. These matters were dealt with in the supplementary report.

7.4.45. The baseline for Smithic Bank and the Holderness coast was described using historical trend analysis. The assessment of effects was driven by expert geomorphological assessment and by a Source-Pathway-Receptor model for Smithic Bank.

7.4.46. North Smithic Bank was said to demonstrate more dynamic behaviour than South Smithic Bank, with larger mobile sand waves driven by strong tidal flows under the influence of Flamborough Head. South Smithic Bank (crossed by the proposed offshore export cable corridor) was more wave exposed, with a more stable, flatter profile. The morphology was shown to change naturally. The bedforms across North Smithic Bank could be up to 9m high and migrated at rates of between 5m and 32m per year between 2011 and 2016. South Smithic Bank migrated some 10m to 15m per year between 1979 and 2011. The change in morphology led to lowering of the crest by approximately 1.5m and a rise of about 3.5m along the flank over the 32 years.

7.4.47. The geomorphological assessment suggested that rotational sand transport around Smithic Bank is likely to be contained within Bridlington Bay, with little or no transport southwards along the Holderness coast.

7.4.48. The modelling examined three main concerns: an adverse effect on the form and function of Smithic Bank; changes to nearshore sediment transport processes caused by changes to wave climate and cable

protection; and changes to erosion rates along the Holderness coast through changed sediment supply from the Bank to the coast.

7.4.49. The requirement for sand wave clearance along the cable routes had been revisited by the Applicant in a clarification note, Justification of Offshore Maximum Design Scenarios [REP3-035]. This proposed a 25.8% reduction in the maximum design scenario volumes for bedform clearance for cable installation. The Applicant changed the relevant numbers in Part 1 of Schedule 1 of the draft DCO [REP4-050], the ES Project Description [REP4-004], the Pro-Rata Annex [REP4-006] and the Dredging and Disposal (Site Characterisation) document [REP6-004] such that the revised maximum could be secured.

7.4.50. Whilst NE welcomed this [REP4-054], it noted that the total area of sand wave clearance was unchanged and requested [AS-048] a commitment to no bedform clearance across Smithic Bank. In response to ExQ2 [PD-012], NE [REP5-111] clarified that it had hoped the additional work would have allowed the bedform clearance area to be reduced where there were no bedforms present, and particularly around Smithic Bank. It considered a strip of 40m along the full length of the cable corridor to represent 'a huge area of temporary disturbance', which it believed not to be standard practice for wind farm developments.

7.4.51. The Applicant provided a rationale [REP5-081] for why further changes were not possible, referring back to the Justification of Offshore Maximum Design Scenarios [REP3-035] and noting that cable installation tools typically require a relatively flat seabed to work effectively and that the cable must be installed to a depth where it is likely to stay buried.

7.4.52. The clarification note also reported that the Applicant had re-evaluated the maximum design scenario for rock protection across Smithic Bank in the light of concerns. It was able to reduce the generic 10% cable protection requirement in the application draft DCO [APP-203] to a maximum of 5% for the length of the cables across Smithic Bank. The relevant numbers were updated in Requirement 5 of the draft DCO [REP4-050], the ES Project Description [REP4-004], and the Pro-Rata Annex [REP4-006], such that the revised maximum could be secured.

7.4.53. The Marine Processes Supplementary Report [REP4-043] noted that any rock protection at the crossing of the Proposed Development and Dogger Bank A and B cable corridors would be seaward of the boundary of Smithic Bank in an area that was not subject to the processes that drive the evolution of Smithic Bank [APP-013] and [APP-067]. Nevertheless, NE [AS-048] continued to have concerns and asked for the maximum rock protection berm height for the crossing to be reduced from 3m to 1.8m.

7.4.54. Smithic Bank provides shelter to the coast around Bridlington, especially during storms, and it is possible that any lowering could affect received wave energy and thus adversely affect the beaches around Bridlington. The supplementary report suggested that the crest of Smithic Bank reduced naturally at an annual average of approximately 47mm between

1979 and 2011 and some 40mm to 160mm per year between 2011 and 2016. This occurred over large areas and constituted a significant loss of sand. The landscape-scale lowering of the bank was considered likely to continue in the future. The volume of sand that would be excavated for the installation of the export cable would be very small in comparison to the much larger volume that is seen to have been lost naturally.

7.4.55. In terms of erosion rates along the Holderness coast, the clockwise tidal gyre around Smithic Bank means that most sediment is contained within the area. Future erosion would continue to be driven by wave processes and sediment supply, unaffected by any changes to Smithic Bank as a result of the installation of the export cable. Climate-induced sea-level rise is likely to increase erosion rates at the coast, but this would also be independent of any changes to Smithic Bank. As such, the report decided that cable installation would not affect the supply of sediment or transport processes for the identified sensitive receptors.

7.4.56. The report [REP4-043] concluded that any changes to sediment supply, transport and pathways caused by the installation of the cable and protection on Smithic Bank would not be significant in the context of the established large-scale, natural changes, which are anticipated to continue into the future. It also predicted a negligible effect on the wave climate. Overall, in turn, there would be no significant effect on any of the identified receptors, including the Holderness Inshore MCZ, the Dimlington Cliffs SSSI, the Humber Estuary SAC, SPA and Ramsar site, or the Flamborough Head SAC.

7.4.57. Professor Mike Elliot's peer review of the Marine Processes Supplementary Report [REP5-066] looked at the relevant marine geology, oceanography and physical processes matters raised by NE and the MMO and how the information submitted by the Applicant dealt with them. Whilst noting that the science was complex and that it was difficult to be precise when assessing potential impacts, the review was generally supportive of the Applicant's approach and conclusions. The ExA sought clarity on some matters in the review at ISH10 [EV-034].

7.4.58. The MMO and NE submitted [REP5-114] their own joint review of the Applicant's Marine Processes Supplementary Report. This noted some areas of continuing disagreement, highlighted data limitations and several omissions, and made suggestions for mitigation and monitoring at Smithic Bank. It noted the importance of retaining the sediment removed from the Bank during cable installation within this system to ensure ongoing integrity (for the project alone and cumulatively with other cabling projects). It also confirmed a continuing concern that cable protection on Smithic Bank could alter hydrodynamics and sediment transport, with the potential for associated morphological impacts.

7.4.59. The joint review questioned the accuracy of the baseline characterisation due to the partial coverage of available data. It noted the inferences made and contended that a high degree of uncertainty remained. As such, section 1.6 of the joint review [REP5-114] recommended a detailed suite of mitigation and monitoring measures.

7.4.60. These matters were discussed in some detail at ISH10 [EV-034] and the Applicant provided a comprehensive response in a Clarification Note on Marine Processes Mitigation and Monitoring [REP5a-017]. The note highlighted that the export cable corridor route plus a 500m temporary works area buffer had been designed to avoid impacts from installation on MCZs, and that the Applicant had been left with little feasible space for a route to the landfall other than crossing Smithic Bank, which, it pointed out, is not protected by designation.

7.4.61. The clarification note included the Applicant's interpretation of the joint review's mitigation and monitoring recommendations [REP5a-017, Table 1] and set out further commitments in relation to Smithic Bank in Tables 4, 5 and 6. Whilst these fell short of complete agreement with the review's suggestions, the Applicant committed to:

- pre-construction monitoring using high-resolution, multi-beam bathymetry of Smithic Bank from the Holderness coast (mean low water springs) to the Dogger Bank A and B Cable Crossing; and
- monitoring surveys every six months for the first three years following completion of construction, with the possible requirement for further surveys reviewed thereafter.

7.4.62. Also, having reviewed its maximum design scenario, the Applicant confirmed that gravity base structure foundations would now be restricted to no more than 80 of the 180 turbine locations, a reduction from a maximum of 110 in the application draft DCO [APP-203]. The revised monitoring proposals were later captured in the updated Outline Marine Monitoring Plan [REP7-058, Table 3].

7.4.63. The clarification note explained why some of the other suggestions would be impractical. For example, the idea of bundling cables would not be feasible without reducing electrical output. The note also provided a review of monitoring requirements in other recently made Orders for offshore wind farms and their relevance to the Proposed Development.

7.4.64. The Applicant noted its earlier commitment to ensuring that the Dogger Bank A and B cable crossing was positioned as far east as possible, beyond the 20m depth contour east of the Smithic Bank. The note added to this by committing to review the proposed mitigation when all the necessary information was available. This was secured through an updated Outline Offshore Cable Specification and Installation Plan [REP6-013, subsequently updated to REP7-056].

7.4.65. The MMO summarised its position in relation to cable installation and Smithic Bank in a post-Hearing note [REP6-050]. It advised a high-resolution, pre-construction survey be undertaken, followed by a post-installation survey every six months for two years, and further surveys every five years for the duration of the project. It considered that tighter control measures were required to ensure that the minimum possible amount of rock protection was deployed across Smithic Bank. It suggested that this be achieved through a condition in the DML requiring submission of the results of detailed pre-construction surveys and a cable burial risk assessment for the Smithic Bank area. This would detail the

method of installation and the percentage of cables needing protection. This would then be reviewed and approved by the MMO. NE generally supported this approach [AS-048].

7.4.66. Close to the end of the Examination, NE [REP7-103] summarised its position on this matter:

"As a result of the combination of the focus on direct impacts without the consideration of the indirect effects of the proposal; the difficulty in adequately characterising the functioning and therefore influence of key receptors, and the further uncertainty introduced through the use of the Rochdale Envelope Approach, Natural England are unable to agree with the conclusions of the ES."

7.4.67. Its final advice relating to cable installation, rock placement, the Dogger Bank A and B cable crossing, and cable repair and remediation therefore focussed on reducing risk, having flexibility in final management plans and securing monitoring with associated triggers and remediation measures.

7.4.68. In its final submission on the matter [REP8-028], NE was content with the pre-construction monitoring proposed for Smithic Bank in the updated Outline Marine Monitoring Plan [REP7-058]. It was also broadly content with the proposed post-construction monitoring methodology, but with some queries regarding the extent and timing of the surveys.

7.4.69. The MMO [REP8-022] sought clearer definition of the 10% buffer to be applied to the cable route and further information on the proposed bathymetry survey.

7.4.70. The key final positions on the proposals for monitoring any impacts on Smithic Bank can therefore be seen in the Applicant's updated Outline Marine Monitoring Plan [REP7-058], NE's End of Examination Position on Marine Processes [REP7-103] and Comments on the Outline Marine Monitoring Plan [REP8-028], and the MMO's D8 submission [REP8-022, section 1.1].

Impacts on the Flamborough Front

7.4.71. Considerable time was spent in the Examination discussing the relationship between the Proposed Development and a phenomenon known as the Flamborough Front. This is a seasonal, tidal-mixing front that forms at the boundary between the southern and northern North Sea.

7.4.72. The MMO's RR [RR-020] noted an outstanding request for further information and assessment that had apparently been discussed with the Applicant pre-application. This included satellite thermal imagery of the impact of the Proposed Development on the Flamborough Front to determine the potential for the development of cold-water thermal plumes as a consequence of increased mixing around foundations, and any secondary impact of this on ecological productivity.

7.4.73. There also appeared to be conflicting information about the location of the Front. The ES [APP-013] suggested that it lay to the south of the proposed array area. NE's RR [RR-029] argued that the evidence set out in the Applicant's Marine Processes Technical Report [APP-067] showed that the location was not fixed and that the proposed array area would overlap or be close to the Front for much of the year.

7.4.74. The ExA felt that the extent to which the location varied and over what sort of time frame it moved was unclear. Consequently, it was not possible to understand the implications for turbulent wakes and their effects, especially if gravity base structure foundations were to be used for turbines in this area.

7.4.75. NE's RR also suggested that the Flamborough Front should have a high sensitivity rather than the medium sensitivity allocated in the ES, given that it was known as an area of high biological productivity, including potentially being the basis of an important food chain that provided fish prey for seabird and marine mammal qualifying features from European sites.

7.4.76. Given the uncertainties, the ExA asked the Applicant for further information about the location, sensitivity and assessment of the Flamborough Front through ExQ1 [PD-006].

7.4.77. The Applicant noted [REP1-038] the ES conclusion that the magnitude of impact on the Front would be negligible. Therefore, even if the sensitivity was considered high, the associated impact would be slight and remain not significant. In response to the MMO, the Applicant said that the use of satellite thermal imagery to determine if cold water thermal plumes could develop would be neither necessary nor feasible, not least because any increased mixing would not be detectable at the spatial resolution of available satellite imagery.

7.4.78. In addition to clarifying some of the information set out in the Marine Processes Technical Report [APP-067], the Applicant proposed to commission further studies to look at the position of Flamborough Front and the potential impacts of the Proposed Development. A proposed scope of work for a Marine Processes Supplementary Report was shared with the MMO and NE and submitted into the Examination [REP1-068]. It included additional consideration of the Flamborough Head SAC and the Humber Estuary SAC, SPA and Ramsar site as receptors.

7.4.79. The matter was considered at ISH4 [EV-027]. There was some discussion about the scope of the ongoing studies, including an MMO suggestion that a historic trends analysis using historic satellite images could usefully be included, but little progress was made in the absence of the additional information due to be provided in the Supplementary Report.

7.4.80. Subsequently, the Applicant submitted the Marine Processes Supplementary Report [REP4-043] into the Examination. A data review drawing on existing models and scientific literature had been employed to provide a further description of the baseline environment of the

Flamborough Front, as historical trend analysis was not considered appropriate. The report considered spatial and temporal extent and variability.

7.4.81. The report [REP4-043] explained that the Flamborough Front is a seasonal tidal mixing front that forms at the boundary of the southern North Sea, which is well-mixed, and the northern North Sea, which is typically deeper, with slightly weaker currents, and some temperature stratification in the spring and summer. During this period, a transition forms between the two - the Flamborough Front. Its precise location varies, though it generally runs parallel to the coast to the north of Flamborough Head, approximately 10km offshore, and then extends for several hundred kilometres in an east to westerly orientation offshore from Flamborough Head.

7.4.82. An analysis of satellite data for the summers between 1999 and 2008 suggested that the front was in a zone east of Flamborough Head for 70% to 90% of the time. This area includes the Proposed Development. In autumn, the front was seen to be in that zone for approximately 30% to 50% of the time.

7.4.83. The report [REP4-043] also drew on a mapping exercise carried out by The Wildlife Trusts, *Areas of Additional Pelagic Ecological Importance*, which compared frontal data from around the UK with marine wildlife distributions. Many biodiversity hotspots coincided with frequent fronts, including those for seals, turtles, sharks, and various cetaceans and seabirds, because of the upwelling of nutrients and plankton. The map suggested that the waters around Flamborough Head are particularly rich in marine life as a result of the proximity to an upwelling of nutrient and prey-rich waters associated with the Flamborough Front.

7.4.84. The report [REP4-043] went on to provide an expert assessment of the potential impact of the Proposed Development on the Flamborough Front. Impacts could derive from changes to near field mixing due to foundation wake effects and the potential for the destabilisation of water column stratification locally, driven by the interaction of tidal processes and the array foundations.

7.4.85. The assessment noted that the worst-case scenario for impacts would be associated with the greatest number of gravity base structures at the minimum spacing between them. This was the scenario tested in the ES.

7.4.86. The report [REP4-043] provided further evidence from published research on the possible impacts of wind turbine foundations on shelf sea stratification, which it noted was also used to support the Hornsea Project Three Offshore Wind Farm application. This suggested that stratification is only very gradually affected (on a timescale of hundreds of days), and then only if the same body of water repeatedly passes through the wind farm. In practice, this would not be the case, and it was suggested that, given the seasonality of the front, there would be only a partial effect. The report also noted that turbulence from the structures would be local to each foundation, and that the effect would dissipate

'downstream'. As the distance of measurable wake was likely to be less than the minimum separation between foundations (810m), this would not lead to any cumulative, array-scale effects.

7.4.87. The report [REP4-043] concluded with an update to the impact assessment. It noted that the offshore array would be located in an area bounded to the north and south by the reported seasonal positions of the Flamborough Front. Thus, over time, the Proposed Development could sit in the well-mixed waters to the south, the stratified waters to the north, or on the front itself. In the last case, the maximum design scenario set out in the ES would have some potential to cause localised turbulent wakes that could affect the tidal mixing process, which in turn could have the potential to affect the formation of the Flamborough Front in the immediate vicinity of the width of the array.

7.4.88. This possible local reduction in the strength of vertical stratification was reconsidered, but the report concluded that the Flamborough Front is strongly stratified in the spring and summer and that the high buoyancy forces associated with the stratification would not be destabilised by the local and relatively small turbulent wakes generated by each foundation. The report thus confirms the findings set out in the ES that the magnitude of any impact on the Flamborough Front would be negligible.

7.4.89. A joint review of the Applicant's Marine Processes Supplementary Report by the MMO and NE [REP5-114] raised some matters of continuing disagreement about the Flamborough Front, along with mitigation and monitoring suggestions. It suggested that recent research by Carpenter *et al* (2016), Christiansen *et al* (2022), and Dorrell *et al* (2022) showed a potential for large-scale hydrodynamic changes from clusters of wind farms in seasonally stratified seas. Turbulent mixing could lead to changes in regional primary productivity and, in turn, the dynamics of the marine ecosystem. The review noted that the research focussed on monopile foundations and that any use of gravity base structures could lead to an even greater effect.

7.4.90. Professor Elliot's peer review of the Marine Processes Supplementary Report [REP5-066] appeared to contend that the Applicant had provided all reasonable scientific evidence and generally to support its conclusions in this context. In relation to the level of potential for the Front to be disturbed, it noted the difference between the Applicant on the one hand and the MMO and NE on the other and came to the conclusion that there was no strong evidence either way without ground truthing after the array was in place.

7.4.91. The ExA explored the matter further at ISH10 [EV-034], including an exploration of the literature sources used by the various parties and the mitigation and monitoring proposals put forward in the MMO and NE review.

7.4.92. The Applicant also submitted a report into the indirect effects of the Proposed Development on birds as a consequence of changes to productivity and fish populations [REP5-085]. The Applicant described in

its Ornithology Environmental Impact Assessment and Habitats Regulations Assessment Annex [REP5-078] how work on this had highlighted that the Flamborough Front was more typically located to the north of the Proposed Development's array area. While it was possible that higher catch rates of commercial fish in those waters was related to the Front, at least in part, there were also higher density hotspots to the south of the Proposed Development's array area. These were considered unlikely to be linked to the Front and were more likely a consequence of the naturally shallower waters.

7.4.93. The Applicant responded to the joint review in a Clarification Note on Marine Processes Mitigation and Monitoring [REP5a-017]. The Applicant's interpretation of, and response to the suggested mitigation and monitoring requirements for the Flamborough Front were addressed in the note and set out in Table 2. The Applicant's revised monitoring proposals were set out in Tables 7, 8 and 9. Whilst these did not fully meet the suggestions in the joint review, particularly in relation to the requirements for, and triggering of far-field monitoring, the Applicant proposed a number of commitments and a future update to the Outline Marine Monitoring Plan [APP-242]. The maximum design scenario for turbine gravity base structures was reduced to 90 (80 for turbine foundations), secured through the draft DCO [REP5a-002, Schedule 1, Part 3, Requirement 13].

7.4.94. Table 8 of the clarification note outlines the Applicant's proposed approach to far-field monitoring. The results of the near-field monitoring proposals (Table 7) would be used to decide whether far-field monitoring was also required. If the near-field monitoring was to confirm turbulent wakes in exceedance of those predicted in the ES, this would trigger the additional far-field monitoring (Table 8). The Applicant [REP6-037] believed the compromise to be proportionate, given the predicted negligible impact.

7.4.95. NE [AS-048] welcomed the commitment to reduce the maximum number of gravity base structures but continued to argue that none should be used, noting that the proposed mitigation might not even be sufficient for the less intrusive and more usual foundation types. It noted published research by Foster (2018) that reported wakes of greater than 1km from other offshore wind farms in the North Sea, and for wake-to-wake merging to occur. It therefore contended that a final detailed layout plan should be put forward pre-construction, with a detailed assessment of wake and plume lengths, and that this must be assessed and discharged by the MMO in consultation with the statutory nature conservation bodies. NE went on to suggest that the Applicant's post-construction monitoring proposals must be at the whole array scale, not just at a small sample of turbines, and should include satellite monitoring across the whole array and beyond.

7.4.96. The MMO [REP6-050] welcomed the progress made by the Applicant and was generally satisfied with the level of detail and resolution of the Applicant's proposed monitoring. However, the MMO believed that the monitoring needed to be at an array scale from the outset, rather than

waiting to see if monitoring at three sample locations triggered a need for a wider scale monitoring. Like NE, the MMO proposed that the monitoring should look at productivity (chlorophyll levels), sediment plumes, and turbine wake interactions, in spring, summer and autumn.

7.4.97. The Applicant submitted an updated Outline Marine Monitoring Plan [REP7-058]. This now included some of the post-construction monitoring measures that had been discussed. In relation to near-field monitoring, the proposal was for surveys in the lee wake of three gravity base structure foundations (if used) across the array, notionally one wind turbine generator gravity base structure, one large box-type gravity base structure and one small box-type gravity base structure. A single survey would be undertaken for each, ideally during spring tides to coincide with times of peak flood or ebb flow (when there would be maximum wake effect), during a period of summer stratification. The survey would use a towed thermistor chain and an acoustic doppler current profiler. Transects would be taken across observed wake at 100m intervals downstream of each foundation to a maximum of 1,000m distance.

7.4.98. Some far-field monitoring proposals had also been added to the updated outline plan, with the continuing caveat that these would only be undertaken should the near-field monitoring confirm turbulent wakes in exceedance of those predicted in the ES. The Applicant argued that it was entirely logical and reasonable to determine and validate whether the ES conclusions at a near-field scale were accurate before considering far-field effects. It highlighted the potential practical and programme limitations that a satellite survey could be prepared, approved and undertaken, then uncontrollable factors such as cloud cover could preclude the use of the data.

7.4.99. The Applicant's proposal for far-field monitoring applied to the whole array area, based on an evaluation of satellite images representing sea surface temperature and chlorophyll concentrations. The Applicant noted that the available satellite image resolution was 1,000m for sea surface temperature and 300m for chlorophyll, which limited the monitoring to array scale effects rather than those of an individual foundation.

7.4.100. The Applicant confirmed that an imagery data bank was available to cover the pre-construction period. Post-construction, the Applicant said that the relevant satellite, known as Sentinel 3, passed over every 27 days, but that the swath width of 1,270km could provide adequate images every 1.4 days, subject to there being no cloud cover. The Applicant proposed to compile and submit bi-monthly composite images for an initial period of 12 months, thus capturing seasonal variations.

7.4.101. At the end of the Examination, differences remained between the parties about the potential effects of the Proposed Development on the Flamborough Front, largely based on the uncertainties associated with the underlying science and the level of precaution that should be taken as a result. The differences relating to the necessity, scope and timing of monitoring had narrowed with compromise suggestions from the Applicant but remained some distance apart. As with its position on

Smithic Bank issues, NE [REP7-103] concluded that it could not endorse the ES findings:

"As a result of the combination of the focus on direct impacts without the consideration of the indirect effects of the proposal; the difficulty in adequately characterising the functioning and therefore influence of key receptors, and the further uncertainty introduced through the use of the Rochdale Envelope Approach, Natural England are unable to agree with the conclusions of the ES."

7.4.102. NE's final advice therefore focussed on reducing risk, ensuring flexibility in the final management plans and securing monitoring with triggers and remediation. Having reviewed the Applicant's updated Outline Marine Monitoring Plan [REP7-058], it submitted a response [REP8-028] that generally welcomed the satellite monitoring proposals, clarified what it believed should be involved, and expressed a new concern that the wording excluded the need for post-construction monitoring for foundation types other than gravity base structures.

7.4.103. In its response to D7 submissions [REP8-016], in relation to the Flamborough Front matters, the Applicant noted:

"The Applicant has exhausted all possible evidence gathering and presentational avenues open during the Examination to demonstrate sufficient understanding of the baseline environment and the predicted impacts upon relevant receptors, with monitoring and mitigation proposed for those areas where the Applicant considers any perceived uncertainty remains. The Applicant notes that the level of detail provided on this topic throughout the Examination, and the monitoring and mitigation proposed by the Applicant, far exceeds that presented by projects on a similar scale, for projects in the vicinity of Hornsea Four as well as more widely in the UK."

7.4.104. The key final positions relating to the proposed monitoring of effects on the Flamborough Front were recorded in the Applicant's updated Outline Marine Monitoring Plan [REP7-058], NE's comments on the Outline Marine Monitoring Plan [REP8-028], and the MMO's D6 submission [REP6-050].

7.5. ExA RESPONSE

7.5.1. Many of the matters raised by the MMO, NE and the East Riding of Yorkshire Council were satisfactorily addressed by the Applicant during the Examination. Initially, the complexity of the pre-application EIA process and the application ES led to some misunderstandings. However, the ExA is content that the entire ES, as updated during the Examination, goes as far as is reasonably possible to address relevant and important matters relating to marine and coastal processes and sediments. This conclusion was reached taking into account the context of available data, scientific understanding, the predicted impacts of the Proposed Development, and the implementation of the necessary mitigation and monitoring through post-consent agreement of management plans.

7.5.2. While some parties questioned the range of flexibility in the design of the Proposed Development that would be consented through the draft Order, and the use of a broad 'Rochdale Envelope', the ExA is content that the approach taken accords with NPS EN-3, which recognises that many details may be unknown to the Applicant at the time of the application, including the foundation type.

7.5.3. Some of the outstanding matters relate to controls and conditions associated with the DMLs that the Applicant is seeking through the Order. Most of these controls would be dependent on the final management and control plans that the Applicant would need to produce (in accordance with the corresponding outline plans that would be certified through the Order). The ExA notes that the relevant management plans associated with DML conditions would need to be agreed and discharged by the MMO, generally following consultation with NE, providing the regulators with a further opportunity to influence final details.

Scope of marine process receptors in the ES

7.5.4. In relation to NE's concerns about MCZs as potential receptors, the ExA is satisfied that the Applicant submitted an assessment [APP-070] that accords with the MMO's guidance, that this is part of the ES, and that it is secured as such through Article 38 and Part 1 of Schedule 15 of the recommended DCO.

7.5.5. The relevance and treatment of European sites as possible receptors is considered in Chapter 13 of this Report, and the ExA agrees with NE that the assessment of the Humber Estuary SPA offers a reliable proxy for consideration of any impacts on the Humber Estuary SSSI.

7.5.6. The ExA notes that by the end of the Examination, NE suggested that the only protected site that might have been missed from the overall assessment was the Dimlington Cliffs SSSI. Notwithstanding the uncertainties around the science and consequent precision of prediction, the ExA is content that the Applicant's Marine Processes Supplementary Report [REP4-043] addressed the potential effects of the Proposed Development on this site, including those potentially associated with cable laying, the beach access ramp and other landfall activities on the cliffs and in the intertidal area, and that the finding of no significant effect is reasonable. The independent review from Professor Elliot [REP5-066] provides further comfort in this respect.

7.5.7. In relation to the 2022 Defra consultation on the potential designation of the Inner Silver Pit South as a HPMA, the ExA considers the Applicant's rationale that the proposed HPMA would be more remote from, and less affected by any impacts experienced at similar, intervening receptors to be reasonable in the context of the broader assessments. As such, the ExA considers it safe to assume that committed measures to protect the interests of those intervening receptors would most likely protect the interest of the proposed HPMA.

Sediment sampling and analysis

7.5.8. The ExA is aware that the issue concerning the validation of the laboratory that undertook the sediment sample particle size analysis was not fully concluded by the end of the Examination, though the Applicant did report that a second analysis by a validated laboratory had been completed and the results reported to the MMO [REP8-016].

7.5.9. Whilst the Applicant had updated the Outline Marine Monitoring Plan [REP7-058] to restrict any sediment disposal activities until the MMO had approved the particle size analysis results, this fell short of the condition on the DMLs that had been suggested by the MMO. As the MMO had no realistic opportunity to provide an opinion about the reanalysis, the ExA considers it necessary to secure this restriction on the face of the DMLs.

7.5.10. The ExA therefore recommends the addition of a new condition at Part 2 of each of the two DMLs sought through the draft Order [REP7-039] as Schedules 11 and 12. This would become Condition 27 of Schedule 11 and Condition 28 of Schedule 12:

"Pre-construction particle size analysis results

No licensable marine activities relating to the dredging or disposal of marine sediments under Paragraph 2 of this licence will take place until the MMO has provided written approval of the laboratory contracted to undertake the particle size analysis of the pre-construction sediment samples.

A request must be submitted for approval at least four months prior to the intended commencement of the licensed activities and the MMO must determine an application for approval 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. Such agreement is not to be unreasonably withheld or delayed."

7.5.11. The ExA considers this to be a reasonable and proportionate condition in the circumstances.

Monitoring of dredgings disposal and drill arisings

7.5.12. The Applicant's final Dredging and Disposal (Site Characterisation) document [REP8-002] summarised the monitoring of dredgings disposal and drill arisings proposed in its Outline Marine Monitoring Plan [REP7-058]. This included post-construction bathymetric surveys, but no other monitoring directly related to the disposal of dredged material. As such, the package fell short of the request from the MMO [REP4-052] and [REP7-111], which included ongoing monitoring of samples of sediment from the proposed dredge and disposal area until construction activities were complete.

7.5.13. The Applicant sets out the rationale for this [REP6-037] and [REP8-002], noting that no long-term impacts are predicted, any short-term impact would be localised, and the material to be disposed of would not be

heavily contaminated. The ExA agrees with the Applicant's rationale and finds no reason to recommend any further monitoring in this respect.

Backfilling of HDD exit pits

7.5.14. Concerns from NE and the MMO about the nature of material that would be used to backfill the HDD exit pits in the landfall area were addressed over the course of the Examination, and the ExA is satisfied that the matter could be managed through Condition 13(1)(h) of the transmission assets DML (Schedule 12 of the recommended DCO).

Impacts on Smithic Bank and the Holderness coast

7.5.15. The ExA has given very careful consideration to the matters that arose during the Examination in relation to Smithic Bank. Whilst accepting the Applicant's position that it is not a feature protected by designation, the evidence does appear to demonstrate that it plays an important role in regional sediment dynamics and movement, as well as providing some protection for beaches and an eroding shoreline.

7.5.16. The ExA is aware of the likely sensitivity of Smithic Bank to cable installation and rock protection, and other construction and long-term interventions, and acknowledges the reductions in relevant maximum design scenarios and other commitments made by the Applicant. These include a commitment in the Outline Offshore Cable Specification and Installation Plan [REP7-056] to re-examine the scale of the rock protection at the crossing of the Proposed Development and Dogger Bank A and B cable corridors once all relevant information is known. The ExA is content all of these can be properly secured through Condition 13 of both of the DMLs in the recommended DCO (Schedules 11 and 12), and it accepts the Applicant's explanation of why further reductions in maximum sand wave clearance and rock protection were not possible.

7.5.17. Whilst accepting that the science and evidence is incomplete, the ExA believes that the Applicant has gone to great lengths to clarify the assessment of possible effects, and that both this uncertainty and the assessment outcomes have been largely accepted in Professor Mike Elliot's peer review [REP5-066].

7.5.18. Given the uncertainties, the ExA concludes that some of the sensitivity and assessment outcomes in the Applicant's ES may have been underestimated, but not to the extent that any of the potential impacts on sensitive receptors would become significant for the EIA, either on Smithic Bank itself, or, more pertinently, at more valuable secondary receptors at a greater distance along the Holderness coast or the various protected sites highlighted during the Examination.

7.5.19. Given this, and the acknowledged level of assumption and inference that had to be used in the assessment, the ExA accepts the contention of the MMO and NE in principle that post-construction monitoring is justified. Such monitoring may not offer an immediate solution to any unpredicted impact that might arise here, but it could do so in certain circumstances,

and it would benefit accumulated knowledge and future projects. This accords with NPS EN-3, which prompts the ExA and SoS to consider:

"… requiring the applicant to undertake monitoring prior to and during construction and during its operation in order to measure and document the effects of the development. This enables an assessment of the accuracy of the original predictions and may inform the scope of future EIAs."

7.5.20. The ExA has therefore considered what might represent a proportionate scale and scope of monitoring. The ExA is generally content that the Applicant's proposals, as set out in its Outline Marine Monitoring Plan [REP7-058, Table 3, page 14], meet that definition. These are for: a pre-construction survey using high-resolution, multi-beam bathymetry of Smithic Bank from the Holderness Coast (MLWS) to the Dogger Bank A and B Cable Crossing; similar monitoring surveys every six months for the first three years following completion of construction; and a review of the requirement for further surveys after the last of these.

7.5.21. As the Outline Marine Monitoring Plan is included in Schedule 15 of the Draft DCO [REP7-039], Part 3, Other Documents to be Certified, the ExA is content that this can be secured.

7.5.22. A lack of clarity remained at the close of the Examination [REP8-022] and [REP8-028] in relation to certain aspects, notably an accurate definition of the 10% buffer applied to the cable route, detail of the proposed bathymetry survey methodology, and the frequency and timing of post-construction monitoring surveys. The ExA is content that the necessary clarifications could be secured by the MMO through the process set out in the recommended DCO for the discharge of Condition 13(1)(f), because:

- Part 1 of Schedule 12 of the recommended DCO (the DML for the transmission assets) defines the Outline Marine Monitoring Plan as, *"the document certified as the outline marine monitoring plan by the Secretary of State for the purposes of this Order under article 38 (certification of plans and documents, etc.)"*;
- Conditions 17, 18 and 19 of that DML (in relation to pre-construction monitoring, construction monitoring and post-construction monitoring respectively) require the submission of a monitoring plan or plans for that stage in accordance with the Outline Marine Monitoring Plan for written approval by the MMO in consultation with the relevant statutory nature conservation body (NE); and
- both Condition 17 and 19 require, *"including details of proposed post-construction surveys, including methodologies (including appropriate buffers, where relevant) and timings, and a proposed format, content and timings for providing reports on the results."*

7.5.23. In addition, the MMO [REP8-022] and NE [AS-048] called for additional controls over cable installation and rock protection placement across Smithic Bank. It was suggested that a condition be placed on the DML requiring submission of detailed survey results and a cable burial risk assessment for the Smithic Bank area. The ExA is content that the

process secured through Condition 13(h)(ii) and (iii) of the DML in the recommended DCO provides a route for their further consideration of this.

Impacts on the Flamborough Front

7.5.24. The ExA is sympathetic to the issues raised by the MMO and NE in relation to the lack of information and assessment provided in the application ES for the Flamborough Front and agrees that the sensitivity of that feature in relation to natural marine processes, productivity and a food chain leading to some important seabird populations was underestimated. The Applicant's contention that upgrading the allocated value of the feature to high would still not lead to a significant impact using the Applicant's EIA methodology would only hold true if the predicted magnitude was accepted to be negligible.

7.5.25. Whilst the MMO and NE argued that there was too little information and assessment in the application ES to determine a negligible impact, the ExA was content that the Applicant's Marine Processes Supplementary Report [REP4-043] and other information and clarifications submitted during the Examination cumulatively represented a thorough evidence gathering exercise that demonstrated sufficient understanding of the baseline, despite the imprecise nature of the background science and the scale, complexity and dynamic nature of the Flamborough Front. In turn, the ExA accepts the Applicant's predictions of direct and indirect impacts, whilst acknowledging the inferences and assumptions that had to be made, and therefore has given the proposed mitigation and monitoring careful consideration.

7.5.26. The ExA notes that Professor Elliot's peer review [REP5-066] advised that all reasonable scientific evidence had been provided. His review went on to suggest that the prediction of effects on the Flamborough Front was difficult against a background of considerable temporal and spatial variability and concluded that that there was no strong evidence either way without ground truthing after the array was in place.

7.5.27. The ExA understands that the likely worst-case scenario for impacts would be associated with the greatest number of gravity base structures at the minimum spacing, and notes that this was the scenario tested in the ES. The ExA also notes that NPS EN-3 places the onus on an Applicant to ensure that the foundation design is technically suitable for the seabed conditions and that technical suitability is not in itself a matter for the Examination. However, the ExA does need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, the physical environment or marine heritage assets.

7.5.28. The major outstanding concerns of the MMO and NE following the Applicant's reduction of gravity base structure foundations to no more than 90 (80 for turbine foundations) generally related to wakes, stratification and cumulative effects.

7.5.29. The ExA notes the Applicant's contention that there would be no significant impact on stratification in practice, as the measurable wake was likely to be shorter than the minimum separation between foundations. Conversely, NE and the MMO [REP5-114] quoted research that was said to demonstrate potential for large-scale hydrodynamic changes, turbulent mixing, changes in productivity and, in turn, the marine ecosystem.

7.5.30. Given the imprecision of the science, the ExA considers that the Applicant's assessment had gone as far as possible, and that monitoring would be useful to establish the accuracy of the assumptions that had been made.

7.5.31. The ExA notes that the monitoring proposed by NE and the MMO was more extensive than that suggested by the Applicant. Having considered the positions of the key parties at the close of the Examination, the likely scale of the possible impacts and the level of assumption that had to be used in the assessment, the ExA concludes that the phased post-construction monitoring programme for three sample foundations put forward by the Applicant in its updated Outline Marine Monitoring Plan [REP7-058, Table 3] is a proportionate response and a good basis for the development of the monitoring regime in the final Marine Monitoring Plan. It notes that the regulators would have further opportunity for influencing the monitoring of potential effects on the Flamborough Front, in that paragraph 1.1.1.8 of the Outline Marine Monitoring Plan [REP7-058] states:

"It is intended that this document will provide the basis for further discussions with the MMO and the relevant statutory advisors to agree the exact detail (timings, methodologies etc.) of any offshore monitoring that is required by the conditions of the DMLs during the post-consent phase. It should be noted that the final detailed plans for monitoring work will not be produced until closer to the time that the actual works will be undertaken (following detailed scheme design). These final monitoring plans, in turn, will subsequently be provided for approval by the MMO (as required by the conditions of the draft DMLs), in consultation where necessary with their statutory advisors, in order to discharge the conditions of the corresponding final DML."

7.5.32. The ExA was not persuaded that monitoring would be warranted if more traditional foundation structures (as used for existing operational wind turbines in UK waters) were to be deployed, given that their wake and turbidity effects have been monitored at operational wind farms and are therefore generally better understood, notwithstanding specific locational characteristics. Consequently, the ExA is content that these monitoring provisions should only apply if gravity base structure foundations are used.

7.6. CONCLUSION

7.6.1. The ExA has considered the impacts of the Proposed Development on the matters relating to marine and coastal processes and sediments discussed in this Chapter of the Report in the context of the policy framework set by the Overarching National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3), the Marine Policy Statement, the EOEIMP and, to the limited extent that it is relevant, the East Riding Local Plan Strategy Document 2012 to 2029.

7.6.2. To deal with a minor outstanding matter at the end of the Examination in relation to the validation of the laboratory that undertook the sediment sample particle size analysis, the ExA has recommended the addition of a new condition to each of the two DMLs sought through the draft Order [REP7-039] to ensure that the MMO is satisfied before work commences.

7.6.3. In all other aspects, the ExA finds that the mitigation, controls and monitoring that would be put in place would provide adequate safeguards to allow the Proposed Development to go ahead in accordance with adopted policy relating to marine and coastal process and sediments matters.

7.6.4. The process of discussing and approving final versions of the various management plans through DML conditions in the recommended DCO would provide further opportunity for the MMO (and the Statutory Nature Conservation Body as a consultee) to influence the detail of many of the necessary mitigation and monitoring measures. This would include the approval of the final Marine Monitoring Plan in relation to a detailed survey and cable burial risk assessment for Smithic Bank, and a phased monitoring programme for three sample gravity base structure foundations (if used) along the Flamborough Front.

7.6.5. Overall, the difficulties associated with making precise impact predictions, combined with some minor residual adverse effects, lead the ExA to a precautionary finding that matters relating to marine and coastal processes and sediments weigh against the case for the Proposed Development to a limited extent.

8. FINDINGS AND CONCLUSIONS IN RELATION TO MARINE AND COASTAL ORNITHOLOGY

8.1. INTRODUCTION

8.1.1. This Chapter covers the ornithological aspects of the coastal and marine environment that were considered in the Applicant's Environmental Statement (ES).

8.1.2. Marine ecology was listed in the Examining Authority's (ExA) Initial Assessment of Principal Issues [PD-005]. "*Effects on coastal and marine birds, including the approach to describing and evaluating the baseline*" formed part of this.

8.1.3. Other marine matters are considered elsewhere in this Report, as summarised in Section 7.1.4. Matters directly related to European sites and the Habitats Regulations Assessment (HRA) are principally addressed in Chapter 13, though there is considerable overlap with some of the issues discussed here. Both chapters should be read together for completeness.

8.1.4. Matters relating to draft Development Consent Order (DCO) Articles and the deemed marine licences (DMLs) are set out in Chapter 16, cross-referenced here as necessary in relation to the topic and issues they refer to.

8.2. POLICY CONSIDERATIONS

8.2.1. Policy considerations in relation to marine ecology and other marine environmental matters are summarised in Section 7.2 of this Report.

8.3. THE APPLICANT'S CASE

8.3.1. Several chapters of the Applicant's ES and associated application documents set out the Applicant's case for the marine element of the Proposed Development. Those most relevant to this section of the report comprised:

- ES chapter on Offshore and Intertidal Ornithology [APP-017];
- ES Annex: Offshore and Intertidal Ornithology Baseline Characterisation Report [APP-074];
- ES Annex: Offshore Ornithology Displacement Analysis [APP-075];
- ES Annex: Offshore Ornithology Collision Risk Modelling [APP-076];
- ES Annex: Offshore Ornithology Population Viability Analysis [APP-077];
- ES Annex: Offshore Ornithology Migratory Birds Report [APP-078 as amended by AS-010];
- ES Annex: Offshore Ornithology MRSea Report [APP-079].

8.3.2. One ES annex was updated during the Examination:

- ES Annex: Offshore Ornithology Displacement Analysis [REP2-003].

8.3.3. Further relevant documents submitted during the Examination included:

- Auk Displacement and Mortality Evidence Review [REP1-069];
- Gannet Displacement and Mortality Evidence Review [REP2-045];
- MRSea Baseline Sensitivity Report (Gannet) [REP2-046] and [REP3-029];
- Assessment of Common Scoter and Red Throated Diver within the Export Cable Corridor [REP2-049];
- Applicant's Response to Natural England's Comments on Auk Displacement and Mortality [REP3-036];
- Ornithological Assessment Sensitivity Report [REP4-041], [REP5-065] and [REP6-026];
- Comparative Gannet Assessment [REP4-047];
- Further Consideration of Lighting Requirements [REP4-048];
- Indirect-effects of Forage Fish and Ornithology [REP5-085];
- Revised Ornithology Baseline [REP5-087] and [REP5a-009];
- Ornithology EIA and HRA Annex [REP5-078], [REP5a-011] and [REP6-028];
- Ornithology Technical Panel Meeting 16, MRSea Baseline Minutes [REP5-080];
- Clarification Note on revised ornithology baseline [REP5a-024];
- Applicant's Ornithology Position Paper [REP7-085];
- Applicant's Response to Deadline 6 Ornithology submissions [REP8-012]; and
- Applicant's comments on Natural England's Deadline 7 Ornithology submissions [REP8-017].

8.3.4. The location of the marine element of the Proposed Development was shown on the Offshore Location Plan [APP-206], with greater detail for the proposed landfall provided in the Onshore Location Plan [APP-207].

8.3.5. The Applicant's assessment was shown in detail in the ES chapter [APP-017] and annexes listed above. The general approach to assessment was as set out in Paragraph 7.3.5 of this Report.

8.3.6. The ES [APP-017] reported the results of offshore bird surveys for the proposed array area (with a 4km buffer), the offshore export cable corridor, and the intertidal zone at the landfall between mean high water spring tides and mean low water spring tides. It considered the potential impact of the Proposed Development on seabirds in the area during the construction, operation, maintenance and decommissioning phases.

8.3.7. Section 5.5 of the ES [APP-017] noted that the area proposed to accommodate wind turbine generators (the array area) had been changed between Environmental Impact Assessment (EIA) scoping and the application. The modifications were based on a qualitative analysis of site-specific data reflecting the spatial distribution of key seabird species. Through this process, the Applicant sought to avoid areas that supported higher numbers of birds to minimise potential impacts, noting that

marine ornithology had been an important issue for previous offshore wind farms in the general area. The ES [APP-017, Figure 5.1] showed the three parcels that were removed from the proposed array area, and the revised area for baseline characterisation.

8.3.8. As the marine bird aerial digital surveys had been undertaken across the original, larger array area, only the sections of the data that were relevant to the revised array area were extracted and used in the assessment, supplemented by data from other sources. To improve the representation of the site for baseline characterisation and impact assessment purposes, these design-based estimates were enhanced for the more abundant and important species associated with Flamborough Head and the Filey coast (fulmar, gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin) using a digital package known as the Marine Renewables Strategic environmental assessment (MRSea) R package[2] [APP-079].

8.3.9. The ES [APP-017, Table 5.17] set out the commitments that the Applicant built into the design of the Proposed Development to reduce impacts, including increasing the clearance beneath the lowest point of rotating wind turbine blades to a minimum of 42.43m above Lowest Astronomical Tide. Table 5.18 summarised the maximum design scenario for the Proposed Development used by the Applicant for the assessment.

8.3.10. The construction, operational and decommissioning activities considered in the assessment included construction of the wind turbine generators, other structures, foundations, cable laying, vessel movements, operational rotation of the turbine blades, and the use of safety lighting on structures. Possible impacts on birds that were considered included direct disturbance, displacement, barrier effects, and physical impacts such as collision, as well as indirect effects such as impacts on important fish prey species. In relevant cases, the combined effects of two or more of these factors was considered for a bird population, for the Proposed Development alone, and cumulatively with other relevant projects.

8.3.11. The ES [APP-017, Tables 5.69 and Table 5.70] provided summaries of the Applicant's assessed impacts for the Proposed Development alone and cumulatively. For the Proposed Development alone, the Applicant found no impacts of greater than negligible magnitude. None was considered significant. For cumulative impacts, the Applicant concluded that there was potential for slight effects due to: disturbance and displacement of guillemot, razorbill and puffin; collision risk for gannet, kittiwake and great black-backed gull; and for all operational activities

[2] R packages are extensions to the R statistical programming language. They include code, data and documentation in a standardised format that can be installed by users of R. MRSea was developed by the Centre for Research into Ecological and Environmental Modelling (CREEM) at the University of St Andrews to look at animal survey data to detect changes in abundance and distribution following marine renewables development.

combined for gannet. No effects were considered significant in the context of the EIA.

8.4. PLANNING ISSUES

Baseline characterisation

8.4.1. As noted above, the ES [APP-017] reported that the area proposed for wind turbines was modified prior to application in response to the recorded offshore distribution of key seabird species derived from aerial surveys of the wider project area plus a 4km buffer [APP-074]. Whilst these design-based abundance estimates were said to be consistent with information from the literature, and in line with previous surveys in the Hornsea zone and other relevant wind farm applications, some data limitations associated with the context of a much wider, original survey area were said to have been raised during pre-application consultation with Natural England (NE) and the RSPB.

8.4.2. Therefore, it had been agreed that the baseline for the key species would be supplemented through the use of the Marine Renewables Strategic environmental assessment (MRSea) R package [APP-079] (MRSea v1).

8.4.3. Whilst not challenging the general approach taken to describing the offshore seabird baseline, NE's [RR-029] and the RSPB's [RR-033] Relevant Representations (RRs) raised concerns about fundamental errors in the way that MRSea v1 had been used to produce the density and abundance estimates that underpinned the assessment for the key seabird species associated with Flamborough Head and the Filey coast, including several interest features of the Flamborough and Filey Coast Special Protection Area (SPA).

8.4.4. The Applicant held further consultation meetings with NE to progress the matter and went on to produce an initial MRSea Baseline Sensitivity Report at Deadline (D) 2 [REP2-046]. This set out the results of a second run (MRSea v2) for one species, gannet, that more closely followed the recommendations of the package developers and NE’s guidance.

8.4.5. The full report was submitted at D3 [REP3-029]. This included a comparison of the MRSea outputs from the two runs for gannet and concluded that MRSea v2 produced a better overall spatial fit and provided a good match for the raw observational datasets. At Issue Specific Hearing (ISH) 5 [EV-028], the Applicant contended that the MRSea v1 and MRSea v2 outputs did not differ significantly. The results were said to demonstrate that MRSea v1 was sufficiently precautionary for assessment purposes, so it was unnecessary to undertake similar second runs for other species. The Applicant reasserted this view in a Comparative Gannet Assessment report [REP4-047].

8.4.6. However, NE [REP4-055], in acknowledging the better data fit for gannet in MRSea v2, submitted that the results demonstrated that the data for each of the other key seabird species would also need to be re-run to provide a fit-for-purpose baseline. The RSPB [REP4-057] concurred.

8.4.7. In response to a request for further information under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010 (Rule 17 request) from the ExA, and whilst reaffirming that the MRSea v1 estimates could be reliably used to inform the EIA and the HRA, the Applicant agreed to re-run the MRSea package for the key species, kittiwake, razorbill and guillemot, in addition to the re-analysis already undertaken for gannet. In line with an agreement reached with NE, only the original, design-based baseline data would be used for the assessments of other seabird species.

8.4.8. The agreement reached between the Applicant and NE on a way forward took place outside the Examination, though it was summarised in the Applicant's response to the ExA's further written questions (ExQ2). The minutes of that meeting (the sixteenth meeting of the Ornithology Technical Panel Meeting, 25 May 2022) were submitted into the Examination at the request of the ExA [REP5-080].

8.4.9. The Applicant submitted a summary of the MRSea v2 output for the key species, together with the design-based assessment for all target species, as a Revised Ornithology Baseline [REP5-087]. This detailed the 'best fit' raw output modelling results for kittiwake, guillemot and razorbill, said to be in accordance with NE advice, along with design-based abundance estimates for fulmar, gannet, great black-backed gull, kittiwake, guillemot, razorbill and puffin.

8.4.10. NE's subsequent Review of the Revised Ornithology Baseline [REP5a-030] summarised some problems that it had identified in the document. These had been notified to the Applicant outside the Examination to allow urgent consideration. Nevertheless, NE confirmed that the revised baseline characterisation had been produced using the agreed combination of model and design-based methods that addressed the original concerns around the baseline. NE said that it expected to be in a position to agree the baseline fully once the newly identified problems had been rectified.

8.4.11. With the benefit of advance notification, the Applicant's Clarification Note on the Revised Ornithology Baseline [REP5a-024] provided responses to NE's points and summarised the consequent changes in a Revised Ornithology Baseline [REP5a-010]. In turn, NE [AS-048] agreed that the baseline characterisation was now acceptable, but with two caveats. The first was a perceived inconsistency in density data for kittiwake and gannet between the revised ornithology baseline [REP5a-010] and an Annex to the EIA and HRA that had also been submitted [REP5a-011].

8.4.12. The second caveat related to a problem that NE had uncovered with its own Population Viability Analysis (PVA) tool. However, this more directly affected the assessment of potential impacts rather than the characterisation of the baseline.

8.4.13. The updated baseline was discussed during ISH11 [EV-035], when the Applicant confirmed that the MRSea v2 outputs had been used to inform

an updated ornithological assessment, presented as an Ornithology EIA and HRA Annex [REP5-078] and [REP5a-011].

8.4.14. The ExA sought clarification about the consequence of the differences between the outputs of MRSea v1 and MRSea v2, which it felt were not clear in the written submissions. The Applicant [REP6-038] found no material difference between the two in the overall baseline characterisation. It said that this had shown that confidence could be placed in the data submitted in the application, and that it would submit an explanatory summary in a final Ornithology Position Paper in due course.

8.4.15. In response to further oral questions, the Applicant said that it did not intend to update the application ES ornithological baseline or assessment, but that all of the relevant amendment and updating documents would be added to Schedule 15 of the draft DCO (secured documents) to become part of a wider ES that had evolved during the Examination. It added that an explanation of the reasoning for this would be provided in the Ornithology Position Paper. Despite an agreed action point [EV-035a], this was apparently overlooked by the Applicant when the Ornithology Position Paper [REP7-085] was submitted, unless it was considered implicit in Table 10 of that document (the Applicant's final position on EIA significance for ornithological receptors).

8.4.16. In relation to the perceived inconsistency in density data for kittiwake and gannet, the Applicant reported discussions with NE, and that it had been a simple copy and paste fault in the assessment documents. This was rectified in a revised version of the Ornithology EIA and HRA Annex [REP6-028].

8.4.17. Submissions from NE [REP7-104] and the RSPB [REP7-099] very close to the end of the Examination indicated satisfaction with the revised baseline characterisation, and that it was 'fit for purpose' as a basis for the coastal and marine ornithology assessments.

Assessment of effects on key seabirds associated with Flamborough Head and the Filey coast: general approach and parameters used

8.4.18. In their RRs, NE [RR-029] and the RSPB [RR-033] raised similar concerns in relation to the assessment methodology adopted by the Applicant. These principally related to the approaches to:

- the biologically defined minimum population scale (BDMPS) biological seasons and derivation of regional breeding season populations;
- the definition of bio-seasons for the displacement analyses;
- the collision risk assessment;
- displacement, barrier effects and associated mortality rates for auks;
- displacement, barrier effects and associated mortality rates for gannet and kittiwake;
- population viability analysis modelling; and
- the use of counterfactuals in population viability analysis.

8.4.19. These matters are dealt with in turn below. Further concerns were raised in relation to the Flamborough and Filey Coast SPA assemblage feature and the apportionment of birds to the SPA flock. These, and any implications of the following matters for the HRA, are dealt with in Chapter 13 of this Report.

8.4.20. Some fundamental differences remained between the Applicant and NE and the RSPB throughout the Examination. These were mostly based around the definitions and application of various parameters that feed into the tools and models that are typically used for marine seabird assessment for offshore wind farm projects. Some of the differences resulted from the dynamic nature of best practice and guidance, whilst most were based on the parties' rather different interpretations of precaution and the reliability of evidence.

8.4.21. Alongside the disagreements over baseline characterisation, described earlier in this Chapter, these differences caused considerable complications during the Examination. The ExA explored the matters repeatedly through written and oral questioning (ExQ1 [PD-006]; ExQ2 [PD-012]; ISH5 [EV-028]; ISH11 [EV-035]), including requests for the Applicant to clarify what NE suggested was a deviation from usual practice in some respects.

8.4.22. The Applicant submitted an Ornithological Assessment Sensitivity Report [REP5-065] to provide further information about the Applicant's and NE's positions in relation to the assessment parameters. This identified a tension in offshore wind farm ornithology project-alone and cumulative assessments between fairly balancing precaution against a realistic, evidence-led result. It noted that variability and uncertainty are inherent at most stages of the assessment, across multiple input parameters. The Applicant's position was that taking a precautionary approach to each parameter and input would produce an unrealistic, compounded output, particularly in a cumulative assessment with other projects.

8.4.23. The sensitivity report identified the components of the assessment for which sources of uncertainty or variability exist and the extent to which these affect the overall assessment. The report also updated the ES in relation to new evidence or guidance that had emerged since the submission of the application. The main theme of the Applicant's case in the report and in other submissions was that the 'standard' approach was overly precautionary and unrealistic, and that a data-led methodology provided a more reliable assessment.

8.4.24. The ExA was unclear what data had been used in the sensitivity report, and whether the analysis had kept pace with the changing baseline. This was discussed at ISH11 [EV-035]. The Applicant confirmed that the data had been taken from its Ornithology EIA and HRA Annex [REP5a-011], and clarification was subsequently provided in an Ornithology Position Paper [REP7-085].

8.4.25. At ISH11 [EV-035], the Applicant also explained that the sensitivity report aimed to, "*provide the ExA and SoS with confidence that the*

Applicant's approach to offshore ornithology impact assessments can be considered suitably precautionary and presents a realistic scenario."

8.4.26. NE [REP6-059] responded to the Applicant's sensitivity report. It highlighted the shortage of empirical data and explained why precaution was necessary, even if that did lead to compounding. Annex I of its report described the uncertainties that make assessing the impacts of offshore wind farms problematical and explained why bespoke inputs are sometimes required.

8.4.27. NE noted that the sensitivity report usefully catalogued some of the areas of precaution in offshore wind farm impact assessments but felt that a focus on sources of uncertainty around seabird behaviour and distribution, and the potential impacts of offshore wind farms on seabirds, would have provided a more balanced analysis of the need for that precaution.

8.4.28. The need to handle uncertainties carefully when faced with a shortfall of robust evidence was said to inform NE's advice about impact methodologies and component parameters. Accordingly, NE continued to advise that the recommended parameters and a range-based approach should be used when making judgements to ensure the level of risk to seabird populations was carefully appraised.

8.4.29. NE also acknowledged that guidance changes as further, reliable evidence is gathered and published. It was aware of projects that hoped to provide refined advice on some collision risk modelling parameters, including avoidance rates, and biometric and behavioural data. However, these were not expected to become available during the Examination, and NE concluded that the current values that it advocated should be used and that these were in line with those on which the Secretary of State (SoS) had considered other recent offshore wind farm projects.

8.4.30. The RSPB [REP7-099] largely agreed with NE's position on precaution.

8.4.31. Successive submissions from the parties generally defended their positions (for example: NE [REP7-104]; the Applicant [REP7-085] and [REP8-012]; and the RSPB [REP8-024]).

8.4.32. At the end of the Examination, the Applicant [REP8-017] suggested that the assessments presented by NE [REP7-104] as a final position had not considered a full range-based approach as they only presented the preferred parameters. The Applicant therefore recommended that the ExA and the SoS should also use the Applicant's assessment in the Ornithology EIA and HRA Annex [REP6-028], which, it said, could be considered to have greater confidence when inferring possible predicted impacts.

Approach to biologically defined minimum population scale biological seasons and derivation of regional breeding season populations

8.4.33. The ES [APP-017, section 5.7.4] had set out the background to the Applicant's approach to, and interpretation of biological seasons (bio-seasons), population definitions and demographics for offshore ornithology receptors. It noted that seabird behaviour and abundance differ across the year, depending on the applicable bio-seasons for each species. Distinct bio-seasons were therefore recognised to establish the level of importance of each seabird species during any particular period of time.

8.4.34. The Applicant based its interpretation of BDMPS bio-seasons and population estimates on research published by Furness (2015) [APP-017, Table 5.12]. The ES noted that this followed guidance in NE's scoping response and other pre-application consultation.

8.4.35. The Applicant's approach to predicting additional mortality as a consequence of the Proposed Development was based on changes to the baseline mortality rate for each relevant seabird species within each of the bio-seasons. The baseline mortality rates were presented in the ES [APP-017, Table 5.13]. For each species, demographic data from Horswill and Robinson (2015) were used to calculate the expected proportions in each age class, each age class survival rate was then multiplied by its stable age proportion, and finally the total for all ages was summed to give the weighted average survival rate, converted to an average mortality rate.

8.4.36. The ES [APP-017, Table 5.14] went on to explain that the regional breeding population of each species was based on the number of birds recorded at the closest breeding colonies and other colonies in the UK North Sea that were within foraging range of the Proposed Development array area (based on foraging ranges from Woodward *et al*, 2019).

8.4.37. The estimated proportions of juvenile, immature and non-breeding birds were then applied to the relevant BDMPS population for each species to generate numbers in the non-migratory breeding bio-season. The known number of breeding individuals was added to this to provide an estimate of the total regional breeding bio-season population [APP-017, Table 5.14].

8.4.38. The wider biogeographic populations for each species with connectivity to UK waters (adults and immatures), as described in Furness (2015), were also used in the assessment [APP-017, Table 5.15].

8.4.39. NE [RR-029] disagreed with the approach taken by the Applicant to calculate regional breeding season populations and suggested a lack of clarity about how some population sizes had been derived.

8.4.40. The Applicant consulted NE outside the Examination and was provided [REP2-083] with clarification on the calculation of breeding season reference population estimates at the BDMPS scale. The matter was

discussed at ISH5 [EV-028], and in its post-Hearing submission [REP4-039], the Applicant noted that the ExA and SoS had agreed that the migration-free breeding season was appropriate at the Hornsea Three Offshore Wind Farm Examination.

8.4.41. The Applicant noted in the Ornithological Assessment Sensitivity Report [REP4-041, Appendix 1 and section 2] that NE's calculated largest breeding season BDMPS values for guillemot and puffin populations were larger than the non-breeding season estimates presented in Furness (2015), and that NE had advised that these should be used in the assessment.

8.4.42. The Applicant used the revised breeding season BDMPS values [REP4-041, section 2] to reassess the impacts and concluded that they led to a reduced overall effect for guillemot and puffin, meaning that the assessment set out in the ES was precautionary. In providing the revised assessments, the Applicant included birds from both the UK and overseas. NE [REP5a-029] confirmed that this followed the guidance for deriving BDMPS reference populations outside the breeding season. However, the advice for defining the breeding season BDMPS population was to include only UK populations in the relevant BDMPS area, as there was no way of estimating with confidence the proportions of birds from overseas colonies that may spend time there during the breeding season.

8.4.43. Based on this, NE did not agree with the BDMPS populations used for the kittiwake, guillemot and puffin assessments in the updated Ornithological Assessment Sensitivity Report [REP5-065] and maintained this position [REP6-055] at ISH11 [EV-035] and in its comments on the sensitivity report [REP6-059].

8.4.44. The Applicant subsequently provided updated versions of the Ornithological Assessment Sensitivity Report [REP6-026] and the Ornithology EIA and HRA Annex [REP6-028] that included amended BDMPS figures for razorbill and great black-backed gull.

8.4.45. NE noted [REP7-104] that the Applicant had continued to use the adjusted BDMPS reference populations for kittiwake, guillemot and puffin in both of the revised documents, and that it had not agreed these changes. As these larger numbers would influence the interpretation of baseline mortality, NE based its own assessments in its end of Examination position [REP7-104] on its previously advised BDMPS populations.

8.4.46. The Applicant [REP8-017] referred back to the Ornithological Assessment Sensitivity Report [REP6-026, section 2.1] and offered further explanation in its comments on D6 ornithology submissions [REP8-012, section 3.2.1]. It suggested that, when considering the annual impacts from a project, the total individuals within a given area are underestimated when the largest BDMPS value from Furness (2015) is used for the breeding season. This was said to be because one BDMPS value only considers birds predicted to be in an area during a specific

bio-season and not the total number of individuals that may occur across all bio-seasons.

8.4.47. This was not considered an issue for the non-breeding season, as this includes birds from the UK and elsewhere, therefore capturing all individuals of a species which might have connectivity to the regional BDMPS. However, this is not the case for the breeding season. To rectify what it considered an issue, the Applicant took a 'logical approach' and added the number of non-UK individuals cited in Furness (2015) with connectivity to the regional BDMPS to the derived breeding BDMPS population size, but only when considering impacts on an annual basis.

8.4.48. The Applicant suggested that excluding non-UK individuals from the regional BDMPS ran the risk of significantly overestimating the potential impacts from UK offshore wind farms on the BDMPS populations.

Approach to definition of bio-seasons for the displacement analyses

8.4.49. NE [RR-029] raised concerns about the seasonal definitions used to derive the regional breeding season populations for the assessment of gannet and kittiwake displacement.

8.4.50. The Applicant [APP-017, Table 5.12] had used the 'migration-free breeding bio-season', which excludes the start and end of the full breeding season when some birds remain engaged in breeding activities, while others are on or starting migration. NE considered that this would lead to an underestimation of displacement impacts and recommended the use of the 'full breeding bio-season'. The differences are summarised in the Ornithology EIA and HRA Annex [REP5-078] as:

- For gannet and kittiwake, the Applicant had used April to August as the migration-free breeding bio-season. NE's preferred approach was to use the full breeding bio-season, defined as March to August for kittiwake and March to September for gannet.
- For guillemot, as detailed in the Offshore Ornithology Displacement Analysis [APP-075], the Applicant used a 'weighted-mean' peak abundance for the non-breeding season to account for the inherent bias caused by a pulse of higher density for a single month during the post-breeding dispersal period (August to September). NE's preferred approach was to use the standard mean peak abundance to calculate the non-breeding bio-season abundance.
- For razorbill and puffin, the approach taken to the definition of seasonality and bio-season abundance was said to be the same for both parties' approach.

8.4.51. The approach to guillemot assessment and the differences between the parties are considered below in the 'Approach to displacement, barrier effects and associated mortality rates for auks' section. Due to the agreement between the parties, the approach to razorbill and puffin assessment in respect of bio-season definition is not considered further.

8.4.52. The Applicant explained [REP1-038] that it had used site-specific surveys to inform its seasonal definitions for gannet and kittiwake. It considered that the migration-free breeding bio-season best represented the distribution and behaviour observed during the surveys, as described in the Offshore and Intertidal Ornithology Baseline Characterisation Report [APP-074]. The Applicant went on to suggest that the use of either definition of the breeding season would not affect the overall annual displacement impact in the context of the EIA.

8.4.53. NE continued to advise that the relevant bio-season for kittiwake should be taken to be March to August [REP2-083].

8.4.54. The ExA pursued the matter at ISH5 [EV-028], where the Applicant explained its rationale further [REP4-039], noting that NE had advocated the use of site-specific data. It explained that the Proposed Development site is in an area of the southern North Sea that is subject to migratory pulses of seabirds throughout the spring and autumn, when birds move to and from their breeding colonies further north in the UK and continental Europe.

8.4.55. The Applicant referred to the earlier Hornsea Three Offshore Wind Farm Examination, noting that the SoS had accepted the Applicant's breeding seasons definitions for gannet and kittiwake in that HRA, based on survey evidence and published tracking studies by Langston (2013) and Cleasby (2018):

"… the Secretary of State agrees with the conclusions of the ExA that the use of the longer breeding season to apportion impacts to the gannet and kittiwake populations at Flamborough and Filey Coast SPA is not justified and therefore, in this case, favours the Applicant's preferred shorter breeding season."

8.4.56. The Applicant also referred to evidence from the site-specific surveys for the Proposed Development, which had recorded the direction of flights. Rose diagrams in the Baseline Characterisation Report [APP-074, Appendix C] showed gannet and kittiwake flights to be more aligned to a north-south direction outside the migration-free breeding bio-season, and to an east-west direction during the migration-free breeding bio-season.

8.4.57. In the Ornithology EIA and HRA Annex [REP5-078], the Applicant reiterated that the recorded flight directions supported the Applicant's assumption that those birds flying in a north-south orientation are migratory birds, whilst those orientated east-west are more likely connected to local breeding colonies.

8.4.58. The RSPB agreed [REP4-057] that there would be migrating adults passing through the array area outside the migration-free breeding season but noted that simply excluding these seasons from the assessment of breeding season displacement mortality would result in an underestimate for birds from the colonies at Flamborough Head and the

Filey coast, as birds were still present here during that period and would continue to be affected.

8.4.59. The ExA pursued the matter further at ISH11 [EV-035] and asked what the actual difference might be to the outcome of the assessment using either approach. Whilst NE [AS-048] continued to disagree with the use of the migration-free breeding bio-season, it noted that the difference was, "… *only likely to affect gannet displacement numbers and is unlikely to make a material difference to our conclusions relating to the significance of impact*…"

8.4.60. The Applicant agreed, and its written summary of oral case at ISH11 [REP6-038] went on to note that the difference in opinion had by then essentially disappeared as the parties had separately agreed that a macro avoidance rate should be applied to the gannet assessment, reducing the collision risk and the overall impact prediction for the species.

Approach to the collision risk assessment

8.4.61. NE [RR-029] queried the lack of upper and lower annual impact estimates in the collision risk assessment, akin to statistical confidence intervals, on the basis that the inherent variability and uncertainty should be reflected in a range-based approach. The ExA sought further information through its first written questions (ExQ1) [PD-006]. The Applicant [REP1-038] said that its updated MRSea Report would provide signposting to 95% confidence intervals.

8.4.62. The MRSea Baseline Sensitivity Report (Gannet) [REP3-029, Figures 41 and 42] subsequently presented upper and lower 95% confidence intervals generated using a tool supplied with the MRSea package.

8.4.63. The RSPB [RR-033] and [REP1-050] did not agree with the use of a 98.9% avoidance rate in the collision risk assessment for breeding gannets, due to behavioural differences during the nesting season. The Applicant [REP1-038] noted that it had consulted on the input parameters for the collision risk modelling and had provided outputs using both its own approach and that recommended by the Statutory Nature Conservation Bodies (SNCBs), but it would, nevertheless, consider any updates from NE on avoidance rates.

