



The Planning Inspectorate
Yr Arolygiaeth Gynllunio

REPORT on the IMPLICATIONS for EUROPEAN SITES

Proposed Norfolk Boreas Offshore Wind Farm

An Examining Authority report prepared with the
support of the Environmental Services Team

Planning Inspectorate Reference: EN010087

07 April 2020

[This page is intentionally left blank]

TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | INTRODUCTION | 1 |
| 1.1 | BACKGROUND | 1 |
| 1.2 | DOCUMENTS USED TO INFORM THIS RIES | 2 |
| 1.3 | STRUCTURE OF THIS RIES..... | 2 |
| 2 | OVERVIEW | 4 |
| 2.1 | EUROPEAN SITES CONSIDERED | 4 |
| 2.2 | POTENTIAL EFFECTS..... | 5 |
| 2.3 | IN-COMBINATION ASSESSMENT | 6 |
| 2.4 | APPLICANT'S HRA REPORT CONCLUSION | 8 |
| 2.5 | OVERVIEW OF HRA MATTERS CONSIDERED DURING THE EXAMINATION | 8 |
| 2.6 | APPLICANT'S SCREENING AND INTEGRITY MATRICES | 8 |
| 3 | STAGE 1: LIKELY SIGNIFICANT EFFECTS..... | 10 |
| 3.1 | THE APPLICANT'S ASSESSMENT | 10 |
| 3.2 | HAISBOROUGH, HAMMOND AND WINTERTON SAC | 16 |
| 3.3 | BREYDON WATER SPA AND RAMSAR, BROADLAND SPA AND RAMSAR AND NORTH NORFOLK COAST SPA AND RAMSAR..... | 16 |
| 3.4 | BROADLAND SPA AND RAMSAR | 16 |
| 3.5 | FLAMBOROUGH AND FILEY COAST SPA..... | 17 |
| 3.6 | GREATER WASH SPA | 17 |
| 3.7 | RIVER WENSUM SAC | 18 |
| 3.8 | SUMMARY OF SCREENING OUTCOMES DURING EXAMINATION | 19 |
| 3.9 | CONCLUSION OF SCREENING (STAGE 1) ASSESSMENT..... | 21 |
| 4 | STAGE 2: ADVERSE EFFECTS ON INTEGRITY..... | 23 |
| 4.1 | CONSERVATION OBJECTIVES..... | 23 |
| 4.2 | THE APPLICANT'S ASSESSMENT | 23 |
| 4.3 | RELEVANT REPRESENTATIONS | 23 |
| 4.4 | POSITIONS AT TIME OF PUBLICATION OF THE RIES | 24 |
| 4.5 | ONSHORE SITES FOR WHICH THERE IS AGREEMENT THAT AEOI CAN BE RULED OUT FOR ALL FEATURES | 24 |
| 4.6 | OFFSHORE SITES FOR WHICH THERE IS AGREEMENT THAT AEOI CAN BE RULED OUT FOR ALL FEATURES | 28 |
| 4.7 | OFFSHORE SITES AND FEATURES FOR WHICH THERE IS NOT AGREEMENT THAT AEOI CAN BE RULED OUT | 30 |
| 4.8 | OFFSHORE ORNITHOLOGY..... | 30 |
| 4.9 | BENTHIC ECOLOGY - HAISBOROUGH, HAMMOND AND WINTERTON SAC | 40 |

| | |
|---|-----------|
| 5 ALTERNATIVES, COMPENSATION AND IROPI | 43 |
| ANNEX 1: EUROPEAN SITES AND NATURA 2000 SITES CONSIDERED BY THE APPLICANT AT THE SCREENING STAGE | 45 |
| ANNEX 2: SUMMARY OF POSITIONS IN RELATION TO ADVERSE EFFECTS ON INTEGRITY | 52 |
| ANNEX 3: INTEGRITY MATRICES..... | 64 |

[This page is intentionally left blank]