8.4.64. The matter was discussed in ISH5 [EV-028] and the Applicant's post-Hearing submission [REP4-039] highlighted that a 98.9% avoidance rate had been accepted in the HRAs for the East Anglia ONE North and East Anglia TWO Offshore Wind Farm applications. The Ornithological Assessment Sensitivity Report [REP4-041, Section 2.2.2] provided further reasoning, acknowledging the change in behaviour but suggesting that it did not justify an amendment to the avoidance rate. It noted that the advocated avoidance rate of 98.9% in the Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review (JNCC *et al*, 2014) was already an inherently precautionary value, as stated in the note itself.

8.4.65. The RSPB raised a further problem with the use of the collision risk model in its Written Representation [REP2-089]. It welcomed the use of the stochastic version of the Band collision risk model, as this would allow for some of the uncertainty and variability. However, it was concerned that the Applicant had applied the model in such a way that only deterministic outputs were provided. As such, it felt that the Applicant had not made use of this functionality and therefore had not given a full account of uncertainty and variability.

8.4.66. The Applicant responded [REP3-031] that there were no stochastic avoidance rates that the SNCBs had confidence in for use in the model. The RSPB [REP4-057] was content with the explanation, though continued to advocate that a stochastic approach would give better results.

8.4.67. As mentioned earlier, the Applicant had made submissions that the SNCBs' advocated precautionary approach to each parameter and input in modelling and prediction led to an unrealistic, compounded output. The Ornithological Assessment Sensitivity Report [REP5-065] included consideration of collision risk modelling (section 2.2), combined collision risk and displacement modelling (section 2.4) and a sensitivity assessment for the parameters used in collision risk modelling (avoidance rate, flight speed, nocturnal activity factors, gannet macro avoidance) (section 3.1). This was discussed at ISH11 [EV-035].

8.4.68. For gannet, the report suggested a variability of 90% or more in output values between the standard precautionary parameter values and, "*updated parameterisation using values derived from the latest evidence from recent post-consent monitoring studies*". The Applicant suggested that this demonstrated that applying precautionary values to all input parameters unnecessarily multiplies up into significantly precautionary collision risk modelling outputs.

8.4.69. From early in the Examination, the Applicant [REP2-038] had alluded to some ongoing work that could potentially lead to updated guidance relating to collision and displacement impacts for gannet, suggesting that the current approach included some double counting of impacts. In NE's absence, the ExA issued an action point [EV-028a] following ISH5, backed by a Rule 17 request [PD-009], for NE to clarify the situation with regard to this matter.

8.4.70. NE's response [REP4-053] suggested that the question related to a paper that was being finalised on the 'Consideration of avoidance behaviour of Northern gannet *Morus bassanus* in collision risk modelling for offshore wind farm impact assessments'. This concept of gannet 'macro avoidance' was introduced during the course of the Examination, and NE [REP6-055] later agreed that the assessment should be revised to account for it, greatly reducing the collision risk assessment for gannet.

8.4.71. At ISH11 [EV-035], the Applicant explained [REP6-038] that it had initially adopted the central point in the suggested macro avoidance displacement range (70%) but had been requested by NE to present

results using macro avoidance rates of 60%, 65%, 70%, 75% and 80%. The Applicant subsequently submitted a revised Ornithology EIA and HRA Annex [REP5a-012] that incorporated macro avoidance at these rates. As expected, these resulted in significant reductions in the collision risk modelling outputs.

8.4.72. Whilst some refinements were said to be needed and the paper on which the revised approach was based had been withdrawn due to some miscalculations, NE nevertheless agreed [REP6-055] with the approach that the Applicant had taken and would now advocate a 70% macro avoidance factor for gannet collision risk assessments.

8.4.73. The RSPB [REP7-099] did not accept the use of the macro avoidance factor and set out a rationale for its position in some detail. It noted that the recommendations from the study had not been formally adopted by the SNCBs and suggested that almost all of the reliable behavioural evidence was from observations of non-breeding birds.

Approach to displacement, barrier effects and associated mortality rates for auks

8.4.74. NE [RR-029] and the RSPB [RR-033] raised concerns in relation to the auk displacement assessment methodology adopted by the Applicant [APP-075]. They questioned the displacement and mortality rates used and suggested that the exclusion of birds in flight from the displacement analysis led to an underestimation of consequent mortality. The RSPB [REP6-068] also criticised the way that displacement and barrier effects were dealt with separately. It explained:

- 'Displacement' can be defined as a reduction in the density of birds in the footprint of the Proposed Development and buffer zone during construction, maintenance, operation or decommissioning, compared with the baseline situation. Displacement is equivalent to habitat loss and may be temporary or permanent, depending on whether or not habituation follows.
- 'Barrier effects' may arise when obstacles, such as groups of wind turbines, cause birds to divert from the route to their intended destination. It principally affects birds in flight. As such, barrier effects are similar, though not the same as displacement effects.

8.4.75. The ES [APP-017, paragraphs 5.11.2.149 to 5.11.2.161] drew on guidance and published papers that grouped displacement and barrier effects but then reported on the assessment of each individually.

8.4.76. The RSPB [REP6-068] noted that it was not practical to disentangle the two and so the effects of both should be considered together in impact assessment, which it said was SNCB advice. It went on to suggest that, as the analysis had not properly addressed barrier effects, it underestimated the scale of impact and had not been precautionary. To address this and other matters, the Applicant subsequently presented revised displacement analyses in the Ornithology EIA and HRA Annex [REP6-028]. Whilst the RSPB acknowledged [REP6-068] that this followed recommendations in the SNCBs' (2022) updated interim

guidance note on displacement, it did not consider it to be overly precautionary.

8.4.77. The Applicant [REP1-038] and [REP4-039] conceded that auks in flight should have been included in the assessment and submitted a revised version of the Offshore Ornithology Displacement Analysis [REP2-003]. This encompassed all relevant behaviours and included revised displacement analyses for guillemot, razorbill and puffin.

8.4.78. The Applicant also provided a supplementary Auk Displacement and Mortality Evidence Review [REP1-069]. This detailed its justification for using 50% displacement and 1% mortality rates, which were not advocated by the SNCBs, but which were based on a review of empirical evidence of auk displacement from post-consent monitoring studies. The Applicant suggested that its scientific approach would help to progress the accuracy of displacement assessments.

8.4.79. However, the Applicant's evidence review did not satisfy NE's concerns in relation to the adopted auk displacement and mortality rates [REP2-085]. NE suggested that the review usefully highlighted the 'patchy and contradictory' evidence base for offshore wind farm seabird displacement and noted 'methodological issues' with many of the cited studies. It concluded that the review did not provide justification for the use of single displacement (50%) and mortality (1%) rates and advised that these values could underestimate impacts. It suggested that the use of single values presented a significant risk of 'false precision' and was inappropriate given the variation in recorded behaviour and the limitations of the studies. NE advocated the use of the range-based approach to avoidance and mortality rates set out in SNCB guidance.

8.4.80. The RSPB [REP3-055] also thought the evidence review added weight to the need for a range of values. It expressed further concerns [REP4-057] about the detail of the methodology, especially inadequate precaution in the Applicant's weighted mean approach.

8.4.81. The Applicant [REP3-036] continued to defend its approach and the evidence that it was based on. It suggested that NE's advocated range of 30% to 70% for auk displacement had been, *"… proven to rely on data sources that would not meet the stringent tests set for use as evidence and are known to under-represent the current evidence now available to determine impacts on these species*…".

8.4.82. The Applicant also pointed out that its approach was indeed range-based. It had considered a range of mortality levels up to 1%, which it said reflected site-specific factors identified from the modelling approaches reviewed and anecdotal evidence from colonies in close proximity to offshore wind farms. It had also used a range for displacement of up to 50%. As such, its use of the 1% and 50% rates in its assessment was said to represent the worst case.

8.4.83. An updated, 2022 note from the SNCBs, 'Interim Displacement Advice Note – Advice on How to Present Assessment Information on the Extent

and Potential Consequences of Seabird Displacement from Offshore Windfarm Developments', was discussed at ISH5 [EV-028]. The Applicant submitted that the material changes related mostly to red-throated divers and that the updating was therefore not relevant. None of the other parties subsequently challenged this interpretation.

8.4.84. The ExA asked the Applicant to justify its use of a weighted mean approach. The Applicant [REP4-039] said that NE had suggested that a bespoke approach would be needed for these displacement assessments, and the Applicant believed that its weighted mean methodology took appropriate account of the circumstances.

8.4.85. The Applicant explained that the methodology had been developed for species such as guillemot for which there is considerable variation in abundance in the months that comprise the non-breeding bio-season. It had divided the non-breeding bio-season into post-breeding, migration-free winter and return migration periods. This was in response to the large peaks in numbers that occurred during the post-breeding period. These were said to be short-lived, inflated the seasonal mean peak estimate for the non-breeding season, and would lead to over-precaution in assessing potential displacement.

8.4.86. The Applicant suggested that the alternative mean peak bio-season abundance approach, as advocated by the RSPB, would overestimate impacts, and that it was not considered suitable for sites with such variation across a bio-season, as it disproportionately weighs the short periods of time when birds occur in higher abundances, even if abundances are significantly lower across the remainder of the extended bio-season.

8.4.87. As a result of continuing disagreement on the approach that should be adopted for auk displacement, NE [REP5-115] submitted bespoke additional guidance on the assessment of guillemot and razorbill displacement impacts to assist the Applicant with the assessment. This provided a detailed explanation of NE's concerns about the Applicant's methodology and advice about its preferred alternative approach.

8.4.88. It acknowledged that the 'standard' approach to displacement assessment did not adequately address the occurrence of peaks in guillemot numbers in August and September due to the adopted bio-season definitions. There was said to be a lack of reliable information on post-breeding movements for guillemot, though Furness (2015) noted that post-breeding aggregations occur off Flamborough Head and the Filey coast and expressed concern that guillemot may be vulnerable to marine renewables development during this period.

8.4.89. The additional guidance also addressed the Applicant's 'new method for estimating seasonal mean peak abundance estimates for guillemot'. NE did not agree with the approach, which it said failed to capture impacts adequately during the chick rearing and moult period when there were large aggregations in the area of the Proposed Development and when individual birds were likely to be particularly vulnerable to displacement.

8.4.90. NE went on to note that the Applicant acknowledged the distinct bio-seasons during the non-breeding period, and questioned why these had not been analysed separately, as had been done for other species such as razorbill. It concluded that the approach had resulted in a significant underestimation of impacts at a critical time of year in the guillemot's life cycle.

8.4.91. The guidance finally set out NE's advocated alternative approach to the derivation of seasonal mean peak abundance estimates for guillemot, based on defined breeding, chick-rearing and moult, and non-breeding seasons.

8.4.92. At ISH11 [EV-035], the ExA explored where disagreements remained, and what difference the two approaches might make to the auk displacement assessment quantitatively and in terms of impact significance.

8.4.93. The Applicant [REP6-038] confirmed that it had seen NE's additional guidance in advance of its submission into the Examination. The Applicant advised that there were 'substantial practical and scientific reasons' for using the weighted mean in the guillemot assessment and for not changing the assessment of displacement to de-couple the current non-breeding season and breeding season approach.

8.4.94. It suggested that the introduction of a separate bio-season and the creation of three separate displacement matrices in the assessment would produce an overly precautionary approach that would not be consistent with how similar post-breeding dispersal peaks have been dealt with for any other offshore wind farm assessment in the North Sea.

8.4.95. The Applicant was asked if it disagreed with NE that the area of sea off Flamborough Head and the Filey coast at times hosted larger numbers of auks in August and September. It said that larger pulses of birds were recorded through the array area but that these were short-lived moments that were not dissimilar to pulses of activity generally across the southern and northern North Sea. As such, it did not believe that the fluctuations justified a change in approach.

8.4.96. The ExA asked the Applicant's view on likely auk displacement impacts if NE's suggestion was followed. The Applicant suggested that there would be a significantly increased impact, as by splitting the non-breeding season, potential impacts would be assessed twice within the same bio-season, and two figures would need to be considered for predicted displacement mortality within the non-breeding bio-season rather than just one.

8.4.97. When asked if that meant that the data for August and September would be double counted, the Applicant appeared to infer that this would be the case, noting that the assessment process was based on matrices, one for each bio-season. NE's approach would involve three matrices instead of two, a breeding season matrix, a post-breeding season matrix and a

non-breeding season matrix. The Applicant was not aware of any other project in the UK where this approach had been required for auks.

8.4.98. Following the Hearing, the ExA issued a Rule 17 request [PD-018] to NE for further clarification on the possible double counting of August and September data. In response [REP8-027], NE said that its approach used three discrete bio-seasons with no overlap between them, so there would be no double counting.

8.4.99. An additional submission accepted from the Applicant at the end of the Examination [AS-053] revisited this matter and suggested that there may have been some confusion. The Applicant agreed that there was no duplication of data, and that its intention had been to highlight that NE had created two assessments for the non-breeding season, whereas 'conventional' assessments have always relied on one.

8.4.100. The Applicant's Ornithological Assessment Sensitivity Report [REP5-065] provided information that compared the Applicant's and NE's positions in relation to displacement analysis (section 2.3), combined collision risk and displacement (section 2.4) and a sensitivity assessment for razorbill (section 3.2).

8.4.101. In the Ornithology EIA and HRA Annex [REP5-078], the Applicant highlighted that the SNCB updated interim guidance (2022) encouraged developers to seek and present emerging sources of empirical evidence to provide support for their displacement assessment. The Applicant had undertaken an extensive literature review of displacement and mortality rates [REP1-069]. It reaffirmed that the review had critically appraised 21 offshore wind farm monitoring studies, which benefitted from up to six years of surveys. The review concluded that displacement rates of up to 50% and mortality rates of up to 1% were most appropriate and suitably precautionary, regardless of the bio-season. The Annex presented displacement assessment outcomes for guillemot (and other species) for each phase of the Proposed Development using both the Applicant's and NE's advocated displacement and mortality rate approaches [REP5-078, Tables 17 to 22].

8.4.102. A response from NE [AS-048] refuted any suggestion that its advice on auk displacement was at odds with SNCB guidance, confirming that the approach to seasonal definition must be case and site specific.

8.4.103. The RSPB [REP6-068] continued to criticise the Applicant's approach to defining auk displacement and mortality rates. To aid the Examination, it submitted its own calculations [REP6-068, section 8] for guillemot and razorbill (specifically those apportioned to the Flamborough and Filey Coast SPA flock), using displacement rates of 50% (favoured by the Applicant), a plausible range of 30% to 70% (advocated by NE) and, "*what can be considered a probable value of 60%, as reflected in advice to offshore wind farm developments in Scottish waters*". This last value, used in combination with a range of mortality rates, was said to better reflect the uncertainty in displacement assessment. The mortality rates used were the 1% rate favoured by the Applicant, a plausible range of

1% to 10% advocated by NE, and, "*what can be considered a probable range of 3-5% for the breeding season and 1-3% for the non-breeding season, as reflected in advice to offshore wind farm developments in Scottish waters*."

8.4.104. NE's End of Examination Position on Offshore Ornithology [REP7-104] set out its own project alone and cumulative assessments for guillemot (and other species), using the Applicant's revised baseline characterisation data [REP5a-009] and impact estimates [REP6-028]. NE used its advocated bespoke approach to assessing guillemot displacement based on the inclusion of a chick rearing and breeding bio-season (August-September) for the Proposed Development, and results based on the standard SNCB approach for comparison. The avoidance rate range used was 30% to 70%, while a range of 1% to 10% was used for mortality.

8.4.105. The Applicant's Ornithology Position Paper [REP7-085] revisited and summarised the Applicant's sources and rationale for its approach, contrasted NE's position where relevant, and made comparisons with equivalent parameters used in The Crown Estate's Round Four Plan Level HRA (Niras, 2022).

8.4.106. In its final comments on NE's D7 Ornithology Submissions, the Applicant [REP8-017] noted that the definition of an appropriate range for displacement mortality impacts for auks was one of the key methodological differences between the Applicant and NE.

8.4.107. The Applicant suggested that the assessments presented in NE's ornithology position paper had not considered a full range-based approach, as it had only presented its own preferred parameters. The Applicant therefore recommended that the ExA and the SoS should utilise its assessment in the Ornithology EIA and HRA Annex [REP6-028], which it considered to provide greater confidence when predicting impacts.

8.4.108. The Applicant noted that in other recent decisions, specifically the Norfolk Boreas, Norfolk Vanguard and East Anglia ONE North Offshore Wind Farm HRAs, the SoS adopted, on the evidence presented in those cases, a 'reasonable scenario' of a 70% displacement rate and 2% mortality rate for the purposes of assessment of impacts on guillemot and razorbill for the Flamborough and Filey Coast SPA. The Applicant considered that this allowed for substantial levels of precaution and that it could now be considered unrealistic based on its own evidence [REP1-069], which was not before the SoS when the HRA was undertaken for those projects and when adopting those parameters. As such, the Applicant confirmed its disagreement that either the SNCB standard or NE advocated bespoke approach to displacement and mortality values should be used and promoted, "*the strongly evidenced position of 50% displacement and 1% mortality*".

Approach to displacement, barrier effects and associated mortality rates for gannet and kittiwake

8.4.109. NE [RR-029] disagreed with the seasonal definitions used by the Applicant in the assessment of displacement effects on gannet and

kittiwake, and with the displacement and mortality rates adopted for the operational phase displacement analysis for gannet. It cited the proximity of the large colonies at Flamborough Head and the Filey coast as a reason.

8.4.110. Whilst not agreeing with the use of the core breeding season definition for gannet and kittiwake and thus maintaining its position, NE [REP8-031] noted that, ultimately, this was only likely to have a material effect on the gannet assessment.

8.4.111. NE requested the use of a range of 60% to 80% for gannet displacement and a range of 1% to 10% for mortality, and the provision of a complete matrix for the Proposed Development area plus a 2km buffer showing both factors from 0% to 100%.

8.4.112. The Applicant submitted a Gannet Displacement and Mortality Evidence Review [REP2-045]. This noted that the use of the 'precautionary 60-80% displacement rate, as advocated by SNCBs' had been considered but that evidence gathered for the review supported the application of seasonal displacement rates of 40% to 60% during the breeding season and 60% to 75% during the non-breeding season for the Proposed Development. The Applicant's rationale for this was set out.

8.4.113. The RSPB [REP3-055] welcomed the Applicant's review but highlighted the variability in displacement rates and suggested that, while there were no data on consequent mortality, it is likely that this would also be highly variable, as both were dependent on a range of complex, site-specific variables. It suggested that a range of values should be presented for displacement and mortality rates.

8.4.114. At ISH5 [EV-028], the ExA asked the Applicant for its view on NE's suggested use of a range of 1% to 10% mortality rates for gannet, and if it intended to revise the assessment.

8.4.115. The Applicant confirmed [REP4-039] that it had taken a similar approach to the auk displacement matter, to review, analyse and report on empirical data in relation to gannet displacement and consequent mortality rates [REP2-045]. This was said to be the first complete review of gannet behaviour in relation to offshore wind farms. The Applicant concluded that the evidence suggested lower displacement rates should be applied during the breeding season and higher displacement rates during the non-breeding seasons, based on empirical evidence from post-consent monitoring reports from wind farms in European waters.

8.4.116. It went on to contend that the review supported its position that gannet displacement mortality in practice was extremely low - up to a maximum of 1%, but likely to be considerably lower. The Applicant, therefore, stood by the gannet displacement assessment in the ES, which it considered to be precautionary.

8.4.117. The Applicant's literature review of gannet displacement and mortality rates was presented in the Gannet Displacement and Mortality Evidence Review [REP2-045]. This critical appraisal of 30 reports and publications

relating to 25 offshore wind farms had informed the Applicant's preferred rates. The Applicant said the review also demonstrated that the advocated range of displacement (60% to 80%) was derived from sources regardless of the quality of study or confidence in the rate, and that it had not accounted for studies that had shown no significant displacement effect or even attraction. There was less empirical evidence for mortality rates, but the Applicant still considered it clear that a mortality rate of up to 1% was realistic, whilst still including a suitable level of precaution.

8.4.118. The Ornithological Assessment Sensitivity Report [REP5-065] summarised the Applicant's and NE's positions in relation to the displacement analysis (section 2.3), combined collision risk and displacement (section 2.4), and a sensitivity assessment for the parameters and tools used in the displacement analysis for gannet. It considered the various assessment parameters, including displacement rates, and illustrated the range of assessment outputs depending on the input parameter values used.

8.4.119. The Ornithology EIA and HRA Annex [REP5-078] noted that the SNCBs' updated interim guidance (2022) encouraged developers to use emerging sources of empirical evidence to support their displacement assessments.

8.4.120. As discussed earlier in this Report, part way through the Examination, NE accepted [REP6-055] the application of a 70% macro avoidance factor for gannet collision risk assessments, though the RSPB did not share this position. As the concerns with gannet had derived from combined collision and displacement mortality, the significant reduction in collision risk that resulted meant that the materiality of this matter largely fell away.

Approach to population viability analysis modelling

8.4.121. NE [RR-029] and the RSPB [RR-033] raised concerns about the PVA that had been undertaken by the Applicant [APP-017] and [APP-077] to investigate the overall vulnerability of seabird populations to the predicted impacts of the Proposed Development. The Population Viability Analysis (PVA) compared projected unimpacted seabird population trajectories with the predicted impacted populations for gannet, kittiwake, great black-backed gull, guillemot, razorbill and puffin.

8.4.122. The Applicant used the Seabird PVA Tool developed by NE (Searle *et al*, 2019, and Mobbs *et al*, 2020), accessed by the 'Shiny App'[3], to perform the modelling and analysis. This approach was not challenged.

8.4.123. The Applicant noted [APP-077] that a PVA could be carried out on either a density dependent or density independent basis. For reasons given, it said that it was more typical to use density independent population models for seabird assessments, and that these were inherently

[3] The Shiny App is a graphical user interface accessible via a standard web-browser that uses the nepva R package.

precautionary. It confirmed that NE had agreed pre-application that the model should be run excluding density dependence [REP5-065].

8.4.124. Many of the concerns had arisen because some of the inputs to the PVA were outputs from the assessment of impacts on the ornithology baseline. As both the baseline characterisation and elements of the assessment methodology (including some of the BDMPS figures) had been challenged by NE until late in the Examination (and in some cases throughout it), there were inevitably knock-on implications for the PVA.

8.4.125. The use of counterfactuals in the PVA was a major issue throughout the Examination and this matter is considered in the next subsection of this Report. Other matters arose during the Examination, as the revised baseline characterisation was agreed, and consequent reassessments were submitted by the Applicant.

8.4.126. In the Ornithological Assessment Sensitivity Report [REP5-065], the Applicant responded to a query in NE's RR [RR-029] as to why a 'burn in' period[4] was not included in the PVA modelling. Pre-application, the initial guidance paper for the NE Seabird PVA Tool had suggested it was not ready for inclusion. Following further consultation with NE [REP2-083], the Applicant agreed to add a 'burn-in' period and Part 2 of the sensitivity report included the revised PVA.

8.4.127. The report explained that during pre-application consultations with NE and the RSPB, it was agreed that the most appropriate demographic survival rates and EIA level productivity figures for the PVA were those presented in Horswill & Robinson (2015). However, the Applicant had subsequently reviewed a more recent paper on the validation of PVA models through comparing the predicted baseline population growth from the model to a corresponding, real-world growth trend (Horswill *et al*, 2022).

8.4.128. This was said to offer additional accuracy to the prediction. However, comparable historic data were not available for populations of greater than local colony size, so validation of the PVA carried out at the EIA level was not possible. The process was, however, carried out for the Flamborough and Filey Coast SPA population level, as sufficient historic data were available for all species of interest except puffin. This is addressed in relation to the HRA in Chapter 13 of this Report.

8.4.129. In the revised EIA PVA set out in the sensitivity report [REP5-065, section 3.4 and Tables 30 to 41], the predicted impacts were reassessed against the following:

- the gannet UK North Sea and English Channel BDMPS population;
- the gannet UK biogeographic population;
- the kittiwake UK North Sea BDMPS population;

[4] The inclusion of additional pseudo-years in the Seabird PVA Tool immediately after the year associated with the initial counts to address the initial divergence between the stable and modelled age structure.

- the kittiwake UK biogeographic population;
- the great black-backed gull UK North Sea BDMPS population;
- the great black-backed gull UK biogeographic population;
- the guillemot UK North Sea and English Channel BDMPS population;
- the guillemot UK biogeographic population;
- the razorbill UK North Sea and English Channel BDMPS population;
- the razorbill UK biogeographic population;
- the puffin UK North Sea and English Channel BDMPS population; and
- the puffin UK biogeographic population.

8.4.130. A revised version of the Ornithology EIA and HRA Annex [REP6-028] was submitted with corrections to some minor typographic errors relating to the gannet, kittiwake and great black-backed gull minimum and maximum collision risk estimates and the revised annual BDMPS population for great black-backed gull and razorbill.

8.4.131. Between Deadlines 5 and 5a, NE had been notified of a coding bug in the NE Seabird PVA Tool [REP5a-029]. Having examined the PVA logs provided by the Applicant [REP5-065], NE identified that the Applicant's PVAs for the kittiwake UK North Sea BDMPS population and the kittiwake UK biogeographic population were susceptible to the identified issue, and it advised the Applicant to re-run those analyses (in addition to further PVAs that only affected the HRA, as set out in Chapter 13 of this Report). At ISH11 [EV-035], the Applicant said [REP6-038] that it was aware of the issue, that NE had provided a work-around solution and that the necessary review had been undertaken.

8.4.132. The Applicant reported orally that the revisions to the kittiwake PVA had not materially altered the results of the modelling, with the outputs for reduced population growth rate differing by less than 0.03%. The Applicant considered this well within the expected limits of natural variability in a stochastic model. The Applicant subsequently submitted a Clarification Note on Kittiwake PVA and BDMPS population estimates [REP8-020]. This confirmed the Applicant's oral evidence in relation to the PVA carried out for the EIA, finding no material change to the PVA results presented in the Ornithological Assessment Sensitivity Report (REP6-027).

8.4.133. In Appendix 1 of its End of Examination Position on Offshore Ornithology [REP7-104], NE continued to disagree with how the Applicant had extrapolated the advocated breeding BDMPS population calculation method to estimate annual predicted BDMPS populations. In addition to accepting the minor typographical errors mentioned above, the Clarification Note on Kittiwake PVA and BDMPS population estimates [REP8-020] maintained that the Applicant's approach to defining the BDMPSs for razorbill and great black-backed gull was the most appropriate, despite the challenge from NE.

8.4.134. The Clarification Note on Kittiwake PVA and BDMPS population estimates also confirmed that the non-breeding BDMPS population sizes from Furness (2015) had been used as the basis for determining annual predicted impacts, as these represented the largest estimated population size in each case.

8.4.135. The Applicant suggested [REP8-020] that NE may have misinterpreted the methodology that had been used and how the updated values had been applied, explaining that NE had stated:

"Whilst we acknowledge the breeding BDMPS populations advised by Natural England do not include any birds from overseas areas, there is currently no way of estimating the proportions of birds from overseas colonies that may spend time in respective UK BDMPS areas during the breeding season with confidence."

8.4.136. The Applicant agreed with NE that there was no reliable way of estimating the number of birds from overseas in the North Sea BDMPS during the breeding season. The Applicant confirmed that it had, as requested, undertaken the breeding season assessments using the advocated population calculation method, which excluded overseas individuals. The breeding season population size had been calculated to be larger than the non-breeding season defined by Furness (2015), and the Applicant had based the assessments on the largest value, as recommended.

8.4.137. However, the Applicant considered that annual assessments should encompass all birds with connectivity to the North Sea during all bio-seasons. Therefore, a further step had been adopted to derive the total population size for the annual assessments and the Applicant suggested that this might have been the basis of the misunderstanding. Overseas, non-breeding season birds, as defined in Furness (2015), had been added to the calculated breeding season populations to derive an annual BDMPS population size that accounted for all possible connectivity with the North Sea region of sea over the year.

Approach to the use of counterfactuals in population viability analysis

8.4.138. In the ES Annex, Offshore Ornithology Population Viability Analysis [APP-077], the Applicant used the counterfactual of population growth rate (CPGR) to assess the population level consequences of the predicted impacts. This was calculated as 'the median of the ratio of the annual growth rate of the impacted to un-impacted population, expressed as a proportion'.

8.4.139. NE [RR-029] raised concerns about the Applicant's use of counterfactuals in the PVA:

"For the Population Viability Analysis, the Applicant has not presented the Counterfactual of 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."

8.4.140. The RSPB raised the same concern [RR-033], arguing the importance of using both the CPGR (the ratio of the impacted annual growth rate to the

unimpacted annual growth rate) and the counterfactual of final population size (CFPS) (the ratio of the impacted final population size to the unimpacted final population size). The RSPB highlighted that the use of both was recommended in a review of output metrics produced by the British Trust for Ornithology for the Joint Nature Conservation Committee (JNCC).

8.4.141. The Applicant stated that the Offshore Ornithology Population Viability Analysis included both counterfactuals [APP-077, paragraph 2.2.1.8], though only the CPGR was used in the assessment. The presentation of the CFPS was not apparent, with the PVA results tables [APP-077, Tables 10 to 21] presenting the density-independent CPGR and the annual reduction in growth rate. It noted that the Applicant considered:

"… that the counterfactual of population growth rate only should be used for interpreting the predicted impacts. This is because the counterfactual of population growth rate can be compared against known population trends for a feature / receptor and is relatively insensitive to the baseline rate of growth and direction (positive or negative). Whereas, the counterfactual of population size will predict very large differences in comparison to the baseline population size, especially when density dependent factors allowing for population recovery or preventing exponential growth are not considered within the PVA, as is the case with these assessments."

8.4.142. The Applicant's response to NE's RR [REP1-038] suggested that the CFPS had not been requested during pre-application consultation, and that it had not been used in similar projects recently. The Applicant went on to say it was further investigating the suitability of both counterfactuals for the assessment, and that it would provide further information during the Examination.

8.4.143. The ExA explored the use of counterfactuals in the PVA at ISH5 [EV-028]. The Applicant's view [REP4-039] was that, when modelling in the absence of density dependence, neither the baseline nor impacted population projections are likely to be credible. It explained its rationale for that view, noting, for example, that a modelled population with a positive growth rate would expand exponentially in the absence of density dependence, unconstrained by environmental and demographic variables.

8.4.144. The Applicant further postulated that there would be significant uncertainty around the interpretation of model outputs using the CFPS, as there would be no way of validating predicted reductions in population size. For the CPGR, the predicted reduction in growth rate could be validated using real-world data, namely recent and historic population growth rates, to provide an informed decision on the likely impact on a population.

8.4.145. The ExA asked the Applicant which counterfactuals had been used in the recent East Anglia Offshore Wind Farm applications and decisions. The Applicant advised that model outputs from both were presented, but only

the CPGR was used for the interpretation of results. This was said also to be the case for Hornsea Project Three, Norfolk Boreas, and Norfolk Vanguard Offshore Wind Farms.

8.4.146. When asked about the ES, the Applicant advised that it did initially present model outputs using both of the counterfactuals, but that it decided to remove the CFPS analysis to avoid confusion.

8.4.147. The ExA asked the Applicant if further consideration could be given to the inclusion of both modelling approaches in order to satisfy NE's and the RSPB's concerns. In its post-Hearing note [REP4-039], the Applicant confirmed that its position remained that the CPGR was the only reliable output value when running a density independent PVA. Nevertheless, the Applicant said that it was still considering the validity of presenting both counterfactuals in the context of the NE Seabird PVA tool.

8.4.148. The RSPB's response [REP5-120] to this was that the:

"... Applicant remains of the position that the CPGR is the only suitable output metric of Population Viability Analysis and will not present the Counterfactual of Population Size. This is against the advice of Natural England and the RSPB and contradicts the results of two expert reviews into the applicability of these output metrics. In order to assist the inquiry, the RSPB asks that both metrics are presented..."

8.4.149. The Applicant's ongoing consideration of the use of counterfactuals was addressed in the Ornithological Assessment Sensitivity Report [REP5-065, section 2.7]. This summarises the Applicant's position and rationale for not presenting the CFPS. It concludes by saying:

"On this basis the Applicant continues to advocate that the CPGR should solely be relied upon when interpreting density independent PVA modelling."

8.4.150. The RSPB [REP6-067] and [REP6-068] and NE [REP7-104, for example] continued to argue for the use of the CFPS. NE suggested that the CPGR and the CFPS have both been shown to be the least sensitive metrics to misspecification of the population trend and demographic rates used in the PVA model. Both provided references [REP6-068, paragraph 5.2] and [REP7-104, page 4], for the two expert reviews into the applicability of the metrics that had been mentioned in the RSPB's earlier submission. The RSPB suggested that the ease of understanding of the CFPS was also crucial to its usefulness, and that the outputs from the CPGR were less understandable outside a technical population modelling context. The RSPB disagreed with the Applicant's assertion that density dependent modelling meant that the CFPS was unreliable. Rather, the RSPB contended that the two metrics were very similar, with the only material difference being that the CPGR does not include the length of time that the wind farm will be operational. As such, they would both be equally affected whether density dependence was included or not.

8.4.151. In order to assist the Examination, the RSPB went on [REP6-068] to present its own modelling calculations using the CFPS for the guillemot

and razorbill populations of the Flamborough and Filey Coast SPA, using the Applicant's data in the Ornithology EIA and HRA Annex [REP5-078, sections 5 and 6].

8.4.152. At ISH11 [EV-035], the ExA asked the Applicant if its audit of the use of the two counterfactuals in PVA in other offshore wind farm DCO applications had progressed. The Applicant said that it would review recent applications and provide a short summary on that topic at the next deadline. The ExA included this as an action point [EV-035a] but the audit was not immediately forthcoming, as later noted by the RSPB [REP8-024].

8.4.153. Following the reminder, the Applicant made a late submission [AS-053] that acknowledged the omission of a response to the action point. Section 2 provides an analysis of the use of counterfactuals in the PVAs for the East Anglia ONE North, East Anglia TWO, Norfolk Boreas, Norfolk Vanguard, Hornsea Project Three, and East Anglia THREE Offshore Wind Farms.

8.4.154. This concluded that the only comparable project was the Norfolk Boreas Offshore Wind Farm, as this was the only one that used the NE Seabird PVA tool in the same manner as the Proposed Development. All of the others used different PVA models with a primary focus on density dependent results.

8.4.155. In summary, the Applicant's interpretation of the matter in the Norfolk Boreas Offshore Wind Farm assessment, examination and decision was:

- The developer ran density independent and density dependent PVA models and presented both the CFPS and the CPGR, though it focused on the CPGR for the prediction of population effects, citing the same concerns as the Applicant in relation to CFPS results in the absence of density dependence.
- The developer ran updated PVA modelling and provided further information for the Flamborough and Filey Coast SPA only. It further reiterated that, in the absence of density dependence, only the CPGR should be relied on for informing PVA outputs.
- At the time, NE had concerns in relation to the manner in which the Seabird PVA Tool had been run, so instead used the PVA results from Hornsea Project Three to inform its position in relation to the SPA apportionment impacts.
- NE's position statement references both the CFPS and CPGR but relied solely on the CPGR for informing its position in relation to impacts.
- Both the CFPS and CPGR were presented in the SoS's HRA analysis of the predicted population level effects for Norfolk Boreas alone and in-combination. However, only the CPGR was considered in detail when comparisons were made with known trends for the qualifying features of the Flamborough and Filey Coast SPA and when informing the final conclusions, "*suggesting that only the CGR was relied upon*".

8.4.156. In a sequence of submissions over the last few deadlines in the Examination (for example, the Applicant [REP8-017], NE [REP7-104], and the RSPB [REP8-032]) the relevant parties repeated their

submissions and refuted opposing views, and thus there was little movement in positions over whether the CFPS should be included or used in the assessment.

Assessment of effects on key seabirds associated with Flamborough Head and the Filey coast: indirect effects through impacts on prey species

8.4.157. Chapter 7 of this Report introduced matters relating to the possible indirect impacts of the Proposed Development on secondary receptors, including important seabird populations through changes to biological productivity. These could arise as a result of impacts on the Flamborough Front and Smithic Bank and consequent changes to marine and coastal processes.

8.4.158. NE's [RR-029] and the MMO's [RR-020] questioned the basis on which the ES had assessed indirect effects on seabirds as a result of impacts on their prey species and suggested that further assessment was necessary. NE suggested that the Applicant's conclusion of no significant impact on the wider stock of forage fish did not necessarily mean there could not be local redistributions or declines that could impact specific seabirds at certain times of the year. It was especially concerned about the vulnerability of moulting, flightless guillemot and razorbill with dependent chicks to locally depleted prey in August and September, postulating that they tended to concentrate in the vicinity of the Proposed Development during this period.

8.4.159. In response to ExQ1 [PD-006], the Applicant [REP2-038] said that further consideration was being given to supplementary work on indirect effects.

8.4.160. At ISH5 [EV-028], the Applicant confirmed that the outputs from the physical processes, marine habitat and fish assessments were being revised and drawn together as the basis of a supplementary assessment of indirect effects. At the same time, in a written summary of that Hearing [REP4-039], it signposted the assessment of indirect effects in the Offshore and Intertidal Ornithology ES chapter [APP-017] and the conclusions in the Fish and Shellfish Ecology ES chapter [APP-015] that there would be no significant adverse impacts as a result of the construction, operation or maintenance of the Proposed Development.

8.4.161. The Applicant subsequently submitted the supplementary Indirect Effects of Forage Fish and Ornithology report [REP5-085], responding to comments about indirect effects of changes to the Flamborough Front on forage fish, notably herring, sandeel and sprat, and, in turn, seabird distributions, including post-breeding, dispersing auks.

8.4.162. The report provided a summary of relevant information from the Marine Processes Supplementary Report [REP4-043] and the Fish and Shellfish Ecology Technical Report [APP-071]. At section 6, it included a summary of bird distributions locally and more widely across the North Sea over the seasons.

8.4.163. The report confirmed a coincidence of forage fish and seabird hotspots and said that the most important of these lie north and south of the proposed array area. It suggested that shallow waters are as important as the Flamborough Front for fish availability to birds, especially to the south of the proposed array area, and maintained that any effects on the Front from foundations would be very localised and immaterial over its full extent.

8.4.164. The report concluded that:

"… the productivity of the Flamborough Front area is linked to multiple factors such as bathymetry and is not solely to the annual formation of the Flamborough Front. The Hornsea Four Array area is located in an area of comparatively lower productivity, and the Applicant's Developable Area Approach has further reduced the potential for impacts by removing from the array area, areas of higher productivity (as inferred from the density and distributions of auks in the post breeding period). As such, the Applicant remains confident in the assessment undertaken to the potential impacts of the project on the surrounding features."

8.4.165. NE [REP6-060] maintained that the region is of high environmental value. It suggested that the limited available data, much of which was very coarse, restricted reliable conclusions to the regional scale, such that little confidence could be placed on conclusions made on a smaller, localised scale. It considered that distinctions made between the relative importance of the proposed array area and other locations in the vicinity of the Front should be given 'limited credence'.

8.4.166. Given that it did not believe that the Applicant had been able to provide sufficient evidence to rule out the potential for changes to marine processes that influence the Flamborough Front, nor, in turn, the distribution, abundance and survival of guillemot and razorbill during the chick rearing and moult period, NE [REP6-057] recommended a detailed monitoring strategy to address uncertainties around the impact of a wind farm on stratification and mixing. The RSPB [REP7-098] agreed with NE's analysis and suggestions. Such monitoring is discussed in Chapter 7 of this Report.

Assessment of effects on key seabirds associated with Flamborough Head and the Filey coast: interpretation of assessment results for project alone and cumulatively

8.4.167. As detailed above, there were substantial differences between the main parties with an interest in the offshore ornithological issues about the most suitable approach to undertaking the ornithological assessment. These ran throughout and up to the end of the Examination. The Applicant, the RSPB and NE all produced versions of at least some of the assessment outcomes for the Proposed Development alone and cumulatively with other relevant plans and projects. This subsection therefore summarises those different views in relation to the EIA output. Birds from the Flamborough and Filey Coast SPA were a major

consideration for the HRA, and this is addressed in Chapter 13 of this Report.

8.4.168. The ES [APP-017] found no significant impacts on seabirds, either as a result of the Proposed Development alone, or cumulatively with other plans and projects. The RRs and early deadline submissions from NE [RR-029] and the RSPB [RR-033] largely focussed on methodological concerns, the nature of which meant that it was not possible for them to make an informed comment on the outcomes of the Applicant's assessment. NE did, however, express preliminary concerns that there could be significant adverse impacts on kittiwake, razorbill, guillemot, gannet and greater black-backed gull due to cumulative collision and displacement effects.

8.4.169. The Applicant changed its view on kittiwake impacts in relation to the HRA in-combination with other plans and projects prior to the Examination [AS-023], acknowledging a potential Adverse Effect on Integrity, but in its response [REP2-038] to ExQ1 [PD-006], the Applicant maintained that there would be no likely significant project-alone or cumulative effects 'in EIA terms'.

8.4.170. As highlighted above, the Applicant submitted a number of reports based on empirical studies of reported collision risk, displacement and mortality factors to justify its departure from the standard approach and modelling parameter ranges. These did not generally satisfy NE's or the RSPB's concerns (for example, [AS-048]).

8.4.171. As the end of the Examination approached, both NE and the RSPB produced their own offshore ornithological assessments using the revised and ultimately agreed baseline characterisation data (from MRSea v2). Whilst the baseline used was common to all assessments, each party used its own preferred methodological approach and parameter values, so the outputs were not directly comparable.

8.4.172. The full details of these assessments were set out or cross-referenced in position statements at the end of the Examination (NE [REP7-104], the RSPB [REP6-068] and the Applicant [REP6-028], [REP7-085] and [REP8-017]).

8.4.173. NE's final position statement [REP7-104, Table 1] set out its position in relation to the EIA ornithological assessment. Its Appendix A provided detailed comments and conclusions on project alone and cumulative EIA impacts, using the agreed MRSea v2 baseline and the approach, parameters and ranges that it had advocated during the Examination.

8.4.174. The RSPB's [REP6-068] assessment was restricted to the guillemot and razorbill populations of the Flamborough and Filey Coast SPA, focussing on the disputed approaches to the apportionment to the SPA flock, displacement and mortality rates, and the application of the CFPS. The results for guillemot are set out in Table 1 and Figures 1 and 2, while the corresponding razorbill results are set out in Table 2 and Figures 3 and 4.

8.4.175. Though referring to HRA matters, a summary of the RSPB's interpretation of the 'probable' implications for guillemot from the Flamborough and Filey Coast SPA population through additional displacement mortality was:

- the population would be 2.5% to 6.4% lower after the lifetime of the Proposed Development than it would be without it;
- in-combination with other developments, the corresponding prediction would be 24.0% to 41.7% lower.

8.4.176. The RSPB's corresponding analysis for razorbill suggested:

- the population would be 13.9% to 20.6% lower after the lifetime of the Proposed Development than it would be without it;
- in-combination with other developments, the corresponding prediction would be 11.1% to 21.9% lower.

8.4.177. The RSPB did not specifically address the significance of EIA impacts, though it concluded that, for HRA purposes, an Adverse Effect on Integrity of the Flamborough and Filey Coast SPA (alone or in-combination) could not be ruled out for guillemot, razorbill, gannet, kittiwake or the total seabird assemblage (Chapter 13 of this Report).

8.4.178. It was possible to make a cautious comparison between the additional mortality estimates generated by NE and the Applicant, though the source documents should be read alongside the following summary tables to understand the different approaches and the caveats attached to those assessments. (Construction phase impacts are also considered in detail in the Applicant's assessment.)

Additional mortality assessments for the operational phase for the key seabird species for the Proposed Development alone

Table 8.1
Gannet: combined collision and displacement assessment additional mortality

	NE Proposed Development alone	Applicant Proposed Development alone (60-80% displacement)	Applicant Proposed Development alone (40-60% displacement)
Without macro avoidance	16 - 298	23 - 62	21 - 60
With 70% macro avoidance	14 - 211	20 - 24	18 - 22

Table 8.2 Kittiwake: collision assessment - additional mortality	
NE Proposed Development alone	Applicant Proposed Development alone
93 (26 – 205)	81 (43 – 149)

Table 8.3 Guillemot: displacement assessment - additional mortality		
	NE Proposed Development alone	Applicant Proposed Development alone
NE bespoke displacement	190 – 4,432	-
SNCB standard displacement	139 – 3,244	-
Applicant approach	-	148

Table 8.4 Razorbill: displacement assessment - additional mortality	
NE Proposed Development alone	Applicant Proposed Development alone
17 - 392	28

Table 8.5 Puffin: displacement assessment - additional mortality	
NE Proposed Development alone	Applicant Proposed Development alone
2 - 45	3

Table 8.6 Great black backed gull: collision - additional mortality	
NE Proposed Development alone	Applicant Proposed Development alone
10 (2 – 50)	7 (3 – 26)

Cumulative mortality assessments for the operational phase for the key seabird species

8.4.179. The projects included in the cumulative consented projects assessment are listed in the Applicant's Ornithology EIA and HRA Annex [REP6-028]. The 'all projects' assessment additionally includes the proposed Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects.

Table 8.7
Gannet: combined displacement and collision cumulative assessment - additional mortality

	NE cumulative consented projects	NE cumulative all projects	Applicant cumulative consented projects	Applicant cumulative all projects
NE approach	1,178 – 4,737	1,194 – 4,849	-	-
Applicant approach (60-80% displacement)	-	-	3,250 – 3,346	3,283 – 3,382
Applicant approach (40-60% displacement)	-	-	3,207 – 3,290	3,240 – 3,325

Table 8.8
Guillemot: cumulative displacement assessment - additional mortality

	NE cumulative consented projects	NE cumulative all projects	Applicant cumulative consented projects	Applicant cumulative all projects
NE bespoke displacement	1,214 – 28,336	1,291 – 30,118	-	-
SNCB standard displacement	1,164 – 27,149	1,240 – 28,931	-	-
Applicant approach	-	-	1,856	1,983

Table 8.9
Razorbill: cumulative displacement assessment - additional mortality

NE cumulative consented projects	NE cumulative all projects	Applicant cumulative consented projects	Applicant cumulative all projects
388 – 9,061	416 – 9,702	647	693

Table 8.10 Puffin: cumulative displacement assessment - additional mortality			
NE cumulative consented projects	NE cumulative all projects	Applicant cumulative consented projects	Applicant cumulative all projects
135 – 3,159	135 – 3,161	226	226

Table 8.11 Great black-backed gull: cumulative collision assessment - additional mortality			
NE cumulative consented projects	NE cumulative all projects	Applicant cumulative consented projects	Applicant cumulative all projects
974	986	973	985

Predicted percentage increase in baseline mortality as a consequence of the operation of the Proposed Development

8.4.180. NE and the Applicant went on to apply these modelling results to a baseline reference population to estimate the increase in percentage mortality as a result of the Proposed Development. The approaches taken and the data used differ in several respects, but the comparative outputs for the BDPS and biogeographical populations have been summarised in the following tables.

Table 8.12 Kittiwake: collision assessment - mortality increase (expressed as a %)				
	NE biogeographic	NE BDMPS	Applicant biogeographic	Applicant BDMPS
Proposed Development alone	0.01	0.07	0.01	0.04
Cumulative consented projects	0.50	3.07	0.50	2.06
Cumulative all projects	0.50	3.10	0.50	2.08

Table 8.13
Guillemot: displacement assessment - mortality increase (expressed as a %)

	NE biogeographic	NE BDMPS	Applicant biogeographic	Applicant BDMPS
Proposed Development alone, Applicant approach	-	-	0.03	0.05
Cumulative consented projects, Applicant approach	-	-	0.33	0.63
Cumulative all projects, Applicant approach	-	-	0.35	0.67
Proposed Development alone, NE bespoke approach	0.03 – 0.78	0.07 – 1.57	-	-
Cumulative consented projects, NE bespoke approach	0.21 – 4.98	0.43 – 10.04	-	-
Cumulative all projects, NE bespoke approach	0.23 – 5.29	0.46 – 10.67	-	-
Proposed Development alone, SNCB standard approach	0.02 - 0.57	0.05 – 1.15	-	-
Cumulative consented projects, SNCB standard approach	0.20 – 4.77	0.41 – 9.62	-	-
Cumulative all projects, SNCB standard approach	0.22 – 5.08	0.44 – 10.25	-	-

Table 8.14
Gannet: combined collision and displacement assessment - mortality increase (expressed as a %)

	NE biogeo-graphic	NE BDMPS	Applicant biogeo-graphic 40-60% displace-ment	Applicant BDMPS 40-60% displace-ment	Applicant biogeo-graphic 60-80% displace-ment	Applicant BDMPS 60-80% displace-ment
Proposed Development alone	0.01 – 0.10	0.02 – 0.25	0.02 – 0.02	0.04 – 0.05	0.02 – 0.02	0.04 – 0.05
Cumulative consented projects	0.53 – 2.15	0.53 – 2.15	0.27 – 0.28	0.70 – 0.72	0.28 – 0.28	0.72 – 0.73
Cumulative all projects	0.54 – 2.20	0.54 – 2.20	0.28 – 0.28	0.71 – 0.73	0.28 – 0.289	0.72 – 0.74

Table 8.15
Razorbill: displacement assessment - mortality increase (expressed as a %)

	NE biogeographic	NE BDMPS	Applicant biogeographic	Applicant BDMPS
Proposed Development alone	0.00 – 0.03	0.00 – 0.08	0.01	0.02
Cumulative consented projects	0.03 – 0.62	0.08 – 1.80	0.20	0.57
Cumulative all projects	0.03 – 0.69	0.08 – 2.00	0.21	0.61

Table 8.16
Puffin: displacement assessment - mortality increase (expressed as a %)

	NE biogeographic	NE BDMPS	Applicant biogeographic	Applicant BDMPS
Proposed Development alone	0.00 – 0.00	0.00 – 0.03	0.00	0.00
Cumulative consented projects	0.01 – 0.15	0.09 – 2.08	0.01	0.14
Cumulative all projects	0.01 – 0.15	0.09 – 2.08	0.01	0.14

Table 8.17 Great black-backed gull: collision assessment - mortality increase (expressed as a %)				
	NE biogeographic	NE BDMPS	Applicant biogeographic	Applicant BDMPS
Proposed Development alone	0.01 – 0.01	0.02 – 0.34	0.01 – 0.07	0.02 – 0.18
Cumulative consented projects	2.59	6.66	2.59	6.66
Cumulative all projects	2.62	6.74	2.62	6.73

8.4.181. Drawing on its assessments, the Applicant's position on the significance of effects remained the same as that in the ES, that there would be no significant EIA level impacts on offshore ornithological receptors, either as a result of the Proposed Development alone, or cumulatively with other projects. A summary table was provided [REP7-085, Table 10].

8.4.182. In brief, NE [REP7-104] concurred that there would be no likely significant effects arising from the Proposed Development alone, but it concluded that significant adverse cumulative effects could not be ruled out, as follows:

- Gannet: it was not possible to rule out a significant adverse impact from combined collision and displacement mortality for the cumulative assessment, though the retrospective application of the agreed macro avoidance rate to earlier projects in the cumulative assessment would most likely reduce this to not significant.
- Kittiwake: the disputed PVA outputs meant that it was not possible to provide a definitive opinion on the significance of additional mortality at the BDMPS scale, but earlier offshore wind farm Examinations identified the potential for significant cumulative effects at the North Sea population scale, so it was not possible to rule out a significant adverse collision impact in the cumulative assessment.
- Guillemot: even using lower displacement and mortality rates of 50% and 2% respectively, and regardless of whether the standard SNCB or bespoke NE approach to displacement was adopted, a significant adverse effect was likely at the North Sea population scale in a cumulative assessment, though the disputed PVA outputs made it difficult to be precise about the implications for the population.
- Razorbill: a significant adverse cumulative impact could not be ruled out, largely due to uncertainty about whether the current net growth of the UK population was sustainable in the face of numerous pressures.
- Puffin: the cumulative displacement assessment, excluding the Sheringham Shoal and Dudgeon Offshore Wind Farm Extensions and Rampion 2, was unlikely to lead to significant effects on the BDMPS population. However, significant adverse cumulative effects could not

be ruled out when the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects were added.

- Great black backed gull: it was not possible to rule out a significant adverse impact from cumulative collision mortality.
- Lesser black-backed gull: a conclusion of no significant adverse impact could be drawn for the cumulative collision mortality from the Proposed Development and consented offshore wind farms. However, significant adverse cumulative collision impacts could not be ruled out when the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects were included in the cumulative assessment.
- Herring gull: no significant adverse impact was predicted for the cumulative collision mortality from the Proposed Development and consented offshore wind farms. However, significant adverse cumulative collision impacts could not be ruled out when the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects were included in the cumulative assessment.

Assessment of effects on other important seabirds: common scoter and red-throated diver

8.4.183. The ES [APP-017] noted that construction activities such as export cable laying would have the potential to cause disturbance and displacement of some other species of seabird. The Applicant suggested that such impacts were generally only considered in relation to activities that could affect offshore areas hosting higher densities of the more sensitive seabird species, so the matter was not often included in offshore wind farm assessments.

8.4.184. The ES identified two species associated with the Greater Wash SPA that were considered sensitive to disturbance and displacement. These were red-throated diver and common scoter. Whilst potential impacts from the installation of the export cable corridor were raised, the ES notes that the export cable corridor would not directly affect the designated site and would avoid the areas of highest density for both species.

8.4.185. The ES contended that common scoters were not regularly recorded in the abundances and densities that would warrant assessment, and it did not consider the species further.

8.4.186. Commitments secured through the draft DCO would mean that construction vessels would be expected to avoid areas of rafting red-throated diver when travelling to and from construction sites, minimising impacts on that species. Nevertheless, the ES did consider potential effects on red-throated diver along the route of the export cable corridor plus a 2km buffer.

8.4.187. The detailed methods were set out in the Offshore Ornithology Displacement Analysis [APP-075]. The results were summarised in

displacement matrices for the minimum and maximum scenarios using mortality rates of 0 to 100% and displacement rates of 0 to 100%.

8.4.188. Using a methodology that was said to have been agreed pre-application with NE, the assessment found that red-throated divers occurred in very low densities of between 0.004 and 0.005 birds per km². Based on these densities, it was estimated that no more than three red-throated divers would be present within an at-risk area. Even then, the Applicant suggested that it would be unlikely that any individuals would be significantly impacted by such temporary and spatially restricted displacement, given there would be large areas of equally suitable habitat surrounding the affected area. The ES concludes that there would be no mortalities of red-throated diver as a consequence of cable laying activities.

8.4.189. NE [RR-029] raised the matter of displacement mortality rates for red-throated diver and common scoter. It advocated the use of a range of mortality rates of between 1% and 10% in the assessment, as 1% was not sufficiently precautionary.

8.4.190. The Applicant provided further information in an Assessment of Common Scoter and Red-Throated Diver within the Export Cable Corridor [REP2-049]. This was said to respond to a pre-application request from NE to clarify the overlap between the 2km buffer from the export cable corridor and the Greater Wash SPA. It concluded a maximum overlap of 0.4% of the protected site as a worst-case scenario, and that the limited spatial and temporal nature of the potential disturbance did not represent a significant risk.

8.4.191. It also provided more detailed evidence in support of the Applicant's EIA conclusions, including a response to the advice that mortality rates of between 1% and 10% should be used. The Applicant's view remained that there would be no significant impacts.

8.4.192. The final version of NE's risks and issues log [REP8-031] suggested that there were no outstanding concerns in relation to the matter, and Table 1 of the position statement [REP7-104], which summarised the EIA conclusions, made no reference to common scoter or red-throated diver. Differences remained in relation to the HRA in respect of this matter, but these are addressed in Chapter 13 of this report.

Highly Pathogenic Avian Influenza

8.4.193. The RSPB submitted information into the Examination about the outbreak of highly pathogenic avian influenza (HPAI) in seabirds in its comments on submissions received at D5 and D5a [REP6-067]. It noted:

"… the importance of the recent outbreak of Highly Pathogenic Avian Influenza on the seabird populations of the East Coast of the UK. This has strong implications for the assessment of offshore wind farms, particularly in the context of the robustness of the population to additional mortality and whether the population can continue to be considered in favourable conservation status."

8.4.194. A similar point was included in Annex I to NE's comments [REP6-059] on the Applicant's Ornithological Assessment Sensitivity Report.

8.4.195. The ExA issued a Rule 17 request to the Applicant [PD-018] asking for its view on the HPAI outbreak in seabird populations along the east coast of the UK and queried if it had any implications for the assessments in the context of robustness of the populations to additional mortality, the baseline figures used in the assessment and the conservation status of the relevant European site qualifying features.

8.4.196. The Applicant's view on the HPAI outbreak [REP8-013] and [REP8-017] was that the disease, in common with any natural or anthropogenic factor that may influence seabird populations, has the potential to reduce seabird populations over the lifespan of the Proposed Development. However, the Applicant contended that, in doing so, it would also:

"… equally reduce the number of seabirds included within the ornithological baseline environment for not only Hornsea Four, but all other OWF developments whose baseline characterisation data was collected prior to avian influenza taking effect. This would result in a proportionate reduction in the level of predicted impact from OWFs and therefore does not need to be included or considered when drawing conclusions from current EIA and HRA assessments."

8.4.197. The Applicant said that it was aware that avian influenza had been reported as having a detrimental effect on some species at some sites, such as gannet at the Bass Rock, but that the impacts on seabirds at Flamborough Head and the Filey coast were yet to be fully established.

8.4.198. The RSPB's comments on D6 submissions [REP7-099], provided an update on the situation:

"A new virulent form of bird flu… has now killed tens of thousands of wild birds in the UK and around the world. First confirmed in Britain during winter 2021/22, it has had major impacts on populations of seabirds across Scotland, and there have been an increasing number of confirmed cases appearing across England, including east coast seabird colonies. At the Farne Islands in Northumberland, thousands of seabirds have died. The disease is now strongly suspected to be the cause of death of seabirds at the Flamborough and Filey Coast SPA, awaiting post-mortem confirmation from DEFRA. Current ongoing monitoring is recording dead and symptomatic birds and includes affected gannet, kittiwake, guillemot and razorbill. Since our Deadline 6 submission, RSPB monitoring staff at [the Flamborough and Filey Coast] have recorded that the spread of the disease amongst gannets and kittiwakes is escalating, and is likely to continue to do so.

It is currently unclear what the population scale impacts of the outbreak will be, but it is likely that they will be severe. This year's outbreak at the Bass Rock gannetry has coincided with, and is the likely cause of, an estimated 95% nest failure. This scale of impact means that seabird populations will be considerably less robust to any additional mortality

arising from offshore wind farm developments… With such uncertainty as to the future of these populations, there is the need for an extremely high level of precaution to be included in examination of impacts arising from the proposed development of Hornsea Project Four."

8.4.199. A further update from RSPB [REP8-024] shortly before the close of the Examination noted that its staff at the Bempton Cliffs Nature Reserve were reporting an apparently accelerating spread of HPAI through gannets and other seabirds in the area, including Flamborough Head. Multiple clusters of carcasses were said to have been seen under breeding cliffs.

8.4.200. Commenting on the Applicant's response to the ExA's Rule 17 request, the RSPB [REP8-032] questioned the assumption that any population decline would be reflected in a proportionate decline in impact. It considered this an oversimplification. It suggested that there was no way of knowing how the disease might influence behaviour and distribution. In particular, it said that HPAI was known to affect spatial awareness, and that this could change the level of risk associated with an affected individual navigating through or around wind turbines. It also confirmed that HPAI had been verified in seabirds at Flamborough Head, and that carcasses of gannet, kittiwake, herring gull, guillemot and razorbill (amongst other species) had been recorded.

8.5. ExA RESPONSE

8.5.1. Some of the matters and questions raised by NE and the RSPB were satisfactorily addressed by the Applicant during the Examination, though significant and important differences associated with levels of precaution and the parameters used in impact assessment remained at the close.

8.5.2. The ExA notes that the complexity of the pre-application EIA process and the ES documents, in part intended to achieve a 'proportionate ES', led to some difficulties and misunderstandings.

8.5.3. The fundamental problems associated with the marine ornithology baseline characterisation and the delay in agreeing an updated version until so late in the Examination caused substantial difficulties to all parties, especially as a baseline underpins the subsequent stages of an assessment, including the identification of impacts and the consideration of mitigation and monitoring requirements.

Baseline characterisation

8.5.4. The ExA has sympathy with the view expressed by NE [REP6-055] that the ES should have been reworked or more clearly amended to incorporate the revised baseline (and consequent changes to the assessment), not least to avoid confusion in the cumulative effect assessments of subsequent projects. However, it also recognises the practical difficulties associated with that course of action so late in Examination, and notes that all of the relevant information was submitted in separate documents that effectively became part of the final

ES: these are properly secured through Part 2 of Schedule 15 of the recommended DCO.

8.5.5. The ExA also acknowledges the Applicant's contention that, even where there is a numerically different outcome, each impact carries the same level of significance whether based on the original or updated baseline. Therefore, overall, the ExA is content that the ES, read as a whole and including the relevant amendments, clarifications and updates submitted during the Examination, provides sufficient information to allow an assessment to be made of the relevant and important matters relating to marine ornithology.

8.5.6. In considering marine ornithology matters, the ExA has taken all of the baseline characterisation information and subsequent representations from Interested Parties into account but has based its recommendations on the updated baseline [REP5a-009] that was ultimately accepted as adequate by NE and the RSPB, rather than the original baseline as set out in the application ES.

Assessment approach and parameters

BDMPS biological seasons and regional breeding season populations

8.5.7. The ExA notes that the sensitive bird receptors exhibit differences in behaviour and abundance across the year, so there was a need to define suitable bio-seasons for each species in the assessment to account for this variation.

8.5.8. The Applicant based its interpretation of BDMPS bio-seasons and population estimates on research published by Furness (2015) and Horswill and Robinson (2015). NE disagreed with elements of the approach and assessment and provided amended breeding season BDMPS values for guillemot and puffin. The Applicant re-ran the assessment using these. The ExA is content that, as the relevant impacts reduced, the assessment in the ES is precautionary in this respect.

8.5.9. The principal remaining disagreement relates to the approach to defining total regional BDMPS populations on an annual basis, and the way that the Applicant accounts for non-UK birds in the breeding bio-season. The ExA understands the Applicant's contention that an element of the overall total is missing in the standard approach to establishing the relevant annual BDMPS population but notes that the SNCB continues to contend that there is no reliable way of accounting for this.

8.5.10. Whilst acknowledging that the nature of the SNCB advocated approach to the definition of annual BDMPS populations is likely to generate precautionary reference populations, the ExA considers the Applicant's attempt to rectify this unclear and somewhat over-simplistic, and therefore does not consider it to offer a more accurate and reliable approach than that set out in the SNCB guidance. The ExA has taken this conclusion into account when considering the assessment stages that rely on the definition of BDMPS biological seasons and regional breeding

season populations that are considered in subsequent subsections of this Report.

The collision risk assessment

8.5.11. The ExA is content that the matters regarding the incorporation of confidence intervals into the collision risk assessment and the use of the model deterministically rather than stochastically were satisfactorily addressed by the Applicant.

8.5.12. The ExA considered section 2 of the Applicant's Ornithological Assessment Sensitivity Report [REP5-065] on collision risk assessment and the precaution associated with the many input parameters very carefully. The work was useful in demonstrating output variability depending on the level of precaution used for the inputs, with up to 90% or more suggested for gannet data. Overall, however, the ExA was largely unconvinced that the alternative inputs generated by the Applicant from its sensitivity studies were based on sufficiently robust and reliable evidence to justify departure from the precautionary standard parameter values advocated by NE.

8.5.13. The ExA considered the matter raised by the RSPB in relation to the gannet avoidance rate. Whilst appreciating the behavioural reasons behind this, the ExA saw no compelling evidence to recommend variance from the 98.9% avoidance rate advocated by NE and the JNCC. In any case, the ExA concluded that the matter had effectively fallen away as a material factor by the close of Examination as a consequence of the adoption of a macro avoidance allowance for gannet, notwithstanding the RSPB's disagreement with its use.

Gannet and kittiwake displacement assessment

8.5.14. The most appropriate approach to bio-season definition for the gannet and kittiwake displacement assessments remained as a difference at the close of the Examination between the Applicant on the one hand, and NE and the RSPB on the other. However, given NE's agreement that, in practice, there was unlikely to be any material difference in significance in EIA terms between the use of the migration-free or full breeding season for kittiwake, and the acceptance late in the Examination that the prediction of gannet collision impacts could be substantially reduced through the adoption of a macro avoidance factor, the ExA is content that this matter falls away in the context of the EIA.

Auk displacement assessment

8.5.15. Polarised views remained at the close of the Examination in relation to the auk displacement assessment. The Applicant's adopted displacement and mortality rates and the treatment of bio-seasons were the main sources of disagreement. The RSPB also remained critical of the way that displacement and barrier effects were dealt with separately, though the exclusion of auks in flight from the initial displacement analysis was addressed by the Applicant to the general satisfaction of the parties and the ExA.

8.5.16. The ExA notes that paragraph 2.6.101 of NPS EN-3 lists displacement and barrier effects separately:

"Offshore wind farms have the potential to impact on birds through…

- *displacement during the operational phase, resulting in loss of foraging/ roosting area; and*
- *impacts on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas."*

8.5.17. However, in practical assessment terms there are difficulties in separating the two effects, and the ExA further notes that SNCB advice is to assess them together. The ExA is content that the Applicant went some way to acknowledging this in the Ornithology EIA and HRA Annex [REP6-028], though also agrees with the RSPB [REP6-068] that, whilst the revised approach generally followed the SNCBs' (2022) updated interim guidance note on displacement, it was not overly cautious and could represent a minor underestimation of effects. As such, the ExA considers this to contribute to a limited extent towards the need to take a precautionary approach to the overall interpretation of the Applicant's assessment.

8.5.18. Whilst the Applicant countered NE's suggestion that it had failed to take a range-based approach to guillemot displacement and mortality rates by pointing out that it had considered a range of mortality levels up to 1% and a range for displacement of up to 50%, the ExA notes that the maxima from the ranges it adopted still fall well short of the upper end of the SNCB advocated ranges of 1% to 10% and 30% to 70% respectively.

8.5.19. NE and the RSPB had additional concerns in relation to the Applicant's use of a weighted mean in the calculations, and the approach to accounting for moulting adults and flightless chicks on the sea during August and September. Both were said to contribute to inadequate precaution.

8.5.20. The ExA has given careful consideration to the views expressed on the matter, the baseline surveys [APP-074], the cumulation of guidance issued by NE during the Examination (for example, [REP5-115]), and the three sets of displacement assessment provided by the Applicant [REP6-028], the RSPB [REP6-068] and NE [REP7-104]).

8.5.21. The ExA welcomes the Applicant's empirical review of monitoring results for auks at existing wind farms and recognises the reasons behind the development of a bespoke statistical approach and rates for species such as guillemot in an area subject to fluctuating numbers and short-term peaks, but it is not convinced that the range and applicability of the evidence used in the Applicant's review was substantial or reliable enough to justify such a major departure from the SNCB's recommended approach.

8.5.22. There was generally agreement that the SNCB guidance on displacement encouraged a case- and site-specific approach to seasonal definition for

the assessment. The parties had rather different views on what the approach should be. NE and the RSPB were firm in their opinions that a bespoke approach was required for the Proposed Development, especially because the standard approach did not adequately address aggregations of guillemots on the sea off Flamborough Head and the Filey coast in August and September. The ExA notes that the Applicant held that the peak numbers of guillemots were short-lived and not dissimilar to pulses of activity generally across the North Sea. As such, the Applicant did not believe a bespoke approach to the displacement assessment was justified.

8.5.23. NE and the RSPB concluded that the Applicant had significantly underestimated potential impacts at a critical time of year for guillemot, and that a separate August and September bio-season was needed in the analysis to account for the unusually high numbers and vulnerable nature of the birds at that time.

8.5.24. With reference to the baseline mapping for guillemot [APP-074, Figure 15], the ExA can see that the greatest potential for displacement impact is during the post-breeding migration bio-season, defined by the Applicant as July to October [APP-074, Table 10], as this is the period when the largest number of birds are present in the proposed array area.

8.5.25. The basis of the bio-season definition disagreement is whether a large potential impact on unusually large aggregations of flightless and vulnerable birds leaving the nesting colony in August and September has been diluted by absorbing that period into the broader July to October bio-season. The ExA notes that the guillemot survey data [APP-074, Figure 13] do appear to indicate that this is the case, with distinct abundance maxima recorded for August and September when considering the two years of survey. These can be seen to be some four to five times greater than the recorded abundances in July and October.

8.5.26. The ExA also recognises the underlying, particular circumstances of the Proposed Development in respect of its location and proximity to the Flamborough Head and Filey coast guillemot colonies, and the potential for the post-fledging dispersal behaviour of the birds and their chicks and the adults during moult to lead to short-term concentrations on the water in the area, though only anecdotal evidence of this was offered. Noting the greater distance from the breeding colonies, the ExA gives very limited weight to the Applicant's comparisons with Hornsea Three and other more distant offshore wind farms in this respect.

8.5.27. Whilst noting the lack of robust information on post-breeding movements locally for guillemot, the ExA gives some weight to the peer-reviewed paper by Furness (2015), which highlights the occurrence of post-breeding aggregations of guillemot off Flamborough Head and the Filey coast and raises the prospect that they may be vulnerable to disturbance and displacement by development and operational activities during August and September.

8.5.28. The ExA considers these specific locational circumstances provide sufficient justification for additional precaution in the guillemot displacement assessment. Thus, it has given more credence to the NE bespoke approach in its consideration of the different assessment outputs and interpretation of results that follows later in this Report.

8.5.29. However, the ExA is content that adequate precaution is provided by this bespoke three bio-season approach, and that any additional case-specific precaution in the definition of guillemot displacement and mortality rates would be inappropriate. Having examined the various suggested rates and ranges put forward by the Applicant, the RSPB and NE, the ExA favours the 'reasonable scenario' of a 70% displacement rate and 2% mortality rate accepted by the SoS in recent decisions for the Norfolk Boreas, Norfolk Vanguard and East Anglia ONE North Offshore Wind Farm HRAs.

8.5.30. As such, the ExA has been guided in its analysis and conclusions by reference to the guillemot operation phase annual displacement matrix in the Applicant's Ornithology EIA and HRA Annex [REP6-028, Table 27]. This shows an annual guillemot mortality rate of 149 using the Applicant's preferred approach (50% displacement and 1% mortality rate), and an annual guillemot mortality rate of 416 for this 'reasonable scenario' (70% displacement rate and 2% mortality rate). For comparison, NE's corresponding calculated values [REP7-104, Table A1] (at 30% to 70% displacement and 1% to 10% mortality) are an annual guillemot mortality rate range of 139 to 3,244 for the standard SNCB approach, and an annual guillemot mortality rate range of 190 to 4,432 for its advocated bespoke approach.

8.5.31. The ExA notes that the corresponding values for the cumulative assessment [REP6-028, Table 57] are 1,983 for the Applicant's approach and 5,553 for the 'reasonable scenario'. NE's corresponding values for the cumulative assessment using consented projects [REP7-104, Table A1] are 1,164 to 27,149 for the standard SNCB approach and 1,214 to 28,336 for the bespoke approach.

8.5.32. As such, the ExA has been guided in its assessment of predicted auk displacement effects by the adoption of the 'reasonable scenario' of a 70% displacement rate and a 2% mortality rate, which it notes produces significantly higher mortality rates than the Applicant's approach, and a result towards the lower end of the range calculated by NE for its bespoke approach.

Approach to PVA modelling: BDMPS reference populations

8.5.33. The late acceptance of the Applicant's revised offshore ornithology baseline characterisation led to a very compressed consideration of the PVA in the Examination. The ExA focussed on the key areas of disagreement that had the potential to have a material effect on the assessment outcome, these being the BDMPS reference populations and the use of counterfactuals. The ExA's consideration of counterfactuals follows in the next subsection of this Report.

8.5.34. Following reassessments and revisions to address errors, the Applicant's PVA modelling results for the relevant BDMPS and biogeographical populations were set out in the Ornithology EIA and HRA Annex [REP6-028] and the Clarification Note on Kittiwake PVA and BDMPS population estimates [REP8-020].

8.5.35. The ExA notes that NE [REP7-104] did not agree with the Applicant's adjustment of the BDMPS reference populations for kittiwake, guillemot and puffin for the PVA, suggesting that this would affect the interpretation of any increases in baseline mortality and affect the analysis. At the close of Examination, NE was still asking the Applicant to revert to the advised values.

8.5.36. The Applicant had advised that the non-breeding BDMPS population sizes from Furness (2015) had been used as the basis for determining annual predicted impacts, as these represented the largest estimated population size in each case, but that overseas, non-breeding season birds had been added to the calculated breeding season populations to derive the annual North Sea BDMPS population for the PVA. This appears to the ExA to be the basis of the difference, though it notes that it has no way of knowing if the Applicant's suggestion [REP8-020] that NE misinterpreted this is correct, as it was made at the close of the Examination, giving NE insufficient time to read and respond to the suggestion of a misunderstanding, had it so wished.

8.5.37. The ExA notes that all parties acknowledged that there was no reliable way of estimating the number of birds from overseas in the North Sea BDMPS during the breeding season, and it is unconvinced by the logic behind the Applicant's approach of adding the number of overseas, non-breeding season birds to the breeding season populations in the final summation to derive the annual North Sea BDMPS population. Whilst the ExA appreciates that excluding the unknown number of breeding season overseas birds from the annual total would inflate the impact predictions, this is nevertheless the approach advocated by the SNCBs in the absence of a more precise methodology and the one to which the ExA gives greater credence.

Approach to PVA modelling: the use of counterfactuals

8.5.38. The ExA is cognisant of the advantages of using logically constructed, statistical counterfactuals in the PVA to compare the predicted future status of a given population subjected to the impacts of the Proposed Development with its future expected status if the Proposed Development was not to proceed. The difference throughout the Examination between the Applicant on the one hand and the RSPB and NE on the other was whether or not the CFPS should have been used alongside the CPGR.

8.5.39. Noting that best practice guidance from the JNCC suggests the inclusion of the CFPS, whilst acknowledging its limitations and the need for careful interpretation, the ExA considers that the publication and interpretation of the CFPS by the Applicant alongside the CPGR would have helped the Examination and enhanced the ease of understanding of the implications

of the PVA outputs. The ExA notes that this approach was taken in a number of recent offshore wind farm ESs, and indeed by the SoS for the HRA of the Norfolk Boreas Offshore Wind Farm DCO application, which had used the NE Seabird PVA tool in the same manner as the Proposed Development.

8.5.40. In considering the PVA and overall impact assessment, the ExA has therefore given full consideration to the alternative RSPB modelling calculations using the CFPS [REP6-068]. Whilst these are restricted to the guillemot and razorbill populations of the Flamborough and Filey Coast SPA and are therefore of more direct relevance to the HRA (see Chapter 13 of this Report), they did provide the ExA with some assistance in understanding the importance and usefulness of the two counterfactuals, and their influence on the interpretation of the PVA more generally.

Indirect effects through impacts on prey species

8.5.41. The Applicant's report, Indirect Effects of Forage Fish and Ornithology [REP5-085], provided further clarity in relation to the potential indirect effects of the Proposed Development on important seabirds as a consequence of changes to marine processes and productivity, most notably the Flamborough Front.

8.5.42. The ExA notes the Applicant's conclusions that most of the coincident forage fish and seabird hotspots lie to the north and south of the proposed array area, which was to be expected given the pre-application refinements to avoid seabird concentrations. It accepts the Applicant's opinion that areas of shallow water are also likely to be important for prey availability.

8.5.43. The ExA notes that the fundamental concern relating to the Flamborough Front was any impact on regional biological productivity per se. The ExA concurs with the observations of NE [REP6-057] and the RSPB [REP7-098] that the supplementary work was largely based on the original data in the ES, and that its high-level, coarse nature precludes making predictions on local effects with any certainty. It also provided little further evidence or conclusion on impacts on productivity.

8.5.44. As reported in Chapter 7, whilst the science was unavoidably imprecise, the Applicant's conclusion was that there would not be a significant impact on primary productivity as a consequence of any localised impacts of the Proposed Development on the Flamborough Front and Smithic Bank. Given that the seabirds that are the subject of this section of the Report are at least two trophic levels down the food chain, and assuming an approximate transfer of only 10% to 20% of energy at each step, then it seems to the ExA that a significant impact on the seabirds foraging for fish would be highly unlikely.

8.5.45. Nevertheless, the ExA considers that this matter gives some additional weight to the need for precaution and a strategy for monitoring any changes associated with the Flamborough Front in particular. This is addressed in Chapter 7.

Assessment of effects on key seabirds associated with Flamborough Head and the Filey coast

BDMPS biological seasons and regional breeding season populations

8.5.46. NE did not agree with the BDMPS populations used by the Applicant in the kittiwake, guillemot and puffin assessments, and provided its own assessments [REP7-104, Table A1] using the advised BDMPS values for these species. The ExA notes the following differences in the annual BDMPS population used in the assessments submitted by NE and the Applicant respectively for the three contended species:

- Kittiwake: 839,456 / 829,937;
- Guillemot: 2,045,078 / 1,617,306;
- Puffin: 868,689 / 260,726.

8.5.47. As noted above, the ExA considers the Applicant's attempt to rectify this unclear and somewhat over-simplistic, and therefore does not consider it to offer a more accurate and reliable approach than that set out in the SNCB guidance.

Outputs from the Applicant's and Natural England's overall assessments

8.5.48. The ExA has considered submissions from the Applicant [REP6-028], [REP7-085] and [REP8-017], NE [REP7-104] and the RSPB [REP6-068] in relation to the assessment outputs. Given the different opinions about the methodology and parameter ranges that should be inputted, not surprisingly, there were differences between the three parties in terms of the interpretation of the assessment outcomes for the key bird species (kittiwake, razorbill, guillemot, gannet, great black-backed gull, lesser black-backed gull and herring gull).

8.5.49. NE and the RSPB believe that the Applicant's position that the CFPS should not be used (and has not been provided) makes an interpretation of the impact of the Proposed Development on the reference populations more difficult to interpret. The ExA is conscious of the caution that is required in respect of the statistical application of counterfactuals but shares the view that it would have been helpful to provide the CFPS for context, even if it was not directly used in the final assessment. As such, the ExA was grateful for the RSPB's contribution of the calculations for the Flamborough and Filey Coast SPA populations in this regard.

8.5.50. The ExA has studied the outputs from the Proposed Development alone and cumulative effects assessments summarised above, though it was cautious about making direct comparisons due to the complexities of the methodologies and use of parameters.

8.5.51. The ExA notes that the Applicant's approach, in each case, produces lower estimates of mortality impact than NE's. This was to be expected, given that the Applicant had applied its own parameter inputs at many points in the process, based on its review of monitoring results, in an attempt to rectify what it considered over-precaution in the standard approach advocated by NE.

8.5.52. The variation in some cases is marked, especially in relation to the displacement analyses for auks, where the difference is of more than an order of magnitude. The ExA notes that this is equally true whether the SNCB standard approach to displacement or NE's advocated bespoke approach for the Proposed Development is used. This can be traced back to the Applicant's modifications to parameters and treatment of bio-seasons, again based on what it presented as a logical application of empirical evidence from a review of offshore wind farm monitoring programmes.

8.5.53. The ExA has tracked the assessments from the generation of the additional mortality predictions to the estimated increases in percentage mortality (with and without the Proposed Development) and reached a conclusion on the reliability of the Applicant's and NE's conclusions on the significance of effects from the Proposed Development alone and cumulatively with other relevant plans and projects.

8.5.54. **Gannet**: the application of the agreed macro avoidance rate to the Proposed Development means that there will not be a significant adverse effect on gannet from combined collision, displacement and barrier impacts. Whilst a minor adverse impact might be identified when considered cumulatively with other consented and proposed offshore wind farms, the ExA considers it appropriate to apply the same macro avoidance factor to the other projects (retrospectively in the case of existing projects), which would also remove any likelihood of a significant adverse cumulative effect.

8.5.55. **Kittiwake**: the outputs from modelling for recent offshore wind farm proposals and decisions made on those by the SoS, when taken alongside the modelling outputs for the Proposed Development, indicate a likelihood of a significant cumulative adverse effect on the North Sea kittiwake population when considered with consented projects. The Applicant's acknowledgement of an Adverse Effect on Integrity in relation to the in-combination HRA for kittiwake is addressed in Chapter 13 of this Report, including the Applicant's proposals for derogation compensation.

8.5.56. **Guillemot**: for the reasons set out earlier in this Report, the ExA gives greater credence to the bespoke displacement modelling results provided by NE, but at the lower end of the range, and whilst recognising the multiple layers of precaution involved, it considers that a cumulative significant adverse effect at the North Sea population scale is likely when it is considered alongside consented projects. Again, this has implications for the HRA (Chapter 13 of this Report), including the Applicant's (without prejudice) proposals for derogation compensation.

8.5.57. **Razorbill**: the ExA considers the razorbill situation to be finely balanced, and it accepts that without a fully robust PVA with counterfactuals it is difficult to predict the long-term impact of the Proposed Development on the razorbill population. The ExA notes that NE [REP7-104] suggested that the predicted impact may not result in a decline if the current net growth of the UK population continues. It went on to adopt additional precaution on the basis of whether the razorbill population is, "*sustainable in the face of the numerous pressures, including offshore wind development, facing them*", and seems to have included factors such as climate change and HPAI in its consideration. The ExA believes this is likely to have included impacting factors and influences that go beyond the requirements of cumulative environmental assessment, and, as such, has taken this into account in its considerations. On balance, the ExA concludes that the modelling demonstrates that there would be an adverse cumulative impact on the razorbill BDMPS population when the Proposed Development is considered with consented projects, but that this is not likely to be significant.

8.5.58. **Puffin**: the ExA concludes that the Proposed Development is unlikely to lead to significant effects on puffin, either alone or cumulatively with consented projects. The ExA notes NE's contention that significant adverse cumulative effects cannot be ruled out if the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects are added into the cumulative assessment. However, at the close of the Examination, neither application had been submitted and the level of detail available about the projects and their effects was limited. The ExA considers this to limit the level of certainty that can be assigned to the projects for the purposes of this cumulative assessment. Therefore, the ExA accepts the Applicant's view that there was insufficient information available at the close of Examination to enable a robust analysis of their contribution to the cumulative effects on puffin to be undertaken, and it finds the cumulative totals excluding the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects to be the most appropriate in this case. In arriving at this conclusion, the ExA is mindful that an assessment of cumulative ornithological effects will be necessary as part of the decision-making processes for those projects in due course.

8.5.59. **Great black backed gull**: the ExA notes that the Applicant followed NE advice for this assessment and so the collision outputs are more or less identical to those from NE's own assessment. The Applicant concluded no significant adverse effect, while NE could not rule out an adverse cumulative effect alongside consented projects. Given the scale of the predicted increase in mortality and reduction in population growth rate, the ExA does not rule out the possibility of a significant adverse effect on the great black backed gull BDMPS population.

8.5.60. **Lesser black-backed gull**: the ExA agrees with both parties that no significant adverse effect is likely for the Proposed Development alone or cumulatively with consented offshore wind farms. The ExA notes NE's contention that significant adverse cumulative effects cannot be ruled out if the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and

Rampion 2 Offshore Wind Farm projects are added into the cumulative assessment. However, at the close of the Examination, neither application had been submitted and the level of detail available about the projects and their effects was limited. The ExA considers this to limit the level of certainty that can be assigned to the projects for the purposes of this cumulative assessment. Therefore, the ExA accepts the Applicant's view that there was insufficient information available at the close of Examination to enable a robust analysis of their contribution to the cumulative effects on lesser black-backed gull to be undertaken, and it finds the cumulative totals excluding the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects to be the most appropriate in this case. In arriving at this conclusion, the ExA is mindful that an assessment of cumulative ornithological effects will be necessary as part of the decision-making processes for those projects in due course.

8.5.61. **Herring gull**: the ExA agrees with the Applicant and NE that no significant adverse effect is likely for the Proposed Development alone or cumulatively with consented offshore wind farms. The ExA notes NE's contention that significant adverse cumulative effects cannot be ruled out if the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects are added into the cumulative assessment. However, at the close of the Examination, neither application had been submitted and the level of detail available about the projects and their effects was limited. The ExA considers this to limit the level of certainty that can be assigned to the projects for the purposes of this cumulative assessment. Therefore, the ExA accepts the Applicant's view that there was insufficient information available at the close of Examination to enable a robust analysis of their contribution to the cumulative effects on herring gull to be undertaken, and it finds the cumulative totals excluding the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension and Rampion 2 Offshore Wind Farm projects to be the most appropriate in this case. In arriving at this conclusion, the ExA is mindful that an assessment of cumulative ornithological effects will be necessary as part of the decision-making processes for those projects in due course.

Assessment of effects on other important seabirds: common scoter and red-throated diver

8.5.62. The ExA is content with the Applicant's rationale that common scoters from the Greater Wash SPA are unlikely to be significantly affected, and that commitments secured through the draft DCO would effectively reduce impacts on red-throated diver from the same protected site. The additional information submitted into the Examination on the prediction of residual impacts on the red-throated diver, including a range of mortality rates, is considered appropriate [REP2-049].

8.5.63. The ExA agrees with the Applicant that there would be no likely significant effects on these birds, either alone or cumulatively with other projects, a position which appears to have been agreed by NE [REP7-104, Table 1] and [REP8-031]. The parallel HRA is considered in Chapter 13 of this Report.

Highly Pathogenic Avian Influenza

8.5.64. The Examination benefitted from the expertise and observations of RSPB staff based at Bempton Cliffs, and it certainly appeared that by the close of the Examination the outbreak of HPAI had unfortunately reached the area.

8.5.65. However, the full picture along the Flamborough and Filey coast for the 2022 breeding season will not be known until the autumn, so any final implications cannot be taken into account in this Report.

8.5.66. The ExA notes that disease outbreaks and other factors that have the potential to influence seabird populations are not unusual, but it has no way of knowing the eventual magnitude or longevity of this outbreak, nor its likely status during the planning, construction and operational stages of the Proposed Development, if consented.

8.5.67. At one end of the scale, the outbreak could be short-term, part of the natural variation in populations from year to year, and - as such - accounted for in the 'averaging' of annual data over a longer period. At the other end of the scale, it could be exceptionally severe and sustained, with major, long-term implications for seabird numbers.

8.5.68. For the purposes of the EIA, the ExA agrees with the Applicant's submission that a reduced number of birds in the area as a consequence of the outbreak would lead to a reduction in the numbers of birds affected by the Proposed Development, though it considers the suggestion that this would be a proportionate reduction to be an oversimplification.

8.5.69. Thus, in terms of actual bird mortalities, the ExA accepts in principle that the assessments considered during the Examination and discussed above present a worse case than would corresponding assessments based on significantly reduced populations as a consequence of a major HPIA outbreak. However, it is also aware that, if there was to be a sustained and catastrophic drop in bird numbers as a result of the outbreak, then the Proposed Development could place a disproportionate additional strain on the viability of any affected population. The ExA believes this to be an additional reason for taking a precautionary position when considering its overall recommendation.

8.5.70. There are additional implications for the HRA in terms of the conservation status of the Flamborough and Filey Coast SPA, but these are dealt with in Chapter 13 of this report.

8.6. CONCLUSION

8.6.1. The ExA has considered the effects of the Proposed Development on marine and coastal ornithology in the context of the policy framework set by the Overarching National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3), the Marine Policy Statement and the East Inshore and East Offshore Marine Plans.

8.6.2. The ExA is content that the ES addresses all of the relevant types of impact listed in NPS EN-3 paragraph 2.6.101, and that its recommendations on assessment and mitigation (paragraphs 2.6.102 to 2.6.110) have been properly considered by the Applicant.

8.6.3. The ExA notes the dynamic nature of best practice guidance in the offshore wind farm industry as an increasing number of projects begin operation, and it welcomes the opportunities these provide for ornithological monitoring surveys. The results can add to knowledge, help to check impact prediction and inform best practice. Nevertheless, the ExA recognises that many of the numerous variables that influence seabird assessments are location- and project-specific, and such factors should be accounted for in the often formulaic and ever-more complex statistical modelling that is used.

8.6.4. For the most part, the ExA is unconvinced by the Applicant's rationale for varying from the SNCBs' advocated standard approach to offshore ornithological assessment modelling. Whilst it understands the frustrations caused by the layered precautionary nature of the advocated approach, the ExA considers the evidence base on which the Applicant based its alternatives to be less than compelling for such a major variation from the guidance and recommended best practice.

8.6.5. As such, the ExA has generally placed greater reliance on the SNCB standard and project bespoke assessments provided by NE, and, as a result, does not agree with the Applicant's finding of no likely significant effect on offshore ornithological receptors for the Proposed Development.

8.6.6. The ExA concludes that there will be no significant adverse effects on marine or coastal bird species as a result of the Proposed Development alone. However, it considers there to be a likelihood of significant adverse effects for kittiwake, guillemot and great black backed gull when the impacts of the Proposed Development are considered alongside those of the consented offshore wind farms used in the ES cumulative assessment [APP-017].

8.6.7. The ExA considers this to weigh heavily against the case for the Proposed Development.

9. FINDINGS AND CONCLUSIONS IN RELATION TO OTHER MARINE ECOLOGY MATTERS

9.1. INTRODUCTION

9.1.1. This Chapter covers the remaining aspects of marine ecology that were considered in the Applicant's Environmental Statement (ES):

- intertidal and benthic habitats;
- fish and shellfish; and
- marine mammals.

9.1.2. Marine underwater noise is considered here to the extent that it relates to fish and marine mammals. Although electromagnetic fields (EMF) in the marine environment had been scoped out of the assessment, the topic was raised during Examination and is also reported here.

9.1.3. Whilst the ecology of fish and shellfish is covered in this Chapter, the commercial fishing of some of these species is dealt with in Chapter 11.

9.1.4. Matters associated with European sites and the Habitats Regulations Assessment (HRA) in Chapter 13 are not repeated here, though both Chapters should be read together for completeness.

9.1.5. Matters relating to draft Development Consent Order (DCO) Articles and the deemed marine licences (DMLs) are set out in Chapter 16 and cross-referenced here as necessary in relation to the topic and issues they refer to.

9.1.6. Amongst the Examining Authority's (ExA) Initial Assessment of Principal Issues [PD-005] were:

1) Marine Ecology, including:

- Effects on benthic and intertidal habitats;
- Effects on fish and shellfish; and
- Effects on marine mammals.

2) Noise, Vibration, EMFs and Light, including:

- Underwater (marine) noise; and
- Other noise, vibration, EMFs and light effects on marine and terrestrial environments.

9.2. POLICY CONSIDERATIONS

9.2.1. Policy considerations in relation to marine ecology and other marine environmental matters are summarised in Section 7.2 of this Report.

9.3. THE APPLICANT'S CASE

9.3.1. Several chapters of the Applicant's ES and associated application documents set out the Applicant's case in relation to the marine ecology (excluding ornithology) implications of the Proposed Development. Those most relevant to this section of the Report comprised:

- ES chapter on Benthic and Intertidal Ecology [APP-014, amended by AS-009];
- ES chapter on Fish and Shellfish Ecology [APP-015];
- ES chapter on Marine Mammals [APP-016];
- ES Subsea Noise Technical Report Part 1 [APP-043];
- ES Subsea Noise Technical Report Part 2 [APP-044];
- ES Benthic and Intertidal Ecology Technical Report [APP-068];
- ES Fish and Shellfish Ecology Technical Report [APP-071];
- ES Marine Mammal Technical Report Part 1 [APP-072];
- ES Marine Mammal Technical Report Part 2 [APP-073];
- Outline Marine Mammal Mitigation Protocol [APP-240];
- Outline Marine Monitoring Plan [APP-242];
- Outline Southern North Sea Special Area of Conservation Site Integrity Plan [APP-246];
- Outline Offshore Cable Installation Plan [APP-250].

9.3.2. The following were updated during the Examination:

- ES chapter on Benthic and Intertidal Ecology [REP7-004];
- ES Benthic and Intertidal Ecology Technical Report [REP7-013];
- Outline Marine Monitoring Plan [REP7-058];
- Outline Southern North Sea Special Area of Conservation Site Integrity Plan [REP7-054];
- Outline Offshore Cable Installation Plan [REP7-056].

9.3.3. Further relevant documents submitted during the Examination included:

- Clarification Note on Drill Arisings and Deposited Sediments [REP5-083];
- Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restrictions [REP7-065];
- Clarification Note on Underwater Noise Abatement Systems [REP2-050];
- Clarification Note on the Installation of Two Monopile Foundations Sequentially [REP3-033];
- Clarification Note on Marine Mammals [REP4-045];
- Clarification Note on Seismic Surveys [REP5a-020].

9.3.4. The location of the marine element of the Proposed Development was shown on the Offshore Location Plan [APP-206], with greater detail for the proposed landfall provided in the Onshore Location Plan [APP-207].

9.3.5. The Applicant's impact assessment for the topics considered here was set out in detail in the ES chapters and accompanying annexes, as listed above. The general approach was similar for each topic, as described in Paragraph 7.3.5.

Benthic and intertidal ecology

9.3.6. The ES chapter [APP-014 amended by AS-009] provides a summary of the benthic and intertidal ecology studies that are set out in full in the Benthic and Intertidal Ecology Technical Report [APP-068].

9.3.7. The Examination focussed on benthic rather than intertidal habitats and issues. The study area for the benthic assessment was defined in the ES [APP-014] by the proposed Order limits below Mean High Water Springs (MHWS), plus a 10 kilometer (km) buffer around the array and a 14km buffer around the offshore section of the export cable corridor to allow for the movement of sediment over a tidal cycle.

9.3.8. The benthic baseline was initially characterised using desktop surveys. The collated data were entered into a predictive habitat model [APP-068] to address some data gaps for the export cable corridor identified during pre-application consultation. Surveys were subsequently carried out to plug these gaps, but the model outputs were retained in the ES to reinforce the understanding and prediction of biotope distribution and the assessment of impacts on benthic habitats.

9.3.9. The ES characterised the baseline through an interrogation of the types and distribution of sediments, seabed features and benthic and intertidal habitats. Protected features and 'valued ecological receptors' were defined. Mitigation commitments inherent in the design of the Proposed Development and in the various outline management plans were described (Table 2.11 of the ES), along with a maximum design scenario that the Applicant used to undertake the assessment (Table 2.12 of the ES).

9.3.10. Potential effects on benthic habitats were considered for the Proposed Development alone and cumulatively with other relevant projects for the pre-construction, construction, operational and decommissioning phases. The potential impacts considered included: temporary construction, maintenance and decommissioning disturbance or damage; permanent loss of habitats; the mobilisation, temporary suspension and redeposition of sediments during construction; release of sediment-bound contaminants; introduction of hard substrates and colonisation by other marine flora and fauna (including marine invasive non-native species); and changes caused by scour and modified marine processes.

9.3.11. The Applicant's assessment found the majority of potential impacts on benthic habitats to be at most of negligible magnitude. A few were concluded to be of slight significance, though none was considered significant in the context of the EIA. These were:

- temporary habitat disturbance from construction activities;
- temporary increase in suspended and deposited sediment during construction;
- long-term habitat loss or change due to foundations, scour protection and cable protection;

- colonisation of the wind turbine generator bases and scour and cable protection leading to a positive or adverse change in benthic biodiversity;
- temporary increase in suspended and deposited sediment during decommissioning of structure foundations and cables; and
- loss of introduced habitat from the removal of foundations at decommissioning (positive or adverse).

Fish and shellfish ecology

9.3.12. The ES chapter [APP-015] provides a summary of the detailed characterisations of the project and wider southern North Sea fish and shellfish study areas that are set out in full in the Fish and Shellfish Ecology Technical Report [APP-071]. Species of ecological, conservation and commercial value are considered.

9.3.13. As with the benthic assessment, the study area for fish and shellfish included an allowance for the equivalent of tidal excursion on a mean spring tide. This was defined by a 14km buffer around the offshore export cable corridor and a 10km buffer around the array. Both desktop and field surveys were used to characterise the baseline, which included consideration of nursery areas for ecologically and commercially important species. Potential impacts on migratory species were scoped out of the assessment.

9.3.14. Mitigation commitments inherent in the design of the Proposed Development and in the various outline management plans were described (Table 3.9 of the ES), along with a maximum design scenario that the Applicant used to undertake the assessment (Table 3.10 of the ES).

9.3.15. Potential construction impacts that were considered included direct damage (such as crushing), temporary increases in suspended sediments, smothering by redeposited sediments, release of sediment-bound contaminants, and underwater noise and vibration induced mortality, injury or behavioural change. All stages of the life cycles of the fish and shellfish receptors were considered as relevant.

9.3.16. The ES chapter also considered possible impacts during operation and from maintenance activities, including increases in suspended sediments, smothering by redeposited sediments, loss of habitat to infrastructure, changes to habitat due to the introduction of hard surfaces, and disturbance from maintenance activities.

9.3.17. Decommissioning was said to bring the potential for similar impacts to those addressed during construction.

9.3.18. Table 3.25 of the ES summarised the key impacts on fish and shellfish. All were found to be either of neutral (ie no) or slight effect and were not considered to be significant in the context of the EIA. Those identified as having a slight residual impact included:

- damage to, or disturbance of various demersal and pelagic fish and shellfish species arising from construction and decommissioning activities;
- temporarily elevated suspended sediment concentrations or smothering by redeposited sediments for herring, brown crab, European lobster and scallop (construction and maintenance);
- construction noise and vibration effects on a wide range of species;
- long-term habitat loss during operation for herring, sandeel, brown crab, scallop and *Nephrops* (Norway lobster);
- the introduction of additional hard substrate throughout operation on herring and sandeel; and
- disturbance of herring, sandeel and a range of shellfish by maintenance activities.

Marine mammals

9.3.19. The Applicant provided marine mammal information and an assessment of the potential impacts of the Proposed Development in an ES chapter [APP-016] and a two-part technical report [APP-072] and [APP-073].

9.3.20. Each marine mammal considered was allocated bespoke project and regional study areas that were influenced by ecology and behaviour. The baseline was established using a desktop study of relevant existing data, supplemented by fieldwork that included aerial surveys and boat-based visual and acoustic surveys. Seals and various cetacean species (whales, dolphins and porpoise) were considered.

9.3.21. Several relevant mitigation commitments secured through outline management plans and protocols were taken into consideration in the Applicant's assessment (Table 4.9 of the ES) and a maximum design scenario was described for the assessment (Table 4.10 of the ES).

9.3.22. The ES chapter included a summary of the Applicant's approach to underwater noise analysis, a key component of the marine mammal assessment (sections 4.10.3 to 4.10.5).

9.3.23. Potential construction impacts that were considered included auditory injury or behavioural disturbance due to noise and vibration from piling and unexploded ordnance (UXO) detonations, collision with construction vessels, disturbance by construction vessels, and indirect effects through reduced prey availability or impeded foraging ability. Operational and maintenance impacts considered included collision with maintenance vessels, changes in prey availability (positive or negative) and a decrease in foraging ability. The possible effects of decommissioning activities through reduced prey availability and impeded foraging ability were also considered.

9.3.24. The chapter included consideration of cumulative impacts with other relevant projects.

9.3.25. Table 4.82 set out the Applicant's summary of the predicted impacts of the Proposed Development on marine mammals. No residual impact of

greater than slight significance was predicted, and those found to be of slight significance were:

- piling noise disturbance of harbour porpoise, bottlenose dolphin and grey seal;
- collision with construction and operational vessels (all species assessed);
- disturbance by construction vessels (all species assessed); and
- disturbance from UXO detonation (harbour porpoise, bottlenose dolphin, harbour seal and grey seal).

9.3.26. None of these was considered significant in the context of the EIA.

9.4. PLANNING ISSUES

Benthic habitats

Biotopes present

9.4.1. The Marine Management Organisation (MMO) [RR-020] criticised the presentation of the benthic habitat information and assessment in the ES, feeling that too little of the detail had been brought into the Benthic and Intertidal Ecology ES chapter [APP-014, amended by AS-009] from the Benthic and Intertidal Ecology Technical Report [APP-068]. The Applicant's view [REP1-038] was that the technical report was inherently part of the ES, and that all relevant information was available.

9.4.2. The MMO [RR-020] questioned if the Applicant's coverage of potential effects on the echinoderm *Amphiura filiformis*, and the polychaete *Saballeria spinulosa* was sufficient. The Applicant clarified [REP1-038] that both species had been considered in the assessment, noting that A. filiformis was included in the assessment of the biotope '*A. filiformis, Kurtiella bidentata* and *Abra nitida'*.

9.4.3. Natural England (NE) [RR-029] commented that, while the presence of *Sabellaria spinulosa* aggregations (Annex I reef) was not recorded in the surveys, individuals of that species were the dominant taxon in grab samples along one section of the export cable corridor and questioned if the samples had been appropriately categorised. The Applicant [REP1-038] did not consider it appropriate to revise the biotope to '*Sabellaria spinulosa* on stable circalittoral mixed sediment' as suggested, as the individuals identified were not considered a reef feature.

9.4.4. The ExA asked a first written question (ExQ1) about how the Applicant would take potential *Sabellaria* reef features into consideration in the pre-construction surveys and, if found, how any impacts could be mitigated. The Applicant [REP2-038] said that the process would be informed by the biogenic and geogenic reef surveys, secured through Conditions 17 and 19 of Schedules 11 and 12 of the draft DCO, and that any reef, if found, would be dealt with as a habitat of principal importance, which commitments Co48 and Co84 (secured by Condition 13(1)(a)(v) of Schedules 11 and 12 of the draft DCO) stated would be microsited around.

9.4.5. NE [REP5-112] continued to highlight that the most up-to-date guidance should be followed when considering stony reef identification, drawing the Applicant's attention to a 2022 Joint Nature Conservation Committee (JNCC) paper on, "*Refining the criteria for defining areas with a 'low resemblance' to Annex I stony reef*". The Applicant confirmed [REP5a-014] that the pre-construction monitoring plan would consider the latest guidance and that NE would be consulted on the final form of that plan.

9.4.6. The Benthic and Intertidal Ecology chapter of the ES [REP7-004] and the Benthic and Intertidal Ecology Technical Report [REP7-013] were updated to give additional consideration to *Amphiura filiformis*, *Sabellaria spinulosa* and the associated biotopes, though the Applicant found no reason to make any change to the assessment's outcome or significance.

9.4.7. As part of the update, the brittlestar dominated biotope '*Amphiura filiformis, Mysella bidentata* and *Abra nitida* in circalittoral sandy mud' was acknowledged to be present in part of the proposed array area, and it was added to the table of valued ecological receptors in Table 2.9 of the ES chapter [REP7-004].

9.4.8. *Sabellaria spinulosa* was also added to the table of valued ecological receptors, with a caveat that all evidence suggested that the sample records represented individuals rather than aggregations or reef habitat.

Monitoring of gravity base structure foundations

9.4.9. The MMO [RR-020] suggested that further assessment and monitoring studies were necessary in relation to the use of gravity base structures (GBS) and their scour impacts on benthic habitats. It suggested that such monitoring could be added to the Outline Marine Monitoring Plan [APP-242].

9.4.10. The Applicant's response [REP1-038] was that these would not be project-specific issues and suggested that a broader, industry-scale strategic monitoring programme would be useful.

9.4.11. The MMO [REP7-111] requested that a minimum of 10% of the proposed turbines should be monitored for benthic impacts. The Applicant updated the Outline Marine Monitoring Plan [REP7-058] to include monitoring at Smithic bank if any GBS foundations were used, recognising a particular relevance in this area. Table 5 of the document, monitoring of benthic habitats, was updated to include:

"*Undertake monitoring of the benthic communities comprising grab samples in the form of a cruciform design at one of each GBS foundation type. The location of the monitored GBS would be identified following the post-construction geophysical survey and would be the location with the greatest level of scour for each foundation type. Analysis of sample data to determine potential changes to the benthic community structure from before and after construction."*

9.4.12. The MMO [REP8-022] acknowledged this update but maintained that the commitment should be to monitoring a minimum of 10% of the turbines.

NE [REP8-028] also requested more monitoring of the effect of GBS on benthic communities. There was no agreement on this at the end of the Examination, though the Applicant's signed Statement of Common Ground (SoCG) with the MMO [REP8-004] notes that this would not lead to a material impact on the assessment conclusions.

Fish and shellfish

9.4.13. Several matters relating to fish and shellfish ecology were discussed during the Examination, particularly the impacts of underwater noise on fish. Some remained unresolved at the close of the Examination. Other issues that arose included the adequacy of baseline data, sediment release, EMF and securing appropriate monitoring.

9.4.14. The MMO [RR-020] raised several questions in relation to the underwater noise modelling, the impact assessment for fish, and the corresponding mitigation commitments put forward by the Applicant.

9.4.15. These matters are discussed below in relation to:

- adequacy of baseline data;
- underwater marine noise;
- sediment release; and
- marine EMF.

Adequacy of baseline data

9.4.16. The Holderness Fishing Industry Group (HFIG) [AS-025] and the National Federation of Fishermen's Organisations (NFFO) [AS-026] had concerns about the approach to the shellfish and fish assessment. They submitted that the data collection methods used by the Applicant to characterise the shellfish ecology baseline were not fully appropriate, and that the baseline was therefore inadequate for the purposes of informing the assessment. As a consequence, they considered that a monitoring programme was required, notably for crabs. Their joint SoCG with the Applicant also recorded their belief that the EIA methodology inappropriately assigned weight to data that were not site-specific [REP3-019].

9.4.17. The NFFO was also concerned that the data used to describe the baseline in relation to fish were too old [REP4-024].

9.4.18. The Applicant [REP1-038] noted that the MMO and NE had agreed that the fish and shellfish baseline characterisation was appropriate. It contended that the wind farm array area would not overlap with any identified breeding grounds for crustaceans and that cable laying would result only in temporary, short-term impacts in any area. As such, no monitoring had been proposed.

9.4.19. The Applicant [REP6-037] reported ongoing discussions with the NFFO and the HFIG outside the Examination. Whilst confirming that the baseline was adequately characterised, it said that it was aiming to reach a commercial agreement in relation to a post-consent shellfish monitoring campaign in the spirit of industry collaboration.

9.4.20. A signed, joint SoCG was submitted [REP6-016]. Whilst the NFFO and the HFIG retained concerns about the fish data, it had been agreed that this would have no material impact on the outcome of the assessment. The document also shows outstanding concerns in relation to the shellfish assessment, but the position summary for each had moved from recording disagreement and a material impact (as had been the case in earlier versions, such as [REP5-052]) to disagreement but with no material impact. The explanation for this progress was that discussions on the matters had been closed as the Applicant was, "*in the process of agreeing the scope of a proposed shellfish ecology monitoring campaign*".

Underwater marine noise

Control of frequency of pin piling

9.4.21. It appeared that the modelling had assumed that only a single monopile would be installed in 24 hours, whereas the draft DCO would allow up to three pin piles to be installed over that period. The Applicant submitted a Clarification Note on the Installation of Two Monopile Foundations Sequentially [REP3-033]. Whilst there was a larger impact on spawning herring, this clarification note found no change in EIA significance for any effects on fish. As the maximum scenario could be controlled through Condition 13(5) of both draft DMLs (Schedules 11 and 12 of the draft DCO), the Applicant submitted that no additional mitigation measures were necessary.

Noise impacts on spawning fish

9.4.22. Fish spawning areas would be sensitive receptors during the construction of the Proposed Development, and disturbance impacts from piling noise received considerable attention during the Examination.

9.4.23. It had been agreed during pre-application consultation that the Banks herring stock was of particular relevance to the assessment. Herring can detect changes in underwater sound pressures and transfer them to the inner ear, making them vulnerable to noise injury and disturbance.

9.4.24. The ES [APP-015] used published literature to identify nursery and spawning grounds in the Proposed Development area, supplemented by contextual baseline data for the wider area from the earlier Hornsea offshore wind farm projects. The benthic habitat baseline was also interrogated to predict the likely distribution of spawning habitat. In addition, the Applicant analysed 15 years of data from the International Council for the Exploration of the Sea's International Herring Larval Survey (IHLS) and suggested that this provided a proxy indication of spawning hot spots. Spawning and nursery habitats had been mapped in the Fish and Shellfish Ecology Technical Report [APP-071].

9.4.25. The ES noted a strong correlation between the IHLS data and published literature describing herring spawning grounds near Flamborough Head. A heatmap derived from the IHLS data suggested that larvae were found primarily in the northern section of the spawning ground, with the centre of the hotspot lying north of Flamborough Head. The proposed export

cable corridor was shown to cross the hotspot, but in an area of lower abundance, while the suggested distribution was said broadly to correspond with the benthic habitat information. The majority of the Proposed Development area was categorised as unsuitable habitat for herring spawning.

9.4.26. In terms of timing, the ES suggested that the herring spawning season ran from August through to October, with the peak period locally being September to October.

9.4.27. The Applicant's assessment took into account the sensitivity of herring to underwater noise (particularly during spawning when the fish are less likely to flee), the small overlap between the export cable corridor and areas of low to medium intensity spawning, and the localised and short-term nature of the impact. The assessment predicted an adverse effect of slight or moderate significance.

9.4.28. The ES contended that a restriction on piling for Work No. 3 (the offshore substation) during the main herring spawning season, defined as 1 September to the 16 October, was sufficient mitigation to ensure that population level effects would be unlikely, and a mitigated residual effect of slight significance was predicted. This was not considered significant in the context of the EIA.

9.4.29. The MMO [RR-020] and NE [RR-029] raised concerns in relation to the adequacy of the proposed mitigation, and in particular the timing of the seasonal restriction on piling.

9.4.30. The Applicant reviewed the data and provided a clarification note [REP2-033]. Whilst analysis of the IHLS data allowed an estimate of the start of the peak spawning season, said by the Applicant to be between 30 August and 10 September, the data were not sufficient to define the end of the season reliably.

9.4.31. The Applicant maintained that 1 September to 16 October was an appropriate and conservative estimate on which to base the seasonal piling restriction. NE [REP3-054] disagreed that this was sufficiently precautionary. The MMO [REP4-052] requested more information about the basis of the Applicant's analysis, including:

- underwater noise propagation to north of Flamborough Head, where the sea temperatures are colder;
- how larval growth rates had been informed by the use of back-calculations of spawning; and
- whether an additional period of restriction was needed to allow for herring migrating into the spawning grounds.

9.4.32. The ExA explored the matter further through questioning at Issue Specific Hearing (ISH) 4 [EV-027] and in a further written question (ExQ2) [PD-012].

9.4.33. The Applicant submitted an updated report [REP5-049] that responded to two of the MMO's concerns, providing details of herring migration routes and the requested temperature overlay.

9.4.34. The Applicant acknowledged the MMO's request to adopt a slower larval growth rate in line with that proposed by Heath (1993) but remained confident that the equation that it had used in the assessment, from Oeberst *et al* (2008), was appropriate for the Banks herring stock. It noted that Heath (1993) draws on herring stocks from across the northeast Atlantic, which would involve significant variations in temperature, and contended that the temperatures related to the more northerly stocks would be much lower than those experienced by the Banks stock.

9.4.35. The matter was raised again at ISH10 [EV-034], and the ExA impressed on the parties the desirability of reaching a conclusion. Having reviewed the new information, NE continued to express concerns, but deferred to the MMO on the matter going forward [AS-048] and [REP6-057]. The MMO [REP6-050] maintained that the proposed peak spawning period of 1 September to 16 October was neither precautionary nor conservative and provided detailed reasoning for its conclusion that it was not appropriate. Its position was that the proposed piling restriction should be effective between 1 August and 31 October each year.

9.4.36. The MMO disagreed with the Applicant in relation to water temperatures, herring larvae development, and the modelled noise contours. In terms of larval growth rate, the MMO acknowledged pros and cons with using either the Heath (1993) or Oeberst *et al* (2009) models and accepted the use of the latter, subject to the input of an appropriate temperature.

9.4.37. The MMO requested the application of a 135dB threshold in relation to the migration route analysis, which it said was supported by peer-reviewed research and was, "*accepted and widely used in underwater noise modelling*".

9.4.38. It suggested that further revisions and amendments were needed, including behavioural response noise modelling and the use of appropriate minimum sea temperatures (which influence the duration of egg and larval development and larval growth rates), both factors which would affect the prediction of a 'peak' spawning period.

9.4.39. Following further discussions with the Applicant outside the Examination, the MMO submitted a further summary of its concerns and the rationale behind them [REP7-111]. In addition to a refinement of the seasonal restriction, it contended that the draft condition should be targeted at those specific areas that coincided with the spawning ground, as, it said, was the case for the Dogger Bank A and B (Creyke Beck) export cable corridor, which also had a route that crossed the Banks herring spawning ground.

9.4.40. The Applicant submitted an updated Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction [REP7-065]. Whilst

maintaining its position that the noise effects from construction would not cause a barrier effect to herring migration (given the route of the circuit in relation to the noise contours) and that the restriction period of 1 September to 16 October would provide sufficient precaution and robust mitigation of the effects of piling for the high voltage alternating current (HVAC) booster station on herring spawning, this set out a compromise restriction period of 21 August to 23 October. Condition 23 of the draft DCO Schedule 12 (the transmission assets DML) was amended to reflect this.

9.4.41. Differences on this matter had been narrowed but disagreements remained by the end of the Examination. The MMO [REP8-022] maintained that a start date of 1 August was required for the piling restriction but was conditionally satisfied to accept the Applicant's newly proposed end date of 23 October. It noted that its agreement was not based on any submitted evidence, but on two assumptions on larval growth and drift that it was content to consider reasonable. In identifying the matters that lay behind the outstanding differences, the MMO [REP8-022] appeared to agree with the Applicant that these were:

- the sea temperatures used in the calculation (which in turn also influence egg development rates and yolk absorption periods);
- the need to present the 135dB behavioural noise contour;
- the growth rate applied in the modelling.

9.4.42. Both parties reiterated the positions that they had previously expressed on these matters (the Applicant [REP7-065]; the MMO [REP8-022]).

9.4.43. For minimum sea temperatures, the MMO noted significant variation in the records for the Banks spawning ground, leading to its recommendation that the back-calculations should use more conservative minimum values of 8.56°C to 9.15°C. The Applicant maintained that 12°C was appropriate.

9.4.44. The MMO continued to contend that appropriate modelled noise contours were needed to demonstrate the range of impact for behavioural effects on herring migrating to, from, and at the spawning grounds. This remained outstanding, with the Applicant content that the assessment took all reasonable risk into account.

9.4.45. In respect of larval growth rates, despite residual disagreement, the Applicant had recently modified the modelling parameters to accept the MMO's suggested values for larval length in survey sample (10mm) and larval length hatch size (5mm) and had applied the Heath (1993) larval growth rate of 0.25mm per day to inform the predicted spawning start date. However, the MMO continued to recommend that the back-calculation should use more conservative minimum sea temperature values (8.56°C to 9.15°C) and provided further calculations to support its concerns that the predictions were not adequately conservative. It contended that these demonstrated that the start date for the piling restriction should be 1 August, in line with its original recommendation.

9.4.46. In summary, the MMO was conditionally content to accept the Applicant's proposed end date for the restriction period of 23 October. In terms of the start date, the Applicant's compromise proposal was 21 August, ten days earlier than originally proposed in the application, but the MMO maintained that a start date of 1 August was necessary.

9.4.47. The final draft DCO [REP7-039] includes the following Condition in Part 2 of Schedule 12 (the transmission assets DML):

"*Piling restriction*

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 21st August and 23rd 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."

9.4.48. The MMO's proposed restriction wording [REP8-022] comprised:

"No piling of any kind is permitted from 1st August to 23rd October (inclusive) in any year."

Other underwater noise matters

9.4.49. The Examination also considered the following underwater noise related topics, which are reported on in more detail in the following marine mammal Section, where they are more relevant:

- commitment 85 in the Commitments Register [REP6-008] and the DML conditions that there will be no concurrent piling operations at the array area and the HVAC booster station;
- the appropriate level of detail and commitment to specific, at-source, underwater noise reduction measures in the outline mitigation plans;
- how other, undefined sources of underwater noise should be assessed.

Sediment release

9.4.50. NE [REP3-054] submitted that potential impacts associated with any arisings from drilled piles should be assessed in the context of fish and shellfish, as they had been for some other receptors in the ES. The Applicant produced a Clarification Note on Drill Arisings [REP5-083] that concluded that there would be no significant effects. Having seen this further assessment, NE [REP6-057] was satisfied that all impacts had been identified in the ES.

9.4.51. The MMO [RR-020] disagreed with the Applicant's assessment [APP-015] of 'minor' magnitude of impact on herring spawning grounds through direct damage and the resettlement of suspended sediment associated with installation activities along the export cable corridor.

9.4.52. In response to theExA's first written questions (ExQ1) [PD-006], the Applicant [REP2-038] maintained its assessment and contended that

there was no need for further assessment or mitigation. The Applicant considered that any seasonal restriction on cable installation activities during the herring spawning season would be unwarranted due to the predicted minor impact. Furthermore, it pointed out that all impacts would be short-term at any one place and that the Proposed Development avoided the core Banks herring spawning grounds.

9.4.53. The matter was discussed throughout the Examination, with the MMO reiterating [REP7-111] that the proposed export cable corridor crossed the Banks herring spawning ground, and that installation activities could result in direct damage to (and smothering of) the gravel beds on which herring lay their eggs. The MMO did not agree that any impact would be short term, as the indicative construction programme suggested that cable installation would take approximately two years [REP7-002], potentially causing disturbance over two consecutive spawning seasons. It noted the construction restrictions applied to the Dogger Bank A and B (Creyke Beck) export cable corridor, which has a similar inshore route transecting the Banks herring spawning ground.

9.4.54. The Applicant provided further information in a Clarification Note on Peak Herring Spawning Period and Seasonal Piling Restriction [REP7-065]. To provide the MMO with further comfort on this matter, the Applicant suggested a restriction on seabed preparation activities using either dredgers or control flow excavator tools during the seasonal restriction period proposed to mitigate noise impacts on spawning herring. The restriction would apply seaward of MHWS out to the westernmost extent of the HVAC booster station works only, as this would be the area closest to the core herring spawning grounds north of Flamborough Head. The restriction was incorporated into an updated Outline Cable Specification and Installation Plan [REP7-056].

9.4.55. The MMO [REP7-111] said it would review the updated Clarification Note [REP7-065] and would provide a final view on whether it satisfied its outstanding concerns at Deadline 8. The MMO's final submission [REP8-022] made no reference to this matter directly. The signed SoCG between the Applicant and the MMO [REP8-004] continued to refer to the MMO's concerns about the issue, though it did welcome the updated Outline Marine Monitoring Plan [REP7-059] proposals for pre- and post-construction monitoring of sandeel and herring habitats, noting that this was an outline plan and that there would be an opportunity for refinement post-consent.

Marine EMF

9.4.56. The ES [APP-041] and [APP-014, amended by AS-009] noted that the EMF effects of transmission cables on benthic and marine communities had been scoped out of the assessment, as EMFs are only likely to increase above background levels in close proximity to the cable. As the majority of cable lengths would be buried or protected, effects would be further mitigated.

9.4.57. NE [RR-029], the MMO [RR-020] and the HFIG [AS-025] highlighted recent research findings that were said to show that some crab species demonstrate behavioural and physiological responses to the presence of EMFs associated with sub-sea cables.

9.4.58. In response, the Applicant [REP1-038] noted that the papers by Scott *et al* that had been quoted were laboratory studies that investigated EMF strengths significantly higher than those that would result from an installed offshore wind farm transmission cable. The lowest experimental EMF considered in the research was a factor of ten higher than that expected for the Proposed Development, and no impacts had been identified at this intensity. Indeed, effects were only demonstrated when crabs were exposed to EMF levels that were a factor of 20 to 1,000 higher than those expected from the Proposed Development. The Applicant therefore considered it unlikely that there would be any impacts, and that EMF had been correctly scoped out of the ES.

9.4.59. NE requested [REP4-054] further evidence to demonstrate that the EMF levels for the cables associated with the Proposed Development would be much lower than those used in the research, and recommended monitoring post-construction to validate the predictions.

9.4.60. The Applicant made an amendment to Condition 13(1)(h) (referring to the Cable Specification and Installation Plan) of Schedule 12 of the draft DCO [REP2-061] (the DML for the transmission assets) by the addition of a requirement to include, "*a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with good industry practice*" in the final version of the Plan, which was supported by the MMO.

9.4.61. The Applicant also provided further information and assessment of the likely EMF effects [REP5-081]. The HVAC and high voltage direct current (HVDC) options for the Proposed Development would have EMF strengths of approximately 16.7μT[5] and 40μT respectively at the seabed directly above the cable. The EMF would attenuate rapidly horizontally and vertically away from the source to reach negligible levels within approximately 10m.

9.4.62. The research by Scott *et al* referenced EMF levels from 65μT to 8,000μT. The upper value was based on EMF levels calculated for the surface of a cable by other researchers. The Applicant noted that the methodology was undefined and that the 8,000μT value was a significant outlier compared to the other values presented. It suggested that this approach contrasted to that typically used for offshore wind farms, where the value is calculated at 1m above the cable. The research paper values attenuated to approximately 20μT to 40μT at 1m from the centre of the cable, comparable to those typically presented for offshore wind farms and the value calculated by the Applicant for the Proposed Development.

[5] The microtesla (μT) is an SI unit of magnetic flux density equal to 10−6 teslas.

9.4.63. The Applicant suggested that, for the impacts in the Scott *et al* research to be environmentally relevant, crab eggs and larvae would have to remain on an unprotected, surface-laid cable for the entirety of their development. It went on to suggest that, whilst it was possible that an individual crab could overwinter on top of a cable, this could not feasibly lead to a significant population-level impact. As such, the Applicant was confident that any assessment of attenuation of EMF strengths, shielding and cable burial depth would not identify significant effects and that post-construction monitoring would therefore be neither proportionate nor appropriate.

9.4.64. Having reviewed the new evidence provided, the MMO [REP6-050] agreed with the Applicant and considered the matter closed. NE [REP6-057] was content with the further information and assessment but considered operational EMF monitoring readings appropriate to validate the assumptions.

Marine mammals

Interpretation of marine noise references in the draft Order and DMLs

9.4.65. The MMO raised several questions in relation to the underwater noise modelling and the corresponding marine mammal mitigation commitments put forward by the Applicant [RR-020].

9.4.66. As noted in the fish and shellfish Section of this Report above, it appeared that the Applicant's modelling had assumed that only a single monopile would be installed in 24 hours, whereas the draft DCO would allow up to three pin piles to be installed over that period. The Applicant's Clarification Note on the Installation of Two Monopile Foundations Sequentially [REP3-033] found no change in EIA significance for any marine mammals. The maximum scenario could be controlled through draft DML Condition 13(5), so the Applicant submitted that additional mitigation measures were unnecessary.

9.4.67. The MMO [RR-020] asked for clarity in relation to commitment 85 in the Commitments Register [REP6-008] and the DML conditions that there would be no concurrent piling operations at the array area and the HVAC booster station. Whilst the Applicant clarified the wording of the DML condition, both the MMO [REP2-077] and NE [REP2-082, superseded by AS-028 and AS-029] requested corresponding changes to the Commitments Register, and an explanation of the difference between 'concurrent' and 'simultaneous' piling. By the close of the Examination, all relevant documents, including the Outline Southern North Sea Special Area of Conservation Site Integrity Plan [REP7-054], had been updated from:

"No more than a maximum of two foundations are to be installed simultaneously."

9.4.68. to:

"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."

Sound exposure criteria

9.4.69. The Applicant's approach to the assessment and mitigation of underwater construction noise on marine mammals was based on the instantaneous sound pressure level (SPLpeak) permanent threshold shift (PTS) onset impact range [APP-016]. The Applicant maintained ([REP6-050], for example) that a second approach, the weighted cumulative sound exposure level onset range (SELcum), was over-precautionary and not a reliable basis for determining mitigation requirements.

9.4.70. The MMO [RR-020] disagreed that the mitigation protocol should focus only on the SPLpeak and maintained that the SELcum range should also be considered. Whilst acknowledging uncertainties and conservatisms with the assessment of SELcum, the MMO noted [REP6-050] that the use of both criteria would address not only instantaneous auditory injury, but also injury from accumulated exposure to pile driving, which it suggested would present a greater risk.

9.4.71. In its Clarification Note on Marine Mammals [REP4-045], the Applicant suggested that the assessment of cumulative PTS is an area of active research and offered to maintain awareness of this, and to continue dialogue with NE. If the approach advanced sufficiently, the Applicant would present a final assessment and mitigation package that would reflect the state of knowledge at the time that the relevant management plans were submitted for approval. The Applicant suggested [REP4-038] a precedent for this approach:

"The Applicant confirms that the cumulative PTS-onset impact ranges predicted for pile driving at East Anglia One North and East Anglia Two are similar in range to those predicted for Hornsea Four. The East Anglia One North HRA document (March 2022) states that 'the MMMP for piling will be developed in the pre-construction period and will be based upon best available information, methodologies and industry best practice. The protocol will be developed with the MMO and relevant SNCBs'."

9.4.72. NE's view [REP5-112] was also that SELcum must be taken into account when determining appropriate mitigation measures to reduce the risk of injury, despite the current limitations in modelling. However, it agreed that active research was underway, that better methods for estimating cumulative PTS distances may become available in the near future, and that any new methods could be taken into account when finalising the mitigation measures post-consent, including in the Marine Mammal Mitigation Protocol (MMMP).

9.4.73. An updated Outline MMMP [REP6-011] confirmed that the final Protocol would include mitigation of the SELcum PTS post-consent, modelled using the latest research and methods available at the time of drafting.

Having reviewed this document, the MMO agreed that the revisions made clear that the final MMMP would consider mitigation for both instantaneous and cumulative PTS.

At-source, underwater noise mitigation measures

9.4.74. There was disagreement during the Examination between the Applicant and the MMO and NE on the appropriate level of detail and commitment to specific, at-source, underwater noise reduction measures in the outline mitigation plans. Commitment 110 in the Applicant's Commitments Register [REP6-008] summarised that:

"A piling Marine Mammal Mitigation Protocol (MMMP)… will include details of soft starts to be used during piling operations with lower hammer energies used at the beginning of the piling sequence before increasing energies to the higher levels."

9.4.75. The MMO [REP2-077] took the position that specific, at-source noise mitigation commitments should be secured in the DMLs, and that, if they were not, there could be less confidence in the conclusions of impact assessments where such mitigation had been relied on. NE [REP2-082, superseded by AS-028 and AS-029] noted that the ES relied on at-source mitigation measures and contended that they must therefore be secured.

9.4.76. The Applicant [REP1-038], on the other hand, noted that the relevant outline management plans included provision for at-source mitigation, 'if required'. As such, the Applicant did not consider it necessary to include specific commitments in the DMLs. During ISH4 [EV-027], the Applicant confirmed this position and suggested it was aligned with other recently consented schemes. The Applicant's post-Hearing note [REP4-038] expanded on this suggested precedent:

"The East Anglia One North draft Marine Mammal Mitigation Protocol (v4, March 2021) states that: 'The final MMMP for piling will ensure there are embedded mitigation measures, as well as any additional mitigation, if required, to prevent the risk of any physical or permanent auditory injury to marine mammals. This will be developed in the pre-construction period, when there is more detailed information on the proposed East Anglia ONE North project design (and environmental conditions) and hence, it will incorporate the most appropriate mitigation measures based upon best available information and proven methodologies at that time'."

9.4.77. Equivalent text was said to be set out in the East Anglia TWO draft MMMP.

9.4.78. NE [REP2-083] also sought evidence that any such noise mitigation measures would be effective in the particular environment of the Proposed Development. The Applicant submitted a Clarification Note [REP2-050] that concluded that the relevant mean wind speeds, wave heights and water depths did not exceed the limitations for the types of at-source measures being considered. Having reviewed the evidence, NE [REP3-054] agreed that this was the case.

9.4.79. Following further Examination discussions, the Applicant submitted an amended Outline MMMP [REP6-011]. This set out more information on the types of at-source measures that could be included, if necessary, in the final Protocol:

"In order to minimise the risk of any auditory injury to marine mammals from underwater noise during pile driving, there are a suite of mitigation measures that the Applicant could implement for Hornsea Four piling. These mitigation measures may include (but are not limited to) the following measures:

- *Pre-piling deployment of ADDs;*
- *Concurrent Marine Mammal Observation;*
- *Passive Acoustic Monitoring;*
- *Piling soft-start procedure; and*
- *At source noise abatement methods."*

9.4.80. The MMO [REP6-050] reviewed the updated Outline MMMP and welcomed the Applicant's commitment to providing at-source noise reduction measures and was content that the choice of methods could be confirmed in the final Protocol along with any requirement for acoustic deterrent devices (ADD) and their activation periods. By the close of the Examination, NE [REP8-031] maintained a preference for commitment to specific mitigation but accepted that the Applicant's approach to mitigation [REP7-054] was an acceptable compromise.

Other undefined sources of underwater noise

9.4.81. The Applicant did not include noise impacts from dealing with any UXO discovered during pre-construction surveys in the assessment, preferring to deal with this later in a separate marine licence application to the MMO. Whilst acknowledging the uncertainties around the number and nature of UXO detonations that might be required, and a general move towards low-order methods of clearance, NE requested [REP4-054] that a nominal high-order detonation should be included in the cumulative and in-combination assessments alongside geophysical surveys in case it was needed as a contingency.

9.4.82. The Applicant [REP5-081] considered it unlikely that high order UXO clearance would be required and did not consider that an illustrative scenario of a noise source for which there was no available information or scheduling would be informative. Notwithstanding this, the Applicant undertook the requested cumulative analysis [REP5a-020] and concluded that, whilst the impacted area would increase, the project alone would not lead to adverse impacts, and that any potential cumulative or in-combination effects could be mitigated through management plans secured in the draft DCO.

9.5. ExA RESPONSE

9.5.1. Most of the matters raised by the MMO, NE, the NFFO and the HFIG were satisfactorily addressed by the Applicant during the Examination, whilst mutually acceptable compromises were reached for others.

9.5.2. The structure and complexity of the ES and the novel pre-application approach adopted by the Applicant in a drive towards presenting a 'proportionate ES' led to some difficulties and misunderstandings, but the ExA is content that the ES, read as a whole and as updated through the Examination, addresses the relevant and important matters relating to marine ecology.

9.5.3. Several of the outstanding matters relate to controls and conditions associated with the DMLs that the Applicant is seeking through the Order. The principles of this are considered in detail in Chapter 16 of this Report, but when considering these matters as they relate to marine ecology, the ExA has taken into consideration the likely outcomes had this been an application directly to the MMO for a marine licence, reflecting the important balance between the desirability of maintaining consistency between the two regimes whilst recognising the benefits of a single, coherent consent.

Adequacy of baseline data

9.5.4. The ExA notes that the MMO and NE had agreed that the fish and shellfish baseline characterisation was adequate for the assessment. Given that the HFIG and the NFFO removed the substance of their representations on this following the Applicant's offer of a commercial agreement in relation to a post-consent shellfish monitoring campaign, the ExA is content that there were no outstanding matters relating to the adequacy of the fish and shellfish baseline.

Benthic biotope information

9.5.5. The ExA is content that the matters raised in relation to the characterisation and valuation of marine benthic biotopes, including those associated with the echinoderm *Amphiura filiformis*, and the polychaete *Saballeria spinulosa*, have been satisfactorily addressed by the Applicant through the provision of further information and assessment. The ExA accepts the Applicant's contention that, while *Sabellaria spinulosa* was recorded in some samples, it was present as individuals rather than aggregations and, as such, Annex I reef was not identified. This was not directly challenged by NE, though caution and reconsideration were recommended.

9.5.6. The addition of the brittlestar dominated biotope '*Amphiura filiformis, Mysella bidentata* and *Abra nitida* in circalittoral sandy mud' and the species Sabellaria spinulosa to the table of valued ecological receptors [REP7-004, Table 2.9] and the associated outline management plan controls responds to that caution and provides reassurance that any relevant features would receive appropriate mitigation should they be discovered in pre-construction surveys.

Monitoring of gravity base structures for scour and benthic habitat effects

9.5.7. The ExA notes that the Applicant did not originally intend to monitor the impact of any GBS foundations on benthic habitats through scour, but that the MMO and NE considered monitoring to be important, given that this would be a novel form of foundation construction for a UK offshore wind farm. Despite the Applicant's suggestion that this was not a project-specific issue, and that an industry-scale strategic monitoring programme would be more appropriate, the ExA considers that the novelty of the technology and the sensitive nature of some of the areas where GBS might need to be used does merit monitoring of scour and consequent benthic community impacts, not least to verify the assumptions made by the Applicant in the assessment.

9.5.8. As such, and in the light of the SoCGs between the parties [REP8-004] and [REP7-068], the ExA accepts as proportionate the Applicant's update to the Outline Marine Monitoring Plan [REP7-058] to include benthic habitat monitoring at a worst-case example of each type of GBS used on Smithic bank - if any were to be used.

Underwater marine noise and fish

9.5.9. With the clarifications submitted during the Examination, the ExA is content that the recommended Order is clear about the maximum design scenario in relation to piling noise and its impacts and control, including sequential and simultaneous activities, and that Condition 13(5) in both of the DMLs provides a means to secure this.

9.5.10. The ExA has given careful consideration to the substantial and detailed representations made throughout the Examination in relation to the potential noise disturbance effects of piling on spawning herring. Despite the range of relevant published research and data referred to, it is clear that there remain differences in interpretation between the Applicant and the MMO. The ExA finds this understandable, given the scale of the matter, natural environmental variability and the complexity of the science.

9.5.11. The differences between the two parties narrowed during the course of the Examination, and the ExA finds that the final positions reflect outstanding differences around the detailed interpretation of underwater noise propagation in different sea temperatures, larval growth rates, and an allowance for the migration of herring into the spawning grounds. These factors, amongst others, underpin the key difference, which is the definition of a start date and a finish date for the sensitive period during which there should be a restriction on piling to mitigate the noise disturbance impacts on spawning herring.

9.5.12. The ExA notes that, shortly before the close of the Examination, the Applicant set out a compromise restriction period of 21 August to 23 October and amended Condition 23 of the draft DCO Schedule 12 (the transmission assets DML) accordingly. In response, the MMO was

conditionally content to accept the proposed end date but maintained that a start date of 1 August was necessary.

9.5.13. The ExA has considered the restrictive conditions suggested by the two parties for Part 2 of Schedule 12 of the Order.

9.5.14. On balance, it considers that restricting the condition to Work No. 3 (as suggested by the Applicant) is justified, given the respective levels of risk that are apparent across the Order area.

9.5.15. Furthermore, having looked at all of the evidence put forward, including consideration of risks associated with impacts in 'shoulder months' outside the peak spawning season, the short-term and localised nature of the impacts, the possibility of impacts over two successive spawning seasons, the location of the impact zone in relation to the core Banks spawning ground, and likely recoverability from any short-term and localised effect, the ExA considers that it would be disproportionate to add further delays to the construction programme of important parts of the Proposed Development. In reaching this conclusion, the ExA has balanced the remaining risks against the recognition of August as a key month in a relatively constrained construction window in the North Sea. It recommends the adoption of the Applicant's amended Condition 23 of the draft DCO Schedule 12 [REP7-039], which it believes offers a proportionate response.

9.5.16. With these controls in place, the ExA does not consider the likely effects on spawning herring to present a significant risk in an EIA context to important predators, including cetaceans and seabirds though this is examined further in the context of the HRA in Chapter 13.

Sediment release from construction activities

9.5.17. One main matter remained unresolved at the close of the Examination in relation to possible impacts of sediment release and resettlement on marine ecology. The ExA notes that the export cable corridor would cross the Banks herring spawning ground, and the view of the Applicant that a restriction on cable installation during the herring spawning season was unwarranted due to the predicted minor, short-term and localised impact.

9.5.18. The ExA also notes the view of the MMO that installation activities could result in direct damage to - and smothering of - the gravel beds on which herring lay their eggs.

9.5.19. With the amendments made by the Applicant during the Examination, the ExA is content that sufficient controls would be available to the MMO through the certification of the final Cable Specification and Installation and Marine Monitoring Plans to ensure proportionate mitigation for effects on spawning grounds from sediment release and resettlement, and cumulatively with noise disturbance. These plans would need to be prepared and agreed in accordance with the outline versions, which are certified documents under Article 38 of the recommended DCO. The updated plans include:

- a restriction to apply seaward of MHWS out to the westernmost extent of the HVAC booster station works on seabed preparation activities using either dredgers or control flow excavator tools during the seasonal restriction period (ie, the period proposed to mitigate noise impacts on spawning herring); and
- pre- and post-construction monitoring of sandeel and herring habitats.

Marine EMF

9.5.20. The ExA has considered the laboratory research findings highlighted during the Examination by NE, the MMO, and the HFIG that demonstrated behavioural and physiological responses by some crab species subjected to EMFs.