1 INTRODUCTION

1.1 Background

- 1.1.1 Norfolk Boreas Limited (the Applicant) has applied to the Secretary of State for a Development Consent Order (DCO) under Section 37 of the Planning Act 2008 (PA2008) for the proposed Norfolk Boreas Offshore Wind Farm (the application). The Secretary of State has appointed an Examining Authority (ExA) to conduct an examination of the application, to report its findings and conclusions, and to make a recommendation to the Secretary of State as to the decision to be made on the application.
- 1.1.2 The relevant Secretary of State is the competent authority for the purposes of the Habitats Directive¹ and the Habitats Regulations² and the Offshore Marine Regulations³ for applications submitted under the PA2008 regime. The findings and conclusions on nature conservation issues reported by the ExA will assist the Secretary of State in performing their duties under the Habitats Regulations and the Offshore Marine Regulations.
- 1.1.3 This report compiles, documents and signposts information provided within the DCO application, and the information submitted throughout the Examination by both the Applicant and Interested Parties (IPs), up to Deadline 7 of the Examination (31 March 2020) in relation to potential effects to European Sites⁴. It is not a standalone document and should be read in conjunction with the Examination documents referred to.
- 1.1.4 It is issued to ensure that IPs including the statutory nature conservation body (SNCB) (Natural England (NE)) is formally consulted on Habitats Regulations matters. This process may be relied on by the Secretary of State for the purposes of Regulation 63(3) of the Habitats Regulations and Regulation 28(4) of the Offshore Marine Regulations. Following consultation, the responses will be considered by the ExA in making its recommendation to the Secretary of State and made available to the Secretary of State along with this report. The RIES will not be revised following publication during the examination and receipt of consultation responses.

¹ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as codified) (the 'Habitats Directive').

² The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations).

³ The Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Marine Regulations) apply beyond UK territorial waters (12 nautical miles). These regulations are relevant when an application is submitted for an energy project in a renewable energy zone (except any part in relation to which the Scottish Ministers have functions).

⁴ The term European Sites in this context includes Sites of Community Importance (SCIs), Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs), possible SACs, potential SPAs, Ramsar sites, proposed Ramsar sites, and any sites identified as compensatory measures for adverse effects on any of the above. For a full description of the designations to which the Habitats Regulations apply, and/ or are applied as a matter of Government policy, see PINS Advice Note 10.

1.2 Documents used to inform this RIES

1.2.1 The Applicant submitted the following documents with the application relevant to the Habitats Regulations Assessment (HRA) process:

- Information to Support Habitats Regulations Assessment [APP-201] ('the Applicant's HRA Report');
- Appendix 5.1 Habitats Regulations Assessment Offshore Screening [APP-202];
- Appendix 5.2 Habitats Regulations Assessment Onshore Screening [APP-203];
- Appendix 5.3 Habitats Regulations Assessment Screening Matrices [APP-204]
- Appendix 5.4 Habitats Regulations Assessment Integrity Matrices [APP-205]

1.2.2 Additional documents used to inform this RIES are referred to in square brackets [] in the text of this report; that reference can be found in the Examination library published on the National Infrastructure Planning website at the following link:

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000897-Norfolk%20Boreas%20Examination%20Library%20PDF%20Version.pdf>

1.3 Structure of this RIES

1.3.1 The remainder of this report is as follows:

- **Section 2** details the European sites and potential impacts that were identified within the DCO application. It provides a summary of the Applicant's assessment and of matters discussed during the Examination period, up to and including Deadline 7.
- **Section 3** provides an overview of the Applicant's assessment of likely significant effects (LSE). It provides a summary of where IPs disputed the Applicant's conclusions and identifies additional European sites and qualifying features screened for potential LSEs during the Examination.
- **Section 4** provides an overview of the Applicant's assessment of adverse effects on integrity (AEoI) of European sites. It provides a summary of where IPs have disputed the Applicant's conclusions.
- **Section 5** provides an overview of the consideration given to alternatives and Imperative Reasons of Overriding Public Interest (IROPI) during the Examination.