9.5.21. In light of the further information and assessment provided by the Applicant, and its amendment of Condition 13(1)(h) of Schedule 12 of the draft DCO to include a requirement for, "*a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with good industry practice*", the ExA is content with the Applicant's conclusion that such impacts were most unlikely to be experienced in practice, and that post-construction monitoring would not be proportionate.

Marine mammals and underwater noise

9.5.22. The ExA recognises that the application documents introduced some confusion in relation to marine noise references in the draft Order and DMLs, including in relation to marine mammals, but is content that the cumulative changes made by the Applicant during the Examination now provide sufficient clarity.

9.5.23. The ExA has considered the Applicant's approach to the assessment and mitigation of underwater construction noise on marine mammals in the ES using the instantaneous SPLpeak PTS onset impact range, and the view of the MMO and NE that the weighted SELcum should also be presented.

9.5.24. The assessment of cumulative PTS is an area of active research, and the ExA is persuaded that better estimation and interpretation tools may become available in the near future. It therefore concurs with the agreement reached between the Applicant and NE during the Examination that both instantaneous and cumulative PTS should be taken into account when finalising the relevant mitigation measures post-consent, using the best available methods at that time. The Applicant's updated outline MMMP [REP6-011] secures this.

9.5.25. The disagreement between the Applicant and the MMO and NE on the appropriate level of detail that should be included in the outline mitigation plans for at-source, underwater noise reduction measures was largely overcome during the Examination. The Applicant submitted further information on the general types of at-source measures that could be included, if necessary, in the final MMMP, and provided evidence

to show these would be achievable in the specific environment of the Proposed Development. The commitment to which, if any, might be required would be reserved until the final version of the plan was agreed, when a more complete understanding of the technical details of construction methods would be known.

9.5.26. The ExA is content that appropriate, at-source noise reduction measures can be successfully secured in this way and notes the precedent in The East Anglia ONE North Marine Mammal Mitigation Protocol that was accepted by the Secretary of State.

9.5.27. The Applicant has chosen to deal separately with licensing for any UXO clearance. The ExA notes that this approach has been adopted for several previous projects, whereas others have chosen to include the relevant consent in the Order. The ExA is content that the matter can be dealt with effectively either way.

9.5.28. Notwithstanding the very low level of probability that a high-order method of clearance would be necessary and that there would be other sources of noise that could act cumulatively, the ExA is content that the Applicant has demonstrated that the Proposed Development alone would not lead to adverse impacts, and that any potential cumulative effects could be mitigated through the Marine Mammal Mitigation Protocol and Southern North Sea Site Integrity Plan that would be secured through the Order.

9.6. CONCLUSION

9.6.1. The ExA has considered the impacts of the Proposed Development on the marine ecology matters discussed in this Chapter of the Report in the context of the policy framework set by the Overarching National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3), the National Policy Statement for Electricity Networks Infrastructure (NPS EN-5), the Marine Policy Statement and the East Inshore and East Offshore Marine Plans.

9.6.2. The ExA notes paragraph 2.6.113 of NPS EN-3, which says that applicants should assess the effects on the subtidal environment from loss of habitat due to (*inter alia*) predicted scour, scour protection and altered sedimentary processes. With the amendments made during Examination, the ExA is content that this policy requirement has been addressed, along with those relating to fish and shellfish (paragraphs 2.6.72 to 2.6.77) and marine mammals (paragraphs 2.6.90 to 2.6.99).

9.6.3. The ExA considers that the Applicant's amended approach reported in this Chapter provides a proportionate mitigation response to the potential for underwater construction noise and the resettlement of suspended sediment to adversely affect spawning herring. Nevertheless, a small residual risk of damage or disturbance would remain, and this is considered to weigh against the case for the Proposed Development to a limited extent.

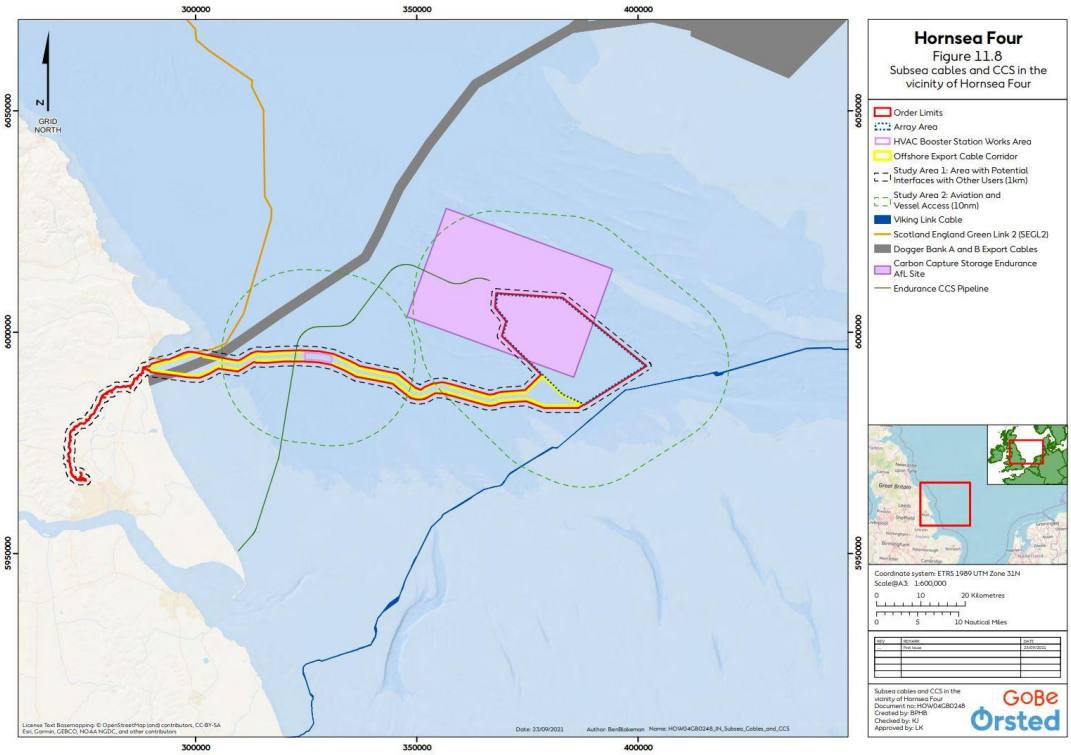
9.6.4. In all other aspects, the ExA finds that the mitigation and controls that would be put in place would provide sufficient safeguards to allow the Proposed Development to go ahead in accordance with adopted policy relating to the marine ecology matters considered in this Chapter.

10. FINDINGS AND CONCLUSIONS IN RELATION TO THE ENDURANCE STORE

10.1. INTRODUCTION

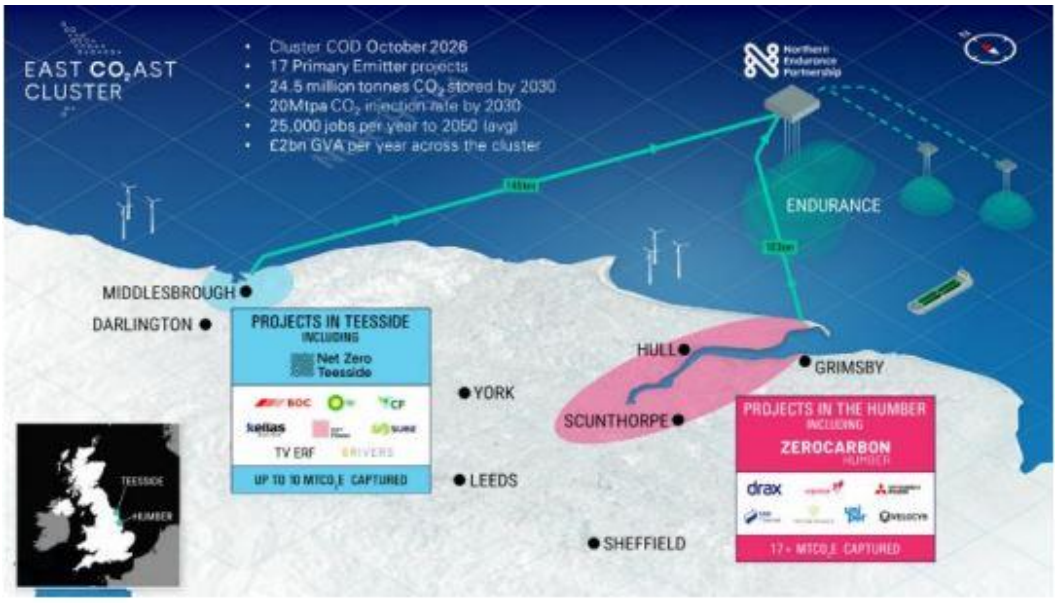
10.1.1. The Endurance Store is a saline aquifer approximately 22 kilometres (km) long, 7km wide and 200 metres (m) thick located approximately 96km east of Flamborough Head. Part of the area of the Endurance Store overlaps with the northern part of the proposed array area [APP-023, Figure 11.8].

Figure 10.1 Location of Endurance Store



10.1.2. The Northern Endurance Partnership (NEP), which is operated by BP Exploration Operating Company Limited (bp) and is made up of bp, Equinor, National Grid, Shell and Total, proposes to use the Endurance Store for the storage of carbon dioxide (CO_2). NEP proposes to construct and operate a CO_2 transportation and storage system that would enable CO_2 from certain carbon capture projects on Teesside and the Humber, known as the East Coast Cluster, to be transported to the Endurance Store where it would be stored.

Figure 10.2 Location plan of East Coast Cluster and NEP



10.1.3. The Examining Authority (ExA) [PD-005, Annex C] identified the relationship between the Proposed Development and the proposals for the Endurance Store as a principal issue in the Examination.

10.1.4. In their submissions, Interested Parties (IPs) have referred to the aquifer/ reservoir, the Carbon Capture and Storage (CCS) project and the area of overlap by a variety of different names. For consistency in this Chapter, the ExA refers to the aquifer as the Endurance Store, the proposals to use it for carbon storage as the Endurance Project and the area of overlap between the Proposed Development and the Endurance Store as the Overlap Zone.

10.2. POLICY CONSIDERATIONS

National policy

10.2.1. Paragraph 2.6.183 of the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) advises that, *"where a proposed offshore windfarm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the* [decision maker]*".* The NPS recognises that much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. The NPS advocates that in such circumstances there is an expectation that the Applicant will minimise negative impacts and reduce risks to as low as reasonably practicable.

10.2.2. NPS EN-3 (paragraph 2.6.184) states that the decision maker should be satisfied that site selection and design have been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. However, the NPS is clear that the decision maker should not consent applications that pose unacceptable risks to safety after mitigation measures have been considered (paragraph 2.6.184).

10.2.3. Where a proposed development is likely to affect the future viability or safety of existing, approved or licensed offshore infrastructure or activities (NPS EN-3, paragraph 2.6.185), the decision maker should give these adverse effects substantial weight in its decision making. However, NPS EN-3 (paragraph 2.6.186) recognises that mitigation measures may be possible to negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the decision maker to grant consent.

10.2.4. The Marine Policy Statement (MPS) (paragraph 3.3.1) recognises that a secure, sustainable and affordable supply of energy is of central importance to the economic and social wellbeing of the United Kingdom (UK). It acknowledges the contribution from not only the oil and gas sectors but the growing contribution from renewable energy. However, it also highlights that contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning.

10.2.5. When decision makers are examining and determining applications for energy infrastructure, the MPS (paragraph 3.3.4) advocates the need, amongst other things, to take into account:

- the positive wider environmental, societal and economic benefits of low carbon electricity generation and carbon capture and storage as key technologies for reducing CO_2 emissions;
- the physical resources and features that form oil and gas fields or suitable sites for gas or CO_2 storage occur in relatively few locations. Similarly, renewable energy resources can only be developed where the resource exists and where economically feasible; and
- the UK's programme to support the development and deployment of CCS and in particular the need for suitable locations that provide for the permanent storage of CO_2.

10.2.6. Table 11.2 of Chapter 11 of the ES [APP-023] sets out the relevant policies from the East Inshore and East Offshore Marine Plans. Section 11.3.3 [APP-023] sets out other policy and guidance documents relevant to the consideration of the effect of the Proposed Development on the Endurance Store.

10.3. THE APPLICANT'S CASE

10.3.1. The effect of the Proposed Development on the Endurance Store was considered by the Applicant in Volume A2, Chapter 11 of the Environmental Statement (ES) [APP-023], which assesses the impact of the Proposed Development on infrastructure and other users.

10.3.2. The Applicant acknowledged that the construction, operation and maintenance and decommissioning of the Proposed Development would have the potential to result in direct and indirect impacts on the Endurance Store [APP-023, paragraph 11.11.1.1].

10.3.3. In order to eliminate or reduce the likely significant effects, the Applicant adopted a number of commitments [APP-023, Table 11.13]. These commitments were a mix of standard offshore practices and specific risk

reduction measures that would reduce interface risks between the Proposed Development and the operators of other relevant infrastructure assets, including the Endurance Store.

10.3.4. The assessment undertaken by the Applicant was based on a Maximum Design Scenario (MDS) [APP-023, Section 11.9]. Should the Proposed Development be constructed using different parameters within the Rochdale Envelope, then the Applicant advocated that the impacts would not be any greater than those set out in the ES using the MDS [APP-023, Table 11.14]. The ES assessed the effects on the Endurance Store in terms of construction, operation and maintenance, and decommissioning. Issues of a commercial nature were not considered in the ES [APP-023, paragraph 11.15.1.2].

10.3.5. The Endurance Store would overlap with the proposed wind turbine generator (WTG) array area. For the purposes of the ES, the Applicant refers to this as the Array Overlap Area. The proposed Easington to Endurance CO_2 injection pipeline associated with the Endurance Store would overlap with the proposed route of the offshore Export Cable Corridor (ECC). The Applicant refers to this as the ECC Overlap Area. In the ES, they are collectively referred to as the Overlap Areas and what the ExA refers to as the Overlap Zone.

Construction

10.3.6. The Applicant accepted that during the proposed three-year construction period, construction activity, installed infrastructure or the presence of safety zones and advisory safety areas within the Overlap Areas might lead to effects on the development or operation of the Endurance Store. That could include effects on, or restriction of access to, planned or installed CCS infrastructure such as wells, manifolds, surface platforms and flowlines [APP-023, paragraph 11.11.3.2]. In addition, the installation of the offshore export cable could temporarily restrict access to the ECC Overlap Area [APP-023, paragraph 11.11.3.3].

10.3.7. The Applicant considered that construction activity or the presence of installed infrastructure also had the potential to impact on the ongoing operation or maintenance of the installed CCS infrastructure, such as restrictions on CCS vessel and helicopter access and the ability to undertake seismic surveys in the Array Overlap Area [APP-023, paragraphs 11.11.3.4 and 11.11.3.5].

10.3.8. In the absence of any mitigation, the Applicant concluded that the potential impact on the CCS development activities arising from the construction of the Proposed Development within the Overlap Areas would be of moderate magnitude. The Endurance Project was assessed to have a high sensitivity [APP-023, paragraph 11.11.3.8], resulting in an impact of large or moderate significance depending on the final details of the CCS Scheme and the extent of the interaction with the Proposed Development [APP-023, paragraph 11.11.3.9].

10.3.9. To mitigate the effect, the Applicant proposed to work collaboratively with the promoters of the Endurance Project to enable them to plan and design their projects accordingly, so as to reduce or avoid adverse effects and to maximise opportunities for co-location and co-existence [APP-023, paragraph 11.11.3.10]. A crossing and proximity agreement would be sought, at the relevant time, in relation to the Easington to Endurance CO_2 injection pipeline.

10.3.10. As a result, the Applicant concluded [APP-023, paragraph 11.11.3.12] that the impact on the Endurance Project would have a residual magnitude of negligible, which, combined with a high sensitivity, would result in a residual significance of 'slight', which the Applicant considered would not be significant in Environmental Impact Assessment (EIA) terms.

Operation

10.3.11. The Applicant acknowledged that the presence of installed infrastructure and ongoing maintenance activity related to the Proposed Development would have the potential to impact on the siting of and access to CCS infrastructure including wells, manifolds, surface platforms and flowlines. In addition, the operation of the Proposed Development would have the potential to impact on the maintenance and operational activities associated with the CCS development and ongoing monitoring or development activities such as conducting of seismic surveys [APP-023, paragraph 11.11.7.3].

10.3.12. The Applicant considered that it would affect a significant portion of the Endurance Store within the Array Overlap Area, would be of medium-term duration (ie the operational period), and would be continuous and of low reversibility (albeit that it would be reversable post-decommissioning). On the basis that the Applicant considered that there was a high level of uncertainty associated with the planned development activities associated with Endurance Store within the Overlap Areas, the magnitude was deemed to be moderate [APP-023, paragraph 11.11.7.4].

10.3.13. In the absence of any mitigation, the Applicant concluded that the potential impact on the Endurance Store arising from operation and maintenance of the Proposed Development within the Overlap Areas would be of moderate magnitude. As with the construction phase, the Endurance Store was assessed to have a high sensitivity [APP-023, paragraph 11.11.7.5], resulting in an impact of moderate or large significance dependent upon the final details of the CCS Scheme and the extent of the interaction with the Proposed Development [APP-023, paragraph 11.11.76].

Decommissioning

10.3.14. The Applicant identified the same impacts for decommissioning as it did for operation and maintenance [APP-023, paragraphs 11.11.13.2 to 11.11.13.6]. In addition, it recognised that decommissioning of the export cables might temporarily restrict access to the proposed Easington

to Endurance CO_2 injection pipeline within the ECC Overlap Area [APP-023, paragraph 11.11.13.3]. The Applicant considered that, in the absence of mitigation, the effect of decommissioning on the CCS development activities would be of moderate magnitude, but as it considered the Endurance Store to have a high sensitivity this would result in an impact of moderate or large significance [APP-023, paragraph 11.11.13.9].

10.3.15. Collaborative working with the developers of the Endurance Project and then, on reversion of the storage site to the State, The Crown Estate (TCE), was proposed as mitigation by the Applicant [APP-023, paragraphs 11.11.13.10 to 11.11.13.13]. The Applicant concluded that, with the development of effective mitigation, the impact on the CCS development within the Overlap Areas would have a residual magnitude of negligible, which, when combined with a high sensitivity, would result in an impact of 'slight' significance, which it did not consider significant in EIA terms.

10.4. PLANNING ISSUES

10.4.1. Concerns about the potential conflict between the Proposed Development and the use of the Endurance Store for CCS were raised by: Equinor New Energy Limited (Equinor) [RR-011]; National Grid Carbon Limited (NGCL) [RR-024] and [REP1-078]; Shell [RR-035]; and BP Exploration Operating Company Limited (bp) [PDL-002].

10.4.2. Equinor [RR-011] advised that it had interests in both hydrogen production and power generation, including CCS projects in the Humber and Teesside areas. It said that the realisation of these would be dependent on, amongst other things, the successful development of the Endurance Store for CCS. As such, Equinor advised that it wished to reserve the right to make representations.

10.4.3. NGCL [RR-024] is proposing to develop the Humber Low Carbon Pipelines (HLCP), which would transport CO_2 and hydrogen to facilitate Carbon Capture Usage and Storage (CCUS). The project is currently in the pre-application stage. NGCL acknowledged that there would be no direct physical link between the HLCP project and the Proposed Development and it would therefore not be seeking protective provisions. However, it considered that a critical component of the successful delivery of a full CCUS chain for the Humber would be the storage opportunity provided by the Endurance Store, which would have a physical interface with the Proposed Development. As a result, NGCL was seeking comfort that the Endurance Store (including any export pipelines below mean low water springs (MLWS)) would not be compromised by the Proposed Development. Having reviewed the application, NGCL considered that it did not.

10.4.4. At Deadline (D) 1 NGCL [REP1-078] submitted draft text for inclusion in a Statement of Common Ground (SoCG) with the Applicant. The text expanded on NGCL's Relevant Representation (RR), providing further detail of the background on the delivery of the East Coast Cluster. NGCL

recognised [REP1-078, 5(b)] that the compatibility of the Proposed Development with the Endurance Project was of critical importance to the delivery of the Government's national net zero objectives, as these would, in part, be secured by the East Coast Cluster and the delivery of terrestrial CCUS infrastructure projects being promoted by NGCL and connecting emitter parties across the Humber region. No SoCG between the Applicant and NGCL was submitted to the Examination.

10.4.5. Shell UK Ltd [RR-035] advised that it was part of the NEP and that successful co-location with the Proposed Development would be critical to both parties' maturation.

10.4.6. At D1, the Applicant [REP1-038, 2.11, 2.24 and 2.35] responded to these RRs advising that it had assessed the potential impacts of the Proposed Development on the Endurance Store in Chapter 11 of the ES [APP-023] and concluded that, with mitigation, the potential impact would be 'slight' and not significant in EIA terms.

10.4.7. The Applicant highlighted that notwithstanding this, to facilitate coexistence between the projects, protective provisions were included in the draft DCO [REP1-002, Part 8 of Schedule 9] that would provide for co-operation on planned proposed development activities, communication and liaison via an Interface Management Group.

10.4.8. Initially, due to the terms of an existing commercial agreement, bp, the lead partner for the Endurance Project, was prevented from lodging any objection or making any representation [PDL-002]. However, the Applicant and bp agreed, subject to certain conditions, to allow representations to be made for the purposes of obtaining the necessary consents for their respective projects [REP1-057, paragraph 2.1.1.5].

10.4.9. Consequently, at D1, the Applicant and bp prepared a position statement [REP1-057] that provided an overview of the ongoing technical discussions between the parties around the potential or otherwise for coexistence between the Proposed Development and the Endurance Project within an overlapping area of the seabed (the Overlap Zone[6]).

10.4.10. The position statement [REP1-057, Section 2] explained that, because both projects were proposed to be located within the Overlap Zone, their commercial relationship was governed by an Interface Agreement (IA) which sought to regulate and co-ordinate activities with a view to managing potential and resolving actual conflicts.

10.4.11. Appendix 1 of the Position Statement [REP1-057] set out the Applicant's position with regards to co-existence and Appendix 2 set out bp's conclusions with regard to the existence of the two projects in the Overlap Zone. The Position Statement also included a set of alternative protective provisions suggested by bp for inclusion in the draft DCO.

[6] This is the same area that Chapter 11 of the ES refers to as the Overlap Area.

10.4.12. To support its position that the projects could co-exist, the Applicant commissioned a study to review a number of different areas of co-location risks [REP1-057, Appendix 1.1]. The study concluded that there was a lack of literature on, and therefore understanding of, the impact of co-locating projects specifically around the impact of turbine layout and noise on measurement, monitoring and verification (MMV) of CCS activities and how to monitor CO_2 plume development. Until further studies provided a definitive conclusion, the study recommended that a standard minimum grid formation of one Wind Turbine Generator (WTG) every 2km would need to be implemented. In the opinion of the authors of the report, this would allow for rig access and would open the potential for using towed seismic streamers for monitoring the CO_2 plume. This would be unless the cost of alternative technologies such as Ocean Bottom Nodes (OBNs) could be justified or reduced, or a series of other technologies could be compiled to provide full MMV coverage of the Endurance Store.

10.4.13. The Applicant advised that the implications for the Proposed Development for not locating any WTG within the Overlap Zone would be the loss of 45 WTGs resulting in a loss of 630 to 675 Megawatts (MW) depending on whether a 14 or 15MW turbine was used [REP1-057, Appendix 1.1, paragraph 5.11.1].

10.4.14. Appendix 2 of the Position Statement [REP1-057] provided bp's summary of the position with regard to the impact of the Proposed Development on the Endurance Project. bp highlighted that the Endurance Store was one of the largest and best appraised reservoirs in the southern North Sea and that the Endurance Project was the only CCUS project that could meet the Government's targets as a standalone project. In order to maximise storage potential while effectively managing CO_2 storage risks and being cost efficient, a reasonable and practicable degree of separation between the two projects would, in bp's opinion, be required.

10.4.15. Based on the need to provide access for helicopters and rigs to enable the drilling of relief wells and CO_2 injector and brine producers' wells and to conduct towed streamer seismic surveys [REP1-057, Annex 2, Figures 36 and 37], bp advocated that no WTG could be installed within a 130 km^2 area, the Overlap Zone.

10.4.16. If the projects were not separated, then bp considered that co-development with the Proposed Development would risk reducing the injection rate and storage capacity of the Endurance Store by up to 70%, which would render the project unviable.

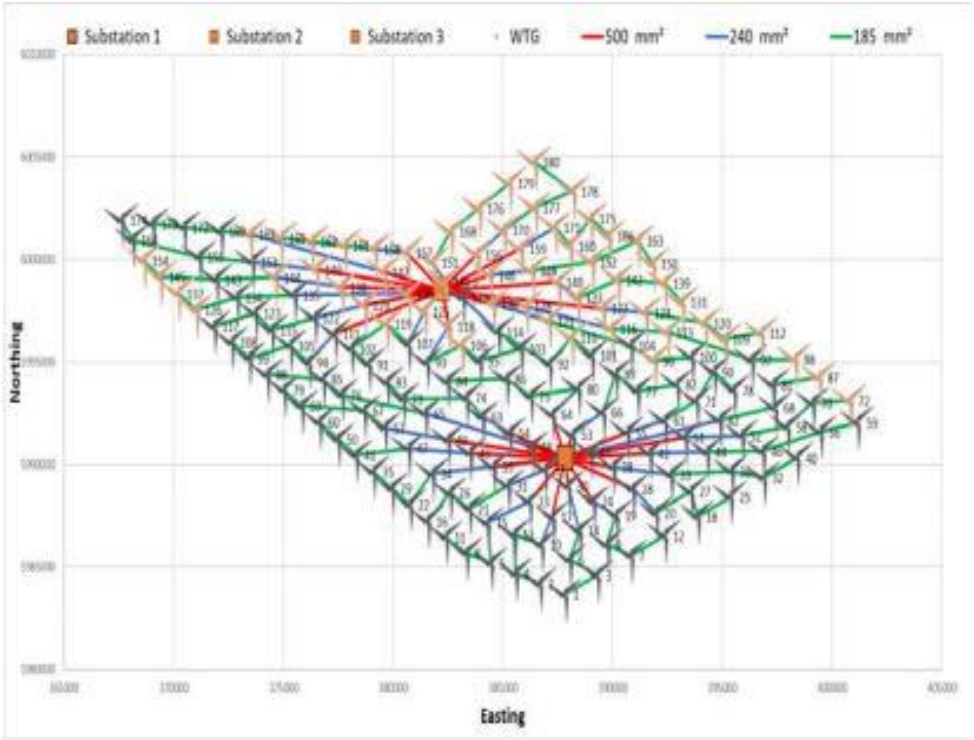
10.4.17. At D2, bp [REP2-062] provided comments on the Applicant's appendix of the Position Statement [REP1-057, Appendix 1.1] including an indicative timeframe for the submission of applications for the Endurance Project [Section 3], and explaining how the Overlap Zone had been reduced to an Exclusion Area and a Notification Zone. This had been achieved through refinement of the area required for seismic monitoring. Whilst bp advocated that no development should occur in the Exclusion Area, the Applicant would be free, subject to first notifying bp, to develop in the

Notification Zone [REP1-057, Appendix 1.1, Figure 8] [Section 4]. However, in the opinion of bp, in the absence of a viable technical solution, mutual exclusivity in the Exclusion Area continued to be the only practicable solution to enable both projects to come forward [REP2-062, paragraph 4.5].

10.4.18. Some initial comments on the Applicant's technical report were provided [REP2-062, Section 5], though bp advised that it was preparing a separate response that would be submitted at D3. It highlighted that both parties agreed that there were no proven technologies that would allow for co-existence. Furthermore, given the timeframes for both projects, even if trials were commenced immediately, bp advised that it would take a number of years to acquire the results [REP2-062, paragraph 5.3.1]. Consequently, bp considered that any new technology would not be available within the timeframes required by the two projects [REP2-062, paragraph 5.3.2]. bp advised [REP2-062, paragraph 5.3.3] that repeatability in seismic acquisition was paramount to generating reliable time lapse images that would be needed for monitoring the CO_2 plume. Consequently, in its opinion, it would not be appropriate to change technologies through the lifetime of the project. As a result, bp repeated its assertion that 4D towed streamer seismic acquisition would be the only appropriate technology for MMV. Finally, bp advised that, as the location of wells (and thus access corridors) could only be determined as the CO_2 plume evolved, the proposal for sparser layout would not represent realistic mitigation that could be relied on [REP2-062, paragraph 5.3.5].

10.4.19. bp [REP1-057, Appendix 2, paragraph 13.1] advocated that whilst the Endurance Store is a fixed geological feature, the Applicant has the flexibility to relocate WTGs into the remaining array area. At D1 (see figure 10.1 below) bp submitted a plan showing how the WTGs in the northern part of the proposed array area could be relocated in the southern area leaving the Exclusion Area free to enable the Endurance Store to be used to its full potential. The total number of WTG would remain at 180 as per the Application. However, bp did acknowledge [REP1-057, Appendix 2, paragraph 13.4] that this could produce wake loss effects due to the increased density of the WTGs albeit this could potentially be compensated for by the use of fewer larger turbines.

Figure 10.3 Potential scenario if all 180 WTGs were constructed within the area outside the Exclusion Area



10.4.20. At ISH1 [EV-008f, 29:22], bp confirmed that the layout shown in figure 10.1 would maintain the minimum spacing of 810m between WTG in all directions in accordance with the design parameters contained within the draft DCO and assessed in the ES.

10.4.21. bp highlighted [REP2-062, paragraph 5.9] that, even if no WTGs were constructed in the Overlap Zone, the Proposed Development would still represent one of the largest offshore wind farms in the world and it would still deliver a significant contribution to the UK's net zero targets

10.4.22. bp confirmed [REP2-062, Section 8] that it agreed with the policy position that had been set out [REP1-057, Appendix 1.2].

10.4.23. At D5 [REP5-075, Appendix 1], the Applicant provided a further independent report regarding monitoring of the Endurance Store with and without the Proposed Development in the Overlap Zone. The report concluded that, in the opinion of the author, there had not been sufficient detailed survey design and evaluation work presented by either bp or the Applicant to be able to demonstrate with confidence whether towed streamers would be the only method that would deliver seismic data of sufficient quality, or whether an OBN-based solution could also deliver such data once the WTGs had been constructed.

10.4.24. It accepted that long towed streamers would have a lower cost and would be the default choice for MMV on an unfettered site. However, where projects would need to co-locate, then conventional (long) towed streamers, where the cables would be longer than 1km, would not be possible and OBN would be the only viable alternative technology,

probably combined with a system such as short streamers (P-cables). Whilst the report acknowledged that this would be more expensive, it considered that the overall economic and environmental value of enabling both projects to be developed could outweigh any additional cost.

10.4.25. The report concluded that, in order to resolve the question of whether the two projects could co-exist, a comprehensive evaluation of different seismic acquisition and processing techniques and survey designs, using forward modelling would be needed. It advised that part of the evaluation should include field trials, and the report highlighted that, potentially, the modelling work undertaken as part of the White Rose project planning[7], could be used as a basis and updated. As a result, the Applicant advocated [REP5-075, paragraph 2.1.1.4] that the ExA and the Secretary of State (SoS) could have confidence that it would not be necessary to adopt bp's position and exclude the Proposed Development from the Overlap Zone.

10.4.26. bp advised [REP5a-025] that, whilst it had fundamental concerns about the Applicant's report (including its independence and brief, the ability to create a meaningful model and the timing for modelling and field studies), it considered that it supported the case for an Exclusion Area. It also highlighted that the report only considered monitoring, and did not address bp's concerns about rig access, helicopter access or relief well access, each of which would necessitate the imposition of an Exclusion Area [REP5a-025, Section 9].

10.4.27. bp repeated its view that co-location would not be possible [REP5a, 025, Annex 1] and [REP6-046, Annex 4]. As a result, bp stated that, in its opinion, in order to preserve the full storage capacity of the Endurance Store and in turn the viability of the East Coast Cluster plan, the Exclusion Area would be required. Without it [REP6-046, paragraph 2.3] bp advised that NEP would not develop the Endurance Store in the Exclusion Area. bp considered the technical case submitted by the Applicant supporting co-location was not credible. Therefore, bp advised [REP6-046, paragraph 2.4] that the ExA and in turn the SoS must consider a choice between:

- the development of the Proposed Development in full (including the Exclusion Area) with the result that NEP would then limit its development of the Endurance Aquifer without the Exclusion Area which would limit it to approximately 30% of the full capacity. This would result in the loss of 10 to 11 million tonnes per annum of CO_2 injection capacity, which would be more than 50% of the Government's minimum CCUS 2030 capacity target. As a result, bp considered that this would render the East Coast Cluster plan unviable; or

[7] The White Rose Project was a previous proposal to use the Endurance Store for CCS

- development of the Proposed Development outside of the Exclusion Area only, so preserving the full extent of the Endurance Aquifer and the viability of the East Coast Cluster plan.

10.4.28. Further submissions [REP6-046, Annex 4] were made by bp on the technical report submitted by the Applicant at D5 [REP5-075, Appendix 1]. In short, bp considered that the only technical matter still 'in-play' was whether a hybrid of dense OBN and short streamers such as P-cables could be used for 4D monitoring if WTGs were to be located in the Exclusion Area. bp highlighted [REP5-075, Appendix 1, paragraph 5.4] that as there was no precedent for use of such a monitoring approach, and that it was purely theoretical. In bp's opinion, investigating this theoretical approach would serve no practical purpose and would result in abortive costs.

10.4.29. The Applicant [REP7-087] clarified that the report submitted at D5 [REP5-075, Appendix 1] and subsequent submissions were supplemental to the evidence of the original report [REP1-057, Appendix 1.1] and did not supersede it, as advocated by bp [REP6-046, paragraph 5.2]. It also confirmed [REP7-087, paragraph 4.11.4] that the issues pertaining to access (rigs, wells and helicopter) were outside the scope of the report. The Applicant signposted the ExA to the response made at D1 [REP1-057] on this matter and confirmed it was confident that coexistence in terms of access for rigs, helicopters and relief wells would be achievable, in line with policy, as it is for all oil and gas operators in the vicinity of wind farms.

10.4.30. In its conclusion on this matter, the Applicant considered that the need for the Proposed Development had been established [APP-234]. However [REP7-087, paragraph 5.1.1.4], given the significant change to the global energy landscape and the publication of the British Energy Security Strategy (BESS) that established a policy to deliver 50 Gigawatts (GW) of offshore wind by 2030, that need had been strengthened. As such, the Applicant advocated [REP7-087, paragraph 5.1.1.6] that it was imperative for the Proposed Development to be delivered in a timely manner, maximising its full capacity to not only meet net zero targets but also to provide security of supply. Whilst CCUS retained its place within the BESS, the Applicant highlighted [REP7-087, paragraph 5.1.1.7] that it had not attracted a more prominent role relating to energy security, given it was an enabler for eliminating carbon emissions from fossil fuel use rather than providing a power source in itself.

10.4.31. bp provided comments [REP8-023, Annex 2] on the North Sea Transition Authority's (NSTA) technical report, MMV of CCS Projects with co-location considerations, which was published in August 2022, and which was referred to in the Applicant's D7 submission [REP7-087, Annex 4]. bp highlighted the reference in the executive summary [REP8-023, Annex 2, paragraph 2.2] that:

"surveying activities around offshore windfarms can be extremely challenging and result in unacceptable collision risk if deploying long towed seismic streamers"

10.4.32. and that:

"periodic access to CCS within offshore windfarms is a more significant obstacle…consequently, largely overlapping carbon storage sites and wind farms are presently considered not to be feasible with current technology".

10.4.33. As a result, bp considered [REP8-023, Annex 2, paragraph 2.6] that the access issues it highlighted [REP6-046] reflected, and would be consistent with, the NSTA's general finding that operational activities required at a CCS site would mean that largely overlapping carbon storage sites and wind farms are not considered feasible.

10.4.34. bp considered [REP8-023, Annex 2, paragraph 2.10] that the NSTA's statements about it not being safe, practicable or possible to use long towed streamers, "*close to and within dense turbine infrastructure*", was consistent with its conclusions in the technical assessment submitted at D1 [REP1-057].

10.4.35. Whilst the NSTA recognises that OBN could be deployed amongst turbines, it acknowledges that: this is dependent on seabed conditions [REP8-023, Annex 2, paragraph 2.20.3]; it has never been used in a wind farm [REP8-023, Annex 2, paragraph 2.20.2]; it could result in gaps in the data [REP8-023, Annex 2, paragraph 2.20.6]; and it would therefore need to be subject to field trials. bp highlighted that the NSTA recognised that, "*there are no one-size fits all solutions*" [REP8-023, Annex 2, paragraph 2.20.8]. Whether it would be appropriate to use OBN in a MMV plan would be specific to the CCS project.

10.4.36. Consequently, bp considered [REP8-023, Annex 2, paragraph 2.21] that, after extensive review and consideration, it would not be in a position to develop a MMV plan for the Endurance Project that would allow co-existence in the Exclusion Area.

10.4.37. No further comments on the topic of the Endurance Project were received from the Applicant.

10.5. ExA RESPONSE

10.5.1. The ExA accepts that as the Endurance Project would be the first project of its kind in the UK, it is important to ensure confidence in the integrity of the store, which would come through, amongst other things, MMV of the CO_2 plume. However, the ExA agrees that the location of WTGs and related infrastructure in the Overlap Zone would affect the ability to monitor CCS at the Endurance Store using bp's preferred method of long towed seismic streamers. The ExA is aware that potential alternative technologies such as OBN and P-Streamers, which, combined with the WTGs being placed further apart, could enable MMV of the Overlap Area. However, both parties accept these are emerging technologies that require further development and testing [REP5-075, Appendix A]. Whilst the ExA acknowledges that previous modelling work could potentially be used as a starting point for this work it considers the 3-month to 14-

month timeframe for undertaking the testing and modelling suggested by the Applicant [REP5-075, Appendix B of Appendix A] to be optimistic.

10.5.2. Given the proposed timeframes for the delivery of both the Proposed Development and the Endurance Project, the contribution that both projects could make to energy security and achieving the Government's net zero targets, the ExA considers that to delay development of either project to enable this testing to be undertaken would be unreasonable and could cause uncertainty for both schemes. Furthermore, the ExA considers that there is no certainty as to the outcome of the testing, nor the availability and cost implications of any alternative technologies.

10.5.3. As a result, the ExA does not consider that the mitigation proposed by the Applicant in the ES would enable the co-location of the Proposed Development and the Endurance Project.

10.5.4. To enable the effective MMV of the Endurance Store, the ExA considers that long towed seismic streamers, which are a tried and tested technology, need to be used. To achieve this, the ExA recommends that no WTGs or related infrastructure should be sited within the Exclusion Area as shown on the Endurance Store Protective Provisions Plan [REP6-046, Annex 3] submitted by bp at D6. This would also ensure that rig access, helicopter access and relief well access would also be possible.

10.5.5. In coming to this view, the ExA recognises that this would reduce the proposed array area available to the Applicant, which has the potential to reduce the number of WTGs that could be deployed by up to 45 WTG. Alternatively, the Applicant could choose to erect the full 180 WTG within the reduced array area albeit that this would result in wake loss effects. In either scenario the ExA consider that the generating capacity of the Proposed Development would be reduced.

10.5.6. However, the Applicant confirmed [EV-008f] that whilst the Proposed Development would be less competitive it would still be viable without the Overlap Zone and that it would probably still intend to proceed with the Proposed Development. The ExA therefore consider that it would therefore still provide a significant contribution to meeting the Government's targets for low carbon energy and net zero.

10.5.7. The ExA considers that this is a pragmatic approach as advocated by NPS EN-3 (paragraph 2.6.183), which would minimise the negative impacts and reduce the risks to both projects to as low as possible. Furthermore, the ExA considers that the imposition of an Exclusion Area would reduce the effects of the Proposed Development on the Endurance Store to a level sufficient to enable the decision maker to grant consent (paragraph 10.5.5).

10.6. CONCLUSION

10.6.1. The ExA has considered the impacts of the Proposed Development on the Endurance Store and its proposed use for CCS in the context of the policy framework provided by NPS EN-1, NPS EN-3, the MPS and the EOEIMP.

10.6.2. For the reasons outlined above, the ExA believes that the mitigation, controls and monitoring proposed by the Applicant would not be sufficiently effective to facilitate the co-location of the Proposed Development and the Endurance Project. The ExA considers that, subject to WTGs and associated infrastructure being excluded from the Exclusion Area [REP6-046, Annex 3], there would be no significant adverse effects on the ability of NEP to undertake MMV of the Endurance Store.

10.6.3. This removal of WTGs within the Exclusion Area would result in a reduction in the size of the proposed array area available to the Applicant and could affect the potential number or layout of WTGs that the Applicant would be able to deploy. As a result, the ExA accepts that the Proposed Development might not be able to generate the same amount of electricity compared to a situation where it had access to the whole array area. Even with this potential reduction in generation capacity the ExA considers that the Proposed Development would still make a significant contribution to meeting the Government's net zero and renewable energy targets. As a result the ExA conclude that the matters in relation to the Endurance Store would not weigh against the case for the Proposed Development.

10.6.4. At D5a the Applicant provided a supplemental assessment to the ES and HRA [REP5a-016] which assessed the scenario of an exclusion zone to avoid overlap of the ETGs and the Endurance Store based on bp's protective provisions. The assessment found [REP5a-016, paragraph 3.1.1.1] that there would be no material change to the significance of assessment presented at the point of Application in respect of both EIA and HRA in the event of a 'no overlap' scenario. The Applicant considered that the EIA and HRA presented at Application to be adequate and complete, having due consideration of the Endurance Project. The ExA is therefore satisfied that should the SoS accepts the ExA's recommendation for the imposition of an Exclusion Area the reduction in the array area available to the Applicant would not give rise to the need for any new or different environmental information to be provided from that which has been assessed in the ES and HRA.

10.7. PROPOSED PROTECTIVE PROVISIONS

10.7.1. Should the Order be made, to enable the co-existence of both projects the Applicant included a set of protective provisions within the draft DCO [APP-203] for the protection of the carbon storage licensee.

10.7.2. The Applicant's proposed protective provisions were structured as follows [REP1-038, paragraph 6.2]:

- No part of the Proposed Development in the Overlap Zone may commence until a Coexistence and Proximity Agreement (CPA) was

entered into between the Undertaker and the Licensee[8] (or the parties agree none is required).

- Provided that all necessary Endurance Consents (ie consents for the Licensee's works within the Overlap Zone) were obtained within three months of the coming into force of the Order, the Undertaker would begin to prepare the CPA.
- To facilitate preparation of the CPA, each party must prepare a plan of work (essentially a programme, method statement, etc for the development of each project) and provide it to the other party. The CPA must be based on those plans of work and the other matters referred to in paragraph 10 of the protective provisions.
- The Undertaker could request additional detail from the Licensee if it considered the Licensee's plan of work provided insufficient detail of the planned works having been minimised to avoid adverse effects on the programming, siting, design, construction or operation of the Proposed Development in the Overlap Zone.
- If the Endurance Consents were not obtained within three months of the grant of the Order, or insufficient detail was provided by the Licensee in response to a request for information from the Undertaker, the restriction on the Proposed Development works within the Overlap Zone would cease to apply.
- Arbitration provisions were included to govern disputes.
- There would be an obligation for each party to keep the other informed of relevant activities.
- The provisions would be without prejudice to the parties' rights and obligations under the existing IA.
- The obligations on the Undertaker would cease to have effect in the event that the license was terminated and no longer had effect, or the Endurance Consents were not obtained within three months of the coming into force of the Order.

10.7.3. The Applicant [REP1-057, paragraph 6.4] considered that the provisions struck an appropriate balance to manage the interests between the parties and the requirement for coexistence prescribed in the IA and the relevant policy.

10.7.4. However, because bp considered that the two projects could not co-exist, it proposed [REP1-038, Annex 2] alternative protective provisions that would prevent the installation of infrastructure by the Applicant in the part of the Overlap Zone in which the carbon storage project would be located (the Exclusion Area) and would disapply the IA.

10.7.5. bp's proposed protective provisions were structured as follows [REP1-057, Annex 2]:

- The Undertaker must not construct any of the Proposed Development within the Exclusion Area.

[8] In the protective provisions undertaker is the term used for the Applicant and Licensee is the term used for Carbon Capture Storage Licensee who during the Examination was represented by bp.

- The Undertaker could, subject to notifying the Licensee and having regard to any written response, construct the Proposed Development within the Notification Area.
- From the date of the making of the Order, the IA would no longer have effect, and no claim for any damages could be made as a result of any alleged antecedent breach of the IA prior to the making of the Order.
- There would be an obligation on the parties to collaborate to keep each other informed of progress with regards to relevant activities.

10.7.6. The matter was the subject of questions at ExQ1 [PD-006, INF.1.2] and ExQ2 [PD-012, INF.2.1]. The matter was examined in detail at ISH1 [EV-008], ISH7 [EV-031] and ISH9 [EV-033]. In addition, the ExA issued a request for further information under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010 (a Rule 17 request) [PD-008].

10.7.7. The main areas of disagreement between the Applicant and bp in relation to protective provisions were:

- whether the Proposed Development and the Endurance Project could co-exist in the Overlap Zone;
- the disapplication of the IA; and
- the appropriateness of the timeframes within both sets of protective provisions.

Co-existence

10.7.8. The matter of whether the Proposed Development and the Endurance Project could co-exist is considered in detail earlier in this Chapter and is therefore not repeated here.

Disapplication of the IA

10.7.9. The IA is a commercial agreement between the Applicant, bp and TCE. Under the terms of the IA [REP3-047, Appendix 2], if the parties, referred to as the Wind Entity (the Applicant) and the Carbon Entity (bp), could not co-exist and the implementation of one entity's scheme would prevent the implementation of the other's, then the affected entity would be able to claim 'relocation costs'. These would cover the additional cost or expenses that would be incurred by the affected entity in accommodating the notifying entity's activities. Where activities could not be reasonably and commercially relocated or could be reasonably and commercially relocated but would result in either a reduction in the output for the Wind Entity or a reduction in injection rate or storage capacity for the Carbon Entity, then compensation would be payable.

10.7.10. In the case of the Wind Entity, compensation would be liable on either the diminution in the market value of the project that would arise due to the loss of turbines or reduction in power output as the case may be. In the case of the Carbon Entity, compensation would be liable on either the diminution in market value that would arise due to the loss of infrastructure or reduction in storage rate or volume as the case may be.

10.7.11. The protective provisions as proposed by the Applicant would not affect any rights or obligations that would arise under the terms of the IA and, should a conflict arise between the protective provisions and the terms of the IA, the IA would prevail [REP7-039, Schedule 9, Part 8, paragraph 13].

10.7.12. As bp's proposed protective provision would prevent the Applicant from developing in the Exclusion Area (effectively the majority of the Overlap Zone) then, under the terms of the IA, bp would be liable to compensate the Applicant.

10.7.13. bp advised [REP1-057, Appendix 2, paragraph 15.4] that the funding model for NEP means it would have limited ability to cover additional exceptional costs, as would apply to such a compensation payment. If the compensation payments were large, which, based on discussions with the Applicant over potential losses, they could be, bp indicated it could render the project uneconomic. Furthermore, bp considered [REP1-057, Appendix 2, paragraph 15.4] that the prospect of such costs falling to NEP investors may prevent them from progressing with the project, deter debt funders and could prevent the Government from committing to all such costs being recoverable as part of whatever regulatory system was put in place.

10.7.14. As a consequence, bp advocated [REP1-057, Appendix 2, paragraph 15.5] that the IA was not appropriate in view of present-day reality, and its terms were now adverse to the public interest in the successful delivery of Government policy. As a result, bp [REP1-057, Annex 2, provision 6] sought to disapply the IA from the date any Order is made and to prevent any claim for damages as a result of any alleged antecedent breach of the agreement prior to the making of any Order.

10.7.15. bp accepted [REP1-057, Appendix 2, paragraph 15.11] that the disapplication of a commercial agreement between the parties in a DCO would be novel. However, bp advocated that section (s) 120(3) of the Planning Act 2008 (PA2008) enables the SoS to include any provision, "*relating to, or matters ancillary to, the development for which consent is granted*". Therefore, bp considered that the ability to do so was clear and fully justified in these unique circumstances.

10.7.16. bp's proposed protective provision would also prevent the parties to the IA, should the IA be disapplied, claiming for antecedent breach. bp considered [REP1-057, Appendix 2, paragraph 15.12] that this would be necessary as there would be a risk that the Applicant could take action under the IA for bp seeking and obtaining such provisions. If this was to happen, it could give rise to a significant liability for the NEP project, rendering it unviable as part of the East Coast Cluster and deterring investment in the project.

10.7.17. Finally, bp acknowledged that in addition to itself and the Applicant, TCE was party to the IA. However, bp considered [REP1-057, Appendix 2, paragraph 15.13] there would be no adverse impact on TCE through the

disapplication of the IA, given the limited number of provisions relevant to TCE in the IA.

10.7.18. The Applicant [REP1-057, paragraph 7.2] considered that the disapplication of the IA would constitute an abuse of process and as a matter of law would be ineffective. The Applicant advised that the potential liability had been known to those promoting the NEP project since 2013. bp entered into the IA cognisant of it and as such should have factored the liability into its financial model. The assertion that it was in the public interest to enable the delivery of the East Coast Cluster was also applicable to the Applicant's case as the energy that the Proposed Development would deliver would help the Government achieve its net zero targets. The Applicant did not consider that bp had justified the lawful basis for the disapplication of the IA and the views of TCE did not appear to have been sought. The Applicant concluded that financial compensation would be needed to facilitate coexistence and the party's rights and obligations under the IA should therefore be left unfettered.

10.7.19. The matter was discussed at ISH1 [EV-008], was the subject of a number of action points [EV-008a], a Rule 17 request [PD-009] and ExQ2 [PD-012, INF.2.1].

10.7.20. In response to the ExA's request for further evidence on the effect of the need to disapply the IA [PD-012, INF.2.1], bp advised [REP5-091, paragraph 3.6] that in addition to financial viability, viability also related to the ability of NEP to use the full capacity of the Endurance Store. For the reasons set out earlier in this Chapter, bp considered that if infrastructure was located in the Overlap Zone, then it would only be able to develop the Endurance Store outside the Overlap Zone, meaning it would only achieve 30% of its potential capacity. Whilst the NEP projects would remain viable in principle, it would render the East Coast Cluster plans unviable [REP5-091, paragraph 3.11].

10.7.21. bp advised that the financing model for the Endurance Project [REP1-057, Appendix 2, Section 9] would mean that NEP would have limited ability to cover additional exceptional costs such as a significant compensation payment. As a result, bp considered [REP5-091, paragraph 3.18] that the risk of a significant compensation claim pursuant to the IA would threaten the "*investability and financiability*" of the NEP Project. As such bp advised [REP5-091, paragraph 3.19] that it would be likely that NEP would elect not to propose utilising the part of the Endurance Store within the Overlap Zone in order to avoid the potential liability and therefore it would render the East Coast Cluster plan unviable [REP5-091, paragraph 3.20].

10.7.22. At D5, TCE [REP5-123] drew the ExA's attention to a number of provisions in the IA that set out how TCE would approach the approval of the siting of infrastructure in the event of any potential conflicts between the two entities in the Overlap Zone and specifically allow TCE to refuse approval in the event of such conflicts. Whilst bp considered that the disapplication of the IA would not adversely affect TCE's position [REP1-057, Appendix 2, paragraph 15.13], TCE did not agree. It considered that

the IA provided a material benefit to TCE, and its disapplication would have an adverse effect on TCE. It would remove the clarity and certainty that the IA provides in relation to the operation of the agreements for lease and the rights and obligations under them, where there is a conflict between the entities. TCE considered that its disapplication would not be necessary for the Proposed Development to be consented and delivered.

10.7.23. Furthermore, TCE considered that s120(3) of the PA2008 should not be used to disapply the IA without provision for compensation, as had been suggested by bp [REP3-047]. Whilst it accepted that s120(3) was a broad power, it would be constrained in that any provision which relies on it must still relate to the development for which consent is granted or to matters ancillary to the development. TCE accepted that protective provisions for the benefit of the carbon storage licensee would be within the scope of s120(3) but did not accept that this power would allow the SoS to include a provision in the Order that would have the effect of setting aside the IA in circumstances where bp had voluntarily agreed to rights and obligations under it. TCE considered such an outcome would be unreasonable and disproportionate as well as unprecedented. The effect of disapplying the IA would be to improve the financial viability of the Endurance Project, and, in the opinion of TCE, this was not related or ancillary to the development of the Proposed Development in the sense those terms are used in s120(3).

10.7.24. TCE considered [REP5-123] the interpretation of s120(3) in a way that allowed the IA to be overridden without payment of compensation would not be consistent with the remaining provisions of the PA2008 and would be contrary to s3 of the Human Rights Act 1998.

10.7.25. TCE advised [REP5-123] that, should the SoS agree to the disapplication of the IA, then the inclusion of such a provision in the Order would, because it relates to Crown land or would affect rights benefiting TCE, require the consent of TCE under s135(2) of the PA2008.

10.7.26. As the Examination progressed, both sets of proposed protective provisions were amended as a result of ongoing discussions between the Applicant and bp and in light of matters raised through the Examination.

10.7.27. The matter was discussed in detail at ISH7 [EV-031] and ISH9 [EV-033]. Further submissions were made from both the Applicant [REP5-076], [REP7-087] and bp [REP5a-025], [REP6-046] and [REP8-023] further validating their positions and providing legal opinions [REP5-076] and [REP8-023, Annex 1] regarding the disapplication of the IA.

10.7.28. At D6 [REP6-046], to address the concerns raised by TCE, bp amended its proposed provision so that it would not affect any rights or obligations that exist under the IA, save that the Carbon Entity would have no liability to the Wind Entity under the IA as a result of not being able to develop in the Overlap Zone, including as the result of any alleged antecedent breach (paragraph 6).

10.7.29. To address the Applicant's concerns about loss of compensation through the disapplication of the IA, a provision for the payment of compensation was inserted (paragraph 7). Two alternative forms of drafting were proposed. Both were put forward on the basis that the amount of compensation would be a matter for the SoS, as bp considered [REP6-046, paragraph 3.17] that the information needed to determine the quantum of compensation was likely to be highly commercially sensitive. Therefore, it would not be appropriate for the parties to put this before the Examination.

10.7.30. Both forms of drafting would require the SoS to determine the quantum of compensation to be paid by the Carbon Entity to the Wind Entity. However, one would require the SoS to determine the amount payable prior to the making of the Order and would write the figure into the Order, which would be bp's preferred option [REP6, 046, Annex 1, footnote 6]. Alternatively, the SoS would need to determine the amount payable within two months of the Order being made.

10.7.31. When determining the amount of compensation (paragraph 8), bp advised that the SoS would be required to balance the impact of the imposition of the Exclusion Area on the Proposed Development with the public interest in preserving the full developable area of the Endurance Store. To do this (paragraph 9), the SoS would need to take into account relevant submissions made by the Entities to the Examination and any additional information that the SoS may request (paragraph 10), which the SoS would be required to treat as confidential and commercially sensitive.

10.7.32. bp considered that, given the importance of both projects and the highly unusual circumstances of the case, the issue of compensation should fall to the SoS to decide [REP6-046, paragraph 3.18]. bp acknowledged [REP6-046, paragraph 3.26] that there was no direct precedent for either approach, and that the SoS would probably prefer not to be placed in the position of having to make a decision on compensation. However, given the circumstances and in the absence of prior agreement, bp did not consider there to be any alternative but for the SoS to make this decision in the public interest, with access to the necessary financial information, and with the benefit of the knowledge of the specialist CCUS team with regard to NEP project, the Endurance Store and the East Coast Cluster plan, and the associated viability considerations.

10.7.33. The Applicant [REP7-087, paragraph 3.1.1.2 (b)] advised that it fundamentally disagreed with bp's provisions on the basis that the compensation provisions would be unnecessary, as the IA already provided an agreed framework for compensation. The Applicant contended that it would be unworkable, as it would not obtain certainty that compensation was payable until the longstop date, with payment not being made until some years later.

10.7.34. bp's provisions no longer sought to disapply the IA in its entirety, instead they sought only to remove the liability for compensation. The Applicant maintained its position [REP7-087, paragraph 3.1.1.2 (d)] that

disapplication of provisions of the IA would deprive it of its contractual rights in an unprecedented manner. It considered that this would not be in the public interest and that there were alternative means freely available to the parties to revisit the quantum of compensation through the renegotiation of commercial terms. Furthermore, the Applicant maintained that Crown Consent would still be required.

10.7.35. TCE [REP8-025] remained concerned about the setting aside of any provisions of the IA in circumstances where all parties, including bp, freely agreed to the rights and obligations under that agreement. TCE maintained that the disapplication of any part of the IA would be unreasonable and disproportionate, that the scope of the SoS's powers under s120(3) of the PA2008 would not be sufficient to give effect to the disapplication of the IA, and that the inclusion in the Order of any provision which had the effect of disapplying the IA (or any part of it) would require Crown Consent. This would remain the case even assuming that the rights of TCE were not directly affected because the IA relates to Crown land (ie the seabed in the Overlap Zone). On the issue of consent under s135(2), TCE advised that it was not minded to agree to bp's protective provisions and the disapplication of any part of the IA. However, it would be willing to review its position once it understood the recommendations of the ExA, the position of the SoS and the progress of discussions between bp and the Applicant.

10.7.36. bp signposted [REP8-023] the ExA to previous submissions on the IA. In addition, it included a legal opinion [REP8-023, Annex 1] to address the approach to *vires* under s120(3) of the PA2008 and any perceived breach of Article 1 of the Protocol No 1 to the European Convention of Human Rights which concluded that:

- s120(3) of the PA2008 when read with Paragraph 3 of Schedule 5 of the PA2008 provides the necessary *vires* for the inclusion of bp's proposed protective provisions in the Order; and
- in circumstances where the provisions are considered to interfere with the 'possessions' of the Order in terms of Article 1 rights, the SoS would be entitled to establish that any such interference would be proportionate in the public interest, given the very strong interest in preserving the full extent of the Endurance Store and the delivery of the East Coast Cluster plan.

10.7.37. In relation to the concerns expressed by TCE, bp considered that the drafting of its provisions ensured that TCE's rights/ interests under the IA would be expressly preserved and not prejudiced in any way [REP8-023, paragraph 2.7]. As a result, bp considered [REP8-023, paragraph 2.9] that to the extent TCE considered that s135(2) was otherwise engaged, because of the nature of the IA and its prevailing context to Crown land, bp anticipated that TCE should be prepared to consent to the inclusion of the provision pursuant to s135 on a 'without-prejudice' basis contingent on the SoS finding in favour of the need for such provisions. If TCE was not prepared to grant Crown consent on a without-prejudice basis, then bp advised that it would continue to liaise with TCE to understand its concerns but recognised that this would be unlikely to be achieved before

the close of the Examination. Therefore it might be a matter that the SoS would need to consider at the decision-making stage [REP8-023, paragraph 2.10].

Time frames

10.7.38. Both the Applicant's and bp's protective provisions included time frames for actions to have occurred, consents to be obtained or payments to be made etc. Both parties objected to the time frames included in the provisions put forward by the other party.

Applicant's protective provisions

10.7.39. The Applicant's protective provision [APP-203, Schedule 9, Part 8] would require that, within three months of the Order coming into force, the Applicant must serve notice on the licensee (bp) requesting it to produce, within 28 days, a plan of its works to enable the Applicant to prepare a CPA (paragraphs 5 and 6). The CPA would then need to be concluded within three months of the date for the production of the plan of licensee's works (paragraph 7). All these provisions were caveated with the tailpiece, *'or such other timescale as may be agreed between the undertaker and the licensee'*, to allow some flexibility.

10.7.40. The three-month time frame set by paragraph 5 was also relevant to paragraph 2 in that, amongst other things, if the consents required to develop the NEP Project were not obtained within that time frame, then the protective provision as a whole would cease to have effect.

10.7.41. This matter was discussed at ISH1 [EV-008] and ISH7 [EV-031a, action point 19] as the ExA wanted to understand whether the time frames proposed would be reasonable in light of the fact that bp had yet to apply for consent for the Endurance Project.

10.7.42. bp advised [REP6-046] that due to the in-principle issues it had with the Applicant's proposed approach, namely that in the opinion of bp the two projects would not be able to co-exist and the risk of a significant compensation liability, amendments to the timescales (even on a without prejudice basis) would not serve to remedy or ameliorate bp's concerns and could serve to distract from these core issues [REP6-046, paragraph 3.5]. Asa a result bp considered that there were no revisions to the timescales which would address these more fundamental points and make the provisions, by consequence workable from bp's perspective [REP6-046, paragraph 3.8]. The only solution that would address bp's concerns would require the imposition of the Exclusion Area and the disapplication of the IA which could be achieved through the use of bp's proposed protective provisions [REP6-046, paragraph 3.9].

10.7.43. In light of the concerns raised by the ExA regarding time frames, the Applicant amended the proposed protective provision to a four-month time frame for both obtaining the required consents for the Endurance Project (paragraph 2) and the serving of notice (paragraph 5) [REP7-039, Schedule 9, Part 8].

bp's protective provisions

10.7.44. At D4 [REP4-059, Appendix 1], bp revised its protective provisions, on a without prejudice basis, to introduce a longstop date. The longstop date was defined as either the date five years after the coming into force of the Order or such later date as may be notified to the entities in writing by the SoS. If the licensee had not obtained the necessary consents to undertake its activities by the longstop date, then the provisions ceased to have effect (paragraph 11), with the exception of the disapplication of the IA (paragraph 12).

10.7.45. The longstop date was introduced as a result of discussions at ISH1 [EV-008a, action point 47]. bp advised [REP4-059, paragraphs 1.7.2 and 1.7.3] a five-year period was appropriate to allow for any unforeseen delays to the consenting process ensuring deliverability of, and investor confidence in, the NEP project. However, bp considered that it would also be in the public interest for the SoS to have the ability to extend the longstop date without having to vary the DCO itself should circumstances merit it.

10.7.46. bp considered [REP4-059, paragraph 1.7.4] that, independent of the engagement of the longstop date, it remained appropriate and important for the IA to continue to be disapplied as whilst the potential liability and risk to bp would no longer apply, the continuance of the IA would continue to represent an impediment to any successor to the carbon storage project, so undermining the future viability of the Endurance Store for carbon storage. bp advocated that this would not be in the public interest. Furthermore, should there be no foreseeable CCS prospect for the Endurance Store and the SoS was content that it was not necessary to safeguard the area for any future potential use then there would no longer be any need for the IA as there would no longer be an 'interface' between the carbon and wind projects in the Overlap Zone, so further supporting its continued disapplication.

10.7.47. The Applicant considered [REP5-075, paragraphs 3.1.1.1 and 3.1.1.2] that the longstop date would provide disproportionate protection for the NEP project and would introduce significant uncertainty for the Proposed Development. As a result of the uncertainty [REP5-075, paragraph 3.1.13], the Applicant advised it would not be able to optimise its layout, supply chain or bid for a future Contract for Difference auction round, particularly because it would be a single-phase project. This would be exacerbated by the ability of the SoS to extend this period to preserve the future viability of the Endurance aquifer for carbon storage. The Applicant highlighted [REP5-075, paragraph 3.1.14] that bp anticipated securing the necessary consents by June 2023, and that to provide bp with clarity it adjusted its proposed protective provisions to reflect this.

10.7.48. Following ISH7 [EV-031], at D6 [REP6-046, Annex 1], bp submitted revised protective provisions that introduced the payment of compensation (paragraphs 7 to 11), and the longstop date (paragraphs 11 and 12) was replaced by a cessation of provisions (paragraph 12) which advised that, with the exception of the disapplication of the IA (paragraph 6), the provisions would cease to have effect if the Carbon

Entity notified the undertaker that development within the Exclusion Area could occur. In recognition of the Applicant's submissions the longstop date was amended to a date three years from the coming into force of the Order or such later date that may be notified by the SoS [REP8-023, paragraph 2.25.2].

10.7.49. The Applicant [REP7-087, paragraph 3.1.1.2, a)] considered that the longstop date would effectively operate as a means of bp excluding the Proposed Development from the Overlap Zone and would not incentivise bp to seek to achieve co-existence within this period. This would be contrary to policies supporting co-existence and the national need for both offshore wind and CCS.

10.7.50. During the longstop period, the Applicant considered [REP7-087, paragraph 3.1.1.2, c)] that it would be forced to work on the premise that it would not be able to develop in the Overlap Zone. The project would be a single-phased project. As a result, the Applicant believed it would be unlikely to be able to build within the Overlap Zone if it was excluded from the Overlap Zone for a period of three years, as it would not be able to accommodate this within the project programme. This could mean that neither project might be located within the Overlap Zone, which the Applicant believed would be detrimental to UK policy for energy security and net zero. In addition, by removing the Overlap Zone, this would result in a smaller developable area and an increase in wind turbine density, which would lead to increases in wake loss impacts that can have a significant effect on the generation performance and, as a result, the overall business case. The Applicant considered this particularly important if it proposed to enter into the highly competitive Contract for Difference Auction Round model where projects compete against each other. The Applicant advocated that an inefficiently designed wind farm with high wake losses would be at a significant disadvantage.

10.7.51. In response, bp confirmed [REP8-023, paragraph 2.5.1] that the longstop date would not incentivise co-existence but as bp considered that co-existence would not be possible the drafting did not intend to preserve that possibility.

10.7.52. bp advised that whilst the three-year period would extend beyond the scheduled Final Investment Decision date for the NEP project, the Applicant considered [REP8-023, paragraph 2.5.2] that an allowance needed to be made for any unforeseen delays. Finally, the proposed timescale for compensation payments was linked to when the Applicant would have started to receive revenue from generating capacity in the Exclusion Area, but with a specific date to ensure that compensation would be paid by a particular point [REP8-023, paragraph 2.5.3].

10.8. ExA RESPONSE ON PROTECTIVE PROVISIONS

10.8.1. As there is an in-principle difference of opinion between bp and the Applicant as to whether the two projects could co-exist in the Overlap Zone, at the close of the Examination the ExA was provided with two sets

of proposed protective provisions for the benefit of the carbon storage licensee [REP7-039] and [REP8-023, Annex 3]. The provisions seek to deliver very different outcomes.

10.8.2. For the reasons set out earlier in this Chapter, the ExA considers that, due to the issues around the use of long towed streamers for MMV of the CO_2 plume, it would not be possible for the two projects to co-exist in the Overlap Zone. As a result, the ExA agrees with bp that the Applicant should, until such point as it becomes clear that the proposals for the Endurance Store might not proceed, be restricted from erecting WTGs and associated infrastructure within this area. In the event that both projects proceed, bp's proposed provisions would subdivide the Overlap Zone into an Exclusion Area, where no development would be allowed and a Notification Area, where, subject to the undertaker notifying the licensee, development could be carried out. The ExA supports this approach as it considers that this would minimise the amount of developable area lost for the Proposed Development.

10.8.3. The ExA notes that bp's proposed provisions, whilst continuing to seek to disapply the IA, do now include a provision for the payment of compensation in the event of the imposition of the Exclusion Area on the Proposed Development (paragraph 7[9]). However, no detail has been provided as to the quantum of compensation payable or the formula by which it would be calculated. bp considers that this should be a matter for the SoS to determine in balancing the impact of imposing the Exclusion Area on the Proposed Development with the public interest of preserving the full developable area of the Endurance Store (paragraph 8).

10.8.4. If the Applicant is unable to locate WTGs and associated infrastructure within the Exclusion Area, then the ExA considers it reasonable for it to expect to be compensated for the loss. The ExA is of the opinion that, unlike bp's proposed provision, the IA provides a long-established, clear and fair formula for the calculation of compensation payments. The ExA considers that the formula has been available to both parties whilst they worked up their respective schemes. The ExA accepts that when bp entered into the agreement it did so in good faith and on the basis that it considered that the two projects could co-exist, and therefore it considered that the probability of paying compensation was relatively limited. However, the ExA considers that as part of any due diligence before completing the agreement, bp should have been aware of the potential level of liability that could arise if a compensation payment was triggered and that this should have been factored into a contingency in any financial modelling for the funding for its project. As a result, the ExA is unclear why such a payment should now affect the viability of the Endurance Project.

10.8.5. Furthermore, the ExA notes that the IA is a commercial agreement and as such it is open to either party at any time to seek to renegotiate its terms, including the formula for compensation. Whilst the ExA notes that,

[9] paragraph references here are to the paragraphs of the protective provision

to date, bp has not attempted to do this, this option would still be available to it should the SoS make the Order. Moreover, the ExA notes that the IA includes, in the event of a dispute, arbitration clauses that would allow the appointment of an independent expert to determine such matters.

10.8.6. Taking all these matters into consideration, the ExA does not consider that the disapplication of the IA has been satisfactorily justified. As the ExA does not recommend that the IA should be disapplied it does not need to consider s120(3) of the PA2008, the issue surrounding s135(2) and the need to obtain Crown Consent would fall away.

10.8.7. With regards to time frames, and dealing first with those proposed by the Applicant, throughout the Examination the ExA raised concerns that the indicative timeframes provided by bp for it obtaining the consents required to develop the NEP Project may be optimistic and didn't allow for any slippage or delay, particularly given that this was a first of its kind project. Therefore, the ExA does not consider the four-month time frame after the Order comes into force for the obtaining of consents by NEP, as would be required by paragraph 2 of the Applicant's provisions, to be reasonable or fair. Furthermore, linked to this, the ExA has concerns regarding the time frames for the production of CPA (paragraphs 4, 5 and 6) proposed by the Applicant, given where bp appears to be in developing its proposals.

10.8.8. In terms of the timeline for the cessation of provisions as proposed by bp, the ExA considers that three years from the Order coming into force would be reasonable as the construction programme [APP-006, Table 3] provided by the Applicant indicates that the offshore works would not commence until year 3 with the construction of WTGs scheduled to commence in year 4.

10.8.9. Finally, the ExA does not consider bp's proposal that should the Endurance Project not proceed that the IA should continue to be disapplied in order that it does not represent an impediment to any successor to the carbon storage project to be appropriate. Any new license would, as bp did when it took over as the Carbone Entity on the IA, need to agree to the terms of the IA and would therefore have the opportunity to renegotiate the terms at the appropriate point.

10.9. CONCLUSION ON PROTECTIVE PROVISIONS

10.9.1. For the reasons set out above, neither of the proposed protective provisions would achieve the necessary outcomes to enable the construction and operation of the Proposed Development whilst protecting the interests of the carbon storage licensee, in the opinion of the ExA. The ExA agrees that the undertaker should be prevented from developing within the Exclusion Area unless the Endurance Project does not proceed. However, it does not agree that the IA, a contractual agreement that was agreed between the parties at the relevant time, should be disapplied as it considers that the undertaker should be fairly and reasonably compensated for its loss. In the opinion of the ExA, the

formula in the IA provides a clear and transparent mechanism for doing this. Furthermore, the parties have the ability to seek to renegotiate this commercial agreement to update terms to reflect changes in circumstances at any point.

10.9.2. In relation to dates to provide certainty for the parties involved, the ExA agrees that any provisions will need to include a time frame whereby, if the Endurance project does not proceed, the provisions for its benefit would fall away. For the reasons set out in Section 10.8, the ExA considers the three-year period suggested by bp would be reasonable as this would allow time for NEP to progress its proposals, obtain the relevant consents and to make the decision to invest, but would potentially still enable the Applicant to develop out the Exclusion Area should NEP decide not to procced. The ExA does not, however, consider that the disapplication of the IA should continue after the provision has fallen away, as it would still provide a relevant mechanism for managing competing interests in this area.

10.9.3. Should the SoS be minded to make the Order, the ExA recommends that the SoS consults with the parties over an alternative form of drafting for the protective provision for the benefit of the Carbon Storage Licensee that would deliver these outcomes.

11. FINDINGS AND CONCLUSIONS IN RELATION TO OTHER MARINE PLANNING ISSUES

11.1. INTRODUCTION

11.1.1. The Examining Authority (ExA) identified commercial fishing and fisheries, historic environment, infrastructure and other users, and navigation and radar (marine and air) in its Initial Assessment of Principal Issues [PD-005, Annex C]. As the Examination evolved, the ExA refined and added to these issues. As a consequence, this Chapter considers the following issues:

- aviation and radar;
- commercial fisheries and fishing;
- offshore historic environment (marine archaeology);
- other offshore infrastructure;
- shipping and marine navigation; and
- seascape and visual impact assessment.

11.1.2. The effects on fish and shellfish ecology are considered in Chapter 9 of this Report. Matters relating to marine processes and sediments are addressed in Chapter 7. Socio-economic effects are considered in the relevant section of Chapter 12.

Overarching policy context

11.1.3. Chapter 3 of this Report sets out the legal and policy context of this Report. The National Policy Statements (NPSs) relevant to the consideration of marine planning issues are NPS EN-1 (Overarching NPS for Energy), NPS EN-3 (Renewable Energy) and NPS EN-5 (Electricity Networks Infrastructure).

11.1.4. In addition, the decision maker must have regard to relevant marine policy, as provided for in the Marine and Coastal Access Act 2009 (MCAA). Section 104(2)(aa) of the Planning Act 2008 (PA2008) requires that the UK Marine Policy Statement (MPS) be taken into consideration when determining an application. The MPS provides the framework for preparing Marine Plans. The East Inshore and East Offshore Marine Plans (EIEOMP) cover the area in which the Proposed Development would be located.

11.1.5. Each of the individual sections below covers the policies relevant to that specific topic in more detail.

11.2. AVIATION AND RADAR

Policy considerations

11.2.1. Section 5.4 of NPS EN-1 notes the need to protect the interests of civil and military aviation and other onshore and offshore defence interests.

11.2.2. If a proposed development could have an effect on civil and military aviation, then NPS EN-1 requires the Applicant to:

- consult the Ministry of Defence (MoD), Civil Aviation Authority (CAA), National Air Traffic Services (NATS) and any aerodrome likely to be affected by the proposed development when preparing an assessment of the Proposed Development (paragraph 5.4.10 to 5.4.13); and
- identify realistic and pragmatic solutions to conflicts that might arise between the Applicant and these parties (paragraph 5.4.15).

11.2.3. Consent should not be granted where:

- the development would significantly impede or compromise the safe and effective use of defence assets or significantly limit military training; or
- the development would have an impact on the safe and efficient provision of en-route air traffic control services for civil aviation, in particular through an adverse effect on the infrastructure required to support communications, navigation or surveillance systems (paragraph 5.4.17).

11.2.4. Section 2.6 of NPS EN-3 addresses the role of offshore wind as part of the Government's energy infrastructure policy. Paragraph 2.6.187 states that it is expected that the Applicant will have progressed detailed discussions with relevant consultees as far as reasonably possible prior to submission of its application. These discussions should include consideration of - and ideally agreement about – appropriate mitigation.

11.2.5. Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety (paragraph 2.6.107).

11.2.6. Where lighting on structures that goes beyond statutory requirements is requested by any of the relevant aviation and defence consultees, the Secretary of State (SoS) should be satisfied about the necessity of such lighting, taking into account the case put forward by the consultees. The effect of such lighting on the landscape and ecology may be a relevant consideration (NPS EN-1, paragraph 5.4.16).

The Applicant's case

11.2.7. The Applicant's assessment of the potential impact of the Proposed Development on aviation and radar is primarily in ES Chapter 8, Aviation and Radar [APP-020]. When making the application, the Applicant's position with regard to these matters was that:

- Analysis indicated that the proposed Wind Turbine Generators (WTGs) could be detected by air traffic control radar at Claxby (in North Lincolnshire). Radar detectability of operational WTGs might affect operations utilising the subject radar system.
- The area covered by the Proposed Development would be transited by helicopters, which could result in the need for them to fly higher when using this route. Military Low-Level Operations take place over the sea in the airspace surrounding the proposed array area and a network of

Helicopter Main Routes is established in the vicinity of the proposed array area to support the transport of personnel and material to offshore oil and gas installations.

- The ES also considered the potential for the Proposed Development to create an aviation obstacle to aircraft, including helicopters operating at adjacent oil and gas platforms, and the impact of increased air traffic associated with the construction and operation of the Proposed Development affecting the available airspace for other users.
- In order to mitigate effects on the Claxby radar system, a change to the classification of the airspace over the array and radar blanking would need to be undertaken by the CAA. The Applicant noted that it had identified a number of mitigations which would improve helicopter access to oil and gas installations in poor weather. The Applicant made the case that with measures adopted as part of the Proposed Development, including (but not limited to) ensuring aviation lighting is fitted to all structures as appropriate, and informing the relevant authorities of the locations, heights and lighting status of the structures to allow inclusion on Aviation Charts, no significant effects on aviation and radar were predicted.

Planning issues

11.2.8. The main issues that the Examination considered were as follows:

- the impact of the Proposed Development on and the continued safe operation of military and civilian aviation activities;
- the effects of the Proposed Development on military air defence radar systems and civilian air traffic control radar systems; and
- the impact of the Proposed Development on oil and gas operators' routine and emergency helicopter access.

Military and civilian aviation

11.2.9. The MoD [RR-022] noted that while it did not hold the view that the Proposed Development would physically impact MoD offshore Danger and Exercise Areas or adversely affect defence maritime navigational interests, there was a risk that both WTGs and some of the tall ancillary offshore structures would affect military low flying training activities that may be conducted in the area of the Proposed Development. It also noted that it would be necessary for these structures to be fitted with appropriate aviation warning lighting to maintain the safety of military air traffic.

11.2.10. The MoD [RR-022] did not consider that the wording of Requirement 10 of the draft Development Consent Order (DCO) [APP-203] submitted with the application was satisfactory to address defence safeguarding needs and proposed alternative wording which it considered suitable to maintain defence requirements.

11.2.11. The Applicant responded at D1 [REP1-038, section RR-022-B], noting that it set out its proposals for aids to navigation (marking and lighting) in ES Chapter 8, Aviation and Radar [APP-020, section 8.8.3]. The Applicant stated that lighting would be deployed in accordance with the

latest relevant available standard industry guidance and as advised by Trinity House (TH), the Maritime Coastguard Agency (MCA), the CAA and the MoD as appropriate. The Applicant set out its commitment Co93 in its Commitments Register [APP-050] to achieve these standards. The Applicant noted that specifications for aviation lighting specifically were provided by the Applicant as part of its application for the Proposed Development [APP-020, section 8.8.3].

11.2.12. In addition, the Applicant [REP1-038, section RR-022-D] noted and accepted the inclusion of the MoD's proposed additional text to Requirement 10 of the draft DCO [APP-203].

11.2.13. The Statement of Common Ground (SoCG) between the Applicant and MoD received at Deadline (D) 1 [REP1-058, Section MOD-005] noted that the commitment to provide lighting in accordance with the latest relevant standard industry guidance [APP-050, Co93] would appropriately account for MoD aviation lighting requirements but only applied to the construction phase and would not account for the operational and maintenance phase. [REP1-058] also noted that Condition 10 of Schedules 11 and 12 of the draft DCO [APP-203] to fit aviation lighting was not referenced. In addition, the MoD noted that only the Marine Management Organisation (MMO) was identified as a relevant determining authority [APP-050, Co93].

11.2.14. The ExA sought an update from both the Applicant and MoD on progress of the SoCG [REP1-058] between the two parties at Issue Specific Hearing (ISH) 3 [EV-011]. The Applicant noted during this Hearing its understanding that only one matter remained outstanding, which related to the wording of Requirement 23 of the draft DCO [REP3-007]. The MoD agreed with this position and noted that an update to the SoCG [REP1-058] was expected to be submitted at D5.

11.2.15. An updated SoCG between the Applicant and MoD was submitted at D5 [REP5-055, MOD-005] which noted that the Applicant had agreed to submit an updated draft DCO with revised wording at paragraph 4 of Part 1 of Schedule 11, which would ensure that the Defence Infrastructure Organisation was listed as a point of contact (representing the MoD). In addition, it was clarified that Commitment 93 would apply to the operational and decommissioning phases as well as construction, and a reference to Condition 10 of Part 2 of Schedule 11 as being relevant to securing this commitment was added. The Applicant submitted an updated Register of Commitments with updated wording to reflect this agreement at D6 [REP6-008, Co93].

11.2.16. The Applicant's updated and final draft DCO was submitted at D7 [REP7-039] incorporating changes to Schedule 11, as agreed with the MoD to secure aviation lighting to MoD requirements during the construction, operational and maintenance phases of the Proposed Development.

Radar systems

11.2.17. The MoD [RR-022] noted that it had determined that the Proposed Development would be in line of sight and detectable to air defence radar

operated at Remote Radar Head (RRH) Staxton Wold. The MoD noted that WTGs have been shown to have detrimental effects on the operation of air defence radar, including the desensitisation of radar in the vicinity of WTGs and the creation of 'false' aircraft returns. This in turn reduces the probability of radar detecting aircraft flying over or in the locality of the WTGs. The MoD therefore noted that WTG proliferation within a specific locality can result in unacceptable degradation of the radar's operational integrity.

11.2.18. The MoD [RR-022] stated that its assessments have determined that, when operational, the Proposed Development would cause unacceptable and unmanageable interference to the effective operation of air defence radar deployed at RRH Staxton Wold.

11.2.19. However, the MoD [RR-022] also acknowledged that the need to mitigate the impacts of the Proposed Development on the effective operation of RRH Staxton Wold had been recognised by the Applicant and that the Applicant had identified means by which a technical mitigation of these impacts could be delivered. The MoD stated that dialogue between it and the Applicant had begun on the preparation of a requirement for inclusion in a draft DCO that would secure provision of a radar mitigation scheme, but that the wording of such a requirement had not been finalised between the parties prior to the submission of the application.

11.2.20. The MoD [RR-022] did not consider that the wording of Requirement 23 of the draft DCO [APP-203] submitted with the application would satisfactorily address defence safeguarding needs. The MoD proposed alternative wording which it considered suitable to maintain defence requirements.

11.2.21. The Applicant responded at D1 [REP1-038, section RR-022-C], noting it was committed to working with the MoD to identify, develop and implement an air defence radar mitigation for RRH Staxton Wold and that it would continue to work with the MoD to reach agreement on the proposed draft DCO [APP-203] wording through the SoCG process.

11.2.22. The Applicant also noted [REP1-038, section RR-022-D] that it had proposed alternative wording for Requirement 23 to the MoD and that it was also working with the MoD to reach agreement on the wording of this Requirement through the SoCG process.

11.2.23. The SoCG between the Applicant and the MoD received at D1 [REP1-058, Section MOD-002, MOD-003 and MOD-009], noted the concerns raised by the MoD and set out above. It confirmed that discussion was ongoing on these matters. All other matters in the SoCG were agreed at this stage.

11.2.24. NATS [RR-028] noted that the Proposed Development would infringe its safeguarding criteria because its proximity, physical size and relative orientation would be sufficient to generate false radar tracks. NATS therefore noted its objection to the Proposed Development within its Relevant Representation (RR).

11.2.25. The SoCG between the Applicant and NATS received at D1 [REP1-059] contained no agreed matters, with all issues noted as being subject to further discussion.

11.2.26. At ISH3 [EV-011], the ExA sought an update from the Applicant, the MoD and NATS on progress of the respective SoCGs [REP1-058] and [REP1-059].

11.2.27. The Applicant stated [REP4-037, section 5.2] that it believed that the only outstanding matter between it and the MoD related to the wording of Requirement 23 in the draft DCO [APP-203]. The MoD agreed with this position and undertook to provide an update at D5 on the wording of Requirement 23.

11.2.28. In relation to the SoCG between the Applicant and NATS, the Applicant confirmed [REP4-037, section 5.1] that Requirement 28 of the draft DCO [APP-203] provided adequate protection for NATS and that the Applicant's focus at that stage was on entering into a mitigation contract with NATS pursuant to the discharge of Requirement 28. NATS confirmed that it was working with the Applicant on concluding its contract for mitigation to be implemented post-consent and on agreement of the SoCG between the Applicant and NATS in parallel.

11.2.29. At D5, the Applicant submitted updated SoCGs with the MoD [REP5-055] and with NATS [REP5-056].

11.2.30. In the SoCG between the Applicant and MoD [REP5-055], the status of items headed MOD-002 and MOD-003 had changed from 'Not Agreed – material impact' to 'Not agreed – no material impact'. In addition, the status of item MOD-009 was changed from 'Not Agreed – material impact' to 'Ongoing point of discussion'. All other matters were noted as agreed. Those matters not agreed related to the mitigation of impacts on the air defence radar system and to the wording of Requirement 23 of the draft DCO [APP-203] respectively.

11.2.31. In the SoCG between the Applicant and NATS [REP5-056], the status of items headed NATS-007 and NATS-008 remained as 'Ongoing point of discussion'. All other matters were noted as agreed. The matters not agreed related to the wording of Requirement 28 of the draft DCO [APP-203].

11.2.32. The ExA requested updates on the progress of SoCGs between the Applicant and both the MoD and NATS at ISH9 [EV-033]. The Applicant confirmed [REP6-036, section 4.1] that its SoCG with the MoD would be updated at D6, at which time the outstanding issue at point MOD-009 would be dealt with. The Applicant noted that the status of items MOD-002 and MOD-003 would not be amended further but that it, nevertheless, believed that these matters were settled. The Applicant's view was that requirements that needed to be put into the draft DCO had been agreed with final stakeholders and that therefore the position of both parties was that these issues had been properly addressed.

11.2.33. At ISH9 [EV-033], the Applicant confirmed [REP6-036, section 4.1] that it intended to submit an updated SoCG with NATS at D6, subject to its mitigation services contract being finalised.

11.2.34. The Applicant submitted its final SoCG with the MoD at D6 [REP6-018] with all matters except MOD-002 and MOD-003 agreed. The matters which remained as not agreed were considered by the Applicant to have no material impact.

11.2.35. The MoD, at D6, also provided a response to action point 9 raised during ISH9 [EV-033a]. In its response [REP6-052], the MoD confirmed its agreement that points MOD-002 and MOD-003 [REP6-018] were not considered to have a material impact on the conclusion of the impact assessments and the subsequent preparation of a draft DCO. It further noted that the Applicant had identified that the Proposed Development would impact the air defence radar at RRH Staxton Wold and that it had undertaken to provide mitigation of this impact.

11.2.36. The Applicant submitted its final SoCG between it and NATS at D6 [REP6-019] with all matters agreed.

11.2.37. The Applicant's updated and final draft DCO submitted at D7 [REP7-039] incorporated changes to Requirement 24 (originally Requirement 23), relating to MoD radar mitigation, with wording agreed with the MoD. The Applicant's updated and final draft DCO [REP7-039] also included Requirement 29 (formerly Requirement 28) in Schedule 1, Part 3, which secured mitigation for effects on NATS' primary surveillance radar at Claxby and associated air traffic (surveillance and control) operations or services.

Oil and gas operators' helicopter access

11.2.38. NEO Energy (SNS) Limited (NEO) [RR-004], which owns and operates the Babbage Field, located approximately 4.3 kilometres (km) from the Proposed Development, did not object to the principle of the development [REP2-065, paragraph 1.3]. However, it considered [REP2-065, paragraph 1.7] and [REP2-066, Section 6] that the Proposed Development might, amongst other things, prejudice future development (including decommissioning) which would prevent NEO from meeting its central obligation under the Oil and Gas Authority Strategy. To address this, NEO sought protective provisions to be included in the DCO to avoid an adverse impact on and serious detriment to, amongst other things, NEO's future operations [REP2-065, paragraph 5.1] and [REP2-066, Section 7].

11.2.39. In response, the Applicant [REP3-030, section 6.2] advised that it did not consider that the Proposed Development would impact the decommissioning of the Babbage Platform and associated infrastructure given the platform's location some 2.4 nautical miles (nm) from the edge of the proposed array area. Furthermore, it considered that infrastructure associated with the Babbage Platform would be located outside the Proposed Development's Order limits.

11.2.40. In terms of future development, the Applicant highlighted that it had carried out its assessments on information in the public domain where there was sufficient certainty to carry out an assessment. The Applicant advised [REP3-030, section 6.2] that it was not aware of any future plans in relation to NEO.

11.2.41. In order to better understand the constraints on agreement being reached between the Applicant and a number of Interested Parties (IPs), during the Examination, the ExA issued a request for further information under Rule 17 of the Infrastructure Planning (Examination Procedure) Rules 2010 (a Rule 17 request) on 25 July 2022 [PD-014] seeking further information from a number of IPs who were unable to attend ISHs during the week commencing 18 July 2022. This included a request for NEO to provide an update on the joint position statement and, if necessary, to add further information to the Applicant's update on this subject provided at ISH9 [EV-033].

11.2.42. NEO responded to this request at D6 [REP6-061], noting its preferred buffer zone radius for safe helicopter operations to the Babbage Platform. In addition, NEO also indicated that it might be able to accept a reduced buffer zone radius provided that adequate annual compensation was made for the disruption to helicopter operations at the Platform.

11.2.43. In addition, NEO also advised that, in its view, the Applicant should meet the direct costs and reasonable overheads of the navigational aids to be installed on the Babbage Platform.

11.2.44. NEO concluded its D6 response [REP6-061] by stressing that both it and the Applicant continued to prioritise discussions with a view towards reaching a satisfactory conclusion, and that a further update would be provided at D7.

11.2.45. NEO submitted a final draft of its proposed protective provisions at D7 [REP7-106].

11.2.46. At D8 [REP8-014, paragraph 1.5.1.1], the Applicant highlighted that paragraph 5 of its proposed protective provision [REP7-039] would ensure that both parties would be kept informed of 'Relevant Activities' so that the licensee and the undertaker might seek to agree solutions to allow those activities to co-exist or to occur after decommissioning had been completed. 'Relevant Activities' would include all development activities undertaken within or adjacent to the Restricted Area. The ExA's conclusions and recommendations relating to protective provisions are considered further in Chapter 16 of this Report.

11.2.47. The ExA notes that whilst the Applicant submitted a draft Position Statement with NEO at D2 [REP2-051] this was unsigned and was not updated during the Examination. As a consequence, NEO's objection is considered to remain outstanding at the close of the Examination.

11.2.48. Harbour Energy [RR-014], which owns and operates the Johnston Field, was concerned that the construction and operation of the Proposed

Development could impact the safe decommissioning of the field facilities at the end of field life.

11.2.49. At D1, the Applicant noted [REP1-038, 2.14] Harbour Energy's concerns regarding decommissioning and advised that it was having constructive commercial negotiations to address Harbour Energy's concerns.

11.2.50. At D5 [REP5-101], Harbour Energy advised that it had reached agreement in principle with the Applicant and was in advanced negotiations on a co-operation agreement relating to the interaction between the Proposed Development and the decommissioning of the Johnston Subsea Gas Field infrastructure.

11.2.51. At D6 [REP6-049], Harbour Energy indicated that it hoped that the collaboration and cooperation agreement that it had drafted with the Applicant would preclude the need for protective provisions. However, if agreement could not be reached then protective provisions would be required to enable marine and aviation access to support production and decommissioning.

11.2.52. The Applicant [REP6-040, paragraph 1.1.1.1] confirmed that it hoped to achieve agreement but in order to put the ExA in an informed position, should protective provisions be required, provided a set of draft provisions it might wish to include.

11.2.53. At D7 [REP7-100], Harbour Energy advised that despite best efforts the coexistence agreement would not be finalised before the end of the Examination. As a result, the protective provisions sought by Harbour Energy remained as outlined in its D6 submission.

11.2.54. The Applicant [REP7-089, paragraphs 1.1.1.1 to 1.1.1.3] confirmed this, and Schedule 9 of the draft DCO [REP7-039] submitted at D7 included protective provisions for the benefit of Harbour Energy based on those submitted by the Applicant at D6.

11.2.55. At D8 [REP8-026, 1.2], Harbour Energy advised that the revised protective provisions submitted by the Applicant at D7 would make it impossible for Johnston Field operations to coexist with the Proposed Development and therefore it would be prevented from fulfilling the legal obligation to maximise economic recovery from the field set out in its licence to operate [REP8-026, section 4.0].

11.2.56. To address this, Harbour Energy advocated that, in order to enable safe helicopter access, a 3nm radius around each wellhead would be required, as secured by its suggested protective provisions. Alternatively, it considered that the protective provisions suggested by the Applicant would need to be amended to permit sufficient space for helicopter access and include a mechanism to compensate Harbour Energy for delays to its rig programmes arising from flight restrictions which would ensue during the operation of the Proposed Development.

11.2.57. The Applicant at D8 [REP8-015] reiterated why its protective provisions in the draft DCO [REP7-039, Schedule 9, Part 13] should be preferred by

the ExA. In particular, it highlighted that whilst it acknowledged Harbour Energy's desire to maximise economic recovery of its field, the Johnston Field made up a very small percentage of UK reserves [REP8-015, paragraph 1.1.1.2], and given that the field started producing in 1994, it was a significantly depleted reservoir [REP8-015, paragraph 1.1.1.3]. Conversely, the Proposed Development would provide a significant amount of electricity from a clean power source which would contribute to energy security and resilience to a far greater extent than the remaining production from the Johnston Field [REP8-015, paragraph 1.1.1.3].

11.2.58. Following the Applicant's D8 request for data to support Harbour Energy's position, this was provided after D8 [AS-049].

11.2.59. Perenco UK Limited (Perenco) [RR-031], which owns and operates the Ravenspurn North and Trent platforms, was concerned that the construction and operation of the Proposed Development could impact on safe helicopter access to the Ravenspurn North platform and that the Proposed Development could obstruct both a microwave link between the Ravenspurn North and Trent platform as well as a marine collision radar early warning system located on the Ravenspurn North platform.

11.2.60. At D4, Perenco [REP4-062] provided a response to action point 5 arising at ISH3 [EV-011a]. This confirmed that, whilst the draft protective provisions submitted by the Applicant at D3 [REP3-007] were written for the protection of NEO, these were shared with Perenco.

11.2.61. The protective provisions shared with Perenco were not submitted into the Examination, but it was noted [REP4-062] that these provisions proposed a similar helicopter access radius around the Ravenspurn North platform to that proposed for NEO. In addition, Perenco confirmed that it was close to agreement with the Applicant on a mechanism to ensure the continued operability of its radar early warning system (REWS) to prevent marine collision.

11.2.62. In the same submission, Perenco noted that it could not accept that the Applicant's proposed helicopter access radius was sufficient to allow aviation operations to take place to and from a platform under a sufficient range of metocean and visibility conditions.

11.2.63. Perenco responded to the ExA's further written questions (ExQ2) at D5 [REP5-118] to provide further detail on specific issues that prevented it from agreeing protective provisions with the Applicant. It noted that it was progressing commercial agreements with the Applicant on all matters, including helicopter access, with the intention being that the commercial agreements would replace any protective provisions.

11.2.64. At D6, the Applicant and Perenco submitted a joint notification letter [REP6-042] to confirm that they had entered into commercial agreements relating to the microwave link between the Ravenspurn North and Trent platforms and the REWS. Both parties therefore

requested that the ExA remove any relevant protective provisions relating to these matters from future versions of the draft DCO.

11.2.65. At D8, the Applicant and Perenco submitted a further joint notification letter [REP8-019] to confirm that they had entered into a commercial agreement relating to helicopter access. Both parties therefore requested that the ExA remove any relevant protective provisions relating to this matter from the final draft DCO [REP7-039].

ExA response

Military and civilian aviation

11.2.66. The ExA has considered the views expressed by the MoD regarding the potential for the Proposed Development to impact the MoD offshore Danger and Exercise Areas or adversely affect defence maritime navigational interests and notes the Applicant's responses during the course of the Examination. With the inclusion of updated wording to paragraph 4 of Part 1 of Schedule 11 of the final draft DCO [REP7-039], which secures aviation lighting to MoD requirements during both the construction and operational and maintenance phases of the Proposed Development, the ExA is satisfied that the draft DCO [REP7-039] makes adequate provision for appropriate aviation warning lighting to maintain the safety of military air traffic as part of the Proposed Development.

Radar systems

11.2.67. The ExA has considered the views expressed by NATS and the MoD regarding the potential for the Proposed Development to impact both civilian and military radar operations and notes the Applicant's responses during the course of the Examination.

11.2.68. With the inclusion of updated wording to Requirement 24, which secures mitigation for effects on NATS' primary surveillance radar at Claxby and the inclusion of Requirement 29 within Schedule 1, Part 3 of the draft DCO [REP7-039], which secures associated air traffic (surveillance and control) operations or services and relating to MoD radar mitigation, as agreed with the MoD, the ExA is satisfied that the final draft DCO [REP7-039] makes adequate provision to secure mitigation against effects on both military and civilian radar operations as part of the Proposed Development.

Oil and gas operators' helicopter access

11.2.69. The ExA recognises the efforts of the Applicant and all of the oil and gas operator IPs to reach agreement before the close of the Examination and notes that agreement was reached with one IP, but that matters remain unresolved between the Applicant and the other oil and gas operators who had made submissions.

11.2.70. The ExA notes that, in all cases, the issue of safe helicopter access for landing on and, in particular, for take-off from oil and gas platforms was a significant concern. The oil and gas operator IPs have presented the ExA with evidence from their helicopter transport providers that supports

the case they made for the safe helicopter access radii that they proposed. The ExA notes the representations made by the Applicant on this matter but does not find that these are sufficiently compelling to override the safety concerns presented by the oil and gas operator IPs and their helicopter access providers.

11.2.71. With this in mind, the ExA recommends that the protective provisions for the benefit of NEO [REP7-106] and Harbour Energy [REP6-049] should be amended to enable safe helicopter access.

11.2.72. The ExA acknowledges that the Applicant and Perenco were able to enter into a commercial agreement before the close of the Examination that protects their interests and removes the requirement for protective provisions proposed by these parties relating to helicopter access.

11.2.73. The drafting of protective provisions for the benefit of oil and gas operators is considered further in Chapter 16 of this Report.

11.2.74. Based on the findings set out above and subject to the insertion of protective provisions for the benefit of NEO [REP7-106] and Harbour Energy [REP6-049], the ExA considers that policy requirements with regard to aviation and radar in NPS EN-1 and NPS EN-3 have been met as follows, by:

- Consultation and assessment in accordance NPS EN-1 Section 5.4 and identification of impacts of the project upon the operation of communications, navigation and surveillance infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures (NPS EN-1, paragraphs 5.4.10 to 5.4.12).
- The consideration of the impact of the Proposed Development on military, defence and civil aviation interests and the appropriate efforts of all relevant parties to work together to identify realistic and pragmatic solutions to their differences (NPS EN-1 paragraphs 5.4.15 to 5.4.18).
- With the inclusion of protective provisions and commercial agreements as set out above, the identification and minimising of negative impacts and the reduction of risks associated with the activities of other offshore operators (NPS EN-3, paragraph 2.6.183).

Conclusion

11.2.75. The inclusion of updated wording to Condition 10 of Part 2 of Schedule 11 as well as the inclusion of Condition 10 of Part 2 of Schedule 12 of the draft DCO [REP7-039], which secure aviation lighting to MoD requirements during both the construction and operational and maintenance phases of the Proposed Development, satisfies the ExA that the final draft DCO [REP7-039] makes adequate provision for appropriate aviation warning lighting to maintain the safety of military air traffic as part of the Proposed Development.

11.2.76. Similarly, following the inclusion of updated wording to Requirement 24 and Requirement 29 in Schedule 1, Part 3 of the final draft DCO [REP7-039], which secures mitigation for effects on NATS' primary surveillance

radar at Claxby and associated air traffic (surveillance and control) operations or services and relating to MoD radar mitigation and as agreed with the MoD respectively, the ExA is satisfied that the final draft DCO [REP7-039] makes adequate provision to secure mitigation against effects on both military and civilian radar operations as part of the Proposed Development.

11.2.77. The insertion of protective provisions relating to helicopter access to platforms operated by NEO and Harbour Energy ensures that helicopter operators providing access to these platforms can do so in a manner that they consider safe.

11.2.78. Taking all of this into account, the ExA concludes that impacts on military aviation, as well as civilian and military radar operations which were identified by IPs could be mitigated through measures secured by Schedules and Requirements in the final draft DCO [REP7-039], as set out above. The Proposed Development would also give rise to impacts on the safe access to platforms currently available to oil and gas operators within, or with close proximity to, the Order limits. The ExA notes that these impacts can be mitigated through protective provisions inserted into the recommended DCO. The ExA therefore concludes that aviation and radar matters would not weigh against the case for the Proposed Development.

11.3. COMMERCIAL FISHERIES AND FISHING

Policy considerations

National policy

11.3.1. NPS EN-3 policies relevant to commercial fisheries and fishing include requirements for consultation with the fishing industry by applicants (paragraphs 2.6.127 and 2.6.128) and for detailed surveys of likely effects on constraints on fishing activity (paragraph 2.6.129).

11.3.2. In reaching a decision, NPS EN-3 requires that the SoS should be satisfied that the site selection process and design of the proposed development has been carried out in a way that reasonably minimises adverse effects on commercial fisheries and fishing and disruption to fishing during construction and operational phases has been mitigated, having consulted representatives of the fishing industry (NPS EN-3, paragraphs 2.6.132, 2.6.133 2.6.134, 2.6.135 and 2.6.136).

11.3.3. The MCAA, Part 4, Section 69, sub-section (1)(c) provides for marine licence decisions to, "*have regard to the need to prevent interference with legitimate uses of the sea*".

11.3.4. The MPS expressly promotes co-existence of marine activities wherever possible.

11.3.5. The policies of the EIEOMP relevant to the issues covered in this section include GOV3 and FISH1 with regard to impacts on existing fishing activities, including the need for making the case for proceeding with

proposals if it is not possible to minimise or mitigate the adverse effects of displacement of activity. The matters around FISH2, impact on spawning and nursery areas, and CAB1, cable burial or protection, apply to both Inshore and Offshore Marine Plan Areas and are considered in Chapter 9 of this Report, 'Other Marine Ecology Matters'.

Other relevant legislation and guidance

11.3.6. International maritime safety is governed by the International Maritime Organisation (IMO) Safety of Life at Sea (SOLAS) Convention Chapter V (Safety of Navigation) 1974 (as amended), which is given effect in United Kingdom (UK) law by The Merchant Shipping (Safety of Navigation) Regulations 2020 and the International Regulations for Preventing Collisions at Sea 1972 (as amended).

11.3.7. Regulation 3A of the Infrastructure Planning (Decisions) Regulations 2010 under the PA2008 makes special reference to the requirement for infrastructure developers to prevent interference with legitimate uses of the sea and to limit the increase of navigation risk to 'As Low as Reasonably Practicable' (ALARP).

The Applicant's case

11.3.8. Potential impacts on fisheries and fishing were assessed in the Applicant's ES Volume A2 Chapter 6 [APP-018], supported by Annex A5.6.1, the Commercial Fisheries Technical Report [APP-080], and the Outline Fisheries Coexistence and Liaison Plan [APP-244], of which revision B was submitted during the course of the Examination [REP1-033].

11.3.9. Consultation undertaken pre-application regarding commercial fisheries and fishing included liaison with the National Federation of Fishermens' Organisations (NFFO), the North-Eastern Inshore Fisheries Conservation Authority and the Holderness Fishing Industry Group (HFIG) [APP-018, Table 6.4].

11.3.10. The Applicant proposed mitigation to minimise adverse effects in relation to commercial fisheries [APP-018, section 6.8.2] that included:

- ongoing liaison with fishing fleets via an appointed Fisheries Liaison Officer; and
- notification of construction, maintenance and decommissioning operations via Notices to Mariners and Kingfisher bulletins in accordance with a Fisheries Coexistence and Liaison Plan (FCLP), which would be secured by the DCO and deemed marine licences (DMLs) under draft DCO Schedules 11 and 12, Part 2, Conditions 13(6) and 14(1)(b) [REP7-039].

11.3.11. The Applicant considered that the impacts of the Proposed Development on commercial fisheries and fishing would be a reduction in access to, or exclusion from fishing grounds due to infrastructure located in the proposed array area and offshore export cable corridor (ECC), which would result in a 'slight adverse' effect for pelagic and demersal fisheries

and 'moderate adverse' effect for the UK potting fishery. However, the Applicant considered that the residual adverse effect to the latter would be 'slight' and therefore not significant in Environmental Impact Assessment (EIA) terms after mitigation by means of 'justifiable disturbance payments' to the potting fishery in accordance with the Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison [APP-018, paragraphs 6.11.1.19 to 6.11.1.21]. This was covered by Commitment Co180 [APP-050] secured through a FCLP as described above.

11.3.12. Safety risk for fishing vessels, notably associated with snagging of fishing gear, was assessed by the Applicant in the Navigational Risk Assessment (NRA) [APP-019, Section 7.11] as ALARP, tolerable and not significant in EIA terms after mitigation, which would be secured by the Applicant's proposed DCO, Schedules 11 and 12, Part 2, Condition 15 [APP-203].

11.3.13. The cumulative effect of reduction in access to or exclusion from fishing grounds together with identified developments, notably the Endurance Project and the Eastern Green Link 2 (EGL2) submarine cable project, was assessed by the Applicant as 'moderate adverse' for UK, Dutch, Danish, French, German and Belgian demersal trawling fleets, which would be significant in EIA terms, and 'slight adverse' for all other fleets during the construction, operational and decommissioning phases [APP-018, paragraphs 6.12.2.14 to 6.12.2.23]. The introduction of Marine Protected Areas (MPAs) and consequential prohibition of bottom-fishing activity would have an influence on the reduction in access to or exclusion from fishing grounds that would be, *"unmitigable by the project and this impact would remain significant without the de minimis cumulative contribution from Hornsea Four"* [APP-018, paragraph 6.12.2.23, 6.12.2.35, 6.12.2.40 and 6.12.3.3] and [APP-024, paragraph 12.5.7.4] and [REP7-086].

11.3.14. Transboundary effects on commercial fishing fleets from the Netherlands, Germany, Belgium, Denmark, Norway, France and Ireland in relation to reduction in access to fishing grounds and displacement into alternative grounds (including in other Exclusive Economic Zones) were assessed by the Applicant as *"…consistent to those presented in the impact assessment … and CEA"* for the Proposed Development [APP-018, paragraph 6.13.1.3].

11.3.15. An inter-related effect arising from the combination of reduction in access to fishing grounds and subsequent increased pressure on adjacent grounds was assessed by the Applicant as not being of greater residual significance after mitigation than as assessed in isolation [APP-018, page 118, Table 6.19].

Planning issues

11.3.16. The HFIG criticised the baseline data applied to commercial potting activity impact assessment, on the basis that Vessel Monitoring System (VMS) data used by the Applicant only presented vessels of more than 15

meters (m) in length, which represented only a small proportion of the potting fleet, which is predominantly between 10m and 12m in length [AS-025]. The HFIG also asserted that monitoring by the developer should include assessing, *"changes in fleet behaviour, landings, catch statistics and effort"* [AS-025]. The Applicant explained that VMS data were not the predominant tool used to understand this fishing activity [REP1-038, note AS-025-J], and also highlighted commitments to appropriate mitigation of adverse effects: commitment 90 (ongoing liaison with the fishing industry); commitment 95 (development of a FCLP); and commitment 180 (following FLOWW Best Practice Guidance). The Applicant concluded that, *"it does not propose any further monitoring of fleet characteristics, effort or landings data"* [REP1-038, note AS-025-L].

11.3.17. The NFFO initially disputed the assessment of magnitude of reduction in access to or exclusion from potting fishing grounds, because the potting boats operating offshore deploy long strings of pots that could be compromised by structures in the proposed array area, and claimed that this impact would be compounded by the cumulative effects of fishing restrictions in Marine Conservation Zones (MCZs) [AS-026]. In its first written questions (ExQ1), the ExA sought comments on this point from both the MMO and the Applicant [PD-006, CF.1.2 and CF.1.7]. In response the Applicant re-stated its assessment that potting fishing would resume within the proposed array area after construction and reiterated the commitments to continue to liaise with the fishing industry to develop appropriate mitigation of adverse effects [REP1-038, note AS-026-E]. The Applicant also responded that the potential restrictions that might be imposed within MPAs (such as MCZs) would be more likely to have an adverse effect on the use of bottom-contact trawled gear because it would be more likely to interact extensively with benthic features than potting gear [REP2-038]. The MMO confirmed that it had nothing further to add to the Applicant's answer [REP3-052, paragraph 2.6.1].

11.3.18. No further matters of concern regarding commercial fishing and fisheries were raised by the HFIG or the NFFO at ISH3 or ISH9 or in response to ExQ2 [PD-012, CF.2.1]. All matters of concern to the HFIG and the NFFO were reported as resolved in the final signed SoCG [REP6-016].

11.3.19. At D5, the Applicant reported that there were no dredge fisheries present in the proposed array area [REP5-004, paragraph 6.11.2.10]. As a result, the overall effect of reduction in access to the fishing ground in the proposed array area during construction, operation and maintenance would be of minor magnitude and low sensitivity, hence of 'slight adverse' significance, "*which is not significant in EIA terms*" [REP5-004, paragraphs 6.11.2.7 and 6.11.2.15].

11.3.20. Also at D5, the Applicant produced an update to Chapter 6 of the ES, Commercial Fisheries, which included clarification in relation to snagging of fishing gear on exposed cables [REP5-004]. All matters of concern to the HFIG and the NFFO were reported as resolved in the final SoCG [REP6-016].

11.3.21. The MMO made a number of comments on the Outline FCLP in relation to roles, responsibilities and timescales for the provision of information [RR-020]. The Applicant responded to these points at D1 by submitting a revised Outline FCLP [REP1-033]. The MMO subsequently supported the revised Outline FCLP, deferring to the NFFO for further comments [REP3-052, paragraph 2.3.2].

11.3.22. The MMO also requested that it be made clear in the Outline FCLP that the MMO would not act as arbitrator nor be involved in discussions on payments to fisheries [REP3-052, paragraph 2.3.1]. The MMO repeated this concern at D5 [REP5-107, paragraph 1.9.1]. The Applicant confirmed [REP5-074] that it would not, *"engage the MMO in discussions relating to the quantum of any compensation payable …"* but declined to amend the Outline FCLP to that effect.

11.3.23. The final submission by the MMO noted its agreement with the Applicant's approach to use MMO fisheries data to identify impacts on shellfish fisheries but advised that the Applicant should consider carefully interpreting data for the recent three years which may have been impacted by Covid-19 pandemic effects [REP7-111, paragraph 3.30]. The MMO reported no matters of outstanding disagreement on commercial fishing and fisheries matters in its final SoCG with the Applicant, with the exception of matters regarding herring spawning [REP7-111].

ExA response

11.3.24. The ExA is satisfied the Applicant has had due regard to NPS EN-3 and relevant Marine Plan policies GOV3 and FISH1, which require proposals to demonstrate that, if adverse impacts resulting in displacement cannot be minimised, how these would be mitigated.

11.3.25. No matters of concern regarding commercial fishing and fisheries were raised by IPs at ISH3 or ISH9 or in response to ExQ2 [PD-012, CF.2.1]. All matters of concern to the HFIG and the NFFO were reported as resolved in the final signed SoCG [REP6-016]. The ExA is therefore satisfied that all IP concerns regarding the assessment of impacts on UK potting activity were resolved at the end of the Examination and that there were no matters regarding commercial fishing and fisheries outstanding, other than related matters of fish and shellfish ecology (including herring spawning), which are discussed in Chapter 9 of this Report.

11.3.26. Therefore, at the end of the Examination, the ExA is satisfied with the Applicant's assessment of likely effects on commercial fisheries and fishing as set out in the ES Volume A2 Chapter 6 [APP-018, revised as REP5-004]. The ExA makes particular note of the Applicant's assessment that while demersal trawl fisheries are expected, *"to experience reduced access to the Hornsea Four array area, the evidence indicates that the Hornsea Four array area is not routinely targeted"* by these trawl fisheries and that the Proposed Development would therefore be, *"unlikely to lead to an overall decline in landings for these fisheries"*.

11.3.27. The ExA also notes the MMO's refusal to act in an arbitration capacity on any disturbance payments to the UK Potting Fishery, but that the Applicant declined to make a change to the Outline FCLP to register that position. The ExA is satisfied that this matter may be dealt with post-consent as part of the marine licensing process requiring agreement between parties of a final FCLP secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12, Part 2, Condition 13(6)].

Conclusion on commercial fisheries and fishing

11.3.28. Based on the evidence and reasoning provided, the ExA concludes that policy tests have been satisfied as reported above, and that:

- Impacts of the Proposed Development alone on Commercial Fisheries and Fishing during construction operation, maintenance and decommissioning would be no more than 'slight adverse' after mitigation including disturbance payments under FLOWW for the UK potting fleet, secured through a final FCLP secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12] as described above.
- Together with other developments, the cumulative and transboundary effects from the impact of reduction in access to or exclusion from fishing grounds during construction, operation and decommissioning phases for UK, Dutch, Danish, French, German and Belgian demersal trawling fleets would be 'moderate adverse'.
- However, the ExA notes and agrees with the Applicant's contention that the adverse impact of other developments on this demersal trawl fishery would remain significant regardless of any additional impact from the Proposed Development.
- Inter-related effects after mitigation would be of no greater significance than effects assessed in isolation.
- The cumulative effect of reduction in access to or exclusion from fishing grounds for the UK potting fishery is assessed as 'moderate adverse' during the construction and decommissioning phases, and that effect can be adequately mitigated through 'justifiable disturbance payments' to the potting fishery which would be secured by the FCLP as a condition of the DMLs under the Applicant's final draft DCO [REP7-039, Schedules 11 and 12].].

11.3.29. The ExA notes the likelihood of 'moderate adverse' residual cumulative transboundary effects from the Proposed Development for UK, Dutch, Danish, French, German and Belgian demersal trawling fleets during construction, operation and decommissioning, and of 'moderate adverse' residual impact to the UK potting fleet during construction and decommissioning. Therefore, in the planning balance for and against the granting of development consent, the ExA attributes limited negative weight to these impacts on commercial fisheries and fishing.

11.4. OFFSHORE HISTORIC ENVIRONMENT (MARINE ARCHAEOLOGY)

Policy considerations

National policy

11.4.1. NPS EN-1 policies relevant to marine archaeology require applicants to:

- provide a description of the significance of heritage assets and likely archaeological features that may be affected by the proposed development (NPS EN-1, paragraph 5.8.8, 5.8.9 and 5.8.10);
- carry out appropriate assessments to assess archaeological interest (NPS EN-1, paragraph 5.8.9); and
- ensure that the extent of the impact of the proposed development can be adequately understood from the application (NPS EN-1, paragraph 5.8.8 to 5.8.10).

11.4.2. In reaching a decision on an application for development consent, NPS EN-1 states that the SoS should:

- weigh any harmful impact on the significance of a designated heritage asset against the public benefit of development (NPS EN-1 paragraph 5.18.15);
- where loss of significance of any heritage asset is justified on the merits of the development proposed, require the developer to record and advance understanding of the significance of a heritage asset before it is lost, in accordance with an agreed and secured written scheme of investigation (NPS EN-1, paragraphs 5.8.20 and 5.8.21); and
- impose requirements to secure appropriate identification and treatment of such assets discovered during construction where the decision maker considers there is a high probability of as-yet undiscovered assets (NPS EN-1, paragraph 5.8.22).

11.4.3. In addition, NPS EN-3 requires the SoS to:

- identify any beneficial effects on the historic marine environment, for example through contribution to new knowledge that arises from investigation (NPS EN-3, paragraphs 2.6.140 to 2.6.143);
- be satisfied that the design of an offshore wind farm and associated offshore infrastructure has considered known heritage assets and their status, notably designated Protected Wrecks (NPS EN-3, paragraph 2.6.144); and
- consider granting consent that allows for micro-siting to be undertaken to accommodate changes to the precise location of infrastructure in circumstances such as the discovery of marine archaeological remains (NPS EN-3, paragraph 2.6.146).

Marine policy

11.4.4. Policy SOC2 of the EIEOMP provides protection for offshore and intertidal heritage assets.

Other relevant legislation and guidance

11.4.5. The Ancient Monuments and Archaeological Areas Act 1979 (as amended by the National Heritage Acts 1983 and 2002) protects scheduled monuments that may include the remains of vessels or aircraft. The Protection of Wrecks Act 1973 provides protection for sites of designated wrecks including provision for a restricted area around the wreck site. The Protection of Military Remains Act 1986 provides protection for the wreckage of military aircraft and designated military vessels.

The Applicant's case

11.4.6. Volume A2 Chapter 9 of the ES, Marine Archaeology, included a description of offshore and intertidal designated heritage assets and features of potential archaeological interest, and an assessment of the potential impacts of the Proposed Development [APP-021]. This was supported by Annexes that comprise a Technical Report and Offshore Historic Environment Plan [APP-085 and APP-216], and an Outline Marine Written Scheme of Investigation (WSI) for marine archaeology [APP-239].

11.4.7. Foreseeable construction impacts on marine archaeology were scoped out of additional assessment as part of the Applicant's 'proportionate approach' to EIA, agreed pre-application with the Planning Inspectorate on the basis of Commitments 46, 140, 166 and 167 [REP6—008], resulting in, *"a negligible impact on marine archaeology receptors [and] previous assessments for Hornsea Project One, Hornsea Project Two and Hornsea Three have shown… no likely significant effect with application of best-practice mitigation"* [APP-021, Table 9.8]. The ES Chapter 9 explained that the proportionate approach taken to EIA *"may contribute to a perceived increased risk to potential maritime archaeological receptors"* but that this would be mitigated by future survey work and commitments as detailed in Table 9.9 of the ES, including the development of a WSI.

11.4.8. ES Chapter 9 [APP-021] explained that the production of a post-consent Marine WSI would be secured by DCO [APP-203] Schedules 11 and 12, Part 2, Conditions 13(2) and 13(3), which required a final version of the WSI to be submitted to the MMO for approval in consultation with Historic England (HE).

11.4.9. Effects on historic seascape were considered by the Applicant in the ES, with a conclusion that no significant effects would be likely for the Proposed Development alone or cumulatively [APP-021, section 9.7.2]. A high voltage alternating current (HVAC) Booster Station Lighting Plan (Commitment 200) would be secured by DCO Schedules 11 and 12, Part 2, Condition 22 [APP-203].

11.4.10. Seabed features of potential archaeological interest in the study area were summarised in section 7 of ES Chapter 9, including paleolandscapes, 18 known shipwrecks and 187 geophysical survey anomalies of unknown origin [APP-021, Table 9.6].

11.4.11. No known aircraft wrecks were reported but due attention was given within the Outline Marine WSI to the potential for any such discovery, and acknowledgment was made of the automatic statutory protection of such finds [REP3-031].

11.4.12. Commitments to mitigate potential effects to marine archaeology would include the following [APP-021, Table 9.9]:

- routing of cables and micro-siting of structures to avoid any identified archaeological receptors (Commitment 46), production of a Marine WSI (Commitment 140), an offshore geophysical survey (Commitment 166), and an offshore geotechnical survey (Commitment 167) would all be secured by DCO Schedules 11 and 12, Part 2, Condition 13(2) and 13(3);
- an Offshore Decommissioning Plan (Commitment 181) would be secured by DCO Schedules 11 and 12, Part 1(6); and
- limitations on use of gravity based structures (Commitment 201) would be secured by DCO Schedule 11, Part 2, Condition 13(1)(c).

11.4.13. Further mitigation proposed in the Outline Marine WSI [APP-239] would include: the establishment of Archaeological Exclusion Zones; further investigation and assessment of anomalies where avoidance by micro-siting was not possible; and further examination and archaeological assessment of geophysical data collected during the Proposed Development.

11.4.14. Any archaeological finds would be monitored and reported using the established Protocol for Archaeological Discoveries: Offshore Renewables Projects (ORPAD), published by The Crown Estate.

11.4.15. The Outline Marine WSI confirmed that a post-construction monitoring plan secured by Schedules 11 and 12, Part 2, Condition 19(2)(b) of the draft DCO [REP7-039] would be developed and submitted for acceptance or comment to the Archaeological Curators (namely HE and East Riding of Yorkshire Council (ERYC), who are jointly responsible for the intertidal zone) [APP-239, paragraphs 7.3.1.1 to 7.3.1.3 and 6.3.1.1].

11.4.16. The Applicant made the case [APP-021, Table 9.9] that the understanding of the archaeological significance of submerged landscapes and of marine archaeological assets in the southern North Sea, including shipwrecks, would be enhanced by dissemination of results of investigation as required in the Outline Marine WSI under commitment 167 secured through DCO Schedules 11 and 12, Part 2, Condition 13(2) and 13(3) [APP-203].

11.4.17. ES Chapter 9 noted that the cumulative effects of the Proposed Development with the proposed Endurance Project could not be fully assessed due to an absence of detail on that project. However, based on its preliminary understanding, the Applicant did not anticipate any significant cumulative adverse effects on archaeological receptors together with the Proposed Development [APP-021, section 9.12].

11.4.18. During the Examination, an updated cumulative effects assessment (CEA) responded to additional information available on the EGL2 subsea cable project and concluded that there would be no likely significant cumulative effects for marine archaeology [REP7-086].

11.4.19. ES Chapter 9 concluded that there would be no potential for significant transboundary effects in relation to the historic environment offshore and that the inter-relationship of effects on marine archaeology would not be expected to cause an impact of greater significance than if assessed individually [APP-021, Table 9.17] and [APP-021, section 9.13].

11.4.20. ERYC made no representation in its Local Impact Report (LIR) [REP1-074] with regard to historic environment heritage assets in the intertidal zone where its responsibilities overlap with those of the MMO and HE, but it confirmed during the Examination that it had no concerns or objections in that regard [REP4-066].

Planning issues

11.4.21. By the end of the Examination, the MMO was satisfied that the Applicant had demonstrated compliance with the relevant marine plans and policies and confirmed that the Proposed Development would lie entirely within the EIEOMP area.

11.4.22. HE expressed its unease about the scoping out of full assessment of marine archaeology impacts as part of the 'proportionate approach' to the EIA [RR-015]. In response, the Applicant provided an explanation of its assessment principles [REP1-038], referring to its EIA Proportionality Memo appended to an additional submission in response to section (s) 51 advice [AS-021]. HE also raised concerns on how commitments to deliver embedded mitigation would be secured through the DCO and DMLs [REP2-075], [REP2-076, paragraphs 4.7 to 4.11, paragraph 5.1 and paragraph 10.3] and [REP4-051, items 2.10, 4.9, 10.2 and iv]. The Applicant provided an explanation at D5 of how the commitments would be secured through the DCO and DMLs [REP5-074].

11.4.23. HE also challenged whether the CEA should have considered how developments in the southern North Sea, "*might compromise scientific activities to explore and map the complexity of prehistoric landscapes…*" [REP2-076, paragraph 4.19] and [REP4-051, point 4.19]. The Applicant explained that the only additional projects relevant to the CEA as scoped were Hornsea Projects One, Two and Three, and that, based on the commitments to mitigation and avoidance measures as set out within a WSI specific to each project, the residual cumulative effects after mitigation together with the Proposed Development would be 'not significant in EIA terms' [REP5-074].

11.4.24. HE requested that the construction method statement which would be secured by Schedules 11 and 12, Part 2, Condition 13(1)(c) of the draft DCO should respond specifically to information derived from pre-construction archaeological surveys and monitoring, and monitoring and reporting of pre-construction surveys should occur, "*within a timeframe*

that supports decision-making at each stage of construction" [REP4-051, Ref 10.2]. The Applicant confirmed [REP5-081] and [REP5-074, point HE.2.7 (ii)] that the results of pre-construction surveys would be incorporated into a design plan and construction method statement to be submitted for approval at least six months prior to the intended start of each stage of licensed activities, that would be secured by Condition 14 of Schedules 11 and 12.

11.4.25. HE subsequently confirmed satisfaction with the Applicant's clarifications [REP4-051], [REP5a-005] and [AS-043], noting that, although it had not been able to agree the conclusions regarding significance of potential impacts, disagreement was of 'no material impact' given the mitigation measures that would be secured by the Applicant's proposed DCO [APP-203, as revised].

ExA response

11.4.26. At the end of the Examination, the Applicant submitted final signed SoCGs with HE [REP5a-005] and ERYC [REP6-070]. All matters were agreed with ERYC (subject to agreement post-consent of a WSI). Although there remained a number of matters regarding marine archaeology not agreed between HE and the Applicant, these disagreements were essentially semantic in nature and marked as 'of no material impact'.

11.4.27. The ExA is satisfied that all IP concerns raised during the Examination were satisfactorily answered and the Marine WSI that would be secured by the Applicant's final draft DCO [REP7-039] would enable adequate HE engagement to manage this matter in consultation with the MMO under the post-consent marine licensing procedures. The ExA agrees with the characterisation of the SoCG with HE that, given the mitigation commitments that would be the Applicant's final draft DCO [REP7-039], the disagreements remaining at the end of the Examination were 'of no material impact'.

11.4.28. Based on its Examination, the ExA considers that policy requirements with regard to marine archaeology in NPS EN-1 and NPS EN-3, and relevant marine plans have been met as follows:

- consultation and assessment in accordance with NPS EN-1 Section 5.8 and identification of any beneficial effects on the historic marine environment (NPS EN-3, paragraphs 2.6.140 to 2.6.143);
- demonstration that the design of the Proposed Development considered known heritage assets and their status, including designated Protected Wrecks (NPS EN-3, paragraph 2.6.144);
- plans for micro-siting of structures and cable routes to allow for the discovery of as-yet unknown marine archaeological remains (NPS EN-3, paragraph 2.6.146);
- description of known heritage assets in such a way that the extent of the impact of the Proposed Development could be adequately understood (NPS EN-1, paragraphs 5.8.8 to 5.8.10); and

- commitments secured by the Applicant's final draft DCO [REP7-039] for timely identification, treatment, recording and dissemination of the significance of any heritage assets encountered before and during construction or maintenance in accordance with an agreed WSI (NPS EN-1, paragraph 5.8.20, 5.8.21 and 5.8.22).

11.4.29. The ExA also considers that policy relevant to marine archaeology in the EIEOMP has been complied with.

11.4.30. Based on the evidence and reasoning given above, the ExA is also satisfied that, by the end of the Examination:

- subject to archaeological investigation, identification, recording and mitigation of risk of harm to archaeological assets which would be secured through the Applicant's final draft DCO, Schedules 11 and 12, Part 2, Condition 13(2) and 13(3) [REP7-039], potential adverse effects resulting from impacts of the Proposed Development on marine archaeology receptors during construction, operation, maintenance and decommissioning would be likely to be no more than 'slight' after mitigation that would be secured through the recommended DCO;
- as elaborated below in Section 11.7 of this Chapter, no significant effects on historic seascape would be likely for the offshore elements of the Proposed Development alone or cumulatively; and
- an enhanced public understanding of the archaeological significance of submerged landscapes and of marine archaeological assets in the southern North Sea would be a potential positive effect of the Proposed Development through investigation and dissemination of results and interpretation of discovered archaeological assets as secured by the Applicant's final draft DCO [REP7-039], as described above.

11.4.31. The ExA notes that effective mitigation of risk of harm to marine archaeological assets (known and unknown) would be reliant on accordance with the DML conditions requiring submission and written approval by the MMO of a marine written scheme of archaeological investigation prior to commencement of licensed activities of any 'stage in construction' [REP7-039, Schedules 11 and 12 Part 2, Condition 13(2)].

11.4.32. The ExA is content that the Applicant's final draft DCO secures the submission and approval of a marine WSI prior to pre-construction preparatory work and pre-commencement 'material operations' [REP7-039, Schedules 11 and 12 Part 2, Condition 13(3)], "*which must accord with the details set out in*" the outline marine WSI [REP5-042].

11.4.33. The ExA also notes that the DMLs specifically require HE to be consulted as an essential part of agreeing a post-consent marine WSI with the MMO.

Conclusion on historic environment offshore (marine archaeology)

11.4.34. Based on the evidence provided and reasoning reported above, the ExA concludes that:

- Necessary policy tests have been satisfied.
- The impacts of the Proposed Development alone on marine archaeology receptors during construction, operation, maintenance and decommissioning would be likely to be of no more than 'slight significance' after mitigation secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12].
- As elaborated below in Section 11.7 of this Chapter, no significant effects on historic seascape would be likely for the offshore elements of the Proposed Development alone or cumulatively.
- The Proposed Development has the potential to generate a positive effect of enhanced public understanding of the archaeological significance of submerged landscapes and of marine archaeological assets in the Southern North Sea due to archaeological investigation and dissemination of results and interpretation as secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12].

11.4.35. The ExA has had regard to potential benefit that could arise from public dissemination of archaeological investigation secured through the Applicant's final draft DCO [REP7-039, Schedules 11 and 12]. This is set against the residual risk of adverse effects to as-yet unknown archaeological receptors during construction and decommissioning. Taking all the matters reported above into consideration the ExA concludes that in matters in relation to the offshore historic environment would not weigh against the case for the Proposed Development.

11.5. OTHER OFFSHORE INFRASTRUCTURE

11.5.1. This Section of the Report considers the effect of the Proposed Development on infrastructure and other users, which for the purposes of the ES consist of:

- the oil and gas industries; and
- subsea cables.

11.5.2. The Applicant identified [APP-023, paragraph 11.11.2.1] that there would be four main categories of potential effects on oil and gas receptors and their operations. These related to:

- oil and gas exploration and production (including pipelines, seismic surveys and drilling, construction and decommissioning of platforms);
- the safety of oil and gas platforms in relation to shipping and navigation (REWS and allision risk);
- helicopter access to oil and gas infrastructure and vessels; and
- the general safe operations of the oil and gas industry (microwave telecommunication links between platforms and diving operations).

11.5.3. This Section of the Report considers only those that relate to oil and gas exploration and production (including pipelines, seismic surveys and drilling, construction and decommissioning of platforms). The other effects are considered elsewhere in this Chapter in the sections on aviation and radar and shipping and marine navigation.

11.5.4. The effect of the Proposed Development on the Endurance Store and the proposals to use this for Carbon Capture and Storage is considered in Chapter 10 of this Report.

Policy considerations

National policy

11.5.5. Paragraph 2.6.183 of NPS EN-3 advises that, *"where a proposed offshore windfarm potentially effects other offshore infrastructure or activity, a pragmatic approach should be employed by the* [SoS]*".* The NPS recognises that much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. The NPS advocates that, in such circumstances, there is an expectation that the Applicant will minimise negative impacts and reduce risks to as low as reasonably practicable.

11.5.6. NPS EN-3 (paragraph 2.6.184) states that the decision maker should be satisfied that site selection and design has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The NPS is clear that the decision maker should not consent applications that pose unacceptable risks to safety after mitigation measures have been considered (paragraph 2.6.184).

11.5.7. Where a proposed development (paragraph 2.6.185) is likely to affect the future viability or safety of an existing, approved or licensed offshore infrastructure or activity, the decision maker should give these adverse effects substantial weight in its decision making. However, the NPS (paragraph 2.6.186) recognises that mitigation measures may be possible to negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the decision maker to grant consent.

11.5.8. The MPS (paragraph 3.3.1) recognises that a secure, sustainable and affordable supply of energy is of central importance to the economic and social wellbeing of the UK. It acknowledges the contribution from not only the oil and gas sectors but also the growing contribution from renewable energy. However, it also highlights that contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning.

11.5.9. When decision makers are examining and determining applications for energy infrastructure, the MPS (paragraph 3.3.4) advocates the need to take into account:

- the national level of need for energy infrastructure as set out in NPS EN-1;
- the UK's policy objective to maximise economic development of the UK's oil and gas resources;
- the positive wider environmental, societal and economic benefits of low carbon electricity generation as a key technology for reducing carbon dioxide (CO_2) emissions;
- that the physical resources and features that form oil and gas fields occur in relatively few locations. Similarly, renewable energy resources can only be developed where the resource exists and where economically feasible; and
- the potential impact of inward investment in offshore wind-related manufacturing and deployment activity, as well as the impact of associated employment opportunities on the regeneration of local and national economies, all of which support the objective of developing the UK's low-carbon manufacturing capability.

11.5.10. Table 11.2 of Chapter 11 of the ES [APP-023] sets out the relevant policies from the EIEOMP. Section 11.3.3 [APP-023] sets out the other policy and guidance documents relevant to the consideration of effects of the Proposed Development on infrastructure and other users.

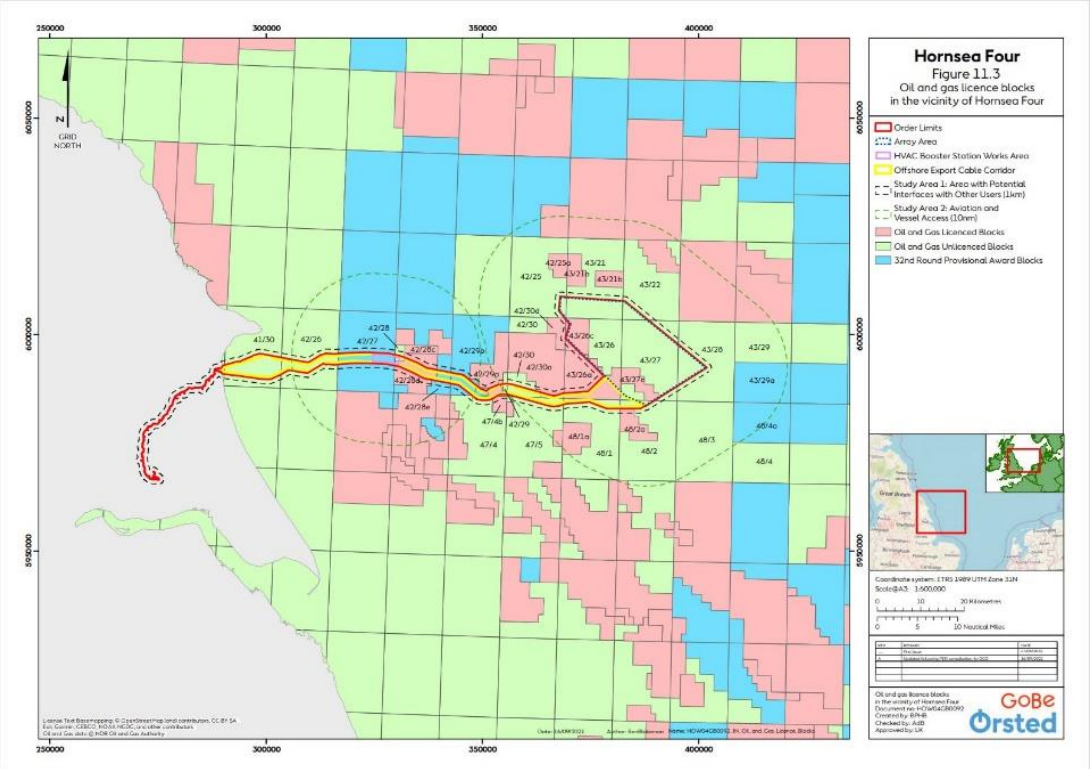
The Applicant's case

11.5.11. Infrastructure and other users were considered in Chapter 11 of the ES [APP-023]. A detailed oil and gas assessment with supporting appendices [REP3-005] was also provided.

11.5.12. The Applicant acknowledged that the construction, operation and maintenance and decommissioning of the Proposed Development would have the potential to result in direct and indirect impacts on infrastructure and other users [APP-023, paragraph 11.11.1.1].

11.5.13. The Applicant noted [APP-023, Section 11.7.1] that the Proposed Development would be located in an area that includes current and potential future activity by the oil and gas industry. It noted that there were currently four licensed and seven unlicensed oil and gas licence blocks that would coincide with the proposed array area [APP-023, Figure 11.3]. A further nine licensed and unlicensed blocks would coincide with the proposed route of the ECC. Whilst there would be no oil and gas platforms located within the proposed array, two platforms (the Ravenspurn North Central Complex) would be located approximately 3km from the western boundary of the proposed array.

Figure 11.1 Oil and gas licence blocks in the vicinity of the Proposed Development



11.5.14. In addition to a number of wells and surface platforms [APP-023, Figure 11.5], there were two active subsea structures associated with the extraction of oil that would be located within the proposed array area [APP-023, paragraph 11.7.1.23]. There would be no active subsea structures within the proposed route of the offshore ECC. Eighteen existing or planned oil and gas associated pipelines were noted that would be located within the Order limits [APP-023, Table 11.11 and Figure 11.7].

11.5.15. Existing and proposed subsea cables (electricity interconnectors and telecommunication cables) were shown on Figure 11.8 of Chapter 11 of the ES [APP-023]. Two offshore wind farm export cables (Dogger Bank A and B) would overlap with the proposed route of the offshore ECC. The Viking Link interconnector cable, currently under construction, would be located in a gap between the Proposed Development and Hornsea Project Two Offshore Wind Farm array area. Two further planned interconnector cables (Eastern Green Link 2 Interconnector and the Continental Link Multi-Purpose Interconnector) would be located near the array area for the Proposed Development.