- **Annex 1** lists the European and Natura 2000 sites considered by the Applicant at the screening stage.
- **Annex 2** contains a table summarising the positions of various IPs in relation to the assessment of effects on integrity at the time of publication of the RIES.
- **Annex 3** comprises matrices for the European sites and qualifying features for which the Applicant's conclusions in relation to adverse effects on the integrity of European sites remained in dispute at the time of publication of the RIES. They summarise the evidence submitted by the Applicant and IPs up to Deadline 7.

2 OVERVIEW

2.1 European Sites Considered

- 2.1.1 The European sites considered by the Applicant for screening includes Natura 2000 sites located outside of the UK in other European Economic Area States. They were established based on the search criteria described below.
- 2.1.2 Marine mammal Special Areas of Conservation (SACs)/Sites of Community Interest (SCIs) [Section 3 of APP-202]:
- harbour porpoise – any site within the harbour porpoise North Sea Management Unit where the species is a grade A, B or C feature;
 - grey seals – any site within 1,000km where the species is a grade A, B or C feature; and
 - harbour seal – any site within 300km where the species is a grade A, B or C feature.
- 2.1.3 *Benthic ecology SACs* [Section 4 of APP-202] - sites within the southern North Sea which directly overlap with a component of the Proposed Development and sites where the interest features are within the range for interaction (e.g. the pathway is not too long for sediment deposition).
- 2.1.4 *Fish SACs* [Section 5 of APP-202] – sites which directly overlap with a component of the Proposed Development; sites where the interest features are within the range for interaction (e.g. the pathway is not too long for sediment deposition); sites from which an interest feature's resources (e.g. prey/habitat could) are within the range for interaction; and sites from which an interest feature's foraging area or migratory route are within the range for interaction.
- 2.1.5 *Offshore ornithological Special Protection Areas (SPAs) and Ramsar sites* [Section 6 of APP-202] – sites which directly overlap with a component of the Proposed Development; sites within the foraging range; sites from which an interest feature's resources (e.g. prey/habitat) are within the range for interaction; and sites from which an interest feature's foraging area or migratory route are within the range for interaction.
- 2.1.6 *Onshore/terrestrial sites* [Section 2 of APP-203] – sites within a 5km buffer zone around the onshore infrastructure.
- 2.1.7 The Applicant's assessment [APP-201 and APP-204] considered a total of 202 European and Natura 2000 sites; these are listed in Annex 1 of this RIES. Only European sites for which the UK is responsible are addressed in this RIES.
- 2.1.8 The Proposed Development is not connected with or necessary to the management for nature conservation of any of the European or Natura 2000 sites considered within the Applicant's assessment.

2.2 Potential effects

2.2.1 The potential effects assessed by the Applicant are summarised in Table 2.1 below.

Table 2.1 Potential effects assessed by the Applicant

| Site Type | Feature(s) | Potential effects |
|--------------------|------------------|---|
| SPA / Ramsar sites | Birds (offshore) | Collision mortality Displacement/disturbance Barrier effect Indirect effect on habitats and prey species |
| | Birds (onshore) | Direct effects within SPA/Ramsar boundary Direct effects on ex-situ habitats Indirect effects within SPA/Ramsar boundary Indirect effects on ex-situ habitats |
| SAC | Benthic habitats | Permanent habitat loss Temporary physical disturbance Introduction of new substrate Smothering due to increased suspended sediment |
| | Marine mammals | Underwater noise Vessel interactions Indirect effects on prey Changes to water quality Disturbance at seal-haul out sites |
| | Fish | Permanent loss (and introduction of new sediment where applicable) Temporary physical disturbance Smothering due to increased suspended sediment Re-mobilisation of contaminated sediments Underwater noise and vibration Electromagnetic fields (EMF) In-combination effects |

| Site Type | Feature(s) | Potential effects |
|-----------|-----------------------|--|
| | Onshore / terrestrial | <p>Direct effects (e.g. habitat loss)</p> <p>Impacts on ex-situ habitats functionally connected to the SAC</p> <p>Impacts from alterations to geology and land contamination</p> <p>Disturbance due to groundwater / hydrology changes</p> <p>Impacts from noise disturbance</p> <p>Impacts from changing air quality</p> <p>Impacts from light disturbance</p> <p>Impacts from visual disturbance</p> <p>In-combination effects</p> |

2.3 In-combination assessment

Ornithology

2.3.1 The Applicant presented in-combination assessments in [APP-201] for:

- Alde-Ore Estuary SPA:
 - collision mortality of lesser black-backed gull (LBBG) with offshore wind farm projects listed in Table 6.7 (Section 6.3.1.1.3);
- Flamborough & Filey Coast (FFC) SPA:
 - collision mortality of gannets and kittiwakes with offshore wind farm projects listed in Tables 6.14 and 6.19 (Sections 6.3.2.3.2 and 6.3.2.6.2);
 - displacement risk for gannet with offshore wind farm projects listed in Table 6.9 (Section 6.3.2.3);
 - displacement plus collision risk for gannet (Section 6.3.2.5);
- Greater Wash SPA:
 - collision mortality of little gull with offshore wind farm projects listed in Table 6.27 (Section 6.3.3.1.2); and
 - displacement of red-throated diver (RTD) (Section 6.3.3.2.2).

2.3.2 The Applicant's in-combination assessment included the proposed Hornsea Project Three and Norfolk Vanguard Offshore Wind Farms. At the time of publication of this RIES, the Examining Authorities had

submitted their recommendation reports to the Secretary of State (SoS). During the decision period, the SoS issued a request for information on various matters including ornithology. Both consultation periods ended before the publication of this RIES and the SoS has set a new date for his decision on both projects as 1 June 2020.

Marine mammals

- 2.3.3 The HRA Report (Section 8.3.15 of [APP-201]) assessed in-combination effects from:
- disturbance from piling noise;
 - disturbance for other noise sources (unexploded ordnance (UXO) clearance, seismic surveys, offshore wind farm non-piling construction activities and vessels, and offshore wind farm operation and maintenance and vessels);
 - changes to prey resource; and
 - vessel collision risk.
- 2.3.4 The other offshore wind farm projects assessed are detailed in Tables 8.50, 8.52 and 8.54 of [APP-201].

Benthic habitats

- 2.3.5 The in-combination assessment was restricted to Norfolk Vanguard as no other plans or projects were considered to have the potential to affect the Haisborough, Hammond and Winterton (HHW) SAC (Section 7.4.2.2 of [APP-201]). In-combination effects were assessed for the effects detailed in Table 2.1 of this RIES.

Onshore

- 2.3.6 In-combination effects were only assessed by the Applicant where the project alone was determined to have the potential for adverse effects on integrity. The Applicant considered that if the project alone was not determined to have the potential for AEOI, there is "*no real prospect of an in-combination effect occurring with another plan or project*" (Section 9.3.1.4 of [APP-201])⁵. In-combination effects were therefore not assessed for the River Wensum SAC, Norfolk Valley Fens SAC and The Broads SAC.
- 2.3.7 In-combination effects were assessed by the Applicant for Paston Great Barn SAC. The projects which have been identified as potentially giving

⁵ At Deadline 2, the Applicant clarified [REP2-021] that it had "*taken a precautionary but proportionate approach to screening and therefore, if there was any uncertainty as to whether the project could have any effect on a European or Ramsar site then these were screened in...if it was determined that there was no connectivity or pathway for the project alone to have an effect on a European or Ramsar site then it was reasoned that there would also be no potential for the project to have an in-combination effect on that European or Ramsar site.*" No concerns have been raised by IPs in this regard.

rise to effects upon Paston Great Barn SAC in-combination with the Norfolk Boreas are identified in Table 9.16 of [APP-201].