Figure 11.2 Oil and gas platforms located in the vicinity of the Proposed Development

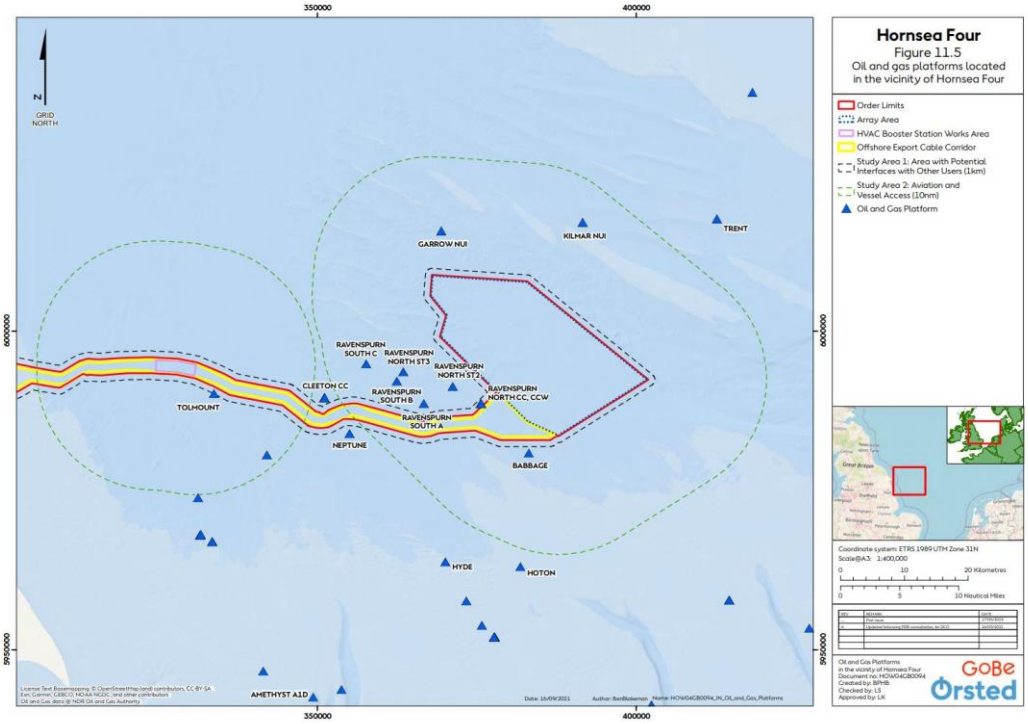
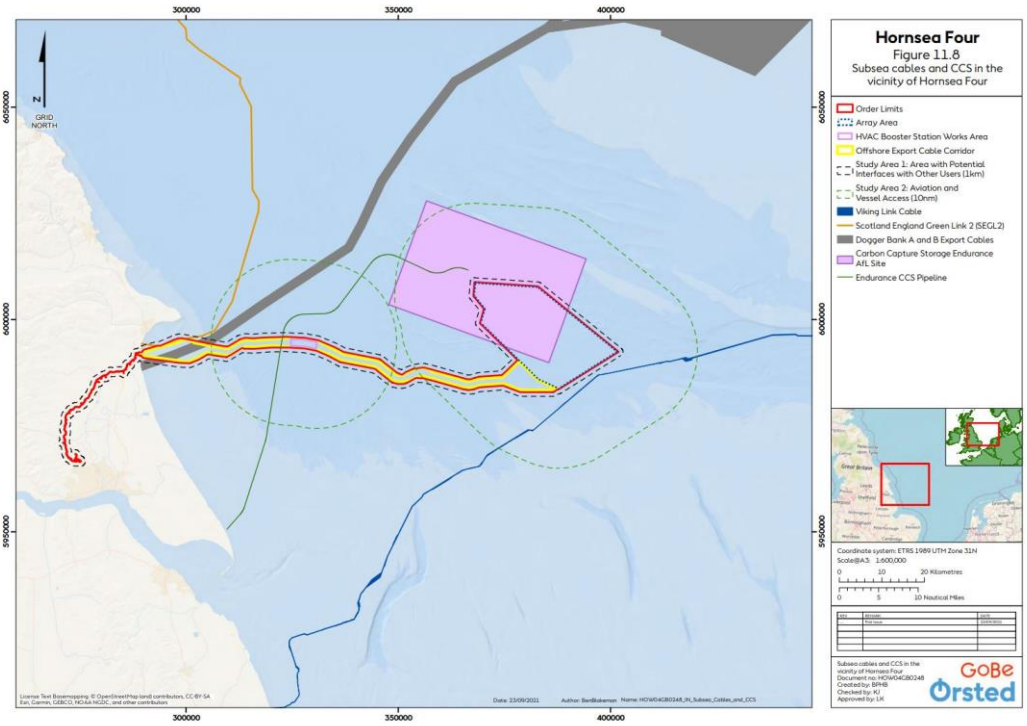


Figure 11.3 Subsea cables and CCS in the vicinity of the Proposed Development



11.5.16. The Applicant advised [APP-023, paragraph 11.7.1.51] that where the export cable would need to cross an active cable it intended to enter into a commercial crossing agreement with the relevant cable operator.

11.5.17. In order to eliminate or reduce the Likely Significant Effects (LSE), the Applicant adopted a number of commitments [APP-023, Table 11.13]. These commitments were a mix of standard offshore practices and specific risk reduction measures that would reduce interface risks between oil and gas operators, the operators of other relevant infrastructure assets and the Proposed Development.

11.5.18. The assessment undertaken by the Applicant was based on a Maximum Design Scenario (MDS) [APP-023, Section 11.9]. Should the Proposed Development be constructed using different parameters within the design envelope, then the Applicant advocates that the impacts would not be any greater than those set out in the ES using the MDS [APP-023, Table 11.14].

11.5.19. The ES assessed the effects on infrastructure and other users in terms of construction, operation and maintenance and decommissioning. The oil and gas assessments were considered from a safety perspective and the conclusions therefore reflected whether the Proposed Development had any implications for the safety of each stakeholder's assets and associated activities. Issues of a commercial nature were not considered in the ES [APP-023, paragraph 11.15.1.2]. The ES did not assess the potential impacts on existing and proposed cables and pipelines as the Scoping Opinion provided by the SoS agreed that this could be scoped out of the ES [APP-235].

Construction

Existing oil and gas infrastructure

11.5.20. The Applicant acknowledged that the presence of partially constructed infrastructure, safety zones and advisory safety distances during construction might, by affecting the safe operation of divers, result in a temporary impact on access to existing oil and gas pipelines and wells for repair and maintenance within the vicinity of the Proposed Development [APP-023, paragraph 11.11.42]. However, the likelihood of this happening was considered by the Applicant to be extremely low and with the embedded mitigation measures such as informing operators of installation activities any risk would be substantially reduced [APP-023, paragraph 11.11.4.4]. The Applicant concluded that the effect would therefore not be significant [APP-023, Table 11.18].

11.5.21. The Applicant identified that piling or drilling of WTG, HVAC booster station and platform foundations could create vibrations that would have the potential to cause damage to existing oil and gas pipelines and wells and affect diving operations [APP-023, paragraph 11.11.4.8]. However, as piling activities would be temporary and intermittent, the Applicant considered that the impact would be negligible [APP-023, paragraphs 11.11.4.10 and 11.11.4.11]. In relation to oil and gas wellheads and manifolds, the Applicant identified that there could be a risk from ground shaking pressure waves. However, given the distances involved, the Applicant expected that such pressure waves would dissipate and only result in minimal impact [APP-086, Section 17.7.2]. In terms of acoustic vibrations, as these could affect divers, the Applicant advocated that

diving should be avoided during such operations [APP-023, paragraph 11.11.4.13]. As a result, the Applicant concluded [APP-023, Table 11.20] that the effect from piling and drilling would not be significant in EIA terms.

11.5.22. The Applicant also recognised that anchors being dropped or anchor snagging from vessels used to construct the Proposed Development could cause damage to existing pipelines and wells [APP-023, paragraph 11.11.4.16]. However, the Applicant considered [APP-023, paragraph 11.11.4.18] that this hazard would not be likely to occur as vessels would be aware of these assets, which would in any event be protected by a 500m radius safety zone. As a result, the Applicant concluded that the likelihood of incidents leading to snagging, hooking or dropping would be negligible [APP-086] and the effect would not be significant in EIA terms [APP-023, Table 11.21].

Future development by oil and gas operators

11.5.23. Noise generated during piling was acknowledged as having the potential to exclude or otherwise interfere with seismic surveys (particularly surveys conducted by conventional towed streamer seismic survey vessels) [APP-023, paragraph 11.11.6.2]. Furthermore, the application of safety zones during construction work would restrict the area available for seismic survey activity [APP-023, paragraph 11.11.6.3]. To address this, the Applicant proposed [APP-023, paragraph 11.11.6.9] the development of a co-existence plan and the potential use of alternative survey methods such as 'ocean bottom nodes' and the use of fixed vertical cables [APP-023, paragraph 11.11.6.4]. The Applicant concluded [APP-023, Table 11.25] that as a result the effect would not be significant in EIA terms.

11.5.24. The Applicant acknowledged that, during the construction phase, the presence of infrastructure related to the Proposed Development would have the potential to restrict drilling and the placement of infrastructure associated with oil and gas field development [APP-023, paragraph 11.11.6.11]. To address this, the Applicant proposed the development of a co-existence plan at the relevant time. As a result, the Applicant concluded [APP-023, Table 11.26] that the effect would not be significant in EIA terms.

Operation and maintenance

Existing oil and gas infrastructure

11.5.25. The Applicant acknowledged that safety zones and advisory safety distances during operation and maintenance of the Proposed Development could result in a temporary impact on access to existing oil and gas pipelines and wells in the vicinity of the Proposed Development. This would have the potential to affect the timing of diving operations in relation to the maintenance and repair of oil and gas infrastructure [APP-023, paragraph 11.11.8.2].

11.5.26. The Applicant considered that the temporary impact on access to pipelines and wells associated with any temporary safety zones or advisory safety distances would be infrequent and limited in extent [APP-023, paragraph 11.11.8.4]. Furthermore, pipelines located in close proximity to the Proposed Development would be covered by a crossing or proximity agreement, which would be entered into at the relevant point with the relevant operator. Thus, there would be no impediment to asset maintenance operations.

11.5.27. Moreover [APP-023, paragraph 11.11.8.5], the Applicant anticipated that during the operation of the Proposed Development, the Johnston wells and associated pipelines would be abandoned or decommissioned. Furthermore, it described the majority of remaining wells located within the proposed array area as abandoned, and therefore requiring no repair or maintenance. As with the construction phase, the Applicant proposed continued consultation with the respective asset owners to agree an approach for temporarily or spatially deconflicting repair and maintenance activities [APP-023, paragraph 11.11.8.6]. The Applicant concluded that, as a result, the effect on operation and maintenance activities for existing oil and gas operators would not be significant [APP-023, Table 11.28].

11.5.28. As for construction, the Applicant recognised the potential for damage to pipelines and wells from anchor snagging and dropping from vessels associated with the Proposed Development. Locations of these assets would be shown on charts and would be protected by a 500m radius safety zone. Moreover, any anchor spreads would be controlled by simultaneous operations review and notified through the promulgation of notices to mariners (NtMs) [APP-023, paragraph 11.11.8.10]. As a result, the Applicant considered that the likelihood of incidents leading to anchor snagging, hooking or dropping would be negligible [APP-023, paragraph 11.11.8.10] and consequently the effect would therefore not be significant in EIA terms [APP-023, Table 11.28].

Future development by oil and gas operators

11.5.29. Oil and gas operators may have a requirement for seismic survey activities around the Proposed Development's array area. The Applicant accepted [APP-023, paragraph 11.11.11.2] that infrastructure and the presence of safety zones associated with maintenance could restrict or exclude access for conventional towed streamer seismic survey vessels. However, it proposed to develop a co-existence plan at the relevant time detailing how seismic survey activity would be implemented without undue interface risk [APP-023, paragraph 11.11.11.6]. Consequently, the Applicant concluded that the effect would not be significant in EIA terms [APP-023, Table 11.36].

11.5.30. The Applicant acknowledged [APP-023, paragraph 11.11.11.11] that exploration and appraisal drilling may be planned in the future within and around the proposed array area and the proposed offshore ECC. At the time of any exploration, the Applicant advised that it intended to develop a co-existence plan. If drilling was to occur, then the Applicant considered that it would be planned and undertaken in line with the

relevant regulatory requirements, good engineering practice and the safe operability regime existing on the UK continental shelf. The Applicant concluded [APP-023, Table 11.37] that, as a result, the effect would not be significant in EIA terms.

Decommissioning

Existing oil and gas infrastructure

11.5.31. The Applicant identified similar impacts for decommissioning as those for construction, albeit that it did highlight that, given the indicative 35-year operational life of the Proposed Development, many of the existing oil and gas pipelines and wells could potentially have been decommissioned in the intervening period [APP-023, paragraphs 11.11.14.6 and 11.11.14.7]. Information on decommissioning activities would be provided through promulgation of NtM and continued consultation with relevant operators to co-ordinate activities [APP-023, paragraph 11.11.14.8]. Consequently, the Applicant assessed the impacts as broadly acceptable and concluded that the impact would not be significant in EIA terms [APP-023, Table 11.39].

11.5.32. Decommissioning activities would be based on reverse installation and therefore would use similar vessels to those used for construction. As a result, the Applicant [APP-023, paragraph 11.11.14.12] considered that, for the same reasons as for construction, the likelihood of incidents leading to snagging, hooking, or dropping of anchors would be negligible and the effect would not be significant [APP-023, paragraph 11.11.14.15].

Future development by oil and gas operators

11.5.33. The Applicant identified that activities associated with decommissioning had the potential to exclude or otherwise interfere with seismic surveys [APP-023, paragraph 11.11.16.2] and restrict drilling and the placement of infrastructure associated with gas field development [APP-023, paragraph 11.11.16.8]. As for operation and maintenance, the Applicant intended to mitigate any impact through developing a co-existence plan along with decommissioning information provided through the NtM [APP-023, paragraphs 11.11.16.4 to 11.11.16.6 and 11.11.16.10 to 11.11.16.11]. As a result, it concluded the effect would not be significant in EIA terms [APP-023, Table 11.44 and 11.45].

Cumulative effects

11.5.34. The Applicant considered that only three projects, Hornsea Project One, Hornsea Project Two and the proposed Endurance Project, had the potential to act in a cumulative manner with the Proposed Development on oil and gas receptors [APP-023, paragraph 11.12.1.14].

11.5.35. The Applicant identified that planned developments associated with the Endurance Store might result in conflicts with the repair and maintenance of existing oil and gas pipelines and wells within the proposed array area. However, due to the anticipated decommissioning

of the Johnston Field assets, the Applicant concluded that the effect would not be significant in EIA terms [APP-023, paragraph 11.12.3.3].

Planning issues

11.5.36. Representations from several IPs were received relating to infrastructure and other users. The oil and gas operators raised the following concerns:

- how the Proposed Development would affect future development by an oil and gas operator [RR-002];
- how the Proposed Development would affect oil and gas operators' obligation to maximise economic recovery from strata beneath UK waters [RR-004] and [RR-014];
- potential for the Proposed Development to preclude future re-use of oil and gas infrastructure for CCS [RR-004]; and
- concern about the ability to decommission wells and production facilities at the same time as the Proposed Development was being constructed [RR-014].

11.5.37. Owners of sub-sea cables raised the following concerns;

- potential damage to the Viking Link interconnector by anchor strike [RR-012]; and
- need for co-ordination between transmission networks [RR-027].

Oil and gas operators

11.5.38. Concerns were raised by: Bridge Petroleum 2 Ltd (Kumatage Field) [RR-002] and [REP5a-026]; NEO Energy (SNS) Ltd (Babbage Field) [RR-004], [REP2-065], [REP4-060], [REP6-061] and [REP7-106]; Harbour Energy (Johnston Field) [RR-014], [REP1-077], [REP2-080], [REP5-101], [REP6-048], [REP7-100], REP8-026] and [AS-049]; and Perenco UK Ltd (Ravenspurn North CC Platform) [RR-031], [REP4-062], [REP5-118] and [REP6-065], in connection with:

- future development including potential reuse for CCS;
- maximising economic recovery; and
- decommissioning.

11.5.39. All these concerns relate to how the operators would access their fields by helicopter and ship to undertake these activities. These matters are considered in detail in Sections 11.2 and 11.6 of this Chapter and are not repeated here.

Subsea cables

11.5.40. The Viking Link is a 1400MW electricity interconnector between Great Britain (GB) and Denmark. It is currently under construction. The route of the link would coincide with a proposed navigable gap between the Proposed Development and the Hornsea Project Two wind farm. That gap would be approximately 2nm wide at its narrowest point to enable a clear navigable route between the wind farms for marine traffic. National Grid Viking Link (NGVL) was concerned [RR-012] and [REP2-098] that, due to the location of the cable in the gap used by marine traffic, it would be

subject to a higher risk of anchor strike and vessel sinking, amongst other matters. To address this concern, NGVL suggested deeper cable burial or rock placement over the cable.

11.5.41. At D1 [REP1-038, 2.12], the Applicant advised that it was aware of the concerns, was in continuing constructive commercial negotiations and was confident that agreement could be reached.

11.5.42. NGVL advised at D2 [REP2-099] and D3 [REP3-057] and [REP3-058] that discussions were ongoing and that it was in the process of preparing a joint position statement with the Applicant.

11.5.43. At D3 [REP3-039, Section 2.2.2], the Applicant advised that the NRA that formed part of its ES [APP-081 to APP-083] did not indicate potential for significant increases in anchor strike or vessel foundering (sinking) following an anchor strike. In relation to the request for rock placement over the cable, the Applicant [REP3-039, paragraph 2.2.3.2] advised that it had requested more information to assess the need for rock protection.

11.5.44. At D5 [REP5-125] and [REP5a-022] a joint statement was submitted that advised the ExA that NGVL and the Applicant continued to engage positively and share information in order to agree a commercial position as soon as practicable.

11.5.45. At D5a, whilst acknowledging that due to the predicted increase in vessel numbers using the gap as a result of route deviations there could be an increase in the risk of emergency anchoring and vessel foundering. The Applicant noted that the increase in vessel traffic predicted in the NRA, and agreed with stakeholders, was not considered a significant increase, and would not directly correlate to an increase in emergency anchoring incidents. As such, the Applicant was confident that additional cable burial depth or protection would not be warranted. Subsequently, on 18 July 2022 [AS-047], NGVL withdrew its objection to the application.

11.5.46. National Grid Interconnector Holdings Ltd (NGIHL) [RR-027] is the promoter of a 1.8GW interconnector, currently known as the Continental Link Multi-Purpose Interconnector, which would connect the UK to other European markets. The project is in the pre-application stage. Mindful of the direction of policy and the Government's and sector's ambition for co-ordinated transmission systems, NGIHL advised it was working with the Applicant on co-ordination of the respective transmission infrastructure (eg use of nearshore cable routes, landfall etc).

11.5.47. At D1 [REP1-040], a signed position statement was submitted into the Examination repeating what NGIHL had set out in its RR. It also highlighted that the Applicant considered, given the ongoing regulatory uncertainties associated with coordinated transmission, it was vital that it continued with its own transmission option for the Proposed Development to ensure that the project could contribute to the urgent need for renewable energy capacity within the 2020s.

11.5.48. The offshore ECC for the Proposed Development would need to cross the offshore ECC for Dogger Bank A (DB-A) and B (DB-B) Offshore Wind

Farms. DB-A and DB-B provided comments [REP5-093] on the proposed protective provisions in Schedule 9, Part 7 and Schedule 13 of the draft DCO [REP4-050]. At D7 [REP7-109] CMS Cameron McKenna Nabarro Olswang LLP confirmed that it was satisfied with the wording of the protective provisions and Schedule 13 which would modify the Dogger Bank Creyke Beck Offshore Wind Farm Order 2015 contained within the final draft DCO [REP7-039].

ExA response

Oil and gas operators

11.5.49. Based on the evidence and reasoning provided in the ES, the ExA is satisfied that any potential impacts from construction activities such as piling and drilling would be very limited and considers that the proposed mitigation measures such as keeping operators informed of installation activities, use of safety zones, etc would reduce these risks to as low as reasonably practicable. A similar approach is proposed for operation and maintenance activities and again the ExA is satisfied that the proposed measures would minimise negative impacts between the Proposed Development and oil and gas operations.

11.5.50. In relation to the potential for anchor snagging, the ExA agrees with the Applicant's conclusion that, due to the use of safety zones, the fact that assets would be shown on charts and the use of NtMs, the likelihood of incidents leading to snagging, hooking or dropping would be negligible.

11.5.51. With regard to future development by oil and gas operators, the ExA is satisfied that the Applicant's proposal to manage this through the development of a co-existence plan at the relevant time would minimise conflicts between the Proposed Development and oil and gas operators.

11.5.52. Finally, the ExA notes that the final draft DCO [REP7-039] includes protective provisions for the benefit of a number of oil and gas operators.

11.5.53. As a result, the ExA considers that, with the exception of how licence holders and operators of oil and gas fields would access their fields by helicopter and ship, which is considered in the aviation and radar and shipping and navigation Sections of this Report, the mitigation measures and protective provisions proposed by the Applicant and secured by the draft DCO [REP7-039] would enable the co-existence of the Proposed Development and oil and gas operators.

Subsea cables

11.5.54. Based on the evidence and reasoning provided, the ExA is satisfied that crossing and proximity agreements have either been entered into or would be entered into closer to the time of construction [AS-051]. As a result, the ExA is satisfied that matters in relation to the potential effect of the Proposed Development on subsea cables has been resolved to the extent that it needs to be for the purposes of the Examination. Therefore, it has no reason to believe that there would be significant adverse effects on subsea cables as a result of the Proposed Development.

11.5.55. The ExA notes the ambition to minimise transmission infrastructure by encouraging operators to coordinate. However, given the timescales involved and the urgent need for renewable energy capacity, the ExA is satisfied that, at this point in time, the Proposed Development would need its own transmission network in order to ensure timely delivery of electricity to the network.

Conclusion on other offshore infrastructure

11.5.56. Based on the findings set out above, the ExA considers that policy requirements with regard to other offshore infrastructure within NPS EN-3, the MPS and the relevant policies of the EIEOMP have been met.

11.5.57. The ExA is satisfied that mitigation measures have been identified to negate or reduce effects on oil and gas exploration, production and general safe operations to the level where there would be no significant adverse effects and, as such, either alone or cumulatively this would not weigh against the case for the Proposed Development.

11.5.58. For the reasons outlined above, the ExA considers that there would be no significant adverse effects on existing or proposed subsea cables and this would not weigh against the case for the Proposed Development in relation to other offshore infrastructure matters.

11.6. SHIPPING AND MARINE NAVIGATION

Policy considerations

National policy

11.6.1. NPS EN-3 Section 2.6 requires an applicant to engage with maritime stakeholders and to undertake a NRA in consultation with them, (NPS EN-3, paragraphs 2.6.153 to 2.6.160), and that, in reaching a decision on an application for development consent, the SoS should:

- be satisfied that site selection has been made with a view to minimising disruption to navigation and shipping (NPS EN-3, paragraph 2.6.162);
- be satisfied that the applicant has minimised any negative impacts to shipping routes to 'As Low As Reasonably Practicable' (ALARP) (NPS EN-3, paragraph 2.6.163);
- be satisfied that the 'scheme' is designed to minimise effects on recreational craft (NPS EN-3, paragraph 2.6.166); and
- have regard to any danger to navigation which is likely to be caused by the 'scheme' and any cumulative effects with other developments (NPS EN-3, paragraphs 2.6.168 and 2.6.169).

11.6.2. The MCAA Part 4, s69, sub-section (1)(c) provides for marine licence decisions to, *"have regard to the need to prevent interference with legitimate uses of the sea".*

11.6.3. The MPS expressly promotes co-existence of marine activities wherever possible. It notes that decision makers should consider any negative impacts on shipping activity, freedom of navigation and navigational

safety as well as taking account of environmental, social and economic effects and compliance with international maritime law.

11.6.4. EIEOMP policies relevant to the issues covered in this Section include:

- PS2, which constrains impacts of static surface infrastructure on important navigation routes including cumulatively with other existing and proposed activities; and
- PS3, which constrains interference of proposals with current and future operations of ports and harbours.

11.6.5. Although the proposed landfall would be approximately 15km south of the North East Inshore Marine Plan Area, the North East Marine Plan is a relevant consideration in relation to Shipping and Navigation considerations for the Proposed Development. NE-PS-1 requires proposals to demonstrate compatibility with current port and harbour activities.

Other relevant legislation and guidance

11.6.6. International maritime safety is governed by the IMO SOLAS Convention Chapter V (Safety of Navigation) 1974 (as amended), which is given effect in UK law by The Merchant Shipping (Safety of Navigation) Regulations 2020.

11.6.7. Regulation 3A of the Infrastructure Planning (Decisions) Regulations 2010 makes special reference to the requirement for infrastructure developers to prevent interference with legitimate uses of the sea and to limit the increase of navigation risk to ALARP.

11.6.8. MGN 654 (M+F) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response, issued in April 2021 by the MCA, is relevant and important to the decision-making process for the Proposed Development. Whilst not mandatory, failure to accept the MGN 654 guidance may result in an adverse recommendation from the MCA to the MMO regarding the consenting and marine licensing process. MGN 654 provides important guidance to developers and operators including:

- recommended safety and mitigation measures for OREIs during construction, operation and decommissioning;
- layout of structures in relation to shipping and navigation;
- separation distances from shipping routes;
- navigation, collision avoidance and communications with mariners; and
- search and rescue and emergency response.

The Applicant's case

11.6.9. Potential impacts on Navigation and Shipping were assessed in ES Volume A2 Chapter 7 [APP-019], supported by a number of Annexes, namely Volume A4 Annex 4.9 Safety Justification for Single Line of Orientation [APP-047], and Volume A5 Annex 7.1 Navigational Risk Assessment Parts 1, 2 and 3 [APP-081 to APP-083].

11.6.10. Site selection and the evolution of the proposed Order limits in relation to existing navigation and shipping routes were addressed in ES Chapter 7 [APP-019, paragraph 7.1.1.3], with greater detail in Volume A1, Chapter 3: Site Selection and Consideration of Alternatives [APP-009] and Volume A4, Annex 3.2: Selection and Refinement of Offshore Infrastructure [APP-037].

11.6.11. Consultation with stakeholders was summarised in ES Chapter 7 Table 7.4 [APP-019].

11.6.12. Recognised sea lanes essential to international navigation were addressed in section 7.7.2 of the ES, where it was confirmed that the Proposed Development would not be located 'within or in proximity to' an IMO designated route [APP-019, Table 7.3].

11.6.13. Potential effects on UK ports were considered by the Applicant pre-application, and consultation was undertaken with the UK Major Ports Group (UKMPG). The Applicant's EIA concluded that, because of its distance offshore, there would not be any direct impact of the Proposed Development on ports. The Applicant also engaged directly with potentially affected regular operators of shipping services in the study area and as a result, the future baseline 'traffic associated with ports' was increased by 10% in the Applicant's EIA [APP-019, paragraph 7.7.4.4].

11.6.14. Potential effects on recreational craft were covered in sections 7.7, 7.11 and 7.12 of the ES [APP-019]. No LSEs from the Proposed Development were foreseen for this receptor, allowing for a prudential 10% increase in volume of recreational use of the relevant sea space over the lifetime of the Proposed Development [APP-019, paragraph 7.7.4.6].

11.6.15. The pre-application evolution of the proposed Order limits included the introduction of a navigable gap for commercial shipping between the Proposed Development and the Hornsea Project Two array. The NRA submitted with the application was based on the configuration of that gap as developed and agreed in consultation with the MCA, TH, the UK Chamber of Shipping (UKCoS) and operational shipping stakeholders [APP-019, Table 7.4 and paragraphs 7.7.4.8, 7.11.1.6 and 7.11.1.7].

11.6.16. The NRA had been carried out in accordance with the methodology prescribed by the MCA in MGN 654. This requires the Applicant to demonstrate assessed risks to be, *"broadly acceptable or tolerable"*, or that sufficient controls (in other words mitigation commitments) would be in place for residual risks to be ALARP after mitigation. That assessment is correlated to a rating of 'slight' significance of effect, which the Applicant considered not significant in EIA terms.

11.6.17. The following commitments to mitigate potential effects on navigation and shipping were detailed in ES Volume A2 Chapter 7, Shipping and Navigation [APP-019, Table 7.10, updated as REP5-006]:

- promulgation of information to mariners and marine traffic coordination (Commitment 89, Commitment 94 both of which would

be secured by the DCO under Schedules 11 and 12, Part 2, Condition 7);

- deployment of aids to navigation in accordance with the latest relevant available standard industry guidance and as advised by TH, MCA, the CAA and the MoD as appropriate (Commitment 93, which would be secured by the DCO under Schedules 11 and 12, Part 2, Conditions 8 and 13(1)(j));
- principles for spacing and alignment of WTGs as agreed with the MMO, including design rules agreed in consultation with the MCA and TH as a framework for post-consent layout approval, including lines of orientation and Search-and-Rescue (SAR) access lanes (Commitment 96, which would be secured by the DCO under Schedules 11 and 12, Part 2, Conditions 13(1)(a));
- compliance with MGN 654 (including Navigational Risk Assessment in consultation with the MCA) (Commitment 99, which would be secured by the DCO under Schedules 11 and 12, Part 2, Conditions 15);
- safety zones around structures during construction including maintenance and use of guard vessels according to risk assessment (Commitment 139, application for safety zones to be made post-consent under The Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007 (SI No 2007/1948));
- all vessels associated with the Proposed Development required to comply with MGN 372 (Merchant and Fishing) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA 2008) or the latest relevant available guidance where appropriate (Commitment 177, which would be secured by the DCO under Schedules 11 and 12, Part 2, Condition 15);
- cable burial and protection including consideration of under-keel clearance (Commitment 83 and Commitment 176 both of which would be secured by the DCO under Schedules 11 and 12, Part 2, Condition 13(1)(h)); and
- coordination with the Marine Helicopter Coordination Centre (Commitment 179, which would be secured by the DCO under Schedules 11 and 12, Part 2, Condition 13(1)(c)(x)).

11.6.18. The Applicant assessed that five of the 14 main shipping routes in the study area, including DFDS Seaways' scheduled passenger ferry routes, would need to deviate around the proposed array area. The extent of deviation would vary between 0.4nm for Route 8 (Tees to Rotterdam, cargo and tankers) and 5.5nm for Route 6 (Grangemouth to Rotterdam, cargo and tankers). The latter would represent an increase of total route length of 1.5% [APP-019, Table 7.15]. Potential effects arising from increased risk of encounters between vessels as a result of deviation and changes to adverse weather routing were concluded by the Applicant to be broadly acceptable and therefore of 'slight adverse' significance which it considered 'not significant in EIA terms' [APP-019, Section 7.11.1].

11.6.19. The Applicant's NRA concluded that for the construction and operational phases for the Proposed Development alone, increased vessel to vessel collision risk (due to increased encounters as a consequence of vessel

deviations), allision risk, and restricted emergency response capability would result in a residual effect after mitigation of 'slight' significance 'which is not significant in EIA terms' [APP-019, section 7.15].

11.6.20. The Applicant recognised the possibility of an increase in vessel-to-vessel collision risk associated with additional deviation of main routes in combination with Tier 1 developments during the construction phase. However, due to short duration of effect, the cumulative effect of any such increase in risk was assessed as 'broadly acceptable' translating to, "*slight significance, which is not significant in EIA terms*". Therefore, including the Tier 3 assessment based on the limited amount of information available for the Endurance project, cumulative effects were assessed as no higher than for the Proposed Development alone [APP-019, sections 7.12.2, 7.12.3 and 7.12.4]. This was on the basis that low levels of traffic were anticipated to deviate to the north of the Proposed Development, with ample available sea room, so that no significant increase in collision risk would result [APP-019, sections 7.12.2, 7.12.3, and 7.12.4].

11.6.21. An updated CEA, to take account of information that had been made available for the Dogger Bank South Offshore Wind Farm project and the EGL2 submarine cable project, concluded that the change of category of these projects would not change the assessment submitted with the application in relation to navigation and radar, *"as EGL2 is not in close proximity to Hornsea Four surface infrastructure resulting in limited vessel deviations"* [REP7-086].

11.6.22. Regarding navigational risk in relation to other infrastructure and users, risk of vessel to structure allision for 'passing vessel traffic' due to cumulative effects, together with other developments of re-routing and deviation around the Proposed Development, was also assessed by the Applicant as 'broadly acceptable'. It was noted by the Applicant that this assessment applied specifically to navigational risk to vessels [APP-019, paragraphs 7.12.3.18 to 7.12.3.32]. Cumulative effects on other infrastructure were assessed separately in ES Chapter 11, Infrastructure and Other Users [APP-023], in which the Applicant assessed that, although deviations of main shipping routes would mean that vessels would pass closer to some other infrastructure than under present routeing, the minimum distance between a shipping route and a platform would always be greater than a typical safe distance of 1nm for large vessels.

11.6.23. Furthermore, taking account of risk mitigation (including commitment 89 and cooperation agreements with oil and gas operators that would be put in place) the resulting increased risk of allision with structures was assessed as 'broadly acceptable' and not significant in EIA terms [APP-023, section 11.12.4, APP-086 and APP-087].

11.6.24. Transboundary effects would be experienced by international shipping between UK ports and European Economic Area ports due to the Proposed Development causing cumulative deviation of main routes of up to 6.7nm and therefore increased passage time and fuel use. However,

the conclusion of the transboundary effects assessment was that the effect would be 'slight and therefore not significant in EIA terms' [APP-019, paragraphs 7.13.1.1 to 7.13.1.10].

11.6.25. The Applicant concluded that there would be no inter-related effects that would combine to create a more significant effect than those assessed in isolation [APP-019, section 7.14].

Planning issues

Compliance with relevant marine plan policies

11.6.26. In response to the MMO's request [RR-020] that the Applicant demonstrate consideration of whether the Proposed Development would adhere to the relevant marine plans and policies for the area, the Applicant reported relevant policies and compliance [REP1-062]. The MMO subsequently confirmed that the proposed Order limits would lie entirely within the EIEOMP area and that the Applicant's demonstration of compliance with policies in relation to shipping and navigation was satisfactory [REP5-107].

Marine navigation effects in relation to other infrastructure

11.6.27. NEO submitted that there, *"could be significant shipping and navigation impacts"*, and it proposed protective provisions in the DCO to safeguard its position [REP7-106, paragraph 2.10 and paragraphs 6 to 9]. The Applicant responded that NEO, *"have failed to provide evidence to counter the conclusions of the Allision Technical Report [APP-087] which is based on the Navigational Risk Assessment (NRA)"* and maintained that the effect of shipping route deviations as a result of the Proposed Development (assessed as only one additional vessel per day passing within 2nm of the Babbage Platform), *"does not equate to a need for any live monitoring equipment or aids to navigation if these were not required previously"* [REP8-014].

Consultation with shipping stakeholders

11.6.28. The UKCoS was satisfied that adequate efforts to consult with shipping operators had been made by the Applicant [REP2-096]. The MCA also confirmed its satisfaction that suitable consultation had taken place with 'key and appropriate stakeholders' [REP2-079].

Navigable gap between the Proposed Development and Hornsea Project Two

11.6.29. The ExA sought confirmation through ExQ1 that IPs were satisfied with the assessment of navigational risk in relation to the navigable gap between the Proposed Development and the Hornsea Project Two array, which had been negotiated with stakeholders including regular shipping service operators, the UKCoS and Associated British Ports (ABP) [PD-006, NAR.1.6, NAR.1.7]. The gap is described in Section 10.5 of this Report. The MCA, TH and UKCoS responded that they were satisfied subject to clarification regarding positioning of WTGs and obstruction of the gap by construction or maintenance plant [REP2-078], [REP2-094]

and [REP2-096]. The Applicant clarified at ISH1 that the minimum gap dimension of 2.2nm on which the safety case was made would be the distance between centres of WTG structures [REP3-043]. Further clarification was sought at ISH3 in relation to concerns expressed by NGVL about risk assessment in relation to navigation and construction and maintenance activities within the gap and the consequential risk to the Viking Link cable passing along that space [EV-011]. It was confirmed by the Applicant that, under the restrictions that would be imposed on construction and maintenance activities, vessels would only be present in the gap if manoeuvring to another location, and when anchored or jacked up would not encroach on the gap [REP4-037].

11.6.30. Immediately prior to ISH9, NGVL's solicitors submitted an email confirming that agreement had been reached with the Applicant regarding risk assessment concerning their cable located in the navigable gap, and that NGVL concerns with regard to this issue were withdrawn [AS-047].

11.6.31. The MCA confirmed satisfaction with the configuration of the gap and the safety case made by the Applicant, *"subject to a post-consent hydrographic survey to update hydrographic data and navigational charting information…",* and confirmed that it would give consideration to proposing an IMO recommended route between the Proposed Development and the Hornsea Project Two array, *"to show the expectations for complying with the International Regulations for Preventing Collisions at Sea (COLREG) when vessels transit through the gap*" [REP2-079, paragraph 1].

Layout principles

11.6.32. The ExA sought clarification from the Applicant on spacing of structures under the MDS for the Proposed Development, in relation to offshore platforms and WTGs. The Applicant explained that two layout scenarios were used for assessing different risks: 1,100m spacing of WTGs to generate the maximum scenario plan area to assess effects of deviation and consequentially increased vessel encounters; and 810m spacing to assess allision risk for vessels navigating within the array and emergency response effects [REP2-038].

11.6.33. The updated SoCG with the MCA at D3 [REP3-021] noted that the MCA was satisfied with the commitment in relation to a minimum width of 500m for SAR lanes required by Layout Principle 3 [APP-045, revised as REP5-008] and the Applicant's Safety Justification for Single Line of Orientation Layout [APP-047, page 16]. In response to the MCA's requests, amendments regarding SAR were made by the Applicant to the ES chapter on Shipping and Navigation [REP5-007] and to the NRA in three parts, to adopt the MCA preferred risk log format [REP4-009, REP4-011 and REP4-013].

11.6.34. In response to a ExQ2 regarding the Layout Principles [PD-012, NAR.2.1], the MCA requested that bridge-linked platforms should comply with all layout principles [REP5-108]. The layout principles were clarified accordingly by the Applicant [REP5-008]. In response to an ExA

clarification question at ISH9, the Applicant confirmed that only one such linked pair of platform structures was anticipated [EV-033] and [REP6-036]. The Project Description [REP6-002] and draft DCO [REP7-039, Schedules 11 and 12] were subsequently amended by the Applicant. The MCA confirmed satisfaction with these revisions [REP6-051].

Definition of clearance dimension under WTG blade tips

11.6.35. The controlling dimension for clearance between sea level and lowest point of WTG blade tips proposed by the Applicant in the draft DCO was related to Lowest Astronomical Tide (LAT). Several IPs were concerned that this was unusual and that it would normally be related to Highest Astronomical Tide (HAT). Following written questions and examination at ISH3, the Applicant committed to amend the draft DCO and draft DMLs at D4 to incorporate a definition and conversion dimension to correlate LAT and HAT [EV-011a] and [REP4-037]. This amendment was made by the Applicant. The MCA confirmed its satisfaction with this matter [REP5-108] and NE did likewise [REP5-111, NAR.2.2].

Potential location of an artificial nesting structure in relation to navigational risk

11.6.36. The MCA sought clarification of Schedule 16 in the draft DCO regarding the potential location of a nesting structure in relation to navigational risk assessment. This was followed up by the ExA at ISH7 [EV-031]. The Applicant clarified at ISH7 that, if such a nesting structure was developed, it would be subject to a separate, future consenting process. The Applicant was confident that navigation risk controls could be agreed with the MCA [REP6-034]. Agreement was documented in the MCA's final SoCG with the Applicant [REP6-017].

Statement of Common Ground

11.6.37. At the end of the Examination, signed SoCGs with the UKCoS, the MCA and TH were submitted. All matters in relation to shipping and navigation were marked as agreed with the MCA and TH. Conclusions were agreed that project-alone and cumulative impacts, including main route deviations, would be unlikely to be significant in EIA terms and that risks (impacts) for the Proposed Development would be ALARP on the understanding that appropriate mitigation measures as noted in the ES Chapter 7 Shipping and Navigation were implemented [REP6-017] and REP5-054]. The UKCoS confirmed that it considered impacts after proposed mitigation to be tolerable both in isolation and cumulatively, but it reserved final agreement whether they would be ALARP after proposed mitigation [REP5-051].

ExA response

11.6.38. Based on its examination of the application and other evidence presented, the ExA considers that policy requirements with regard to shipping and navigation in NPS EN-1 and NPS EN-3 have been satisfied, notably:

- a NRA including assessment of worst-case effects of safety zones and effects on recreational navigation was carried out in consultation with appropriate navigational stakeholders (NPS EN-3, paragraphs 2.6.156 to 159 and 2.6.164 to 167);
- site selection and configuration was undertaken with a view to minimising disruption to navigation and shipping and avoidance of interference with international sea lanes (NPS EN-3, paragraphs 2.6.161 and 2.6.162);
- any negative impacts to shipping routes would be minimised to ALARP (NPS EN-3, paragraph 2.6.163);
- the Applicant's final draft DCO Schedules 11 and 12, Part 2, Condition 13(1)(a) and 13(1)(c) [REP7-039] secure the provision of a Search and Rescue Response Assessment (NPS EN-3, paragraph 2.6.164); and
- after mitigation commitments proposed and secured in the Applicant's final draft DCO [REP7-039], there would be no remaining unacceptable risks to navigational safety arising from impacts from the Proposed Development as a project alone or cumulatively with other relevant OWFs or other infrastructure and users (NPS EN-3, paragraphs 2.6.165 to 169).

11.6.39. Based on its examination of evidence submitted, the ExA also considers that the Applicant has had due regard to relevant marine policies in the MCAA with regard to the need to avoid or mitigate adverse impacts on shipping activity, current and future operations of ports and harbours, legitimate uses of the sea, freedom of navigation and navigational safety, and that relevant policy in the EIEOMP has been complied with.

11.6.40. The ExA notes the MMO's conclusion that the Proposed Development would not fall within the North East Inshore and Offshore Marine Plan but the ExA considers policy NE-PS-1 of the latter plan to be an important and relevant consideration. This requires proposals to demonstrate compatibility with current port and harbour activities. The Applicant's ES Chapter 7 notes that both the East Inshore Marine Plan policy PS3 and the North East Marine Plan policy NE-PS-1 were taken into consideration by the Applicant when it assessed the compatibility of the Proposed Development with operations of ports and harbours, having consulted port stakeholders including ABP and UKMPG. The Applicant's conclusion was that because of its distance offshore there would not be any direct impact of the Proposed Development on port operations [APP-019, Table 7.4]. The ExA has no reason to disagree with that conclusion.

11.6.41. The ExA has found no reason to disagree with the Applicant's conclusion of a transboundary commercial effect of displacement of vessel routing, including consideration of effects on ports, as not significant.

11.6.42. The ExA has had regard to the Applicant's commitments to undertake vessel traffic monitoring during and after construction (including in relation to any offshore HVAC booster station) to confirm the conclusions of the NRA as submitted to the Examination in relation to the shipping and navigation impacts of the Proposed Development on other infrastructure and users, such that if any discrepancy was to be identified

between actual impacts and the impacts predicted in that NRA, then the MCA and TH as competent authorities would automatically be consulted on additional risk controls.

11.6.43. The ExA notes that during the Examination relevant shipping and navigation stakeholders confirmed satisfaction with the Applicant's assessment of likely impacts on shipping and navigation receptors. The greatest likely effect was assessed as 'slight', and therefore not significant, after mitigation of likely increased navigation risk, specifically including that relating to the navigable gap between the Proposed Development and the Hornsea Project Two array. The ExA notes that NGVL withdrew its concerns in regard to risks to its cable within that gap. The ExA is therefore satisfied with the assessment and proposed mitigation, including post-consent hydrographic survey to inform navigational charting, which is adequately secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12, Part 2, Condition 26].

11.6.44. Layout principles for the Proposed Development, including spacing of offshore structures with regard to SAR requirements, were agreed by the Applicant with the MCA as the competent authority, and these would be subject to the marine licensing procedures subsequent to post-consent design refinement.

11.6.45. The ExA is also satisfied that the construction of the Proposed Development in accordance with the layout principles (including spacing and positioning of offshore structures) would be adequately secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12, Part 2, Condition 13], including in relation to the navigable gap between the Proposed Development and the Hornsea Project Two array.

11.6.46. As reported above, the Applicant's assessment of transboundary adverse effects due to the impact of Proposed Development causing deviation of shipping main routes and therefore increased passage time and fuel consumption was 'slight'. The Applicant also assessed that the increase in navigation risk associated with such deviation both for the Proposed Development alone and cumulatively with other assessed projects would be 'slight'. On the basis of evidence examined, the ExA has no reason to disagree with these assessments.

11.6.47. Regarding the concerns expressed by NEO about potential marine navigation effects in relation to its infrastructure, the ExA has had regard to the Applicant's commitments to undertake vessel traffic monitoring during and after construction to confirm the conclusions of the NRA. The ExA notes that the MCA and TH (as the competent authorities for navigational safety) would necessarily be consulted as a condition of the marine licences on the potential need for additional risk controls if a discrepancy were to be identified between predicted and actual vessel traffic, and in particular, that the Applicant accordingly would need to update the Aids to Navigation Management Plan, secured by draft DCO Schedule 11 Condition 13 (1)(i)) [REP7-039].

11.6.48. The ExA notes the Applicant's argument [REP8-014] that it would be redundant to include protective provisions in the DCO, as proposed by NEO in relation to additional aids to navigation, or regarding service of notice to the Hornsea Project Four undertaker if an impact to shipping and navigation were considered to have occurred. However, the ExA considers it would not be unreasonably prejudicial to the Applicant's interests if the SoS were to include in a DCO as made those protective provisions proposed by NEO, even if redundant.

Conclusion on shipping and marine navigation

11.6.49. Based on the evidence provided and reasoning discussed above, the ExA concludes that all necessary policy tests have been satisfied and that the Applicant has demonstrated:

- suitable consultation with appropriate stakeholders and production of a NRA to the satisfaction of the MCA (NPS EN-3, paragraphs 2.6.153 to 2.6.160);
- site selection and configuration to minimise disruption to shipping and navigation (NPS EN-3, paragraph 2.6.162);
- assessment of impacts on shipping and navigation receptors to the satisfaction of all IPs (NPS EN-3, paragraphs 2.6.163);
- minimisation to ALARP of negative impacts to shipping routes and recreational craft (NPS EN-3, paragraph 2.6.166); and
- due regard to any danger to navigation which is likely to be caused by the Proposed Development and any cumulative effects with other developments (NPS EN-3, paragraphs 2.6.168 and 169).

11.6.50. The ExA accepts the Applicant's assessment that effects from the Proposed Development alone on shipping and navigation receptors during construction, operation and decommissioning would be likely to be no more than 'slight' after mitigation commitments, including post-construction vessel traffic monitoring, which are adequately secured in the Applicant's final draft DCO [REP7-039, Schedules 11 and 12, Part 2].

11.6.51. The ExA notes the adverse cumulative effect of increase in navigation risk, together with other relevant developments, that would result from compression of shipping traffic during construction, operation and decommissioning phases of the Proposed Development, which can be reduced by mitigation commitments to ALARP and tolerable. If the Order is made, those mitigation commitments would be secured by the Applicant's final draft DCO [REP7-039, Schedules 11 and 12, Part 2].

11.6.52. The ExA accepts the Applicant's assessment of likely transboundary effects of deviation to main shipping routes as a consequence of the Proposed Development during construction, operation and decommissioning as 'slight'.

11.6.53. The ExA is satisfied that, at the end of the Examination, there were no outstanding disagreements from IPs in respect of shipping or marine navigation matters, with the exception of bp in relation to the Endurance project, as reported in Chapter 10 of this Report.

11.6.54. Taking all the matters reported above into consideration, the ExA considers that shipping and marine navigation matters would not weigh against the case for the Proposed Development.

11.7. SEASCAPE AND VISUAL IMPACT ASSESSMENT

Policy considerations

11.7.1. Section 5.9 of NPS EN-1 sets out national policy with regard to landscape and visual effects. It notes that the Applicant's assessment should include the effects during construction of the project and the effects of the completed development and its operation on landscape components and landscape character (paragraph 5.9.6). It explains that the assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity, including light pollution effects (paragraph 5.9.7). Impacts on seascape should be addressed in addition to landscape and visual effects discussed in NPS EN-1 (paragraph 2.6.202).

11.7.2. Paragraph 2.6.201 of NPS EN-3 is clear that some applications for offshore wind farms submitted to the SoS will be proposed at distances that mean that a project would not be visible from the shore. In these instances, the SoS is likely to be able to conclude that a Seascape and Visual Impact Assessment will not be required.

11.7.3. The MPS states that, in considering the impact of development on seascape, the decision maker should take into account existing character and quality, how highly it is valued and its capacity to accommodate change (paragraph 2.6.5.3). Policy SCC3 of the EIEOMP seeks, in order of preference, to avoid, minimise and mitigate adverse impacts on the terrestrial and marine character of an area. Where it would not be possible to minimise or mitigate the adverse effect, applicants should demonstrate the case for proceeding with the proposal.

11.7.4. Paragraph 178 of the NPPF establishes that within areas defined as Heritage Coast which do not already fall within one of the designated areas mentioned in paragraph 176 (National Parks, the Broads and Areas of Outstanding Natural Beauty), planning policies and decisions should be consistent with the special character of the area and the importance of its conservation. Major development within a Heritage Coast is unlikely to be appropriate, unless it is compatible with its special character.

11.7.5. Protection of the Flamborough Head Heritage Coast (FHHC) is provided by policies within the Local Plan. It defines Heritage Coast as, "*Areas of undeveloped coastline which are managed to conserve their natural beauty, and, where appropriate, to improve accessibility for visitors*".

11.7.6. Local Plan Policy ENV2 (Promoting a high-quality landscape) states that proposals should, "*protect and enhance existing landscape character as described in the East Riding Landscape Character Assessment*". It notes that, in particular, this applies to Important Landscape Areas which include the Heritage Coast at Flamborough Head.

11.7.7. In addition, Local Plan Policy A2 (Bridlington Coastal sub area) notes that plans, strategies and development decisions in the Bridlington Coastal sub area should, "*Sensitively maintain the character of the undeveloped coast, particularly the Flamborough Heritage Coast, and improve public access to, and enjoyment of, the coast, ensuring that development proposals protect and enhance its distinctive landscape, conservation initiatives and the quality of the natural environment*".

The Applicant's Case

11.7.8. The Applicant's assessment of the potential impact of the Proposed Development on seascape and visual resources was primarily set out in ES Chapter 10, Seascape, Landscape and Visual Resources [APP-022]. When making the application, the Applicant's position with regard to these matters was that:

- Seascape, landscape and visual resources impacts have been either scoped out or it was agreed with relevant stakeholders that consideration in detail (including impact assessments) would not be required in the Applicant's ES.
- In relation to concerns over the potential effects of the HVAC Booster Station lighting on the dark skies out to sea, which NE considers form part of the special character of the FHHC, the Applicant proposed commitments, secured by its HVAC Booster Station Lighting Plan [APP-252], which it believes are sufficient to mitigate the potential effect of the lighting of the HVAC Booster Stations satisfactorily, so that the effects on 'the dark skies out to sea' Special Character of the FHHC would not be significant and could therefore be scoped out of the EIA.
- Consultation was undertaken with relevant stakeholders (ERYC and NE) who agreed that, due to the distance of the HVAC Booster Stations from the FHHC, this impact was not required to be considered in the ES.
- Examples of existing offshore windfarm developments provided by the Applicant [APP-022, paragraph 10.16.1.5] provide evidence that the magnitude of the seascape, landscape and visual resource impacts of the Proposed Development would be similar or less than the impacts of the existing precedents cited by the Applicant.
- The Applicant's simple assessment of the seascape, landscape and visual effects of the Proposed Development concluded that there would be no LSE.

Examination matters

11.7.9. Following the submission of the application for the Proposed Development, a RR was received from NE [RR-029] on the potential visual impact of the Proposed Development on the FHHC and the effects of lighting to offshore structures. In its RR, NE indicated that it did not have concerns regarding the potential impact of the Proposed Development with regard to the effects of lighting to offshore structures. In addition, it noted that NE considered that the Proposed Development would not have the potential to impact on the special character of the FHHC and its seascape setting.

ExA response

11.7.10. The ExA was satisfied with the responses received on the topics outlined above and did not find it necessary to consider these matters further during the remainder of the Examination.

11.7.11. Based on the findings set out above, the ExA considers that policy requirements with regards to seascape and visual resources in NPS EN-1 and NPS EN-3 have been met through consultation and assessment of the impact of the Proposed Development on seascape and visual resources during its construction, operation and decommissioning phases.

11.7.12. As a result of the consultation and assessment work carried out by the Applicant and described in its ES, the ExA considers that the Proposed Development would be in compliance with local plan policy relating to seascape and visual resources.

Conclusion on seascape and visual assessment

11.7.13. Taking all of this into account, the ExA concludes that the overall effects on seascape and visual resources alone and cumulatively would not weigh against the case for the Proposed Development.

11.8. OVERALL CONCLUSION ON OTHER MARINE PLANNING ISSUES

11.8.1. The ExA is satisfied that there has been a thorough consideration through the Examination of the principal and other issues in relation to other marine planning matters. In Chapter 14 of this Report the ExA applies the planning balance together with the other relevant Examination matters.

12. FINDINGS AND CONCLUSIONS IN RELATION TO ONSHORE PLANNING ISSUES

12.1. INTRODUCTION

12.1.1. The Examining Authority's (ExA) Initial Assessment of Principal Issues [PD,005, Annex C] included: design; the historic environment; landscape and visual effects; noise, vibration, electromagnetic fields (EMFs) and light; onshore ecology; onshore water environment; socio-economics and land use; and traffic and transport and Public Rights of Way (PRoWs). As the Examination evolved, the ExA refined and added to these issues.

12.1.2. This Chapter considers onshore planning issues under the following subheadings:

- landscape and visual matters including good design;
- traffic and transport including PRoWs;
- geology and ground conditions;
- onshore historic environment;
- onshore water environment;
- socio-economic and land use effects;
- onshore ecology;
- noise and vibration; and
- air quality and health.

Overarching policy context

12.1.3. Chapter 3 of this Report sets out the legal and policy context. The relevant National Policy Statements (NPSs) for the onshore planning issues are NPS EN-1 (Overarching NPS for Energy), NPS EN-3 (Renewable Energy) and NPS EN-5 (Electricity Networks Infrastructure).

12.1.4. In addition, the National Planning Policy Framework (NPPF) and the accompanying National Planning Practice Guidance (NPPG) are relevant to consideration of the onshore planning issues.

12.1.5. The onshore elements of the Proposed Development would lie within the administrative county of the East Riding of Yorkshire. As such, the relevant development plan is the East Riding Local Plan Strategy Document (April 2016) (the Local Plan) and Allocations Document (July 2016).

12.1.6. In its Local Impact Report (LIR), East Riding of Yorkshire Council (ERYC) [REP1-074, paragraph 3.2] advised that a review of the local plan had commenced but that this remained at an early stage and, as a result, no weight was being attached to it by the Council.

12.1.7. Each of the individual sections below covers the policies relevant to that topic in more detail.

12.2. LANDSCAPE AND VISUAL MATTERS INCLUDING GOOD DESIGN

Policy considerations

National policy

12.2.1. Paragraph 2.4.2 of NPS EN-1 requires that proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity.

12.2.2. NPS EN-1 notes that good design is a means by which many policy objectives in the NPS can be met. Paragraph 4.5.3 states that: *"Whilst the applicant may not have any or very limited choice in the physical appearance of some energy infrastructure, there may be opportunities for the applicant to demonstrate good design in terms of siting relative to existing landscape character, landform and vegetation"*

12.2.3. Paragraph 5.9.8 of NPS EN-1 provides that: *"Projects need to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints the aim should be to minimise harm to the landscape providing reasonable mitigation where possible and appropriate".*

12.2.4. The need for the demonstration of good design for renewable energy infrastructure in respect of landscape and visual impact is reiterated in Paragraph 2.4.2 of NPS EN-3. *"Proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity, and in the design of the project to mitigate impacts such as noise and effects on ecology."*

12.2.5. Paragraph 2.8.2 of NPS EN-5 acknowledges that new substations, sealing end compounds and other above-ground installations that form connection, switching and voltage transformation points on the electricity networks can also give rise to landscape and visual impacts.

12.2.6. The NPPF overarching policy ambition is to achieve sustainable development by, amongst other things, protecting and enhancing our natural environment, making effective use of land and mitigating and adapting to climate change, including moving to a low carbon economy. It directs that planning policies and decisions should contribute to and enhance the natural and local environment by recognising the intrinsic character and beauty of the countryside.

Local policy

12.2.7. Local plan policy ENV2, Promoting a high-quality landscape, sets out a number of provisions that are relevant to the Applicant's landscape and visual impact assessment (LVIA). It advocates that development proposals should be sensitively integrated into the existing landscape, demonstrate an understanding of the intrinsic qualities of the landscape setting and, where possible, seek to make the most of the opportunities to protect and enhance landscape characteristics and features.

12.2.8. Proposals should protect and enhance existing landscape character in the East Riding Landscape Character Assessment, including areas within the Heritage Coast designations at Flamborough and within the Yorkshire Wolds.

The Applicant's case

12.2.9. The Applicant's assessment of the potential impacts of the Proposed Development on landscape and visual amenity receptors is set out in Chapter 4 of the Environmental Statement (ES) [APP-028]. It considers the potential impact of the Proposed Development landward of Mean Low Water Springs (MLWS) during its construction, operation and maintenance and decommissioning phases.

12.2.10. The Applicant's LVIA [APP-028] considered the potential effects of the Proposed Development on:

- the landscape as a resource – as a result of changes to the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the character of the landscape; and
- views and visual amenity as experienced by people – as a result of changes to the appearance of the landscape.

12.2.11. The LVIA was supported by representative visualisations and wireframe photomontages in Annex 4.1 to the ES, Landscape and Visual Resources: Photography and Photomontages [REP5-010].

12.2.12. The Applicant's outline approach to embedded design mitigation for the onshore substation (OnSS) and energy balancing infrastructure (EBI) was described in Chapter 13 of the ES, the Outline Design Plan [REP4-021]. The Applicant intended that this would later inform the detailed design.

12.2.13. Annex 4.6, the Design Vision Statement [REP7-006], provided a visual representation of how the Applicant proposed that project mitigation, further enhancement and net gain may interact.

12.2.14. The Applicant's position at application and during the Examination was that its Landscape and Visual Assessment [APP-028] established the predicted adverse effects, considered both the duration and reversibility of all effects and set out the proposed mitigation for these effects where appropriate in this document alongside the Outline Design Plan [REP4-021].

Planning issues

12.2.15. Following the submission of the application for the Proposed Development, several Relevant Representations (RR) were received concerning landscape and visual impact issues. The Applicant provided a response at Deadline (D) 1 [REP1-038]. In summary:

- ERYC [RR-008] noted a general interest in a number of matters including landscape and visual;

- East Suffolk Council [RR-009] noted an interest in matters covering topic areas including (but not limited to) design and landscape;
- The Environment Agency [RR-010] sought to ensure that, where hedgerows and trees were removed, replacement planting would consist of more diverse and locally native species than those removed;
- Historic England (HE) [RR-015] raised concerns about the assessment of the impact of the OnSS and associated buildings on what it considered to be a sensitive landscape; and
- Mrs Taylor [RR-017] and Mr Taylor [RR-019] highlighted the visual impact of the OnSS and associated buildings on the surrounding area.

12.2.16. ERYC's LIR [REP1-074] briefly touched on the issue of landscape and visual impact. It did not raise concerns in relation to landscape and visual impact, and confirmed that the studies carried out by the Applicant appeared to have been carried out in a manner consistent with recognised best practice and guidance. The ExA has given due regard to the points in the LIR.

12.2.17. In addition, the Applicant noted the points raised in the LIR [REP-074] in its Responses to the Local Impact Report [REP2-039].

The replacement and maintenance of landscape and planting

12.2.18. ERYC's LIR [REP1-074, paragraph 4.2.4] accepted that the OnSS and EBI buildings would be of a significant scale and considered that the Proposed Development would, "*inevitably irreversibly affect the character of the landscape in this area*". Furthermore, it highlighted that there would be a number of sensitive receptors (residential properties and PRoW) in the immediate vicinity and a cumulative effect with other infrastructure in the area. However, ERYC considered that the effect would be relatively localised and that substantial additional landscaping, including bunds, which would be secured through Requirements in the draft Development Consent Order (DCO) would help to mitigate the effects.

12.2.19. ERYC also accepted that the Proposed Development would result in the loss of trees and hedgerows [REP1-074, paragraph 4.3.6], but that replacement would be secured through Requirements in the draft DCO.

12.2.20. ERYC and the Applicant were asked to comment on the Applicant's intended landscape maintenance and its proposed actions to remedy any failure of the planting scheme to achieve its objectives [PD-006, LV.1.17]. The Applicant confirmed [REP2-038] that longer-term maintenance of landscape planting would be secured through a Landscape Management Plan (LMP) that would be submitted to ERYC for approval prior to the commencement of any works.

12.2.21. ERYC was asked whether the Applicant's proposed landscape maintenance, management and enhancement strategies were satisfactory. It responded [REP2-070, LV.1.17] that Requirement 9 of the draft DCO [APP-203] should be amended to require the retention, management and maintenance of the landscaping scheme for the lifetime of the Proposed Development.

12.2.22. The Applicant submitted an updated version of the draft DCO at D3 [REP3-007] with an amended Requirement 9 that would secure the management and maintenance of landscape works at the OnSS until the decommissioning of the connection works.

12.2.23. At Issue Specific Hearing (ISH) 2 [EV-010], the ExA asked ERYC to confirm whether it was satisfied with the amended wording for Requirement 9 of the draft DCO [REP3-007]. ERYC subsequently responded [REP4-065] that it was.

The effectiveness of landscape mitigation against visual impact

12.2.24. While the Applicant made progress in securing the maintenance, management and enhancement strategies for its proposed landscape mitigation, the ExA continued to examine the overall effectiveness of landscaping as a means of mitigating the visual impact of the OnSS and EBI buildings.

12.2.25. In its first written questions (ExQ1) [PD-006, LV.1.12], the ExA sought to clarify further the extent and effectiveness of mitigation that would be provided by the Applicant's landscape proposals around the OnSS and EBI structures. In addition the ExA sought the opinion of ERYC and any other Interested Party (IP) on whether they agreed with the Applicant's conclusions in relation to certain representative photomontages [APP-115] (notably viewpoints 1 to 4). The photomontages showed that the predicted change resulting from the establishment and growth of the landscape planting between year 1 to year 10, and beyond, would change considerably the magnitude and significance of the visual impact of the OnSS and EBI buildings.

12.2.26. At D2 [REP2-038, LV.1.12] the Applicant advised that it was not possible for photomontages to accurately represent how the appearance of the OnSS would change over the initial 10 years of its operating period. The Applicant considered that the growth and form of mitigation planting could only be indicatively shown, and so it had only applied a conservative estimate of plant growth (height and density) in order to depict a 'worst case'. It considered that no weathering of the structures could be shown as the exact rate of weathering is an unknown. Furthermore, the Applicant contended that the photomontages are unable to depict the way that viewers would become accustomed over time to seeing the OnSS and EBI as part of the landscape.

12.2.27. In response, ERYC [REP2-070, LV.1.12] suggested that the Applicant's proposals should be amended to provide increased landscape planting along the northern boundary of the OnSS site to mitigate the effect on users of the surrounding PRoW network further. ERYC went on to confirm that, subject to this change, it considered that reasonable steps had been taken to mitigate the visual effect of the Proposed Development.

12.2.28. ERYC reiterated its request for a stronger landscaped boundary to the northern side of the OnSS in its response [REP4-065] to an action point from ISH2 [EV-010].

12.2.29. At ISH2 [EV-010], the ExA asked the Applicant to confirm that the proposed landscape mitigation would be sufficient to reduce the visual impact of the OnSS and EBI buildings to an acceptable level. In response, the Applicant stated that it believed the landscape mitigation to be sufficient. The Applicant recognised that the OnSS and EBI buildings would be large and that it would not be possible to completely hide them with landscaping or screening. The Applicant added that it had considered other forms of mitigation through design for this reason.

12.2.30. In response to the same question, ERYC referred the ExA to comments in its LIR [REP1-074, paragraph 4.2.4], which are summarised above.

The quality and effectiveness of the design process and outcome at the close of the Examination

12.2.31. In ExQ1 [PD-006, DGN.1.2], the ExA sought to understand the Applicant's design process in further detail and asked a series of questions with this in mind. The ExA asked the Applicant to set out, in further detail than that provided in the application, the extent of its design process up to application stage. The ExA also requested the Applicant to provide an explanation and summary of its design review process for the OnSS and EBI buildings and structures prior to submission of the application.

12.2.32. The Applicant provided a response at D2 [REP2-038, DGN 1.2], noting that technical and health and safety requirements had been provided by specialists and that these parameters formed the fundamental, primary considerations of the design process.

12.2.33. The Applicant explained that independent design advice on the form and appearance of the OnSS and EBI buildings had been provided by Land Use Consultants, who had been instrumental in the production of the Applicant's Outline LMP [APP-243], Outline Design Plan [APP-248] and Design Vision Statement [APP-048].

12.2.34. The Applicant noted that its, *"design review process sought to minimise the landscape and visual impact of Hornsea Four and ensure that the proposed buildings, associated infrastructure as well as landscape and boundary treatments considered local landscape character and setting and how this development could best respond to and be integrated into the local landscape."*

12.2.35. The Applicant concluded by setting out a series of design principles that it had developed with the aim of identifying how the Proposed Development might best be integrated into the landscape and how impact on the landscape and visual amenity could be minimised.

12.2.36. The ExA also explored [PD-006, DGN.1.3] the process through which the Applicant had arrived at its approach to the treatment of the external envelope of enclosures to structures at the OnSS.

12.2.37. The Applicant proposed an approach based on an application of colour to the façades of the OnSS buildings. The Applicant did not present a

finalised design proposal at application, rather it presented examples of how its chosen approach might be applied to the OnSS buildings in its Outline Design Plan [APP-248] in the expectation that its proposals would be refined in consultation with the local authority during the pre-construction phase of the Proposed Development.

12.2.38. The ExA requested additional detail from the Applicant to explain why it believed this was the most appropriate approach in this context. The ExA asked the Applicant to provide additional detail, including reference to successful examples of the Applicant's approach in a similar context, explaining the process that had led it to form the view that applying blocks of colour to, significant structures within a landscape would be an effective strategy to lessen their visual impact on that landscape.

12.2.39. The Applicant also provided a response to this question at D2 [REP2-038, DGN 1.3]. This provided examples of existing buildings that the Applicant believed demonstrated the success of the approach, but did not provide further information or background about the design and decision-making processes that had been undertaken and which had informed the Applicant's choice of approach in forming the OnSS envelopes.

12.2.40. The ExA explored this matter in further detail during ISH2 [EV-010] and, recognising that the design of the OnSS and EBI was an engineering-led process, asked the Applicant to give an overview of this process.

12.2.41. The Applicant expressed its belief that it had complied with NPS EN-1, paragraph 4.5, relating to good design. The Applicant went on to explain that the layout and the vernacular and structural design of the buildings was fundamentally informed by technical requirements for efficiency purposes, in addition to health and safety requirements relating to the operation of the OnSS and EBI. The Applicant explained that the shape and size of buildings was constrained by those technical requirements [REP4-036, Sections 2.1 and 2.2].

12.2.42. The ExA enquired further into the design process at ISH2 to understand what options for the external treatment of the building façades, apart from the application of colour, had been considered and why those options had been discounted.

12.2.43. The Applicant believed it was heavily constrained by the technical requirements that it had outlined and that a number of options that it had considered were not deemed to be feasible due to resultant impacts on the size or shape of the OnSS buildings.

12.2.44. The ExA asked the Applicant if it had explored any successful examples of alternative approaches to the architectural and structural expression of the building envelope for this building typology. The Applicant responded that it was not aware of any significant, useful or effective methods of mitigating buildings such as these that would not have a materially negative impact on the technical feasibility of the buildings [REP4-036, Sections 2.1 and 2.2].

12.2.45. The ExA also asked [EV-010] the Applicant whether any member of its consultant team had the relevant professional qualifications to provide the Applicant with architectural services, including advice on the design of the façade elements of the OnSS and EBI buildings.

12.2.46. The Applicant responded that it had not received advice on the design, massing or form of the buildings from a chartered architect, but it believed that, where there had been opportunities to demonstrate good design and improve the external appearance of the buildings to ensure that they would sit as best as they could within the existing landscape, those opportunities had been taken.

12.2.47. The Applicant concluded by contending that its approach to the design of the OnSS and EBI buildings was standard for energy infrastructure projects in terms of design for onshore apparatus, and its view was that it was not necessary to engage a chartered architect in order to comply with the design requirements set out within NPS EN-1.

ExA response

The replacement and maintenance of landscape and planting

12.2.48. The ExA has considered the views expressed by ERYC regarding the Applicant's proposed landscape maintenance, management and enhancement strategies and notes the Applicant's responses during the course of the Examination. With the inclusion of updated wording to Requirement 9 of the draft DCO [REP7-039], which secures the management and maintenance of the landscape works at the onshore substation until the connection works are decommissioned, the ExA is satisfied that the draft DCO [REP7-039] makes adequate provision for new and replacement landscape and planting and its maintenance.

The effectiveness of landscape mitigation against visual impact

12.2.49. The ExA has considered the responses to the issues raised under this topic during the Examination. Based on information provided, the ExA concludes that the representative photomontage views do not demonstrate that the landscape mitigation proposed by the Applicant would change the magnitude and significance of the visual impact of the OnSS and EBI buildings in the time frame suggested.

12.2.50. The ExA notes the view expressed by ERYC that the Applicant should amend its landscaping proposals to provide increased landscape mitigation along the northern boundary of the OnSS site.

12.2.51. The ExA agrees with the Applicant that it would not be possible to screen the OnSS and EBI buildings fully with landscape and planting alone. The ExA acknowledges that the Applicant has sought to provide indicative, conservative estimates of the growth and form of proposed mitigation planting. However, it is unconvinced by the evidence provided to demonstrate significantly reduced landscape and visual effects from the OnSS buildings at year 30, particularly from viewpoints 1 to 4.

The quality and effectiveness of the design process and resultant outcome at the close of the Examination

12.2.52. In considering the Applicant's design solution for the OnSS and EBI buildings, the ExA has been mindful of the criteria for good design for energy infrastructure set out in NPS EN-1. The SoS needs to be satisfied that the Proposed Development is as sustainable and, having regard to regulatory and other constraints, as attractive, durable and adaptable as it can be (taking account of natural hazards such as flooding).

12.2.53. The ExA notes that the design of the OnSS and EBI has been heavily constrained by technical and health and safety considerations and notes NPS EN-1 section 4.5.1, which acknowledges that the nature of much energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area. Whilst NPS EN-1 section 4.5.3 notes that applicants may not have any or very limited choice in the physical appearance of some energy infrastructure, the ExA is not of the view that this applies to the design and use of materials related to the onshore substation and energy balancing infrastructure buildings.

12.2.54. In the course of the Examination, the ExA sought to establish, with input from the Applicant, how it had arrived at its design proposal for the external appearance of the OnSS and EBI buildings. The Applicant did not present the ExA with evidence of a rigorous design process that had led it to choose the approach presented at application stage. The Applicant discounted the possibility of alternative design solutions for the external appearance at an early stage in the design development of the Proposed Development and did so without exploring the possibility of alternatives. In doing so, it is the ExA's view that the Applicant has not fully met the criteria for good design set out in NPS EN-1 sections 4.5.3 and 4.5.4.

12.2.55. The Applicant has acknowledged the negative impact that the OnSS and EBI buildings will have on the character of the surrounding landscape and on local receptors. In taking the view that it was not necessary to appoint a chartered architect to assist with the design of buildings of such significant scale and mass, the Applicant has not taken the opportunity to work with the most appropriate professional consultants available to it. In addition, the Applicant has not sought to enter into a process of independent design review to ensure that its proposals are as attractive, durable and adaptable as they can be.

12.2.56. The ExA considers that the Applicant has not fully met the criteria for good design set out in NPS EN-1. To address this, the ExA proposes that amended wording is inserted into Requirement 7 (detailed design approval onshore) of the recommended DCO to ensure that the OnSS and EBI buildings and surrounding new landscape proposals are subject to an independent design review process to ensure that they meet the criteria for good design and mitigate, as fully as possible, any adverse impact on views and the character of the surrounding landscape.

Conclusion on landscape and visual matters including good design

12.2.57. The ExA considers that, with the inclusion of updated wording to Requirement 9 of the draft DCO [REP7-039], the Applicant has made adequate provision for landscaping and planting, as well as for maintenance of the landscape and planting.

12.2.58. The ExA notes that the Applicant has sought to provide indicative, conservative estimates of the growth and form of proposed mitigation planting but considers that the Applicant's evidence to demonstrate reduced effects on landscape character and views at year 30 is not convincing, particularly at viewpoints 1 to 4.

12.2.59. The ExA concludes that it would not be possible to fully screen the OnSS and EBI buildings with landscape and planting alone. Therefore, the ExA takes the view that the design and appearance of the structures and buildings proposed for the OnSS and EBI site and the landscape design strategy must form part of a co-ordinated design response that meets the requirements set out in NPS EN-1 sections 5.9.8 and 5.9.16.

12.2.60. Having particular regard to section 4.5 of NPS EN-1, the ExA does not consider the Applicant's design process to be sufficiently robust to meet fully the criteria for good design for energy infrastructure. Therefore, the ExA concludes that the Proposed Development does not fully comply with NPS EN-1.

12.2.61. Taking all of this into account, the ExA concludes that the Proposed Development has the potential for significant impacts on landscape character and visual amenity and that it would not fully meet the criteria for good design. The ExA therefore attributes negative weight in the planning balance to landscape, visual and good design matters. To address this, the ExA proposes additional wording for Requirement 7 to ensure that the OnSS and EBI buildings and new landscape proposals are subject to an independent design review process.

12.2.62. With the additional wording in Requirement 7, the ExA is satisfied that that the Proposed Development could meet the criteria for good design set out in NPS EN-1 and therefore would not weigh against the case for the Proposed Development. If the SoS considers that the additional wording is not necessary, then the ExA takes the view that, for the reasons set out above, the effects of the Proposed Development on landscape and visual matters including good design would have negative weight in the planning balance.

12.3. TRAFFIC AND TRANSPORT INCLUDING PUBLIC RIGHTS OF WAY

Policy considerations

National policy

12.3.1. The Overarching National Policy Statement for Energy EN-1 (NPS EN-1) acknowledges in paragraph 5.13.1 that, *"The transport of materials, goods and personnel to and from a development during all project phases can have a variety of impacts on the surrounding transport infrastructure and potentially on connecting transport networks…"*

12.3.2. Paragraph 5.13.6 of NPS EN-1 advises that, *"A new energy NSIP may give rise to substantial impacts on the surrounding transport infrastructure and the* [decision maker] *should therefore ensure that the applicant has sought to mitigate these impacts, including during the construction phase of the development."*

12.3.3. NPS EN-1 paragraph 5.13.7 states that, *"Provided that the applicant is willing to enter into planning obligations or requirements can be imposed to mitigate transport impacts … then development consent should not be withheld, and appropriately limited weight should be applied to residual effects on the surrounding transport infrastructure."*

12.3.4. In terms of mitigation NPS EN-1, paragraph 5.13.12 guides that, *"If an applicant suggests that the costs of meeting any obligations or requirements would make the proposal economically unviable this should not in itself justify the relaxation by the* [decision maker] *of any obligations or requirements needed to secure the mitigation."*

Local policy

12.3.5. The relevant Local Plan policies are as follows:

- Policy EC4 relates to promoting sustainable travel.
- Policy S8 seeks protection and enhancement of cycling and footpath networks including PRoW.
- Policy ENV5 seeks enhancement of functionality and connectivity of green infrastructure corridors.
- Policy A2 seeks to maintain, protect and enhance the character of undeveloped coast and improve public access to and enjoyment of the coast.

The Applicant's case

12.3.6. The Applicant's case regarding traffic and transport matters was primarily set out in ES Volume A3 Chapter 7, Traffic and Transport, [APP-031] and PRoW, coastal and cycle route matters were covered in ES Volume A3 Chapter 6, Land Use and Agriculture [APP-030]. The Applicant also submitted the following documents to accompany the application:

- Traffic and Transport Technical Report [APP-125];
- Abnormal Load Report [APP-126]; and

- Outline Code of Construction Practice (Outline CoCP) [APP-237] as updated by [REP1-027] and [REP4-019]. Appendix F of the Outline CoCP comprised an Outline Construction Traffic Management Plan (Outline CTMP) and Appendix C comprised an Outline Public Right of Way Management Plan.

12.3.7. As reported in ES Volume A3 Chapter 7 [APP-031], the detailed mitigation measures would be agreed with the relevant stakeholders in the final CTMP that would be secured by Requirement 19 of the Applicant's final draft DCO [REP7-039]. The potential mitigation measures suggested by the Applicant included:

- junction or highway widening (if deemed necessary);
- the provision of new passing places and formalising existing passing places;
- the use of an escort vehicle, if required;
- avoiding traffic movements during school start and finish times; and
- enhanced maintenance of junction visibility splays.

12.3.8. Table 7.29 of Volume A3 Chapter 7 of the ES [APP-031] summarised the impacts on traffic and transport and concluded that there would be 'slight adverse' potential residual impacts on the following:

- driver delay (local roads);
- severance;
- pedestrian amenity; and
- accidents and road safety (in relation to Killingwoldgraves Lane/ Coppleflat Lane (Links 57, 58, 59 and 61)).

12.3.9. Impacts on driver delay (capacity) and accidents and road safety for all other links except Killingwoldgraves Lane/ Coppleflat Lane were assessed in Table 7.29 as being 'not significant'.

12.3.10. ES Volume A3 Chapter 7 [APP-031] concluded that the construction phase would represent the highest potential for significant traffic and transport environmental effects and the effects during decommissioning would, at worst, be of equal significance to the construction phase. The operational traffic impacts would be very limited and would mainly relate to maintenance at the OnSS.

Cumulative and transboundary impacts

12.3.11. Following discussions at the Technical Panel meetings with ERYC, the Applicant considered the following schemes within the cumulative effects assessment [APP-031, paragraph 7.12.1.4]:

- A164/ Jock's Lodge highway improvement scheme; and
- A63 Castle Street highway improvement scheme.

12.3.12. The Applicant also assessed information in relation to the following three other schemes:

- National Grid Creyke Beck substation expansion;

- Scotland England Green Link 2 (subsequently renamed Eastern Green Link 2); and
- Albanwise Solar Farm.

12.3.13. The Applicant concluded in [APP-031, paragraph 7.15.1.4] that, *"No cumulative or inter-related effects have been identified which increase the significance of any standalone assessment."* The Applicant also concluded that there was no potential for significant transboundary effects regarding traffic and transport [APP-031, paragraph 7.13.1.1].

Planning issues

Assessment and methodology

12.3.14. Lockington Parish Council (LPC) raised queries regarding some of the assessment methodology used by the Applicant, including the use of updated traffic information. Also, in ExQ1 [PD-006] and at ISH2 [EV-010], the ExA sought further clarification on a number of matters regarding the traffic and transport assessment data and methodology.

12.3.15. In ExQ1 [PD-006], the ExA asked the Applicant and ERYC to clarify a number of traffic and transport assessment matters including:

- the summary of potential impacts for traffic and transport;
- the methodology used for the automated traffic counts;
- the figures that had been used in Appendices D, E and F of the Traffic and Transport Technical Report [APP-125]; and
- the various definitions of vehicle movements used by the Applicant.

12.3.16. Responses to these methodological matters were provided by the Applicant [REP2-038]. The Applicant also responded to the queries raised by LPC regarding updated peak flow figures and confirmed that Table 7.18 of ES Volume A3 Chapter 7 [APP-031] contained details of the relevant finalised numbers of peak and average daily vehicle movements.

Traffic mitigation and improvements

12.3.17. In ExQ1 [PD-006, TT.1.6] the Applicant and ERYC were asked to confirm how the mitigation would be assessed and undertaken. In response, the Applicant [REP2-038] stated that any road widening would be designed to fall entirely within the public highway and would be subject to technical approval of the Highway Authority under Article 14 of the DCO. ERYC [REP3-049] stated that it agreed with the Applicant's response on this.

Primary logistics compound near Lockington

12.3.18. Objections were raised by LPC in relation to the location of the proposed primary logistics compound on the outskirts of Lockington [RR-018] and [REP1-075]. The Applicant proposed that the primary logistics compound would be located on the western side of the A164 and would be accessed off the initial stretch of Station Road that leads towards the village of Lockington (hereafter referred to as Station Road West). However, LPC considered that there would be little difference in locational terms if the

primary logistics compound were to be located on the opposite, ie eastern, side of the A164 accessed off the stretch of Station Road that leads to the village of Aike (hereafter referred to as Station Road East). LPC's view was that the primary logistics compound could be located in the north-east quadrant of the Station Road and A416 crossroads (hereafter referred to as the alternative logistics compound). LPC provided photographs of this area [RR-018].

12.3.19. Table 7.18 of ES Volume A3 Chapter 7 [APP-031] set out the existing and proposed daily flows for the various links in the highway network. Link No. 43 represented the stretch of Station Road from west of the A164 junction to the primary logistics compound. As set out in Table 7.18, the background average annual weekday traffic for link 43 was predicted for the year 2024 to be 686 for all vehicles, of which five would be heavy goods vehicles (HGVs). Table 7.18 went on to predict that the construction vehicle two-way movements[10] using link 43 would be an average of 66 per day, of which 15 would be HGVs. The peak daily two-way construction vehicle movements using link 43 were predicted to be 175 per day, of which 67 would be HGVs.

12.3.20. LPC contended that the alternative logistics compound would alleviate traffic issues for residents of Lockington in terms of increased traffic queues at the junction of the A146 and Station Road West. Although this would in effect relocate those queues on to the eastern side of this crossroads, according to LPC [REP1-075], this would affect some 30 houses in Aike as opposed to some 160 houses in Lockington. LPC raised concerns that the Applicant's preferred location for the primary logistics compound would entail more vehicular traffic travelling through the village of Lockington, including the potential for HGVs to use this route. LPC also cited safety concerns for users of the footpath that leads from Lockington to the bus stop at the Station Road West/ A146 crossroads.

12.3.21. In response, the Applicant cited traffic safety concerns, landowners using the land for other purposes and potential issues of nearby springs and the consequent potential for flooding issues as matters that would all weigh against the alternative logistics compound proposed by LPC [REP1-038] and [REP2-038].

12.3.22. In its ExQ1 [PD-006, TT.1.15, TT.1.17 and PDS.1.3] the ExA asked both the Applicant and ERYC to comment on highway safety matters related to the proposed primary logistics compound at Lockington. In response to these questions the Applicant and ERYC both confirmed that in highway safety terms and for traffic flow considerations on the A164 the location of the primary logistics compound accessed off Station Road West would be preferable to the alternative logistics compound proposed by LPC. This was because LPC's preference would involve more HGVs waiting to make a right turn off the A164 on to Station Road East. This was based on the

[10] The Applicant confirmed [REP2-038] that, "*A two-way movement represents the inbound (laden trip from source) and the outbound unladen trip (back to source). For example, 20 two-way movements comprise 10 laden trips from source and 10 outbound unladen trips back to source*."

assumption, which was not disputed by any IP, that the majority of HGVs and other traffic would arise from south of the primary logistics compound.

12.3.23. There was disagreement between LPC and the Applicant regarding the respective widths of Station Road West and Lockington Road East near to the junction with the A164. In order to ascertain the respective widths at the approximate locations where the access into either the proposed primary logistics compound or the alternative logistics compound would be taken, the ExA asked the Applicant to provide a plan [EV-010]. This was provided [REP4-046] and it demonstrated that whilst Lockington Road East has a layby area that at 6.81 meters (m) would be wider, beyond that to the east it was 3.78m and therefore narrower than the stretch of Station Road West at the access point to the primary logistics compound which measured some 5.33m in width. In response to the ExA's further written questions (ExQ2) [PD-012, TT.2.1] ERYC confirmed in [REP5-094] that it was satisfied with the Applicant's justification for site selection, with the primary logistics compound being accessed off Station Road West.

The onshore substation access road and alternatives considered

12.3.24. Gordons LLP and Quod made a number of representations on behalf of Mr and Mrs Dransfield who reside at Jillywood Farm. Quod described [REP5-100] what it considered would be a better, alternative access to the OnSS for both construction and operational use. The promoted route in [REP5-100] was the 'Option 2 route' detailed in Figure 7 of ES Volume 4 Annex 3.3, Selection and Refinement of Onshore Infrastructure [APP-038], which would take the access route from west of the OnSS via the A164 to the south of Dunflat Road. The Applicant's proposed route for the OnSS access road was via the existing northbound layby of the A1079, described as Option 4 [APP-038].

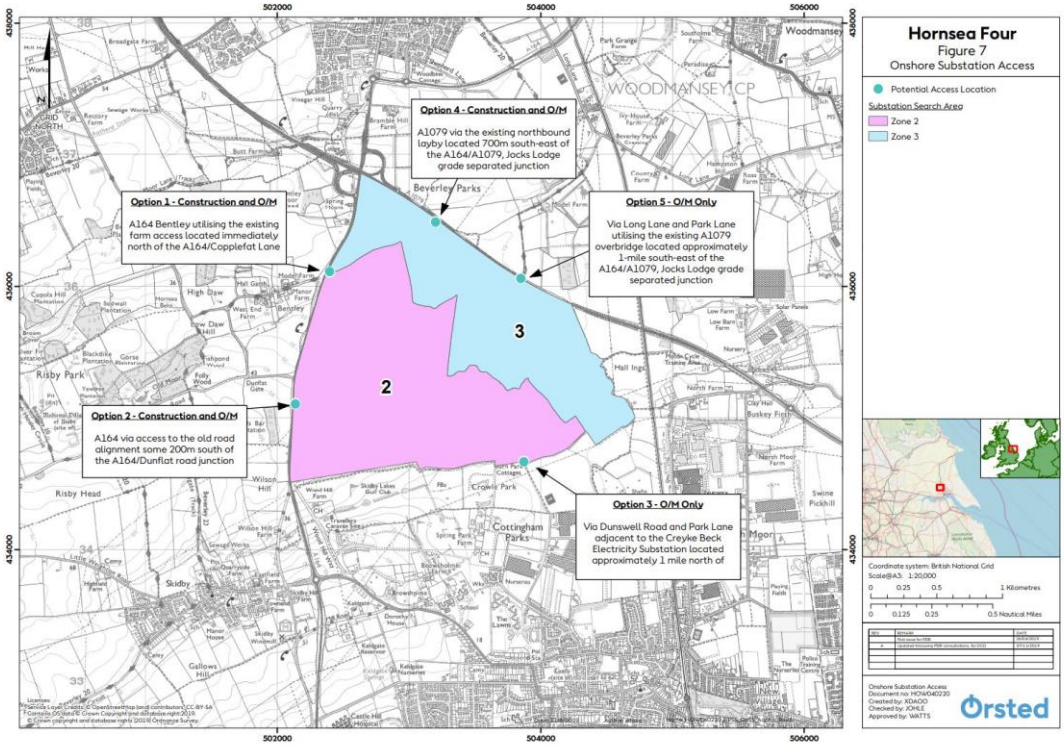
12.3.25. In ExQ2 [PD-012, TT.2.3 and TT.2.4] the ExA asked the Applicant and ERYC to comment on the concerns that had been raised on behalf of Mr and Mrs Dransfield, including the assessment of alternative options for the OnSS access road.

12.3.26. The Applicant [REP5-074] replied that: *"It is noted that Quod concur with the discounting of most access options identified, based on independent review. Regarding access option 2, the clearest constraint on the utilisation of this access option is the potential interaction with the Jock's Lodge Highways Improvement Scheme. ERYC has expressed a clear preference for access to be taken from the A1079, avoiding the A164; which reduces the: Rerouting of construction vehicles to account for the duelling of the A164 (i.e. no right turn off the A164); and Interaction between the project footprints. In respect of topographical differences between the A1079 and the OnSS access route, this has been factored into the amended access design…"*.

12.3.27. ERYC in [REP5-094] responded that: *"Different access options have been considered and assessed prior to option 4 A1079 via the existing northbound layby was agreed with ERYC because it provides the best*

option from those considered for providing both construction and operations/ maintenance access."

Figure 12.1 Onshore substation access



12.3.28. Gordons LLP and Quod on behalf of Mrs Dransfield submitted further information in [REP5-100] to support their argument for an alternative location for the OnSS access route, running to the west of the OnSS site with an access taken off the A164.

12.3.29. In response to ExQ2 [PD-012, TT.2.4] ERYC confirmed in [REP5-094] that the applicant for the Jock's Lodge highway improvement scheme had not yet applied to discharge Condition 22 of planning permission 20/01073/STPLF that refers to site access details for seven named private properties including Jillywood Farm, Platwood Farm, Mouse Hill and Rose Villa. At ISH8 the ExA asked the Applicant and ERYC to clarify how this proposed access road would interact with the access road for the OnSS as both would be taken off the layby of the A1079 northbound.

12.3.30. The Applicant responded [EV-032b] and [REP6-035] that it was confident that there would be sufficient space within this layby area even if both the Proposed Development and the new access road as a result of the Jock's Lodge improvement scheme needed to be constructed at the same time and had revised the access design to accommodate this. The Applicant also noted that in the Outline CTMP [REP4-019, Appendix F, section 4.8] specific reference was made to mitigation measures being provided in the final CTMP that is secured in Requirement 19 of the final draft DCO [REP7-039] should there be an overlap between construction for the Proposed Development and Jock's Lodge.

Impacts on level crossings

12.3.31. Addleshaw Goddard LLP on behalf of Network Rail Infrastructure Limited (NR) [RR-001], [REP2-086] and [REP2-087] expressed concerns about the impact of construction traffic on level crossings and in particular the Wansford Road level crossing. As set out in Table 7.18 of ES Volume A3 Chapter 7 [APP-031], the construction phase of the Proposed Development would give rise to an average increase of 38 two-way vehicle movements per day (of which 33 would be two-way HGV movements) and a peak of 80 two-way vehicle movements per day (of which 70 would be two-way HGV movements) for links 23 and 24 that relate to the Wansford Road level crossing. It was NR's contention that the increase in HGVs associated with the construction phase of the Proposed Development had the potential to cause further deterioration in the condition of this and the other nearby level crossings.

12.3.32. In response to ExQ2 [PD-012, TT.2.2] which asked for an update on progress regarding protective provisions, NR responded in [REP5-117] that an option agreement and deed of easement had been agreed and would be exchanged simultaneously with a private side agreement on the outstanding level crossing issues.

Impacts on public rights of way, pedestrians and cyclists

12.3.33. In its LIR [REP1-074, section 4.5], ERYC noted that there would be 36 locations where the construction works for the Proposed Development would intersect with the PRoW network. As reported in Table 1 of Appendix C to the Outline CoCP [REP4-019], for the majority of these, there was a proposed temporary closure of PRoWs for no longer than three months at any one time or no longer than six months over the whole construction period. However, permanent diversions were proposed for Skidby Footpath No. 16 and Rowley Bridleway No. 13, and a longer-term temporary diversion for Barmston Footpath No. 4 at the proposed landfall compound area.

12.3.34. On Sheet 27 of the Public Rights of Way Plan [APP-215] the Applicant indicated the route for that section of the Rowley Bridleway No. 13 that was proposed to be permanently diverted. In effect this would entail a minimal difference from the existing route for a short length along what would be the western part of the OnSS access road before linking back in with the existing bridleway.

12.3.35. Sheet 28 of the Public Rights of Way Plan [APP-215] indicated the section of Skidby Footpath No.16 that was proposed to be permanently diverted. A 'Public Right of Way Diversion - Area 1' was depicted on Sheet 28 which included a zone immediately to the north-west of the existing footpath and also a section that ran along what would be part of the OnSS access road as far as Rowley Footpath No. 12. The reason for this was that the exact route of the diverted footpath would not be known until the detailed design stage. Under the worst-case scenario that such a route would not be possible through the Public Right of Way Diversion Area 1, then a link back to the surrounding PRoW network via the route

along part of the OnSS access road would entail a deviation of some 500m in length.

12.3.36. In its RR [RR-032], the East Riding of Yorkshire and Kingston upon Hull Joint Local Access Forum (the Joint Local Access Forum) raised concerns about the level of detail provided about footpath diversions, the duration of the temporary closures, and the longer-term management of footpaths, including remedial measures arising from soil settlement. It also wished to see a commitment to funding for improvements to PRoWs in the locality. In its RR, the Ramblers, East Yorkshire and Derwent Area [RR-038] sought clarification over how access for walkers to routes around Jillywood Lane would be maintained, as there were good network links in this area.

12.3.37. In ExQ1 [PD-006, TT.1.24] the ExA asked the Applicant to comment on the concerns raised by the Joint Local Access Forum [RR-032]. In response, the Applicant [REP2-038] explained that the final PRoW Management Plan that would be required as part of the final CoCP under Requirement 18 of the final draft DCO [REP7-039] would deal with post-construction monitoring and maintenance issues for all reinstated footpaths.

12.3.38. In ExQ1 TT.1.22 [PD-006] the Applicant was asked about how the safety of users of the diverted PRoW/coastal path in the vicinity of the landfall area would be ensured. The Applicant responded in [REP2-038] that measures to ensure this would be agreed with ERYC and would be set out in the final Public Rights of Way Management Plan.

12.3.39. As reported in ES Volume A3 Chapter 7 [APP-031], the Applicant had agreed with ERYC that traffic impacts on pedestrian delay and amenity could be considered as part of the general impacts on pedestrian amenity, which were assessed in Table 7.29 of [APP-031] as having a 'slight adverse' residual impact.

Cumulative impacts

12.3.40. In its LIR [REP1-074], ERYC lodged a holding objection in regard to how the onshore cable route would cross the A164 and the resulting implications for the Jock's Lodge Improvement Scheme. However, it acknowledged that it anticipated that agreement would be reached on the issue.

12.3.41. In [REP7-095] ERYC stated that it was satisfied regarding the potential impacts of the Proposed Development on the Jock's Lodge highways improvement scheme and it withdrew its objection on this specific issue.

ExA response

Assessment methodology

12.3.42. ERYC's LIR [REP1-074] stated that the methodology and findings underpinning the ES in regard to highways had been agreed. ERYC also confirmed [REP2-070] that it was satisfied with the assessment of impacts for both the Proposed Development alone and cumulatively.

12.3.43. The ExA was satisfied with the responses to ExQ1 [PD-006] and that all outstanding queries regarding the methodologies used to assess traffic and transport impacts had been adequately answered.

12.3.44. In terms of the need for road safety audits, the Applicant responded [REP2-038] that a Stage 1 Road Safety Audit had been provided for the OnSS Access (A1079 Northbound Layby Extension) and that further Road Safety Audits for other elements of the Proposed Development would be provided at the detailed design stage. ERYC in the final SoCG [REP7-060] agreed with this approach.

12.3.45. In the final SoCG with ERYC [REP7-060], all matters regarding highways methodology were noted as being agreed. A draft SoCG with National Highways (NH) was submitted with the application [APP-256]. In this, all matters were either agreed or, where not agreed, noted as being of no material impact. However, as the draft SoCG with NH [APP-256] was not signed, the ExA attaches little weight to it.

12.3.46. Taking all of this into account, the ExA considers that the Applicant's assessment methodology in relation to traffic and transport is appropriate and acceptable.

Traffic mitigation and improvements

12.3.47. The ExA notes that the final CTMP, that is secured under Requirement 19 of the final draft DCO [REP7-039], would be the mechanism for finalising and agreeing the proposed mitigation measures.

12.3.48. Whilst the Applicant did not submit a Specific Travel Plan, the Outline CTMP which is Appendix F of the Outline CoCP [REP4-019] does contain measures to promote more sustainable travel measures for the workforce. A Construction Traffic Management Plan Co-ordinator would be appointed, and the measures referenced in the Outline CTMP include the promotion of car sharing and the provision of facilities for cyclists. The ExA considers that this would be an acceptable approach having regard to the predicted volume, nature and duration of workforce traffic that would be generated during the construction phase.

Logistics compound at Lockington

12.3.49. The ExA has carefully considered the concerns put forward by LPC and its alternative logistics compound to be accessed via Station Road East. Whilst this would reduce the predicted construction traffic movements on Station Road West, and so would benefit the residents of Lockington, it would have the effect of shifting the predicted construction traffic

movements on to Station Road East and thereby impact on the residents of Aike. The ExA acknowledges that there are fewer people residing in Aike than in Lockington and therefore delays at the junction of the A164 and Station Road West would be likely to affect fewer residents.

12.3.50. However, LPC has not provided any substantive evidence to counter the Applicant's and ERYC 's preference for the primary logistics compound to be accessed via Station Road West for reasons of both highway safety and traffic flow along the A164. It is the ExA's view that these considerations carry more weight than the issue of some increase to driver delay for the residents of Lockington. The ExA notes that HGVs would not be allowed to pass through Lockington village due to a weight restriction order, and monitoring and enforcement measures for construction traffic are set out in the Outline CTMP [REP4-019, Appendix F] that is secured in Requirement 19 of the final draft DCO [REP7-039]. Furthermore, having regard to the nature of the road network and settlement pattern in this area, there is no substantive evidence that the drivers of other construction vehicles would use that stretch of Station Road West that lies to the west of the primary logistics compound and which leads to Lockington village and beyond.

12.3.51. In regard to the safety issues referred to by LPC for users of the footway on the northern side of Station Road West, the ExA noted on its Unaccompanied Site Inspection (USI) [EV-001] this is in effect a footway/ pavement that it is separated from the Station Road West carriageway. Having regard to the width of Station Road West and the width and location of this footway, the ExA does not consider that vehicles entering or exiting the primary logistics compound would give rise to any significant safety concerns for users of this footway.

12.3.52. The ExA gives significant weight to the traffic safety and traffic flow considerations that have been advanced by the Applicant and supported by ERYC. The additional construction vehicle movements along link No. 43 are not predicted to exceed a peak of 175 daily two-way movements for all vehicles which would represent a 25.5% increase. The ExA does not consider this worst-case to represent a substantial increase and notes that the predicted average two-way construction vehicle movements would be less than half of this figure. Taking all of this into account, the ExA is content that the Applicant's preferred location for the primary logistics compound would be suitable and would be preferable to the alternative logistics compound put forward by LPC.

The onshore substation access road and alternatives considered

12.3.53. Both the Applicant and ERYC have expressed a preference for the location of the OnSS access road as applied for in the Proposed Development, ie to be taken from the layby of the A1079, rather than the option via the A164 promoted in [REP5-100]. In [REP5-074] the Applicant reported that the road safety baseline was worse for the A164 than the A1079 and that the A164 experienced higher traffic flows and was therefore more congested [APP-031]. The ExA accepts the view expressed by both the Applicant and ERYC that the proposed OnSS access road would provide a better access for traffic in terms of road

safety and not increasing congestion than if an access from the A164 was developed.

12.3.54. Furthermore, should construction works for the Jock's Lodge Highways Improvement Scheme happen to coincide with those for the Proposed Development then the OnSS access road being taken from the A1079 would spatially separate out the construction impacts. Having regard to the Applicant's response on this matter, the ExA is satisfied that there would be sufficient space available within the layby area of the A1079 for the simultaneous construction and operation of both access roads.

12.3.55. Having considered all the evidence that has been submitted into the Examination, the ExA concurs with the views expressed by the Applicant and ERYC in this regard.

Impacts on level crossings

12.3.56. In [REP7-096] Addleshaw Goddard LLP on behalf of NR confirmed that it had reached agreement regarding, amongst other matters, the inclusion and retention of NR's preferred wording for the protective provision in Schedule 9 Part 4 of the final draft DCO [REP7-039]. NR therefore withdrew its objection to the Proposed Development. In light of this agreement, the ExA is content that this issue has now been resolved such that the Proposed Development would not give rise to any adverse impacts on level crossings.

Impacts on PRoWs, pedestrians and cyclists

12.3.57. In its LIR [REP1-074] ERYC acknowledged that there would be an impact on the PRoW network which would be dispersed throughout its area during the construction period. ERYC also considered that whilst there would be some permanent changes to the PRoW network in the vicinity of the OnSS the network in that area is sufficiently dense that effects would not be significantly adverse. In the SoCG with ERYC [REP7-060] all matters in regard to the assessment of effects on PRoWs had been agreed.

12.3.58. The ExA notes that, as part of the final CoCP, a Public Rights of Way Management Plan is secured under Requirement 18 of the final draft DCO [REP7-039], and that it would need to be agreed with ERYC before the connection works could commence. The ExA concludes that the adverse effects of proposed temporary impacts on PRoWs during the construction period would not be significant and that the proposed permanent diversion of the Rowley Bridleway No. 13 to the other side of the OnSS access road would entail minimal adverse effects. The ExA also concludes that the proposed permanent diversion of Skidby Footpath No.16 would have the potential to be of minor significance as an adverse effect to users of the PRoW network. This would depend on whether or not a route can be developed through the Public Right of Way Diversion Area 1 that could reconnect to the existing network with minimal deviation.

12.3.59. The ExA notes that potential measures for improving public footpath accessibility through the provision of signage, gates, vegetation

clearance and improved surfacing were referenced in the Outline Enhancement Strategy [APP-249]. The Applicant has stated in [APP-249] that these measures *"may be implemented"* with the exact measures being agreed with ERYC in the final Enhancement Strategy that is secured in Requirement 23 of the draft DCO [REP7-039]. The ExA is content that there could be some resultant improvements to public footpaths, but only if satisfactorily negotiated between the Applicant and ERYC.

12.3.60. Table 6.12 of ES Volume A3 Chapter 6: Land Use and Agriculture [APP-030] noted that no likely significant effects on National Cycle Network routes were identified and therefore were not considered in detail in the ES. No specific issues regarding impacts on cyclists were raised during the Examination and the ExA has no reason to disagree with the Applicant's assessment on this matter.

12.3.61. The Applicant has concluded that the residual impact on pedestrians during the construction phase would be slight adverse. LPC raised concerns about the potential impacts of the primary logistics compound on users of the pavement that leads from Lockington to the bus stop at the junction of Station Road West and the A164. However, there is a clear segregation of this stretch of pavement from Station Road West and therefore the ExA does not consider there would be any significant safety issues for pedestrians using this footway.

12.3.62. The ExA concludes that the impacts on PRoWs have been adequately assessed by the Applicant and the majority of impacts would be temporary and not significant with the exception of the proposed permanent diversion of Skidby Footpath No. 16 which has the potential to give rise to negative effects due to deviation of up to about 500metres in length, depending on the final route determined. However, even in the worst-case scenario, linkages to the existing PRoW network would be maintained. The ExA also considers that the longer-term monitoring and maintenance of reinstated PRoWs has been adequately secured in the draft DCO as part of the final CoCP.

Cumulative Impacts

12.3.63. In [REP7-095] ERYC withdrew its previous holding objection in regard to potential impacts on Jock's Lodge. In response to ExQ1 [PD-006, TT.1.4] both ERYC in [REP2-070] and Hull City Council (HCC) in [REP5-106] confirmed their view that there would be no cumulative effects from other schemes that would increase the significance of any of the project alone assessments for traffic impacts. The ExA has no reason to disagree with this.

Conclusion on traffic and transport including public rights of way

12.3.64. There has been no disagreement that the main traffic and transport impacts arising from the Proposed Development would be during the construction phase, which would be for a three-year period. ERYC and HCC are content with the assessment of impacts for both the project alone and cumulatively. Requirement 19 of the final draft DCO [REP7-039] makes reference to the CTMP being approved by the relevant highway authorities, which is defined in Part 1(2) of the draft DCO as meaning both ERYC and HCC.

12.3.65. The impacts on PRoWs would be limited and, with the exception of the two permanent diversions, would be for short-term periods during the overall construction phase. In the final SoCG with ERYC [REP7-060] all matters in relation to traffic and transport, coastal recreation, National Cycle Network routes and PRoWs are noted as being agreed.

12.3.66. The concerns that had been expressed by Addleshaw Goddard LLP on behalf of NR have now been overcome after discussions with the Applicant and the amended protective provision in Schedule 9 Part 4 of the final draft DCO [REP7-039]. Therefore, NR's objection was withdrawn in its D7 submission [REP7-096].

12.3.67. The ExA considers that the Applicant and ERYC have made a convincing case, particularly in terms of highway safety and traffic flow on the A146, regarding the location of the primary logistics compound to be accessed off Station Road West as opposed to the alternative logistics compound location that was proposed by LPC.

12.3.68. The ExA also considers that the Applicant has adequately assessed alternatives to its preferred OnSS access road, including the 'Option 2' alternative that was preferred by Quod on behalf of Mr and Mrs Dransfield [REP5-100]. The ExA concludes that taking the access from the existing A1079 layby would provide a safer and less congested means of construction traffic accessing the OnSS area than a route via the A164. Furthermore, the ExA considers that the benefits of the Applicant's preferred route in terms of highway safety and traffic flow would outweigh any limited disbenefits that may arise regarding ecology, flood risk or amenity impacts.

12.3.69. Having particular regard to paragraphs 5.13.6 and 5.13.7 of NPS EN-1 the ExA concludes that the Proposed Development would comply with NPS EN-1. Also, the Proposed Development would be in compliance with local plan policy since measures to promote green networks and sustainable travel during construction operations are included.

12.3.70. Taking all of this into account the ExA concludes that during the construction phase the Proposed Development alone and cumulatively would give rise to impacts on traffic and transport, including PRoW users and pedestrians, that in the planning balance would have a negative weight and to a minor degree. The decommissioning phase would be

likely to be less than or equal to the construction phase. Once in operation the Proposed Development would generate minimal additional traffic and its operational impacts would not therefore weigh against the case for the Proposed Development.

12.4. GEOLOGY AND GROUND CONDITIONS

Policy considerations

National policy

12.4.1. NPS EN-1 sets out policy considerations that are of relevance to matters pertaining to geology and ground conditions.

12.4.2. Paragraph 4.10.3 of NPS EN-1 advises that, *"In considering an application for development consent, the* [decision maker] *should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves."*

12.4.3. Paragraph 5.10.9 guides that applicants should safeguard mineral resources, *"as far as possible, taking into account the long-term potential of the land after decommissioning has taken place."*

Local policy

12.4.4. Policy ENV6 of the local plan relates to managing environmental hazards, including groundwater pollution, by avoiding development that would increase the risk of pollution in Source Protection Zones unless appropriate mitigation is employed.

The Applicant's case

12.4.5. The Applicant's case regarding geology and ground conditions was set out in ES Volume A3 Chapter 1, Geology and Ground Conditions [APP-025]. To accompany the application, the Applicant also submitted the following documents:

- Land Quality Preliminary Risk Assessment [APP-088];
- Geomorphological Baseline Survey Report [APP-097]; and
- Envirocheck Report, in eight separate parts [APP-089] to [APP-096].

12.4.6. In terms of geology and ground conditions, and as summarised in Table 1.9 of ES Volume A3 Chapter 1 [APP-025], the following potential impacts were considered:

- exposure of workforce to health impacts (construction phase);
- encountering contamination during intrusive works (construction phase); and
- sterilisation of mineral resources (operational phase).

12.4.7. Table 1.8 of ES Volume A3 Chapter 1 [APP-025] detailed the relevant commitments for geology and ground conditions that sought to eliminate or reduce the likely significant effects of a number of impacts. These

included the use of horizontal directional drilling (HDD) or other trenchless technology to cross features such as main rivers, drains, railways and roads, with specified separation distances for entry and exit pits. Also, there would be the development of a Pollution Prevention Plan that would be in accordance with the Outline Pollution Prevention Plan that was included as Appendix D of the Outline CoCP [REP4-019]. In addition, Appendices B and E of the Outline CoCP included respectively an Outline Soil Management Strategy and an Outline Site Waste Management Plan.

12.4.8. Table 1.16 of ES Volume A3 Chapter 1 [APP-025] concluded that during the construction phase there would be 'slight (not significant)' residual impacts due to the potential exposure of the workforce to health impacts and encountering contamination during intrusive works. The Applicant concluded in [APP-025] that residual impacts would be 'negligible adverse' in relation to geology and ground conditions.

Cumulative and transboundary impacts

12.4.9. Table 1.14 of [APP-025] listed a number of other projects that could give rise to cumulative impacts. However, the Applicant concluded that none of these other projects would have the potential to cause significant cumulative effects. The Applicant also concluded that there was no potential for significant transboundary effects regarding geology and ground conditions [APP-025, paragraph 1.13.1.1].

Planning issues

Historic landfill sites and contaminated land

12.4.10. In ExQ1 [PD-006, SEL.1.14], the ExA queried the potential for historic landfill sites that could be affected by the Proposed Development. In response, the Applicant stated [REP2-038] that, within the area of the Proposed Development, there were mineral workings that had been backfilled, but that there were no known landfill sites.

Minerals Safeguarding Areas

12.4.11. In paragraph 1.7.1.27 of [APP-025], the Applicant noted that, within the Order limits for the Proposed Development, the Minerals Safeguarding Areas covered approximately 1,130,000m^2, which would equate to 0.12% of the total Minerals Safeguarding Area within the overall boundary of ERYC.

ExA response

Historic landfill sites and contaminated land

12.4.12. The Applicant confirmed that no historic landfill sites were identified that would be directly affected. In the final SoCGs with ERYC [REP7-060] and the Environment Agency (EA) [REP7-067], all matters in relation to geology and ground conditions were noted as being agreed. Requirement 15 of the final draft DCO [REP7-039] requires the submission of a contaminated land and groundwater scheme before any stage of the

development could commence and this would need to be approved by the relevant planning authority in consultation with the EA. The ExA considers that this would provide a suitable mechanism for identifying any contamination and approving any remedial measures that may be required before connection works could commence.

12.4.13. The Outline CoCP [REP4-019] contained outline documents for soil management, site waste management and pollution prevention. Final versions of these would be required to be included for approval of the relevant planning authority, in consultation with the EA, in the final CoCP that is secured through Requirement 18 of the final draft DCO [REP7-039]. Taking all of this into account, the ExA is satisfied that the impacts of the Proposed Development on this issue would be acceptable and adequate mitigation has been secured in the draft DCO.

Minerals Safeguarding Areas

12.4.14. In response to ExQ1 [PD-006, SEL.1.6 and SEL.1.10], ERYC confirmed [REP2-070] that it was satisfied with the Applicant's approach with regard to mineral resources and the approach that was noted in the Impacts Register [APP-049]. The underlying minerals deposits are sand and gravel and the ExA has not been presented with any evidence that these would be of particular importance. Therefore, whilst parts of the Proposed Development would cross through some minerals safeguarding areas, the ExA is content that the overall impact on minerals resources, when considered at the local authority level, would be very limited.

Conclusion on geology and ground conditions

12.4.15. In its LIR [REP1-074], ERYC did not specifically reference geology and ground conditions, except for coastal erosion matters, which are considered in Chapter 7 of this Report. In the final SoCGs with ERYC [REP7-060] and the EA [REP7-067], all matters were agreed regarding geology and ground conditions. Any impacts on geology and ground conditions would be localised, small-scale and limited to the construction period. There would be the potential for the sterilisation of some sand and gravel resources, but only to a very limited degree when considered in the context of the resource available within ERYC's overall area.

12.4.16. The ExA considers that the mitigation measures proposed by the Applicant, including the submission of a contaminated land and groundwater scheme that is secured in Requirement 15 of the final draft DCO [REP7-039], and the measures contained within the Outline CoCP [REP4-019], would be adequate to ensure that any contamination encountered would be properly dealt with.

12.4.17. The ExA therefore concludes that the Proposed Development, both alone and cumulatively, would accord with NPS EN-1 and local policy in this regard.

12.4.18. Taking all of this into account, the ExA concludes that the overall effects on geology and ground conditions would either alone or cumulatively weigh not weigh against the case for the Proposed Development.

12.5. ONSHORE HISTORIC ENVIRONMENT

12.5.1. This Section considers the historic environment, identified as a principal issue in the ExA's initial assessment. The matters considered in this section include:

- effects on the onshore historic environment including archaeology and designated heritage assets; and
- archaeological investigation, monitoring and supervision.

Policy considerations

National policy

12.5.2. NPS EN-1 requires the applicant to:

- Provide a description of the significance of the heritage assets and likely archaeological features that may be affected by the Proposed Development and the contribution of their setting to that significance. Where proposed development would affect the setting of a heritage asset, the applicant may need to provide representative visualisations (paragraphs 5.8.8, 5.8.9 and 5.8.10).
- Carry out appropriate desk-based assessments, supplemented by field evaluation if the former is insufficient to assess archaeological interest (paragraph 5.8.9).
- Ensure that the extent of the impact of the proposed development can be adequately understood from the application with supporting documents, and that the level of detail required is proportionate to the importance of the heritage asset (paragraphs 5.8.8 to 5.8.10).

12.5.3. In reaching a decision on an application for development consent, NPS EN-1 requires that the decision maker (SoS) should:

- seek to identify and assess the particular significance of any heritage asset that may be affected including the setting of the heritage asset (paragraph 5.8.11);
- take account of the particular nature of the significance of the heritage assets and the value they hold for this and future generations (paragraph 5.8.12);
- take into account the desirability of sustaining and enhancing the significance of heritage assets (paragraph 5.8.13);
- presume in favour of conserving designated heritage assets such that the greater the significance of the designated asset, the greater the presumption in favour of its conservation (paragraph 5.8.14);
- weigh any harmful impact on the significance of a designated heritage asset against the public benefit of development (paragraph 5.18.15);
- where loss of significance of any heritage asset is justified on the merits of the development proposed, the decision maker should consider imposing a condition or requirement for the applicant to enter into an obligation that will prevent such loss occurring until it is reasonably certain that the relevant part of the development is to proceed (paragraph 5.8.17);

- require the developer to record and advance understanding of the significance of a heritage asset before it is lost, proportionate to the degree of significance of the asset where loss of significance of any heritage asset is justified on the merits of the development proposed (paragraph 5.8.20);
- impose requirements where such recording and publication is required that such work is carried out in a timely manner in accordance with an agreed and secured written scheme of investigation (paragraph 5.8.21); and
- impose requirements to secure appropriate identification and treatment of such assets discovered during construction where the decision maker considers there is a high probability of as-yet undiscovered assets (paragraph 5.8.22).

12.5.4. The NPPF establishes that heritage assets should be conserved in a manner appropriate to their significance. Section 16 deals with conserving and enhancing the historic environment. It sets out the assessment requirements and consideration to be given to potential impacts, which are compatible with the policy position set out in NPS EN-1.

Other relevant legislation and guidance

12.5.5. Regulation 3 of the Infrastructure Planning (Decisions) Regulations 2010 sets out requirements for the decision maker in connection with listed buildings and scheduled monuments (SMs).

12.5.6. Schedule 9 of the Electricity Act 1989 places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity infrastructure, to have regard to the desirability of protecting (*inter alia*) sites, buildings and objects of architectural, historic or archaeological interest.

Local policy

12.5.7. Policy ENV3 of the local plan sets out the issues the Council will consider in relation to the historic environment.

12.5.8. The local plan notes that the significance, views, setting, character, appearance and context of heritage assets, both designated and non-designated, should be conserved. In particular, key features of the East Riding landscape should be considered as part of the planning process. Examples include the nationally important archaeological sites of the Yorkshire Wolds, parts of Holderness where waterlogged archaeological deposits survive, Listed Buildings, Conservation Areas, historic parks and gardens and heritage assets associated with the East Yorkshire coast.

12.5.9. Policy ENV3(c) states that development that is likely to cause harm to the significance of a heritage asset will only be granted permission where the public benefits of the proposal outweigh the potential harm.

12.5.10. The Council notes (Policy ENV3(d)) that, where development affecting archaeological sites is acceptable in principle, it will seek to ensure mitigation of damage through preservation of the remains *in situ* as a

preferred solution. Where this is not possible, then the developer will be required to make adequate provision for excavation and recording before or during development.

The Applicant's case

12.5.11. The Applicant's ES Volume A3 Chapter 5, Historic Environment [APP-029] included an assessment of onshore archaeology and cultural heritage for the construction, operational and decommissioning stages. It was supported by Annexes [APP-116] and [APP-117], including assessments of effects of the Proposed Development on the significance of onshore heritage assets. Cumulative effects on onshore archaeology and cultural heritage are covered in Volume 4 Onshore Cumulative Effects Annex 5.5 [APP-053]. An outline Written Scheme of Investigation (WSI) for Onshore Archaeology was submitted with the application [APP-245, revised as REP3-012]. The WSI would be secured under Requirement 16 of the draft DCO [APP-203].

12.5.12. The Applicant established four historic environment study areas of varying size around the onshore elements of the Proposed Development, to ensure a full assessment of any potential impacts was undertaken. These study areas were decided using professional judgement and industry guidance, alongside consideration of the zone of theoretical visibility produced for the OnSS buildings and structures.

12.5.13. The study areas established by the Applicant in its assessment were:

- Onshore Export Cable Corridor (ECC) Boundary (including landfall):
  - a 500m study area either side of the onshore ECC and 400 KiloVolt (kV) National Grid Electricity Transmission Plc (NGET) connection area for non-designated heritage assets; and
  - a 1km study area either side of the onshore ECC and 400kV NGET connection area for designated heritage assets.
- OnSS Boundary (including the EBI):
  - A 5 kilometer (km) study area from the OnSS for designated heritage assets and non-designated built heritage assets; and
  - A 1km study area from the OnSS for other non-designated heritage assets (ie buried archaeological remains and findspots).

12.5.14. The Applicant identified a total of 69 heritage assets, or groupings of heritage assets (both designated and non-designated), that it considered 'key' to the Proposed Development due to their susceptibility to an impact arising during construction, operation and maintenance, or decommissioning [APP-029, Table 5.5, Figure 5.2].

12.5.15. The Applicant defined key assets as those which had the potential to be affected either directly or indirectly by the project and which were identified through the assessment work undertaken to inform the Applicant's ES. These were initially identified as part of the Applicant's Historic Environment Desk Based Assessment (DBA) and then refined and updated for this chapter following the information provided from the

other archaeological assessments (Aerial Photographic and Lidar Assessment, Priority Archaeological Geophysical Survey and Geoarchaeological DBA).

12.5.16. The key, non-designated heritage assets that the Applicant identified as likely to be subject to a direct (physical) impact were brought forward into the impact assessment, as presented in Section 5.11 of its historic environment chapter [APP-029].

12.5.17. Key designated and non-designated heritage assets that were identified as having intervisibility or potential intervisibility with the Proposed Development, and therefore possibly subject to alterations to their setting, were described in detail in the Applicant's Historic Environment DBA [APP-116].

12.5.18. The Applicant identified a single Scheduled Monument (HP4-56 – Beverley Sanctuary Limit Stone, Bishop Burton) located within the Proposed Development Order limits. For this reason, direct (physical) impacts on designated heritage assets were assessed by the Applicant within its historic environment ES chapter [APP-029]. The Applicant has clarified that all other designated heritage assets would be avoided by the Order limits and provided additional information to confirm this in commitment 2 in its Commitments Register [REP4-007].

12.5.19. The Applicant's Planning Statement [APP-229, paragraph 7.6.1.4] noted that direct (physical) impacts could occur to the Beverley Sanctuary Limit Stone Scheduled Monument located within the onshore ECC, but concluded that with mitigation measures in place, alongside the commitments set out by the Applicant, the residual level of impact would not be significant.

12.5.20. The assessment of the effects of the Proposed Development on the settings of heritage assets identified that the OnSS structures would form a new, permanent, intrusive visual element within the wider setting of some. However, the Applicant took the view in its Planning Statement [APP-229, paragraph 7.6.1.3] that this change in setting would not adversely affect the ability to appreciate heritage significance or adversely impact the significance of those heritage assets.

12.5.21. Table 5.15 of the Applicant's historic environment chapter of the ES [APP-029] assessed in summary that no significant effects would be likely after mitigation, including exclusion zones, micro-siting and best practice archaeological mitigation [APP-029, Table 5.15].

12.5.22. In addition, the Applicant submitted a Commitments Register [APP-050], that compiled mitigation commitments. Relevant Onshore Historic Environment commitments were tabulated, with corresponding signposting to confirm where they would be secured by the DCO (commitments: 2, 7, 25, 26, 28, 30, 69, 124, 127, 145, 150, 151, 159, 160, 193, 195 [APP-029, Table 5.7]).

Cumulative effects

12.5.23. The potential likelihood of cumulative effects on the historic environment was set out in Table 5.13 of ES Volume A3 Chapter 5 [APP-029]. A number of specific developments, including: Dogger Bank Creyke Beck A and B substations and associated cabling projects; other infrastructure projects near to the OnSS, such as a battery storage facility; a large housing development with a park and ride facility north of Minster Way; and a number of 'smaller' projects within 5km of the OnSS or 1km of the onshore ECC were included to provide context. For all developments, the Applicant considered there would be, "*No potential for significant cumulative effects*." The Applicant also identified that there was no potential for significant transboundary effects in relation to the historic environment [APP-029, paragraph 5.13.1.1].

Inter-related effects

12.5.24. Table 5.14 of ES Volume A3 Chapter 5 [APP-029] reports the Applicant's assessment of inter-related impacts on the onshore historic environment. The Applicant identified that there would be some project lifetime effects, whilst receptor-led effects were also identified. The results of these inter-related effects were not considered by the Applicant to result in an effect of greater significance than when assessed individually.

Planning issues

12.5.25. ERYC is the relevant planning authority for heritage matters onshore, consulting with its advisers Humber Archaeological Partnership as well as HE. ERYC jurisdiction extends across the intertidal zone landward of MLWS at the proposed landfall site.

12.5.26. In its LIR [REP1-074], ERYC noted that only one designated heritage asset would be located within the Order limits, HP4-56, Beverley Sanctuary Limit Stone, Bishop Burton, which is a Scheduled Monument (SM). ERYC noted that the Applicant had proposed measures to avoid direct physical effects [REP1-074, paragraph4.8.3]. The LIR also noted the potential for effects on non-designated heritage assets including World War II defences and concrete tracks at Lissett Airfield. ERYC advised that the means of dealing with these assets would need to be agreed through the development of a WSI. ERYC made no representation in its LIR about historic environment heritage assets in the intertidal zone, but confirmed during the Examination that it had no concerns or objections in that regard [REP4-066].

Impact assessment and protection of Scheduled Monument at York Road during construction

12.5.27. HE [RR-015] expressed concern that appropriate bodies, including HE, might not be adequately consulted on the potential impact of the onshore ECC on an area of considerable archaeological potential. This concern was based on wording set out in the Applicant's WSI for Onshore Archaeology.

12.5.28. The Applicant responded to this concern [REP1-038, section RR-015-5], confirming its intention that HE would be consulted on matters of archaeological science and high-level research questions, as well as at the request of Humber Archaeology Partnership.

12.5.29. A SoCG between the Applicant and HE [REP1-043] was submitted by the Applicant at D1 with the position of all matters noted as being 'ongoing points of discussion'.

12.5.30. The Impact Register [APP-049, page 57] reported that, following route refinement, the Applicant had identified that a SM would be located within the onshore ECC. As a consequence, the Applicant had scoped the impact on designated heritage assets during construction back in for assessment. However, the Impact Register indicated that this was a 'simple assessment' rather than a 'detailed assessment'. Given the potential to impact on a SM, the ExA [PD-006, HE.1.6] sought the views of HE as to whether they agreed with this approach.

12.5.31. HE responded at D2 [REP2-075] to confirm that the specific heritage asset referred to was the Beverley Sanctuary Limit Stone, Bishop Burton cross. HE noted that this SM was believed to be in its original location and that it therefore had high evidential and historical value. HE nevertheless agreed with the Applicant's assessment that there would be no physical impact on the designated site and that whilst construction activities would temporarily alter its setting, this was considered to be a short-term adverse impact. HE also confirmed [REP2-075] that it agreed with the Applicant's EIA approach.

12.5.32. The ExA also sought comment from the Applicant, HE and ERYC [PD-006, HE 1.9] on the agreement of further mitigation measures to lessen the impact of the Proposed Development on heritage assets.

12.5.33. The Applicant responded [REP2-038] that it did not foresee any barriers that would prevent the agreement of further mitigation measures, as defined in its Historic Environment ES chapter [APP-029] and in its outline WSI for onshore archaeology [APP-245].

12.5.34. HE [REP2-075, HE 1.9] noted that, while it agreed with the Applicant's assessment approach and assessment of impact, the safety and protection of heritage assets during the construction process would be reliant on effective communication between all parties. In the same response, HE called for the Applicant to set out a clear suite of best work practices detailing responsibilities, working methods, risk assessments and reporting procedures. HE also recommended that there should be a specific requirement in the DCO requiring submission of detail and sign off from HE regarding the measures to be adopted by the Applicant to ensure the safety of the Beverley Sanctuary Limit Stone and its setting during the construction works.

12.5.35. ERYC responded [REP2-070] that it agreed with the mitigation identified by the Applicant and considered that this mitigation could be secured

through Requirements in the draft DCO, subject to an acceptable detailed scheme being submitted during the Examination process.

12.5.36. The Applicant submitted an updated WSI at D3 [REP3-012], which included updated wording to include further specific details for the safety and protection of the Beverley Sanctuary Limit Stone during construction, and a requirement to produce a specific Mitigation Method Statement which would be referred to in its outline CoCP.

12.5.37. At D4, the Applicant submitted a revised outline CoCP [REP4-019], which included additional wording to confirm that a Mitigation Method Statement detailing additional measures to ensure the protection of the Beverley Sanctuary Limit Stone would be produced.

12.5.38. The Applicant submitted an updated SoCG with HE at D5a [REP5a-005], which noted agreement from HE that an appropriate works methodology to secure the protection of the Beverley Sanctuary Limit Stone and its setting during the works process had been developed.

12.5.39. The Applicant submitted a final signed SoCG with HE [REP7-069]. Three matters retained the position of 'not agreed. No material impact' within this submission: item G1.14:1.1, which HE considered to be a matter for the ExA; and items G1.14:1.8 and 1.9, which both highlighted the differing interpretations of the word 'significance' between the two parties and its usage by the Applicant through its ES.

ExA response

12.5.40. The ExA has noted the outstanding points which remain as not agreed between the Applicant and HE. Taking these into account and considering the Applicant's progress in addressing the concerns raised by HE relating to the mitigation of potential impacts to onshore heritage assets, the ExA considers that the Applicant's assessment methodology in relation to the historic environment and its methodology to ensure the safety of the Beverley Sanctuary Limit Stone are appropriate and acceptable.

12.5.41. With regards to the potential impact on onshore archaeology, the ExA is satisfied that, should archaeological finds be discovered during construction, the WSI secured by Requirement 17 (Onshore archaeology) would ensure that they would be protected, recorded or preserved as secured. Part 17(2) of the Requirement ensures that HE would be consulted by ERYC on the detail of the WSI.

12.5.42. The ExA is satisfied that, while the setting of the Beverley Sanctuary Limit Stone would be affected during construction, this would be temporary and for a limited period. As a result, the ExA considers that the Beverley Sanctuary Limit Stone and its setting would not be adversely affected as a result of the Proposed Development

12.5.43. Based on its Examination, the ExA considers that policy requirements in NPS EN-1 and NPS EN-3 with regard to the historic environment, have been met as follows:

- by consulting with relevant statutory consultees at an early stage and carrying out assessment in accordance with policy within NPS EN-1 Section 5.8 (NPS EN-3 paragraphs 2.6.140 to 2.6.143);
- by providing a description of known heritage assets in a level of detail proportionate to the importance of the heritage assets and in such a way that the extent of the impact of the Proposed Development could be adequately understood (NPS EN-1, paragraphs 5.8.8 to 5.8.10); and
- by providing commitments secured by the draft DCO to record and advance understanding of the significance of any heritage asset before it is lost, proportionately and in a timely manner in accordance with an agreed and secured written scheme of investigation to secure appropriate identification and treatment of such assets discovered during construction (NPS EN-1, paragraphs 5.8.20, 5.8.21 and 5.8.22).

12.5.44. As a result, the ExA considers that there would be no substantial harm from the construction or operation of the Proposed Development, either physically or on the setting of any heritage assets, including non-designated assets. The Proposed Development would not result in the loss of any designated or non-designated assets, and should new assets be found in the form of archaeological remains, the ExA, as set out above, is satisfied that there would be measures in place to ensure that they were adequately protected. The Proposed Development would also therefore comply with the guidance contained within the NPPF, the requirements of the Electricity Act 1989 and policy ENV3 of the Local Plan.

Conclusion on onshore historic environment

12.5.45. On the basis of the evidence and the proposed mitigation that would be secured through the Applicant's final draft DCO [REP7-039], the ExA considers that all impacts have been addressed in a manner that complies with the historic environment elements of NPS EN-1 and NPS EN-3, such that the Proposed Development would not harm the historic environment. Furthermore, there is potential for public benefit to derive from archaeological investigation undertaken as part of the Proposed Development.

12.5.46. Accordingly, the ExA is satisfied that the Proposed Development would have no likely significant effects on the historic environment and is satisfied that mitigation would be adequately provided for and secured through the recommended DCO, if made. In this respect, the ExA consider that onshore historic environment matters would not weigh against the case for the Proposed Development.

12.6. ONSHORE WATER ENVIRONMENT

Policy considerations

National policy

12.6.1. NPS EN-1 sets out policy considerations that are of relevance to the onshore water environment. Paragraph 5.7.3 of NPS EN-1 states that the aims of planning policy on development and flood risk are to ensure that flood risk from all sources is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding. Paragraph 5.7.5 of NPS EN-1 sets out the minimum requirements that should be addressed in flood risk assessments, including a consideration of both the risk of flooding arising from the project as well as flooding to the project. Such assessments should take the effects of climate change into account.

12.6.2. NPS EN-3 supports NPS EN-1, and it also provides guidance on flood risk that accords with NPS EN-1.

Local policy

12.6.3. Policy S2 of the local plan relates to addressing climate change and adapting to its expected impacts.

12.6.4. Policy ENV5 requires that development proposals should incorporate new green infrastructure features, including Sustainable Drainage Systems (SuDS), in their design.

12.6.5. Policy ENV6 refers to managing environmental hazards. In regard to flood risk, this means the application of a sequential test on the basis of the East Riding of Yorkshire Strategic Flood Risk Assessment and the Environment Agency's Flood Map. Policy ENV6 also refers to proactively managing flood risk by ensuring that new developments undertake a number of measures including limiting surface water run-off to existing run-off rates on greenfield sites, not increasing flood risk within or beyond the site and incorporating SuDS.

The Applicant's case

12.6.6. The Applicant's case in relation to the onshore water environment was mainly set out in ES Volume A3 Chapter 2, Hydrology and Flood Risk [APP-026]. In addition, Volume A3 Chapter 1 [APP-025] assessed Geology and Ground Conditions, including potential impacts on groundwater receptors.

12.6.7. The Applicant also submitted the following documents to accompany the application:

- Onshore Infrastructure Flood Risk Assessment (OIFRA) [APP-098];
- Water Framework Directive Compliance Assessment [APP-099];
- Outline Onshore Infrastructure Drainage Strategy (Outline OIDS) [APP-241];

- Outline Pollution Prevention Plan (Appendix D of the Outline CoCP)[APP-237] and
- Onshore Crossing Schedule [APP-040].

12.6.8. Furthermore, Table 3 of the Outline CoCP [REP4-019] indicated that a number of plans would be submitted as stand-alone documents, including a Construction Drainage Scheme, Pollution Prevention Plan and an Onshore Infrastructure Drainage Strategy.

12.6.9. As detailed in ES Volume A3 Chapter 2, Hydrology and Flood Risk [APP-026], the Onshore Crossing Schedule [APP-040], the Outline CoCP [REP4-019] and the Commitments Register [REP6-008] hydrology and flood risk mitigation would include the following measures:

- an OIDS, in accordance with the Outline OIDS (commitment 19);
- the permanent OnSS access track would be designed to maintain floodplain capacity, including an allowance for climate change, where it crosses a watercourse (commitment 184) and would maintain existing ground elevations (commitment 185);
- the drainage design at the OnSS would include SuDS measures (commitment 191);
- minimum separation distances for HDD entry and exit points in relation to watercourses and minimum installation depth of 1.2m beneath the hard bed of any watercourses (commitment 18);
- ensuring no loss of cross-sectional area to EA main rivers, and undertaking a pre- and post-construction condition survey at EA main river crossings (commitments 172 and 175).

12.6.10. By the close of the Examination, the final version of the Commitments Register was [REP6-008]. However, all of the aforementioned Commitments were not altered.

12.6.11. ES Volume A3 Chapter 2 [APP-026] concluded that, *"no LSE* [likely significant effects] *have been identified during the construction, operation and decommissioning stages following implementation of the project commitments…"*

12.6.12. In section 5 of its ES Volume A6 Annex 2.3, Water Framework Directive Compliance Assessment [APP-099] the Applicant concluded that:

" … following implementation of the control measures … there will be no permanent impacts on the status of any river or groundwater bodies that are sufficient to result in a deterioration in status of these water bodies. …[the Proposed Development] will not prevent water body status objectives from being achieved in the future and is therefore considered to be compliant with the requirements of the WFD."

12.6.13. As set out in Table 2.14 of [APP-026], the Applicant also concluded that there would be no significant cumulative impacts on hydrology and flood risk arising from either the construction or operation phases of the Proposed Development. Also, the Applicant considered that there would be no potential for significant transboundary effects in relation to hydrology and flood risk [APP-026, paragraph 2.13.1.1].

Planning issues

Impacts on watercourses and groundwater

12.6.14. The EA [RR-010], [AS-030] and [REP2-072] raised concerns about the impact on certain watercourses within the Order limits, particularly Watton Beck. The EA considered that there was uncertainty around both the depth of the onshore cabling associated with the Proposed Development and also the ground conditions at Watton Beck. Consequently, the EA's concern was that the presence of onshore cables could hinder any future flood improvement works that are likely to be required at Watton Beck. This would particularly be the case should such future flood defence works require piling.

12.6.15. The EA also raised concerns about the need for temporary bridge crossings at five main rivers [REP2-072]. Three of the proposed locations, Watton Beck, Scurf Dyke and Driffield Canal, had flood embankments within the proposed route of the onshore cable corridor route. The EA recommended that temporary crossings would need to work independently of any flood defence infrastructure so as not to load or disturb them, and to allow for maintenance access.

12.6.16. Associated with this, the EA also raised concerns [RR-010] about the Applicant's proposal in Article 6 of the draft DCO for the disapplication of the Environmental Permitting (England and Wales) Regulations 2016 in relation to permits for flood risk activities.

12.6.17. In Table 2.9 of ES Volume A3 Chapter 2, Hydrology and Flood Risk [APP-026] the Applicant stated that impacts due to changes in water quality had been scoped out of the ES and this had been agreed with the EA and the Beverley and Holderness Internal Drainage Board (IDB).

12.6.18. In its D7 response [REP7-097], the EA confirmed that it had reviewed action points 9 and 10 that arose from ISH8 [EV-032a] and had listened to the recording of ISH8 [EV-032b] and [EV-032c]. In [REP7-097] the EA confirmed its agreement with the summary that had been provided by the Applicant. Negotiations during the Examination resulted in the Applicant being able to demonstrate to the EA's satisfaction that the onshore cable route passing under Watton Beck would not prejudice the ability of the EA to undertake any flood defence works in that location in the future.

12.6.19. Consequently, by the close of the Examination, as reported in its D7 response [REP7-097] the EA stated that it could "*confirm that all outstanding matters have now been agreed*." This included the crossings of all watercourses and meant that the disapplication of the Environmental Permitting (England and Wales) Regulations 2016 had also been agreed by the EA. Also, in the final SoCG with the EA [REP7-067] all matters were noted as having been agreed.

The Onshore Substation, Flood Risk and Sustainable Drainage Systems

12.6.20. Another issue that arose during the Examination was the potential for flooding to occur in the OnSS area of the Order limits and the flood risk mitigation proposed. Mr and Mrs Taylor [RR-017], [RR-019] and [REP3-059] raised concerns about parts of the proposed OnSS site that currently act as 'natural flood areas' as parts of the existing fields were flooded at times.