2.4 Applicant's HRA Report conclusion

- 2.4.1 The Applicant's HRA Report [APP-201] concluded that there would be a LSE on 16 European sites (see Table 3.1 of this RIES), but also concluded there would be no AEoI on any of these sites, either alone or in-combination with other plans and projects.
- 2.4.2 These conclusions were disputed by IPs during the Examination, as discussed throughout the remainder of this RIES.

2.5 Overview of HRA Matters Considered During the Examination

- 2.5.1 The key HRA matters discussed during the Examination were as follows:
- Onshore SACs and SPAs:
 - impacts of drilling fluid breakout;
 - hedgerow mitigation plan;
 - collision risk to non-seabird migrants; and
 - effects on ex-situ habitats used by foraging swans and geese.
 - Offshore SPAs:
 - collision risk modelling and displacement assessment methodologies;
 - population modelling; and
 - the level of precaution in the assessment.
 - Offshore SACs:
 - cable protection;
 - ability to microsite;
 - reef and sandbank recovery;
 - underwater noise mitigation measures; and
 - the appropriateness of Site Integrity Plans.

- 2.5.2 These matters are described in more detail throughout the RIES.

2.6 Applicant's screening and integrity matrices

- 2.6.1 The Applicant submitted screening and integrity matrices as Appendices to the HRA Report [APP-204 and APP-205]. These were revised by the Applicant during the Examination as follows:

- Additional submissions in response to Section 51 advice [AS-002 and AS-004];
- Deadline 1 [REP1-012 and REP1-014]; and
- Deadline 6 [REP6-005 and REP6-007].

2.6.2 The ExA has revised and appended to this RIES integrity matrices for the European sites and qualifying features where the conclusions of the Applicant's assessment remain in dispute at the time of publication of this RIES (see Section 0.0 of this RIES).

2.6.3 Unless otherwise specified, any references within this RIES to the Applicant's screening matrices are to the Deadline 6 versions.

3 STAGE 1: LIKELY SIGNIFICANT EFFECTS

3.1 The Applicant's Assessment

- 3.1.1 The Applicant's HRA Report [APP-201] screened the European and Natura 2000 sites listed in Annex 1 of this RIES for LSEs.
- 3.1.2 The process through which the Applicant screened in offshore European sites (i.e. identified a LSE) was based on a number of factors including predicted zones of impact / influence, foraging ranges, migration patterns, the distance of a site from the Proposed Development and survey data.
- 3.1.3 Of the European sites screened, the Applicant concluded that the project is likely to give rise to significant effects, either alone or in-combination with other projects or plans, on the qualifying features of the European sites listed in Table 3.1 below.
- 3.1.4 The locations of the onshore sites for which a LSE was identified by the Applicant are shown on Figure 5.6 of [APP-045]. Offshore sites for which a LSE was identified by the Applicant are shown on Figures 5.1, 5.2, 5.3 and 5.4 of [APP-201].
- 3.1.5 The Applicant concluded that there would be no LSE from Norfolk Boreas for any of the European sites which has migratory fish species as a qualifying feature [APP-201 and APP-202].
- 3.1.6 Several matters were discussed during the Examination relating to the identification of LSEs, as detailed below in Sections 3.2 to 3.7 of this RIES.

Table 3.1: European sites, qualifying features and potential impacts for which the Applicant concluded a LSE in [APP-201]

| Site type | European site | Feature | Impact |
|----------------------|---------------------------------|---|--|
| SPA / Ramsar sites | Alde-Ore Estuary SPA and Ramsar | LBBG (breeding) | Collision mortality |
| | Outer Thames Estuary SPA | RTD (non-breeding) | Displacement due to operation and maintenance vessel movements |
| | FFC SPA | Gannet (breeding) | Collision mortality |
| | | | Displacement during operation |
| | | Kittiwake (breeding) | Collision mortality |
| | | Guillemot (breeding) | Displacement during operation |
| | | Razorbill (breeding) | Displacement during operation |
| | Greater Wash SPA | RTD (non-breeding) | Construction disturbance and displacement due to cable laying |
| | | | Displacement due to operation and maintenance vessel movements |
| | | Little gull (non-breeding) | Collision mortality |
| Benthic habitat SACs | HHW SAC | Sandbanks slightly covered by seawater at all times Reef | Temporary physical disturbance |
| | | | Permanent habitat loss |
| | | | Introduction of new substrate |
| | | | Smothering due to increased suspended sediment |
| Marine | Southern North Sea | Harbour porpoise | Underwater noise (auditory injury and disturbance) |

| Site type | European site | Feature | Impact |
|----------------|---|---------------------------|---|
| mammal SACs | (SNS) SAC | | Collision mortality (vessel interactions) |
| | | | Changes to prey resource |
| | | | Changes to water quality |
| | Humber Estuary SAC | Grey seal | Disturbance from underwater noise |
| | | | Collision mortality (vessel interactions) |
| | | | Changes to prey resource |
| | | | Changes to water quality |
| | | | Disturbance at haul-out sites |
| | The Wash and North Norfolk Coast SAC ⁶ | Harbour seal Grey seal | Disturbance from underwater noise |
| | | | Collision mortality (vessel interactions) |
| | | | Changes to prey resource |
| | | | Changes to water quality |
| | | | Disturbance at haul-out sites |
| | Winterton-Horsey Dunes SAC ⁶ | Grey seal | Disturbance from underwater noise in cable corridor |
| | | | Collision mortality (vessel interactions) in cable corridor |
| | | | Changes to prey resource in cable corridor |

⁶ The HRA Report [APP-201] explains that although grey seal is not a qualifying feature at The Wash and North Norfolk SAC (which includes Blakeney Point) or Winterton-Horsey Dunes SAC, it is recognised that these sites are important for the population, as breeding, moulting and haul-out sites; therefore this was taken into account within the HRA. Nevertheless, grey seal was removed from the Applicant's updated screening and integrity matrices for these sites at Deadline 6 [REP6-006 and REP6-008].

| Site type | European site | Feature | Impact |
|-----------------|-------------------------|--|--|
| Onshore SACs | | | Changes to water quality in cable corridor |
| | | | Disturbance at haul-out sites |
| | | | Direct effects within the ex-situ habitats of the SAC |
| | River Wensum SAC | Watercourse of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation; Desmoulin's whorl snail | Indirect effects within the SAC from geology/contamination/groundwater/hydrology effects |
| | | | Indirect effects within ex-situ habitats of the SAC from geology/contamination/groundwater/hydrology effects |
| | | | |
| | Paston Great Barn SAC | Barbastelle bats | Direct effects on bats present in ex-situ habitats of SAC (hedgerows/watercourses) |
| | | | Indirect effects on bats present in ex-situ habitats from light and groundwater/hydrology effects |
| | Norfolk Valley Fens SAC | Alkaline fens; Northern Atlantic wet heaths with <i>Erica tetralix</i> ; European dry heaths; Molinia meadows on calcareous, peaty or clayey-silt-laden soils; Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> ; Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ; | Indirect effects on features present within ex-situ habitats of the SAC arising from air quality and groundwater / hydrology effects |

| Site type | European site | Feature | Impact |
|-----------|----------------|--|--|
| | The Broads SAC | <p>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp</i>;</p> <p>Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation;</p> <p>Transition mires and quaking bogs;</p> <p>Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>;</p> <p>Alkaline fens;</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>);</p> <p><i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>);</p> <p>Desmoulin's whorl snail;</p> <p>Fen orchid;</p> <p>Ramshorn snail</p> | Indirect effects upon habitats and species within the SAC boundary arising from changes in local groundwater / hydrology conditions |
| | | Otter | Direct effects upon ex-situ habitats which may support the qualifying feature otter, due to suitable ex-situ habitats for this feature being present |

| Site type | European site | Feature | Impact |
|-----------|---------------|---------|---|
| | | | Indirect effects upon ex-situ habitats which may support the qualifying feature otter, arising from changes in groundwater / hydrology conditions |