12.6.21. Also, Quod, on behalf of Mr and Mrs Dransfield [REP5-100], contended that taking the permanent access road to the OnSS from the west off the A164 would avoid the need to cross areas in Flood Zone 3.

12.6.22. In response to the concerns that had been raised by Mr and Mrs Taylor regarding the potential for the OnSS or its immediate surrounds to be at risk of flooding, the Applicant submitted a Position Paper on Hydrology and Flood Risk [REP2-053]. This contained an assessment of the modelled water levels for the OnSS and the EBI (part of Work No. 7 in the final draft DCO). In its LIR [REP1-074], ERYC noted that the design parameters would allow for raised floor levels at the OnSS above anticipated flood levels for the lifetime of the development.

12.6.23. In response to Mr and Mrs Taylor's D3 submission [REP3-059], the Applicant produced a Signposting Document [REP4-042]. In this, amongst other matters, the Applicant referenced the mitigation measures in the Commitments Register [APP-050]. Also, the Applicant confirmed in [REP4-042] that the existing flood risk in the areas referred to by Mr and Mrs Taylor had been considered in the OIFRA [APP-098] in terms of both flood risk to the OnSS and any off-site impacts. The Applicant also stated [REP4-042] that drainage channels would be constructed on either one or both sides of the onshore cable corridor.

12.6.24. Work No. 7 in the final draft DCO [REP7-039] included the OnSS, EBI and a water attenuation feature. In response to ExQ1 [PD-006, OWE.1.6], the Applicant confirmed [REP2-038] that there would be sufficient space within the overall OnSS site for the other proposed SuDS and BNG measures to be provided in addition to the surface water attenuation feature. The Applicant referenced Figure 2 of the Outline LMP [APP-243], which provided a scaled indicative layout and depicted the water attenuation feature. Figure 2 was retained in the final version of the Outline LMP [REP3-010].

12.6.25. In response to ExQ2 [PD-012, OWE.2.3], ERYC noted [REP5-094] its agreement with the EA in relation to the section 51 advice on flood risk assessment. During the course of the Examination, the EA published updated peak rainfall allowances. In response to ExQ2 [PD-012, OWE.2.4] that asked about this, the Applicant stated [REP5-074] that the allowances in the updated guidance were lower than those already set out in the OIFRA [APP-098] and the Outline OIDS [APP-241], which used a conservative value of 30%. Therefore, the Applicant argued that the updated guidance did not alter the conclusions of those documents.

12.6.26. The EA commented in its D5 submission [REP5-099] that it would defer to ERYC as the lead local flood authority (LLFA) and also recommended that the Applicant reviewed the latest guidance in light of the lifetime of the Proposed Development and that a slightly larger attenuation feature might be required. In response to ExQ2 [PD-012, OWE.2.4], ERYC agreed with the Applicant that the updated guidance would not alter the conclusions of the OIFRA and the Outline OIDS [REP5-094].

Sequential Test and Exception Test

12.6.27. The Applicant applied the Sequential and Exception Test in the OIFRA [APP-098]. The Applicant concluded that the Proposed Development represented Essential Infrastructure and that the area within the Order limits lay in Flood Zones 1, 2 and 3. The Applicant stated in the OIFRA that the built elements of the permanent OnSS would be located in Flood Zone 1 and the permanent access road would also primarily be located in Flood Zone 1 [APP-098, paragraph 5.2.1.5]. However, where part of the access road would pass over the Atkin's Keld watercourse, it would be within Flood Zone 3. Therefore, the Applicant considered that the application of the Exception Test was required. For the first part of the Exception Test, the Applicant argued that the Proposed Development would provide wider sustainability benefits. In regard to the second part, the Applicant stated that where the permanent access track would pass over a watercourse it would be designed to maintain floodplain capacity and flow conveyance, including an allowance for climate change.

12.6.28. No concerns regarding the Applicant's assessment of the Sequential Test and the Exception Test were raised by either the EA or ERYC. In response to ExQ1 [PD-006, OWE.1.2], the Applicant confirmed [REP2-038] that it had, in line with the updated NPPF, considered all sources of flooding in its assessment. In its LIR [REP1-074], ERYC concurred with the Applicant that the majority of the Proposed Development would take place in Flood Zone 1 but that there were areas that fell within Flood Zones 2 and 3. It was ERYC's view that this was to be expected for a site which covered a large geographical area.

Nutrient levels in river basin catchments

12.6.29. During the course of the Examination, a Written Ministerial Statement was issued in relation to nutrient levels in some river basin catchments, including examples in the ERYC area. In response to ExQ2 [PD-012, OWE.2.2], the Applicant noted [REP5-074] that the Hornsea Mere Special Protection Area (SPA), which is located entirely within the Stream Dyke catchment, was assessed as being in unfavourable condition due to excess nitrogen and phosphorous. The Applicant contended that, as the Proposed Development was not located in the Stream Dyke catchment, there was no mechanism for it to increase the supply of nitrogen and phosphorous to Hornsea Mere SPA.

ExA response

Impacts on watercourses and groundwater

12.6.30. The ExA notes that the final draft DCO [REP7-039] secures the need for final, detailed versions of the following:

- a surface and foul water drainage scheme (Requirement 14);
- a contaminated land and groundwater scheme (Requirement 15);
- a surface water scheme (Requirement 16); and
- a pollution prevention plan (Requirement 18).

All of this information would need to be approved by the relevant planning authority in consultation with the EA. The ExA is therefore content that the approval of detailed matters pertaining to the watercourses and groundwater, once the detailed design of the Proposed Development has been formulated, has been adequately secured in the draft DCO.

12.6.31. In the final SoCG [REP7-060] with ERYC in its role as LLFA, all matters in relation to the assessment of impacts on watercourses had been agreed. Having regard to this agreement, the ExA is content that the Proposed Development, either alone or cumulatively, would not give rise to any significant impacts on watercourses. The ExA notes the Applicant's assessment in [APP-099] that the Proposed Development would comply with the Water Framework Directive, and the ExA has not been presented with any reason to disagree with this.

The Onshore Substation, flood risk and sustainable drainage systems

12.6.32. The ExA notes the scaled indicative layout provided by the Applicant that includes the proposed water attenuation feature [REP3-010]. Having regard to this, the ExA has no reason to disagree with the Applicant's contention that sufficient space would be available within the OnSS area for all the SuDS measures plus other measures such as Biodiversity Net Gain (BNG) features. However, the ExA notes that this could only be confirmed once the detailed design for all the infrastructure at the OnSS has been undertaken.

12.6.33. Flooding and drainage matters for the OnSS are secured in the final draft DCO [REP7-039] through Requirement 16, which requires a detailed surface water scheme, and Requirement 14 of the draft DCO, which requires final surface and foul water drainage details to be approved in writing by the LLFA after consultation with the relevant sewerage and drainage authorities and the EA. In addition, Requirement 7 of the draft DCO requires the approval of finished ground levels and drainage for Work No. 7.

12.6.34. Having regard to the information submitted by the Applicant, the comments received from the EA and ERYC, and the requirement for further assessments to be submitted and approved once the detailed design has been undertaken, the ExA is satisfied that matters relating to

flood risk and SuDS, particularly in the area of the OnSS, have been adequately accounted for and that further assessments based on the detailed design are properly secured in the final draft DCO [REP7-039].

Sequential Test and Exception Test

12.6.35. The ExA acknowledges that, as indicated in [REP5-100], an alternative location for the permanent OnSS access road to run from the west via the A164 might be able to avoid Flood Zone 3. However, that would depend on detailed design considerations. Even if that were the case, the Applicant and ERYC have cited reasons relating to traffic flow and road safety that support the preferred location for the permanent access road. These matters are considered in more detail in the traffic and transport Section of this Chapter.

12.6.36. The ExA is satisfied that the first part of the Exception Test has been passed since the Proposed Development would, as set out in Chapter 5 of this Report, clearly provide wider sustainability benefits through the provision of renewable energy. The areas of Flood Zone 3 that would be crossed by the permanent access road for Proposed Development would not be large in size and the Applicant has demonstrated that suitable mitigation could be provided. In addition, the ExA has had regard to the responses received from ERYC and the EA and considers that the Applicant has adequately demonstrated that flood capacity and flow conveyance would be maintained. Therefore, it is the ExA's view that the second part of the Exception Test has been met.

Nutrient levels in river basin catchments

12.6.37. The EA [REP5-099] considered that there would be no implications for the Proposed Development as a result of the Written Ministerial Statement. Taking into account the responses received to ExQ2 [PD-012, OWE.2.2] the ExA is satisfied that there would be no implications arising from this Written Ministerial Statement for the Proposed Development.

Conclusion on onshore water environment

12.6.38. As detailed in the final SoCGs with ERYC [REP7-060] and the EA [REP7-067], all matters regarding hydrology and flood risk have now been agreed. This includes agreement that adequate mitigation has been provided and a conclusion that there would be no significant impacts from the Proposed Development alone or cumulatively.

12.6.39. The ExA considers that the Applicant has taken reasonable steps to avoid development in Flood Zone 3 as far as possible. It has been agreed by the EA and ERYC (in its role as the LLFA) that the mitigation measures proposed by the Applicant, as summarised in the final Commitments Register [REP6-008], would adequately mitigate the impacts. The ExA has not been presented with any substantive evidence to doubt this.

12.6.40. The proposed water attenuation feature and associated SuDS at the OnSS would alleviate flood risk taking account of climate change. Furthermore, the floor levels at the proposed OnSS site would be

sufficiently elevated to avoid flooding. Requirement 16 of the final draft DCO [REP7-039] requires the submission and approval of a surface water scheme, and Requirement 18 of the draft DCO requires the submission of the final CoCP that contains, amongst other matters, a Construction Drainage Scheme, a Pollution Prevention Plan and an Onshore Infrastructure Drainage Strategy to be submitted as stand-alone documents. Having regard to this, the ExA considers that appropriate mitigation measures for the onshore water environment have been adequately secured in the final draft DCO.

12.6.41. Whilst there would be some impacts during the construction phase, these would be localised and minimal. The ExA therefore concludes that the Proposed Development would be in accordance with NPS EN-1 and local policy in regard to impacts on the onshore water environment.

12.6.42. Talking all of this into account the ExA concludes that, with the appropriate mitigation measures in place, the overall impact of the Proposed Development alone and cumulatively on the onshore water environment would not weigh against the case for the Proposed Development.

12.7. SOCIO-ECONOMIC AND LAND USE EFFECTS

12.7.1. The matters considered in this Section include:

- effects on jobs and skills with particular reference to maritime and coastal industries and tourism; and
- effects on agricultural and recreational land use (excluding PRoW).

Policy considerations

National policy

12.7.2. Paragraphs 5.12.2 and 5.12.3 of NPS EN-1 require that where a project is likely to have socio-economic impacts at local or regional levels, the Applicant should undertake and include in its application an assessment of these impacts as part of the ES, and should consider all relevant socio-economic impacts, including the creation of jobs and training, the provision of additional services, effects on tourism, the impact of a changing influx of workers and cumulative effects.

12.7.3. NPS EN-1 paragraphs 5.12.6 and 5.12.7 require that the decision maker should have regard to the potential socio-economic impacts of new energy infrastructure and also that, *"the* [decision maker] *may conclude that limited weight is to be given to assertions of socio-economic impacts that are not supported by evidence (particularly in view of the need for energy infrastructure as set out in this NPS)."*

12.7.4. For matters relating to land use and agriculture, NPS EN-1 requires the Applicant to identify existing and proposed land uses near the Proposed Development, to assess the potential effects of preventing continuing use of a neighbouring site or precluding a new development or use proposed in a development plan (Paragraphs 5.10.5 and 5.10.6), and to assess

effects on soil quality and Best and Most Versatile (BMV) agricultural land (Paragraph 5.10.8). In reaching a decision on an application for development consent, the decision maker should ensure applicants do not site development on BMV agricultural land without justification (Paragraph 5.10.15).

Local policy

12.7.5. Local Plan Policy EC1 refers to developing and strengthening key employment sectors and clusters and specifically references renewable energy. The supporting text to Policy EC1 states that, *"The Indices of Multiple Deprivation, which are compiled nationally, identify some parts of the East Riding as being amongst the most deprived areas in the country."*

The Applicant's case

Socio-economics

12.7.6. The Applicant's case regarding socio-economic matters was mainly set out in ES Volume A3 Chapter 10, Socio-economics [APP-034]. Whilst the Applicant included PRoWs within this ES chapter, the impacts on PRoWs are considered in the Traffic and Transport section of this Report.

12.7.7. The Applicant also submitted the following documents to accompany the application:

- Socio-economics Technical Report [APP-128]; and
- Outline Employment and Skills Plan [APP-253].

12.7.8. As noted in Table 10.10 of ES Volume A3 Chapter 10 [APP-034], the assessment drew mainly on assumptions from industry evidence rather than specific design factors. In Table 10.15 [APP-034], the Applicant set out its predicted impact on employment during the construction phase. Using a local study area of the former Humber Local Enterprise Partnership (LEP), the Applicant's predicted average annual impact over a construction period of 4.5 years was 1,600 full-time equivalent (FTE) jobs if a port in the Humber and East Yorkshire (HEY) region was used. This would reduce to 200 FTE jobs in a non-HEY United Kingdom (UK) port scenario or 100 jobs in a non-UK port scenario. During the operation and maintenance phase of the Proposed Development, the Applicant's prediction for the former Humber LEP local study area [APP-034, Table 10.16] was 200 FTE jobs in a HEY port scenario or less than 50 jobs in a non-HEY UK port scenario.

12.7.9. As reported in Table 10.9 of ES Volume A3 Chapter 10 [APP-034], the Applicant considered that there would be no likely significant effects on tourism, services and infrastructure, contributions to economic activity and employment, and cumulative effects. As stated in paragraph 10.8.2.3 of [APP-034], the Applicant did not consider that it was practicable to embed mitigation or enhancements to provide economic benefits due to the early stages of the Proposed Development. However, the Applicant referred to the final Outline Skills and Employment Plan that would be developed.

12.7.10. As set out in Table 10.17 of ES Volume A3 Chapter 10 [APP-034], the Applicant considered that there would be 'moderate beneficial' residual impacts from the project alone in terms of enabling local residents to access employment opportunities for both HEY ports and also non-HEY ports in the United Kingdom. All other residual impacts were assessed as being 'neutral'.

12.7.11. The Applicant noted that at this stage of the Proposed Development there was a degree of uncertainty about how goods, services and employment would be procured. In the Socio-economics Technical Report [APP-128], the Applicant acknowledged that there was some uncertainty regarding the location of ports for both the construction and operation and maintenance phases. The Applicant considered that the most likely port locations would fall within the former Humber LEP area. In section 4.18 of the Socio-economics Technical Report [APP-128], the Applicant noted that there were major businesses in the local study area that were involved in offshore wind developments, including the Siemens Gamesa blade manufacturing facility in Hull and REDS Maritime, which provided cable remediation and support. Whilst there may be opportunities for local business, these would be subject to subsequent commercial agreements and therefore could not be guaranteed to accrue locally.

Land use and agriculture

12.7.12. In ES Volume A3 Chapter 6, Land Use and Agriculture, the Applicant reported that no conflicts had been identified with projects or plans in a development plan that the Proposed Development would prevent or preclude, that no Green Belt would be affected by the Proposed Development, and that there would be no loss of open space [APP-030, Table 6.2].

12.7.13. The Applicant's ES confirmed that the design of the OnSS took account of the local environment and land uses [APP-030, page 10]. No community facilities fell within the Order limits of the Proposed Development and the nearest common land lay 80m to the north of the proposed Order limits at the National Grid substation at Creyke Beck [APP-030, paragraph 6.7.5.12].

12.7.14. The Applicant reported that 0.24% of the total land in Environmental Stewardship in the wider ERYC area was located within the proposed Order limits, the great majority of which would only be affected temporarily as it would be within the onshore ECC [APP-030, section 6.7.4].

12.7.15. In its assessment of effects on BMV agricultural land, the Applicant noted that the great majority of the land within the area studied for alternative cable corridor routing is classed as BMV land and therefore, opportunities for avoidance were very limited. The Applicant also noted that almost all of the land within the Order limits in the locality of the OnSS and National Grid connection was Grade 2, making avoidance of such BMV land impossible [APP-030, paragraph 6.7.2.14].

12.7.16. The Applicant assessed that existing farming practices would resume above the buried export cables after the reinstatement of the land [APP-030, paragraph 6.11.1.13].

12.7.17. In reporting on pre-application consultation, the Applicant explained that the assessment of significance of effect differentiates between permanent, medium-term and short-term loss of BMV soils and noted that it was undertaken using publicly available Agricultural Land Category (ALC) data and that a 'conservative and protective' approach was taken. This assumed all Grade 3 land to be Grade 3A and thus overestimated the area of BMV land. Consequently, "*the absence of further ALC data is not considered to affect the assessment or the mitigation identified to any significant degree*" [APP-030, Table 6.4 and paragraph 6.7.2.7 and sections 6.7.8 and 6.11].

12.7.18. The ES reported that, under commitment 10, [REP6-008] effects on agricultural soils would be minimised by the adoption of a Soil Management Strategy and reinstatement to pre-existing conditions wherever possible. This would be secured through the Requirement 18 (CoCP) in the DCO.

12.7.19. The Applicant assessed that the permanent loss of BMV land, together with impacts exceeding 10 years duration, would constitute approximately 18.9 hecatres (ha) of Grade 2 land at the OnSS (16.38ha for permanent work area and 2.53ha for permanent access tracks). Minor amounts of other BMV land would be lost to cable joint access covers along the onshore ECC. In aggregate, this would represent a little over 19.1ha, approximately 0.05% of the total Grade 2 BMV land in the bounds of ERYC [APP-030, paragraphs 6.7.2.14 and 6.11.1.6]. Being less than 20ha in extent, this impact was considered to be of minor magnitude, based on the Design Manual for Roads and Bridges methodology, as explained in the ES [APP-030, Table 6.16 and paragraph 6.10.2.1].

12.7.20. The effect of disruption to farming practices and reduction in land available for farming activities during construction was also identified as being of minor magnitude, given the temporary nature of effects after mitigation commitments were taken into account, including adoption of a CoCP secured through Requirement 18 of the final draft DCO [REP7-039]. Although the receptor was assessed to be of very high sensitivity, the Applicant concluded the significance of effect of loss of BMV land as 'slight adverse, and therefore not significant in EIA terms' [APP-030, paragraphs 6.11.1.7, 6.11.1.9 and 6.11.1.15].

12.7.21. Relevant commitments (commitments 63, 68, 8, 10, 19, 61 and 124) were proposed by the Applicant to mitigate impacts of construction on, *"agricultural land and farm holdings resulting in temporary disruption or reduction in land available for farming"* [APP-030, Table 6.14]. The Commitments Register confirmed how and where they would be secured by the draft DCO [APP-050]. Residual impacts after mitigation on land use and agriculture during construction were assessed as of 'slight

adverse' significance and none were considered 'significant in EIA terms' [APP-030, paragraphs 6.15.1.3 and 6.15.1.6].

12.7.22. Detailed consideration of the impacts of construction of the Proposed Development on coastal recreation through temporary disruption to coastal paths and beach at the proposed landfall location is reported as having been 'not considered in detail in the ES' by agreement with ERYC as no likely significant effect was identified [APP-030, Table 6.12]. However, coastal recreation was considered in ES Chapter 3 Site Selection and Consideration of Alternatives [APP-009] and the Applicant's commitment 192 would maintain beach access for the public during construction unless emergency access was to be required due to an unplanned event occurring [APP-249, page 12].

12.7.23. With the exception of matters mentioned above, no other direct or indirect impact of the Proposed Development on common land, Green Belt, community open space or sports and recreation facilities was identified in the application.

Cumulative Effects Assessment

12.7.24. The Applicant's assessment concluded no likely significant cumulative effects on land use, agriculture or recreation (including use of PRoWs) from the construction, operation or decommissioning of the Proposed Development [APP-030, section 6.12].

Transboundary and inter-related effects

12.7.25. The ES also concluded there would be no potential for transboundary effects with regard to land use and agriculture [APP-030, paragraph 6.13.1.1], and no significant inter-related effects in relation to land use and agriculture from construction or operation of the Proposed Development [APP-030, paragraph 6.14.1.3].

Planning issues

Impacts on the local economy

12.7.26. In its LIR, ERYC referenced socio-economic matters and acknowledged that the contribution the Proposed Development would make to economic activity and employment was not considered in detail [REP1-074]. However, ERYC went on to consider that:

"it is not disputed that there would be economic benefits arising from the application. The proposal could enhance the increasing focus on the region generally as the Energy Estuary and this could have other indirect effects such as educational value and putting the East Riding 'on the map' generating positive publicity".

12.7.27. An Outline Employment and Skills Plan [APP-253] was submitted to accompany the application. The submission of a final version was secured through Requirement 26 of the final draft DCO [REP7-039], which stipulated that no stage of the connection works may commence until a

final Employment and Skills Plan had been approved in writing by the relevant planning authority.

12.7.28. In its LIR, ERYC commented that the Outline Employment and Skills Plan, "… *includes general measures to identify opportunities for companies in Yorkshire and the Humber to access the supply chain and to work with partners to seek to maximise the ability of local people to access associated employment opportunities*" [REP1-074, paragraph 4.9.2]. This positive potential was also acknowledged by HCC [AS-001]. ERYC's LIR makes no reference to agriculture.

12.7.29. The Outline Skills and Employment Plan [APP-253] included the requirement to work with the LEP to identify skills and employment needs in the local area. This would increase the likelihood that the Proposed Development would bring about positive economic benefits within the local area. In response to ExQ1 [PD-006, SEL.1.3], HCC confirmed [REP5-106] that it had not identified any additional measures which it would wish to see included in the Employment and Skills Plan and ERYC [REP2-070] confirmed that it was satisfied with the examples of measures to promote employment and skills that were set out in it.

Impacts on local services and socio-economic infrastructure

12.7.30. As recorded in ES Table 10.9 [APP-034], the Applicant screened out an assessment of impacts on tourism. The Applicant's reasoning for this was that neither the offshore nor the onshore elements of the Proposed Development were close to major tourism centres or tourism and leisure assets. Similarly, in Table 10.9 [APP-034], the Applicant did not consider the potential negative impacts of the Proposed Development on social services and housing pressures. The Applicant contended that much of the construction workforce would be drawn from local and regional resources and there would be no service exposed to a large-scale demand from workers, and accommodation demand would be spread over a relatively wide area.

12.7.31. ERYC's LIR acknowledged that the effects of the Proposed Development on tourism, health, housing infrastructure and services were scoped out of the EIA. ERYC concurred that there would be no likely significant effects on these issues as a result of this application [REP1-074, paragraph 4.9.4]. The Applicant's assessment [APP-034] of no likely significant effects on tourism and local services was not disputed by HCC or the LEP. Furthermore, in response to ExQ1 [PD-006, SEL.1.4], ERYC confirmed [REP2-070] that it was content with the Applicant's assessment of no likely significant effects on tourism and recreation.

Land use and agriculture

12.7.32. ERYC's LIR [REP1-074] made no reference to agriculture but the signed SoCG with ERYC lists all matters on land use and agriculture as agreed [REP7-060]. There were no representations on this matter from the National Farmers Union or landowners.

12.7.33. The ExA asked the Applicant to clarify the thresholds of magnitude used in the EIA regarding the loss and temporary disturbance of BMV soils [PD-006, SEL.1.5]. The Applicant confirmed that it had liaised with Natural England (NE), resulting in the methodology used for assessment being amended. Following this, the residual impact on BMV soils in the construction phase was assessed as non-significant after mitigation, subject to measures incorporated in the Outline CoCP [APP-237, section 1.6 Soil Management Commitments], the Defra[11] Construction Code of Practice for Sustainable Use of Soils on Construction Sites 2009, and the oversight of an Agricultural Liaison Officer (commitment 61) [REP2-038].

12.7.34. NE confirmed that, whilst it would have preferred to have seen pre-application soil surveys to justify the classification of agricultural land that would be affected by the Proposed Development, it was satisfied by the commitment to surveys and mitigation regarding soil quality post-consent [REP2-082, superseded by AS-028, SEL.1.5].

12.7.35. As an action point from ISH2 [EV-010, AP 24], the ExA asked for further clarification of the aggregate loss of agricultural land to link boxes in the cable corridor, and received comprehensive clarification from the Applicant that the aggregate area of medium term or permanent loss of BMV agricultural land would be 19.116ha including the OnSS and its access and landscaping, and that all other land in the onshore ECC and at landfall should be reinstated to its former status under the commitments in the Outline CoCP and based on best practice guidance from Defra [REP4-036, item 9.1 and AP25].

12.7.36. In ExQ1 [PD-006, SEL.1.8], the ExA asked the Applicant to respond to Mr and Mrs Taylor's submissions [RR-017] and [RR-019] that the *"land disturbed by the wide cable corridor will leave parcels of land unworkable by modern agricultural machinery."* The Applicant responded [REP2-038] that, *"some areas of land lying adjacent to Burn Park Farmhouse may be temporarily unworkable by modern agricultural machinery during the construction works, and compensation will be payable to the relevant landowner and occupier of the land at the time"*.

ExA response

Impacts on the local economy

12.7.37. The predicted beneficial employment impacts arising from the construction and operational phases of the Proposed Development for the local study area of the former Humber LEP, as set out in Tables 10.15 and 10.16 of ES Volume A3 Chapter 10 [APP-034], were not disputed by ERYC or HCC. The ExA notes that the Applicant's assessment was based on assumptions from industry evidence and has no reason to disagree. Consequently, the ExA considers that employment benefits in terms of job creation and retention would accrue as a result of the construction and the operation and maintenance phases of the Proposed Development. The ExA also notes that the beneficial effects on

[11] Department for Environment, Food and Rural Affairs

employment within the local area, ie the former Humber LEP area, would be significantly greater under the HEY port scenario.

12.7.38. In the final SoCG with ERYC [REP7-060], all matters regarding socio-economic issues were agreed, including the EIA assessment methodology and conclusions, and that the measures described in the Outline Skills and Employment Plan were appropriate.

12.7.39. Having regard to the wording of the Outline Skills and Employment Plan and consultation responses from ERYC and HCC, the ExA considers that socio-economic matters have been properly taken into account and employment and skills opportunities have been identified. Furthermore, the ExA is content that the need for a final version of the Employment and Skills Plan to be provided by the Applicant, that would have regard to the detailed design and commercial considerations, has been adequately secured in Requirement 26 of the final draft DCO [REP7-039].

Impacts on local services and socio-economic infrastructure

12.7.40. Due to the location of the Proposed Development, and the predominantly local and regional labour market for the predicted employment creation, the ExA agrees with the views expressed by the Applicant and ERYC that there would not be any significant impacts on local tourism or significant pressure on local social services including health and education and other infrastructure such as housing.

12.7.41. Also, in response to ExQ1 [PD-006, SEL.1.1], ERYC [REP2-070] agreed with the Applicant's assessment that there would not be any likely significant cumulative socio-economic effects. Having regard to the nature and location of the Proposed Development and the predicted employment generation, the ExA concurs with this.

Impacts on land use and agriculture

12.7.42. In its final signed SoCG with the Applicant, ERYC confirmed satisfaction that measures secured via the Outline CoCP and its appendices would be adequate to mitigate construction and post-construction effects on land use and agriculture receptors [REP7-060].

12.7.43. Based on its Examination of the application and evidence from IPs, the ExA considers that:

- The Applicant has adequately assessed the effects of the Proposed Development on soil quality and BMV agricultural land (NPS EN-1, Paragraph 5.10.8), and has sited the Proposed Development on BMV agricultural land only with adequate justification (NPS EN-1, Paragraph 5.10.15).
- No conflicts have been identified with projects or plans in a development plan that the Proposed Development would prevent or preclude.
- No Green Belt land, community facilities or common land would be affected by the Proposed Development and no public open space loss would occur.

12.7.44. At the end of the Examination, the ExA was satisfied with the Applicant's clarified assessment of loss and temporary disturbance of BMV soils, and its assessment of non-significant residual impact of the Proposed Development during construction and operation, after mitigation in conformity with the Defra Construction Code of Practice for Sustainable Use of Soils on Construction Sites. The ExA is satisfied that mitigation commitments, which are established in the Outline CoCP, are secured through the draft DCO.

12.7.45. The ExA is satisfied with the Applicant's explanation that some parcels of land near the property occupied by Mr and Mrs Taylor would be temporarily unworkable by modern agricultural machinery, but that compensation would be payable at the time [REP2-038, item SEL.1.8].

Conclusion on socio-economic and land use effects

12.7.46. As set out in the final SoCG [REP7-060], ERYC agrees with all matters regarding the socio-economic impacts of the Proposed Development.

12.7.47. The ExA considers that the Outline Employment and Skills Plan contains a reasonable assessment of future socio-economic provision and that the final version is adequately secured in the draft DCO by means of Requirement 26 [REP7-039].

12.7.48. Overall, the ExA agrees with ERYC's view that the Proposed Development has the potential to provide investment into the area and to deliver employment and training opportunities. The Proposed Development would therefore accord with NPS EN-1 and local policy in this regard.

12.7.49. The ExA considers that, with mitigation, there would be no likely significant effects on land use and agriculture from the construction, operation or decommissioning of the Proposed Development alone or cumulatively with other projects. The ExA concurs with the Applicant's assessment of impacts on BMV agricultural land as not significant after mitigation, based on the amount of permanent land loss being less than 20ha and taking account of the soil management measures in the CoCP secured through the draft DCO. Therefore, the ExA concludes that land use and agriculture matters (excluding PRoW) would not weigh against the case for the Proposed Development.

12.7.50. The ExA considers that an exact calculation of the socio-economic benefits to the local area would be difficult to quantify at this stage as it would depend on the exact nature of future commercial decisions, including whether a HEY port was utilised. The ExA notes that the predicted range in terms of average annual employment impacts for the local study area would be between 100 and 1,600 FTE jobs during the construction phase [APP-034, Table 10.15]. Having regard to this, it is the ExA's conclusion that the Proposed Development would give rise to beneficial economic impacts in terms of job creation and retention. However, due to the inherent economic uncertainties, until future commercial decisions have been made, the ExA considers that a cautious approach to the assessment of benefits should be applied. Furthermore,

there have been no adverse socio-economic effects that have been identified. Therefore, the ExA concludes that the impacts of the Proposed Development on socio-economic matters would have a minor positive weight in the planning balance.

12.8. ONSHORE ECOLOGY

Policy considerations

National policy

12.8.1. NPS EN-1 sets out policy considerations that are of relevance to onshore ecology.

12.8.2. Paragraph 5.3.6 of NPS EN-1 guides that failure to address the challenge of climate change will result in significant adverse impacts to biodiversity. It goes on to state in Paragraph 5.3.6 that, *"… The benefits of nationally significant low carbon energy infrastructure development may include benefits for biodiversity and geological conservation interests and these benefits may outweigh harm to these interests. The* [decision maker] *may take account of any such net benefit in cases where it can be demonstrated."*

12.8.3. Paragraph 5.3.7 of NPS EN-1 states that, *"As a general principle … development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives ... where significant harm cannot be avoided, then appropriate compensation measures should be sought."*

12.8.4. NPS EN-3 and NPS EN-5 both reference NPS EN-1. Paragraph 2.4.1 of NPS EN-5 guides that, due to their linear nature, electricity networks infrastructure provides excellent opportunities to reconnect important habitats via green corridors, biodiversity stepping zones and re-establishment of hedgerows.

Local policy

12.8.5. Local Plan Policy S2 refers to the need to address climate change, and among the delivery mechanisms is the promotion of proposals that enhance and link habitat networks to allow biodiversity to adapt.

12.8.6. Policy ENV4 of the Local Plan seeks to conserve and enhance biodiversity and geodiversity. Among other matters, it states that development resulting in loss or significant harm to a Local Site, or habitats or species supported by Local Sites, whether directly or indirectly, will only be supported if it can be demonstrated that there is a need for the development in that location and the benefits outweigh the loss or harm.

12.8.7. Policy ENV5 of the Local Plan promotes the incorporation of green infrastructure into development proposals.

The Applicant's case

12.8.8. The Applicant's case regarding onshore ecology is mainly set out in ES Volume A3 Chapter 3, Ecology and Nature Conservation [APP-027]. Paragraph 3.7.6.4 of ES Volume A3 Chapter 3 was subsequently amended early on in the Examination by [AS-008] in respect of the EU Withdrawal Bill coming into force. The study areas for various ecological receptors considered in the ES were set out in Table 3.5 of [APP-027]. Whilst all of the survey areas encompassed all of the Order limits, they varied in size in terms of the boundary and extended up to 2km for features such as statutory and non-statutory sites. The Applicant submitted the following survey reports to accompany the application:

- Extended Phase 1 Habitat Survey and Target Note Tables [APP-100] and [APP-101];
- Wintering, Migratory and Breeding Bird Survey Reports [APP-102] and [APP-103];
- Great Crested Newt (GCN) eDNA Survey Report [APP-104];
- Water Vole Survey Report [APP-105];
- Otter Survey Report [APP-106];
- Bat Survey Reports [APP-107 to APP-112];
- Hedgerow and Arboricultural Survey Report [APP-113]; and
- Badger Survey Report [APP-114].

12.8.9. In addition, the Applicant submitted an Outline Ecological Management Plan (Outline EMP) [APP-238], an Outline Net Gain Strategy [APP-251] and an Outline Onshore Biosecurity Risk Assessment (Appendix A of the Outline CoCP) [APP-237]. During the course of the Examination, the Outline EMP was updated [REP1-029], as was the Outline CoCP [REP4-019].

12.8.10. As outlined in ES Volume A3 Chapter 3 [APP-027], the Commitments Register [REP6-008], and the Outline EMP [REP1-029] there were a number of embedded and other mitigation measures. Table 3.14 of ES Volume A3 Chapter 3 listed the commitments that were of relevance to ecology and nature conservation. These included:

- crossing all main rivers, IDB maintained drains, main roads and railways using HDD, unless HDD technologies are not practical (commitment 1);
- avoidance of a number of sensitive areas including 33 local wildlife sites, and where possible, mature and protected trees (commitment 2);
- the replacement of any removed sections of hedgerows with like for like species (commitment 26);
- the development of a Landscaping Management Plan to include details of mitigation planting at the OnSS site (commitment 30);
- removing vegetation outside the bird nesting season, as far as practicable (commitment 33);
- the development of an Ecological Management Plan in accordance with the Outline EMP to include details of long-term mitigation and management measures (commitment 168); and

- the reinstatement of the bed and banks of watercourses to their pre-construction condition following the removal of any temporary structures (commitment 172).

12.8.11. The River Hull Headwaters Site of Special Scientific Interest (RHH SSSI) would be the only statutory site that would fall within any part of the Order limits [APP-027, paragraph 3.11.1.3]. The RHH SSSI includes a chalk stream with associated riverside grassland, woodland and fen habitats that support a diverse breeding bird community.

12.8.12. Also, the following non-statutory sites, ie Local Wildlife Sites, would fall within the Order limits:

- Moor Lane, intact ancient and species-rich hedge;
- Newbald Road, intact species-rich hedgerow;
- Raventhorpe Embankment, mosaic habitat of dense and scattered scrub;
- Bryan Mills Beck, stream with associated vegetation;
- Bealey's Beck, stream with dense or continuous scrub and ruderal vegetation; and
- Jillywood Lane, intact ancient species-rich hedgerow and medieval boundary.

Project alone impacts

12.8.13. Table 3.23 of ES Volume A3 Chapter 3 [APP-027] summarised the residual impacts of the project alone on onshore ecology. The impacts were predominantly predicted to be 'negligible, minor adverse' for most matters except for the potential impacts on badgers during the construction phase, which was categorised as being 'medium, minor adverse.'

12.8.14. The Applicant concluded in paragraph 3.15.1.2 of [APP-027] that, *"…provided the mitigation measures and individual commitments are in place to prevent impact on those receptors from the project, potential impacts are expected to be minor or not significant in relation to onshore ecological receptors."*

Cumulative impacts

12.8.15. The potential likelihood of cumulative effects on onshore ecology was set out in Table 3.21 of ES Volume A3 Chapter 3 [APP-027]. A number of existing developments, including the Riverhead Hall Nursing Home and Humberside Egg Laying Unit were considered to have the potential to generate nutrient nitrogen and acid deposition or nitrogen oxides (NO_x) emissions and were included in order to provide context. However, the 'minor adverse' predicted cumulative impacts were not considered by the Applicant to be significant. For all other developments, the Applicant considered there would be 'no potential for significant cumulative effects.' The Applicant also identified that there was no potential for significant transboundary effects in relation to onshore ecology and nature conservation [APP-027, paragraph 3.13.1.1].

Planning issues

Protected sites and other habitats

12.8.16. Yorkshire Wildlife Trust [RR-043] welcomed the Applicant's amendment to part of the Proposed Development to avoid impacting on Skerne Wetlands.

12.8.17. The only statutory site through which the onshore cable route for the Proposed Development would pass would be the RHH SSSI. The Applicant proposed, where possible, to use HDD or another trenchless technology for the construction of the onshore cable corridor within the RHH SSSI. The onshore cable corridor route would be also approximately 150m from Bryan Mills Field SSSI and 300m from Burton Bushes SSSI at the closest points, and the nearest part of the Greater Wash Special Protection Area (SPA) would be 1km away from the Proposed Development [APP-027].

12.8.18. The onshore cable corridor would pass through part of the RHH SSSI and the Applicant proposed the use of HDD or other trenchless technology, where practical, to cross watercourses. The Outline CoCP [REP4-019] required a Crossing Method Statement to form an appendix to the final CoCP. Furthermore, commitment 18 [REP6-008], which would be secured by Requirement 18 of the draft DCO as part of the final CoCP, required that HDD entry and exit pits would be located at least 9m away from IDB and ordinary surface watercourses and 20m from EA surface watercourses and the onshore export cables would be installed at least 1.2m below the hard bed of any watercourses.

12.8.19. As reported in ES Volume A3 Chapter 3 [APP-027], the Applicant assessed the impact on the RHH SSSI and Bryan Mills Field SSSI from nutrient nitrogen deposition, NO_x, acid deposition and ammonia concentrations as being not significant.

12.8.20. Concerns were raised on behalf of Mr and Mrs Dransfield [REP5-100] about potential impacts on the ecology of Jillywood Lane and Birkhill Woods, both listed Local Wildlife Sites. At ISH8 [EV-032] the ExA asked the Applicant to comment on the nature of that part of the Jillywood Lane Local Wildlife Site that could be affected by the permanent access road for the OnSS. In response, the Applicant stated [REP5a-014] that the access road would be at least some 15m away from the Birkhill Wood non-designated site, that this had been agreed with NE, and it would utilise a hedgerow gap to avoid intercepting with the Jillywood Lane Local Wildlife Site [REP6-035]. ERYC had not raised any concerns about impacts on either of these sites.

12.8.21. The Applicant noted in [APP-027] that the predominant habitat type in the OnSS area, which represented the majority of the permanent onshore development, was arable land surrounded by species poor hedgerows and was of relatively low ecological value. In terms of other habitats affected, as reported in the Ecology and Nature Conservation ES Chapter [APP-027], a total of 151 hedgerows was recorded within the Extended Phase 1 habitat survey area of the Order limits plus a 50m

buffer beyond. The majority of the hedgerows were classified as species-poor intact hedgerows. The construction phase of the Proposed Development would entail the temporary loss of sections of hedgerow and also some mature trees, primarily those located within hedgerows. For example, as indicated in paragraph 4.11.1.7 of ES Volume A3 Chapter 4 [APP-028] within the OnSS site there would be the removal of 210m of species-poor hedgerow and this would include a mature oak tree.

12.8.22. As indicated in Figure 2 of the Outline LMP [REP3-010], new tree and hedgerow planting using, as far as possible, locally-sourced native species, was proposed within the OnSS area.

Protected species

12.8.23. In addition to an Extended Phase 1 Habitat Survey [APP- 100], the Applicant submitted, to accompany the application, surveys for the following European protected species (EPS): bat species; otter; water vole; and GCN. Also, a badger survey was undertaken as this species is protected under the Protection of Badgers Act 1992.

12.8.24. Whilst no bat roosts were found during the 2019 survey work, it was noted that two trees potentially had bat emergence. There was no evidence of any maternity roosts within the Order limits. However, six bat species were recorded utilising habitats within the Order limits for foraging and commuting, including three that are considered as Species of Principal Importance. With bat species present within the Order limits, using hedgerows for foraging and commuting, additional mitigation measures would be undertaken. These included the use of moveable features to restore hedgerow gaps and the use of construction lighting in accordance with Guidance Note 8[12] [APP-027, paragraph 3.11.1.29].

12.8.25. As set out in ES Volume A3 Chapter 3 [APP-027], two main badger setts were located beyond the 30m buffer for the Order limits and a disused main sett was located on the Order limits. The presence of three outlier badger setts within the Order limits was also indicated in [APP-114].

12.8.26. A pre-construction survey for badgers was indicated in Table 2 of the Outline EMP [APP-238], with a final version of the EMP being secured in Requirement 10 of the final draft DCO [REP7-039]. In ES Volume A3 Chapter 3 [APP-027], the Applicant noted that the badger outlier setts would be subject to a badger mitigation licence application should pre-construction surveys confirm that they remain present and in use by badgers.

12.8.27. A pre-construction survey for breeding birds was also specified in Table 2 of the Outline EMP [APP-238]. Also, a 100m buffer for a barn owl nest

[12] Guidance Note 8 – Bats and Artificial Lighting, Institute of Lighting Professionals, 2018.

that had been identified near to part of the landfall access road was indicated in Figure 4 of [APP-238].

12.8.28. Water vole field signs were recorded at six watercourses within the survey area for the Proposed Development [APP-105]. No signs of the presence of otter were found during the survey work in 2019. One of the ponds in the eDNA survey [APP-104] indicated the presence of GCNs in an ornamental pond approximately 200m from the onshore ECC. Prior to the commencement of construction, the Applicant proposed the re-survey of all ponds that have not been surveyed within two years and also any ponds that were yet to be surveyed. The Applicant concluded in [APP-027] the effect on GCN would be of minor adverse significance which was not considered significant in EIA terms.

12.8.29. No substantial areas of reptile habitat were recorded during the Extended Phase 1 Habitat Survey and, as reported in ES Volume A3 Chapter 3 [APP-027, paragraph 3.7.5.59], it was agreed with NE, ERYC and the Yorkshire Wildlife Trust that reptile surveys were not needed.

Mitigation, enhancement and biodiversity net gain

12.8.30. To accompany the application, the Applicant submitted information relating to mitigation measures, enhancement (in the Outline EMP [APP-238]) and also BNG (in the Outline Net Gain Strategy [APP-251]). In its RR [RR-010], the EA raised questions about BNG. It noted that the proposed BNG would only cover the OnSS area and considered that there should be demonstrable gain for river habitats and that the possibility of off-site BNG should be considered.

12.8.31. ERYC concluded in its LIR [REP1-074] that, *"Subject to the implementation of the mitigation that is proposed in the ES and appropriate conditions as set out in the Draft DCO no concerns should be raised regarding the terrestrial aspects of the proposal".*

12.8.32. At ISH2 [EV-010], the ExA queried the nature of the relationship between the proposed mitigation, enhancement and BNG, and the Applicant confirmed that BNG would be in addition to enhancement [EV-010c]. This was followed up in ExQ2 [PD-012] as the ExA asked the Applicant and ERYC to comment on the relationship between ecological enhancement and BNG. In response, the Applicant stated [REP5-074] that, whilst there was an overlap in the outline plans, there would be a clear distinction between enhancement and BNG in the final plans that are required to be submitted.

12.8.33. In ExQ1 [PD-006, OE.1.7], the ExA asked the Applicant about the mechanism for post-construction monitoring and remedial measures for the proposed biodiversity mitigation, enhancement and BNG. In response [EV-010c] and [REP4-036], the Applicant stated that this would be set out in the final EMP and BNG Strategy that are both secured through the draft DCO and which would require approval of the relevant planning authority in consultation with the relevant Statutory Nature Conservation Body (SNCB).

ExA response

Protected sites and other habitats

12.8.34. No concerns were raised by NE or ERYC about any specific impacts on the RHH SSSI or any of the SSSIs that are outside the Order limits. The ExA is content that the onshore ecological mitigation measures are appropriate and have been adequately secured in the final draft DCO [REP7-039]. Taking this into account, the ExA is satisfied that any impacts on designated sites have been minimised as far as possible and would not be significant.

12.8.35. The ExA is satisfied that the location of the Proposed Development would be at a sufficient distance away so as not to give rise to any significant impacts on either of the Jillywood Lane or Birkhill Wood Local Wildlife Sites.

12.8.36. The construction phase of the Proposed Development would lead to the loss of some sections of hedgerows and trees, including mature specimens. Any hedgerow or tree removal would take place outside the bird nesting season and, if that could not be achieved, then a check for nesting birds would be undertaken and, if found, then the vegetation would not be removed until the young had fledged or the nest had failed [REP6-008, commitment 33]. Whilst this would inevitably have some impact on onshore ecology, the Applicant committed in the Outline EMP to the restoration of hedgerow lengths for all sections that require removal [APP-238]. A final version of the EMP would be secured through Requirement 10 of the final draft DCO [REP7-039] and would need to be approved by the relevant planning authority in consultation with the relevant SNCB, and also the EA if wetland habitats might be affected.

12.8.37. Therefore, the ExA is content that there would not be any significant adverse impacts on non-designated sites. Furthermore, whilst there would be short to medium term impacts caused by the removal of sections of hedgerow and some trees, the proposed planting, including replacement planting, would balance this out over the longer term.

Protected species

12.8.38. The Applicant concluded that, with the adoption of additional mitigation measures, the effect on bats would be of minor adverse significance. This assessment has not been contested by ERYC or NE and therefore the ExA has no reason to disagree with this.

12.8.39. Water voles were found to be present at six watercourses, of which five were proposed to be crossed using HDD and one using an open-cut technique. For the open-cut crossing, the Applicant has proposed undertaking a displacement exercise with an approved low impact water vole licence from NE [APP-027, paragraph 3.11.1.44]. The ExA has not been presented with any evidence to suggest that this would not be an acceptable approach and notes that, as recorded in [REP7-062], NE is content with the proposed mitigation measures and has issued a Letter of No Impediment in relation to water vole.

12.8.40. As indicated in the Outline EMP [APP-238], a draft GCN mitigation licence has been approved by NE with a Letter of No Impediment issues on 22 June 2021.

12.8.41. For all EPS, repeat, pre-construction surveys are required prior to the commencement of any stage of the connection works under Requirement 20 of the final draft DCO [REP7-039]. Should the presence of any EPS be identified then consultation with the relevant SNCB would be required. Furthermore, Table 2 of the Outline EMP [REP1-029], a final version of which is secured in Requirement 10 of the final draft DCO, also requires pre-construction surveys for badger and breeding birds.

12.8.42. In its LIR [REP1-074], ERYC commented in relation to biodiversity and ecology that, "*The assessments have been prepared in an appropriate manner that is consistent with recognised best practice and guidance*". In the final SoCG with ERYC [REP7-060], all matters in relation to onshore ecology are agreed.

12.8.43. Taking all of this into account, the ExA agrees with the Applicant's assessment that the impact would be minor adverse for EPS and other species during the construction phase and that adequate mitigation measures are secured in the final draft DCO [REP7-039] for EPS and other species including badger and nesting birds.

Mitigation, enhancement and biodiversity net gain

12.8.44. The ExA considers that, as it currently stands, the Applicant has not provided sufficient clarity around the measures that could be considered to fall under the ambit of BNG. Consequently, there would be the potential for duplication and double counting of the proposed enhancement and BNG measures. The ExA is aware of the Applicant's response that BNG measures would be worked up in more detail once the detailed design of or the Proposed Development had been completed, as required by Requirement 6 of the final draft DCO [REP7-039].

12.8.45. The ExA recommends that this matter needs to be clarified once the detailed design and final BNG Strategy is submitted for approval as required by Requirement 6 of the Applicant's final draft DCO [REP7-039]. However, the ExA also appreciates that BNG is not yet formally required for nationally significant infrastructure projects (NSIPs). On this basis, and having regard to current policy, the ExA considers that the final EMP and enhancement strategy that are secured under Requirement 10 and Requirement 23 respectively of the Applicant's final draft DCO, along with the final BNG Strategy that is secured under Requirement 6 of the final draft DCO, would collectively represent an acceptable level of provision for ecological enhancement and BNG based on current policy considerations.

Conclusion on onshore ecology

12.8.46. In its final Risk and Issues Log [REP7-105] and final SoCG [REP7-062], NE confirmed that it was satisfied with all matters in relation to onshore ecology. As stated in the final SoCG [REP7-060], ERYC is content with

the assessment of impacts for both the project alone and cumulatively in terms of onshore ecology. It is the ExA's view that the issue of BNG has been adequately provided for by the Applicant, having regard to the current legislative requirements.

12.8.47. The ExA agrees with the Applicant's assessment that the Proposed Development would have the potential to give rise to minor adverse impacts on bats, badger, GCN, water vole, and breeding and over-wintering bird species. However, due to the nature and location of construction activities and the species numbers likely to be affected, the impacts of the project alone and cumulatively would be minor adverse and would not be significant.

12.8.48. The mitigation and enhancement measures proposed by the Applicant would be both appropriate and adequate. Post-construction, there would be opportunities for the provision of ecological enhancement measures and BNG, particularly in the vicinity of the OnSS.

12.8.49. The Proposed Development would avoid significant harm to biodiversity interests and therefore the ExA concludes that the Proposed Development alone and cumulatively would accord with NPS EN-1 and local policy in this regard. In reaching this view, the ExA has had regard to NPS EN-1, including Paragraph 5.3.6, which recognises that the national benefits of low carbon energy infrastructure should be taken account of.

12.8.50. Taking all of this into account, the ExA considers that the overall effects on onshore ecology would be of limited negative weight in the planning balance in the short-term due to the construction operations. The proposed enhancement and BNG measures would give rise to positive benefits of limited positive weight in the longer term. Taken together, the ExA concludes that the overall effects of the Proposed Development, when all of its phases are considered together, would not weigh against the case for the Proposed Development.

12.9. NOISE AND VIBRATION

Policy considerations

12.9.1. NPS EN-1 (paragraph 4.14.2) considers it very important at the application stage for the decision maker to identify possible sources of nuisance under s79(1) of the Environmental Protection Act 1990 and how they may be mitigated or limited. This includes noise and vibration.

12.9.2. Specific advice on noise and vibration is provided in section 5.11. Amongst other things it advises (paragraph 5.11.9) that development consent should not be granted unless the decision maker can be satisfied that the Proposed Development would:

- avoid significant adverse impacts on health and quality of life from noise;
- mitigate and minimise other adverse impacts on health and quality of life from noise; and

- where possible, contribute to improvements to health and quality of life through the effective management and control of noise.

12.9.3. NPS EN-1 also advocates (paragraph 5.11.11) that the [decision-maker] should consider whether mitigation measures are needed both for operational and construction noise, over and above any which may form part of the application.

National Planning Policy Framework

12.9.4. Paragraph 170 of the NPPF sets out that planning policies and decisions should contribute to and enhance the natural and local environment.

12.9.5. Paragraph 180 of the NPPF states that planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

Noise Policy Statement for England, 2010

12.9.6. Paragraph 2.24 of the Noise Policy Statement for England March 2010 states that projects should:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

12.9.7. The first two points above require that significant adverse impacts should not occur and that, where a noise level falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect:

"*…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur*." (paragraph 2.24).

National Planning Practice Guidance for Noise, 2014

12.9.8. Paragraph 001 Reference ID: 30-001-20190722 of the National Planning Policy Guidance for Noise, as updated July 2019, establishes that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or making decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

Local planning policy

12.9.9. Policy EC5 (Supporting the Energy Sector) of the Local Plan states, in relation to noise:

"Proposals for the development of the energy sector, excluding wind energy but including the other types of development listed in Table 7, will be supported where any significant adverse impacts are addressed satisfactorily, and the residual harm is outweighed by the wider benefits of the proposal. Developments and their associated infrastructure should be acceptable in terms of:

1) The cumulative impact of the proposal with other existing and proposed energy sector developments;
……
3) The effects of development on:

i. *local amenity, including noise, air and water quality, traffic, vibration, dust and visual impact*..."

12.9.10. The ExA notes, however, that 'wind energy' in this context refers to onshore wind developments.

The Applicant's case

12.9.11. The Applicant's Volume A3, Chapter 8, Noise and Vibration of the ES [APP-032] was submitted as its assessment of the potential impact from the onshore element of the Proposed Development on noise and vibration receptors.

12.9.12. It included a summary [APP-032, Table 8.39] of the significant impacts assessed, along with any mitigation and the residual effects.

12.9.13. The Applicant has noted the consultation procedures that it undertook in advance of making the Application and has provided a summary of the responses received during this consultation [APP-032, Section 8.4].

12.9.14. The Applicant has provided narrative explanations [APP-032, Section 8.11] to be used in conjunction with Table 8.39. The Applicant formed the view that the evidence presented in the ES [APP-032] demonstrated that, with mitigation measures in place to prevent impacts on receptors from the Proposed Development, potential impacts were anticipated to be not significant to slight adverse in relation to noise and vibration receptors.

12.9.15. Further detail regarding noise nuisance is provided by the Statutory Nuisance Statement [APP-232] submitted by the Applicant to accompany its application.

Planning issues

12.9.16. Some RRs raised onshore noise and vibration issues:

- ERYC [RR-008] noted a general interest in a number of matters including noise;
- Gordons LLP, on behalf of Mr and Mrs Dransfield [RR-013], set out the view that the Applicant's noise assessment was inadequate to consider the true impact on the Dransfield's property; and
- Mr and Mrs Taylor [RR-017] and [RR-019] raised welfare concerns for livestock as a result of noise, dust and vibrations associated with the Proposed Development.

12.9.17. In addition, HCC [AS-001] raised concerns that there was the potential for noise and vibration impacts to register with sensitive receptors within the HCC area.

12.9.18. The Applicant provided comment on these at D1 [REP1-038].

12.9.19. ERYC's LIR [REP1-074] briefly touched on the issue of noise and residential amenity. While this did not raise concerns, the ExA has nevertheless given due regard to the points made.

12.9.20. The Applicant noted the points raised by ERYC in its LIR [REP-074] in its Responses to the Local Impact Report submitted at D2 [REP2-039].

12.9.21. In addition, Gordons LLP on behalf of Mr and Mrs Dransfield submitted a Written Representation (WR) at D2 [REP2-074].

12.9.22. The main issues that concerned the Examination were as follows:

- the potential for adverse effects from noise at receptors as a result of the construction and operation of the Proposed Development;
- cumulative effects of construction and operational impacts on the living conditions of residential receptors;
- the necessity for and likely effectiveness of any mitigation of these effects; and
- the adequacy of the Applicant's noise assessment in its consideration of the impact on receptors.

12.9.23. Gordons LLP, acting on behalf of Mr and Mrs Dransfield, submitted a RR [RR-013] that raised a number of issues that they believed the ExA should have regard to during the course of the Examination. Within this RR, the adequacy of the Applicant's noise assessment to consider the true impact on the Dransfield's property was cited as a primary concern. The issues raised on behalf of the Dransfield's relating to the Applicant's level of engagement and consultation are addressed further in Chapter 4 of this Report.

12.9.24. The Applicant responded at D1 [REP1-038]. In its response, the Applicant provided details of the noise assessment it had undertaken. This included the methodology for assessment of construction traffic noise impacts,

operation noise impacts and any relevant mitigation as presented in the Applicant's ES chapter on noise and vibration [APP-032].

12.9.25. The Applicant noted in its response [REP1-038, Appendix 2, Section RR-0130-APDX:A-I] that its assessment of construction traffic noise concluded that the impact at the Dransfield's residence would be negligible and therefore 'not significant in EIA terms'. The Applicant further noted that operational noise would be controlled by measures secured within the draft DCO [APP-203] and that these measures would ensure that operational noise would not be greater than 5 decibels (dB) above the background noise level at any receptor, including the Dransfield's residence. The Applicant therefore concluded that significant operational noise effects would not be experienced at the Dransfield's residence.

12.9.26. The ExA sought further evidence to support the Applicant's position on this matter at ExQ2 [PD-012, NVL.2.3]. The ExA noted the concerns raised by the Dransfield's in their RR [RR-013] about the proximity of the proposed OnSS access road to their residence, in particular the possibility that the proposed access road might be closer than 150m from their residence.

12.9.27. The ExA therefore sought confirmation from the Applicant on the basis for the defined 150m minimum distance and clarification of what parameters were included within the measurement. In addition, the ExA requested that the Applicant provide a plan to the Examination, at scale 1:1250, showing the closest distances between the proposed OnSS access road and the Dransfield's residence alongside the locations of monitoring points SMP5 and SMP6.

12.9.28. The Applicant responded at D5 [REP5-074], providing confirmation that the OnSS access road would be located more than 150m from the Dransfield's residence. The Applicant clarified that it had sought to place the proposed access road equidistant between residential properties to the east and west in order to maximise the distance to both properties and thus reduce potential noise impacts at both. As a result, the Applicant reiterated that it identified no significant effects from noise and vibration.

12.9.29. The Applicant also provided additional clarification on the guidance used to assess construction noise impacts (BS 5228-1: Code of practice for noise and vibration control on construction and open sites). The Applicant noted that this guidance requires that construction noise impacts should be assessed based on the predicted construction noise level at 1m from a façade of an occupied residential dwelling, with the aim of achieving reasonable construction noise levels inside residential properties.

12.9.30. The Applicant submitted a plan [REP5-079] showing the proximity of the proposed OnSS access road to the Dransfield's residence. The ExA noted that this plan confirmed that the proposed access road would be located more than 150m from the property in question. The ExA also noted that the plan showed that the proposed access road would be approximately

equidistant between the Dransfield's residence and monitoring point SMP5.

12.9.31. Mr and Mrs Taylor [RR-017] and [RR-019] attended the OFH [EV-007b] where they expanded on the concerns and raised a number of new issues. The points that they raised in relation to flooding; effect on the PRoW; effect on living conditions for residents of the farmhouse and potential impacts on agriculture are considered in the relevant Sections of this Report.

12.9.32. Mrs Taylor [EV-007b] advised that the effect of the Proposed Development on animal welfare related to concerns around the potential effect of construction noise and disturbance on elderly rescue ponies, some with respiratory problems, that resided at the farm. A vet's report submitted at D3 [REP3-059] confirmed that construction work in such a close vicinity to where the animals were both housed and grazed could have a negative impact on their welfare.

12.9.33. The Applicant responded in detail to these concerns at D4 [REP4-042]. It acknowledged the proximity of the OnSS site to the Taylor's property and the need for mitigation measures to be secured for both the construction and operational stages of the Proposed Development in order to reduce any potentially significant effects. With regard to the effects of noise and vibration, the Applicant noted measures set out in its outline CoCP [REP4-018, Section 6.9].

12.9.34. The ExA did not find it necessary to consider these matters further during the remainder of the Examination.

ExA response

12.9.35. Based on the findings set out above, the ExA considers that policy requirements with regard to noise and vibration in NPS EN-1 and with regard to relevant local policies have been met through:

- Consultation and assessment of the noise impact of the Proposed Development during the construction, operation and decommissioning phases (NPS EN-1, paragraphs 5.11.4 to 5.11.7).
- The identification, selection and layout of plant to minimise noise emissions and the use of landscape features, bunds or noise barriers to reduce noise transmission (NPS EN-1, paragraphs 5.11.8 to 5.11.10).

12.9.36. As a result of the Applicant's consultation and assessment work described above, alongside the cumulative assessment of potential adverse noise and vibration effects, the ExA considers that the Proposed Development would be in compliance with local plan policy relating to noise and vibration.

12.9.37. Having considered the information provided by both the Applicant and IPs before and during the Examination, the ExA is satisfied that the Proposed Development would not result in significant adverse effects

from noise and vibration for either Mr and Mrs Taylor or Mr and Mrs Dransfield at their respective residences.

Conclusion on noise and vibration

12.9.38. Taking all of this into account, the ExA concludes that the overall noise and vibration effects associated with the Proposed Development would, both the project alone and cumulatively, not weigh against the case for the Proposed Development.

12.10. AIR QUALITY AND HEALTH

Policy considerations

12.10.1. Paragraph 5.2.7 of NPS EN-1 notes that the ES should describe:

- any significant air emissions, their mitigation and any residual effects, distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;
- the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;
- existing air quality levels and the relative change in air quality from existing levels; and
- any potential eutrophication impacts.

12.10.2. Paragraph 5.2.9 of NPS EN-1 states that the [decision maker] should generally give air quality considerations substantial weight where a project would lead to a deterioration in air quality in an area or leads to a new area where air quality breaches any national air quality limits. However, air quality considerations will also be important where substantial changes in air quality levels are expected, even if this does not lead to any breaches of national air quality limits.

12.10.3. Paragraph 5.2.10 of NPS EN-1 confirms that in all cases the [decision maker] must take account of any relevant statutory air quality limits. Where a project is likely to lead to a breach of such limits, developers should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed. In the event that a project will lead to non-compliance with a statutory limit, consent should be refused.

12.10.4. Paragraphs 5.2.11, 5.2.12 and 5.2.13 of NPS EN-1 note that the [decision maker] should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application, as well as the methods that the Applicant could effectively employ to codify any mitigation at the application stage.

Local policy

12.10.5. Policy EC5 of the local plan, Supporting the Energy Sector, gives in-principle support to energy sector development (but excludes wind energy) where significant adverse effects are outweighed by wider benefits of a proposal.

12.10.6. HCC adopted the Hull Local Plan 2016 to 2032 (HLP) in November 2017. This guides development in the city until 2032. Policy 18, Renewable and Low Carbon Energy, states that development that generates, transmits or stores renewable or low carbon energy will be supported where the impact is or can be made acceptable.

12.10.7. Relevant sections of HLP Policy 47, Atmospheric Pollution, state that an assessment of air quality must accompany applications for major development that could individually, or cumulatively with planning permissions and developments under construction, worsen air quality in an Air Quality Management Area.

12.10.8. In addition, if a development is located within 200m of the Humber Estuary Special Area of Conservation (SAC), the application should specifically address the impact of the proposal on the SAC saltmarsh qualifying feature. Where effects cannot be avoided, appropriate mitigation measures should be provided to ensure that there is no adverse effect on the integrity of the Humber Estuary SAC.

The Applicant's case

12.10.9. The Applicant's assessment of the potential impact of the Proposed Development on air quality is primarily set out in ES Chapter 9, Air Quality [APP-033]. When making the application, the Applicant's position with regard to these matters was that this chapter quantified the impact of air emissions associated with construction-generated traffic at human and ecological receptors and that it presented the impact of air emissions associated with the Proposed Development and any decommissioning works, as well as any potential for breaches of air quality limits and proposed mitigation, where necessary.

12.10.10. The Applicant provided a cumulative assessment of potential adverse effects on air quality in its ES chapter on air quality [APP-033, Section 9.12].

12.10.11. Provision was made in the draft DCO [APP-203] for a CoCP under Requirement 17. In addition, an outline CoCP [APP-237] was prepared by the Applicant and submitted with the application.

12.10.12. Impacts on receptors within the Air Quality Management Area (AQMA) and the saltmarsh feature of the Humber Estuary SAC, which is adjacent to a potential construction traffic link, were considered in the Applicant's ES [APP-033, Section 9.11.1].

Planning issues

12.10.13. The main issues that concerned the Examination were:

- cumulative effects of construction and operational impacts on the amenity of residential receptors; and
- the risk assessment and EIA of the EBI within the ES submitted by the Applicant for factors including air quality.

Cumulative effects of construction and operational impacts on the amenity of residential receptors

12.10.14. Mr and Mrs Taylor [RR-017] and [RR-019] attended the Open Floor Hearing [EV-007b] and expanded on the concerns that they had raised in their RR.

12.10.15. Mrs Taylor [EV-007b] advised that the effect of the Proposed Development on animal welfare related to concerns around the potential effect of noise and disturbance arising from construction on the elderly rescue ponies, some of which have respiratory problems that resided at the farm. A vet's report submitted at D3 [REP3-059] confirmed that construction work in such a close vicinity to where the animals are both housed and graze could have a negative impact on their welfare.

12.10.16. In response the Applicant at D4 [REP4-042] advised that specific consideration of livestock and horses was not typical in the EIA process. However, it considered that the assessments undertaken for the OnSS on human and ecological receptors sufficiently assessed constructional and operational impacts that would arise from the Proposed Development and that the CoCP would secure the necessary mitigation measures which would avoid significant effects arising from the Proposed Development

The risk assessment and EIA of the EBI within the ES submitted by the Applicant for factors including air quality.

12.10.17. In ExQ1 [PD-006, question ES 1.5], the ExA asked a question relating to the vulnerability of the Proposed Development, specifically the OnSS and EBI, to risks of major accidents or disasters. The ExA noted that the Applicant had provided information pertaining to the risk of an accident occurring, rather than an assessment of the impacts that might occur in the unlikely event of an accident. The ExA therefore requested supplementary assessments of any likely significant effects on the environment that could result and how mitigation of these risks was secured in the draft DCO [APP-203].

12.10.18. The Applicant responded at D2 [REP2-038] by signposting its assessment of both likelihood of accidents occurring and the severity of any impact on named receptor categories. In addition, the Applicant provided a revised Outline Energy Balancing Infrastructure HazID Report [REP2-029], which was updated to incorporate descriptions of its risk management techniques. It noted that this would be secured through Requirement 26 of the draft DCO [APP-203].

12.10.19. The ExA examined this issue further in ExQ2 [PD-012, ES 2.3]. The ExA sought to establish how the risk assessment carried out by the Applicant satisfied the requirements of Schedule 4 of the EIA Regulations, how the identification and evaluation of receptors was carried out and how this informed the source, pathway and receptor and EIA significance matrices produced by the Applicant for relevant factors such as air quality and human health.

12.10.20. The Applicant responded [REP5-074] by noting that the outcome of its environmental risk assessment for the OnSS and EBI [AS-020] accorded with a finding of no significant effects in EIA terms and was therefore below the threshold for consideration in EIA terms.

12.10.21. The Applicant's response continued by noting that since no significant adverse effects were identified in its risk assessment, there were therefore no detailed assessments provided within its technical topic chapters as would otherwise be required by Schedule 4 of the EIA Regulations.

12.10.22. The response provided by the Applicant did nevertheless recognise that there would be clear safety considerations for human receptors located in close proximity to OnSS and EBI and that the Applicant would therefore ensure that all relevant regulations requiring fire safety would be rigorously applied, and that any additional permits or consents relating to the OnSS would be applied for if required.

12.10.23. The ExA sought further clarification on this matter at ISH8 [EV-032], asking the Applicant to confirm whether the cumulative effects on individual receptors – specifically in the onshore environment – had been adequately addressed in the documents submitted into the Examination.

12.10.24. The Applicant responded at ISH8 and in its written summary of its oral case made at that hearing [REP6-035, section 6] confirming that, in its view, this matter had been adequately addressed. The Applicant noted that it had considered three forms of cumulative assessment:

- multiple projects combining together and the potential for that to increase the significance of an effect;
- the cumulative increase of impacts during construction and operation combining over time and impacting on certain receptors; and
- the intra combination of multiple topic areas from the environmental statement combining together on receptors (for example, traffic, noise and air quality).

12.10.25. The Applicant concluded by confirming that the cumulative scenarios set out above were assessed in the Applicant's onshore EIA, typically in section 14 of each chapter of its ES.

12.10.26. The ExA did not find it necessary to consider these matters further during the remainder of the Examination.

ExA response

12.10.27. Based on the findings set out above, the ExA considers that policy requirements with regard to air quality in NPS EN-1 have been met through consultation and assessment of the impact of air emissions associated with the Proposed Development during its construction, operation and decommissioning phases (NPS EN-1, paragraph 5.2.7).

12.10.28. As a result of the Applicant's consultation and assessment work described above, alongside the cumulative assessment of potential adverse effects

on air quality and assessment of impacts on receptors within the HCC AQMA and the saltmarsh feature of the Humber Estuary SAC, the ExA considers that the Proposed Development would be in compliance with local plan policy relating to air quality.

Conclusion on air quality and health

12.10.29. Taking all of this into account, the ExA concludes that the overall effects on air quality would, both for the project alone and cumulatively, not weigh against the case for the Proposed Development.

12.11. CONCLUSIONS

12.11.1. The ExA is satisfied that there has been a thorough consideration of the principal and other issues through the Examination in relation to onshore planning issues. The ExA applies the planning balance to these and all other relevant Examination matters in Chapter 14 of this Report.

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