3.2 Haisborough, Hammond and Winterton SAC

Increased suspended sediment and smothering of Annex I sandbanks

- 3.2.1 In response to the Applicant's Deadline 6 screening and integrity matrices, NE [REP7-050] noted that the Applicant had greyed out increased suspended sediment and smothering impacts to Annex I sandbanks. However, NE noted that the Applicant had considered deposition effects from sandwave levelling within the ES so there is an impact pathway and therefore a LSE during construction.
- 3.2.2 The Applicant did not have the opportunity to respond to this matter before the publication of the RIES.

3.3 Breydon Water SPA and Ramsar, Broadland SPA and Ramsar and North Norfolk Coast SPA and Ramsar

Collision risk of non-seabird migrants

- 3.3.1 The Applicant's onshore screening appendix [APP-203] concluded no LSE to these sites and stated that negligible numbers of SPA birds are likely to pass through the Boreas wind farm site during migration. However, in contrast, the Applicant's screening matrices submitted with the application [APP-204] identified a LSE for collision mortality. The effect of collision risk was not addressed in the Applicant's integrity matrices [APP-205].
- 3.3.2 In response to post-acceptance Section 51 advice [PD-002], the Applicant confirmed a LSE should be identified for collision mortality for all qualifying features of these sites (colloquially termed 'non-seabird migrants'), except common tern, of Breydon Water SPA and Ramsar site (as Norfolk Boreas is beyond the maximum foraging range of common tern, so there is no breeding season connectivity). This was welcomed by NE [REP2-080] and reflected within the Applicant's screening and integrity matrices [REP6-005 and REP6-007].

3.4 Broadland SPA and Ramsar

Effects on ex-situ habitats to foraging swans and geese

- 3.4.1 All components of the Broadland SPA are located 4.5km or more from the onshore infrastructure [APP-201]. However, the Applicant acknowledged that the qualifying features of the Broadland SPA are likely to utilise a range of supporting habitats (ex-situ habitats/functionally linked land) outside the boundary of the SPA over winter months. Nevertheless, it screened out a LSE to features using ex-situ habitats on the basis that surveys of land within 5km of the site and within a 1km buffer from the onshore project area recorded low levels of wintering birds [APP-201 and APP-203].

- 3.4.2 NE advised that the survey data was not of sufficient duration and had not been linked to crop rotations. It therefore would not be possible to comment on whether qualifying features may be using ex-situ habitats during the construction phase. It did not agree that a LSE should be screened out [RR-099 and REP2-080].
- 3.4.3 The Applicant's screening and integrity matrices [REP6-005 and REP6-007] explained that although the Applicant maintained a position of no LSE, it had followed NE's advice and screened in a LSE for direct and indirect effects on ex-situ habitats to Bewick's swan, Whooper Swan, Pink-footed Goose, Tundra Swan and Greylag goose due to the temporary loss of crop stubble which provide overwintering habitat for these species during construction and decommissioning. This was welcomed by NE [REP3-022].

3.5 Flamborough and Filey Coast SPA

Seabird assemblage – collision risk

- 3.5.1 The Applicant's HRA Report [APP-201] noted that the FFC SPA supports a breeding seabird assemblage feature; however, as noted by the RSPB [RR-054], an assessment of effects on the assemblage was not presented. Breeding puffin forms part of the assemblage, and effects on puffin were addressed in the screening matrices [APP-204].
- 3.5.2 NE [AS-029] considered a LSE to the assemblage feature could not be ruled out due to issues identified for individual qualifying features (ie kittiwake and gannet) and due to concerns with in-combination effects relating to the omission of some wind farms in the assessment.
- 3.5.3 The Applicant [AS-024] explained that no methodology has been proposed for assessing impacts on assemblages. Nevertheless, it agreed to screen in a LSE for operational collision risk and disturbance for the assemblage [REP2-021], as reflected in the Applicant's screening and integrity matrices [REP6-005 and REP6-007]. The erroneous inclusion of puffin within the original screening matrices [APP-202] was also corrected.

3.6 Greater Wash SPA

Common scoter – construction phase displacement/disturbance

- 3.6.1 The Greater Wash SPA boundary overlaps with the offshore cable corridor near the Norfolk Coast [Figure 5.2 of APP-201]. Nevertheless, the Applicant screened out a LSE to non-breeding common scoter from cable installation activities on the basis that NE and JNCC common scoter distribution data indicates no overlap with the species' boundary with the offshore cable corridor [APP-201 and APP-204].
- 3.6.2 During the Examination, the Applicant explained that NE considered there to be a potential LSE for displacement/disturbance from offshore cable installation [REP1-012 and REP2-035]. NE confirmed [REP4-039] that screening should be a coarse filter and there is a potential pathway as the cable route passes through the Greater Wash SPA. The Applicant

agreed to screen in a LSE and presented an assessment of effects on integrity in [REP2-035], as reflected in the screening and integrity matrices [REP6-005 and REP6-007].

3.7 River Wensum SAC

Drilling fluid breakout

- 3.7.1 The onshore cable corridor crosses the River Wensum at Elsing. The Applicant screened out direct effects within the River Wensum SAC boundary as Horizontal Directional Drilling (HDD) would be employed at this location [APP-201, APP-203 and APP-204].
- 3.7.2 However, NE [RR-099 and REP3-022] advised that a number of drilling mud breakouts have occurred on other offshore wind farm projects and that it is a regular enough occurrence to be considered a likely impact; therefore, direct effects due to HDD breakout should be screened in.
- 3.7.3 The Environment Agency (EA) [RR-095] also highlighted concerns of potential damage in the event of a bentonite breakout and a lack of detail in the outline Code of Construction Practice (OCoCP) [APP-692]. Whilst it welcomed the inclusion of a Bentonite Breakout Plan in the OCoCP, it considered there to be insufficient detail to assess either the risk of, likelihood or extent of breakout and stated that an emphasis should be on the prevention of breakouts [AS-026].
- 3.7.4 Although the Applicant considered there would be no direct LSE to the qualifying features of the River Wensum within the SAC boundary, it subsequently agreed to screen in a LSE to reflect NE's concerns of potential effects arising from a drilling fluid breakout and provided an assessment of effects of drilling fluid breakout, as reflected in the screening and integrity matrices [REP6-005 and REP6-007].

Air quality

- 3.7.5 NE [RR-099] noted that the Applicant's ES identified that the Proposed Development may have in-combination air quality impacts on designated sites in proximity to traffic and transport routes, in particular The River Wensum SAC. NE explained [REP2-080] that Water courses of plain to montane levels with *Ranunculus* and *Callitriche-Batrachion* vegetation, white clawed crayfish, brook lamprey and bullhead may all be sensitive to nitrogen levels. It further noted that the Supplementary Advice on Conservation Objectives for River Wensum includes an aim regarding air quality to restore the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System. NE therefore advised [RR-099] the Applicant to include mitigation measures to reduce potential effects, particularly where critical levels are already exceeded.
- 3.7.6 The Applicant [AS-024] explained that its assessment of cumulative air quality effects upon designated sites and ancient woodland is detailed in Section 22.8.1.1 of Chapter 22 Onshore Ecology [APP-235] and Section 26.8.1.2 of Chapter 26 Air Quality [APP-239] and confirmed that nitrogen deposition is not predicted to breach the critical load at any site. At two

sites, nitrogen deposition is predicted to be 2% of the critical load; however, further assessment in [APP-235] concludes that an effect of at most negligible magnitude is predicted, and as such no mitigation is required.

- 3.7.7 The Applicant [REP4-010] explained that the traffic numbers assessed in the ES are secured in the outline Traffic Management Plan (TMP)⁷. At Deadline 5, it updated the outline TMP [REP5-026] to state that *"In the event that the final vehicle movements differ from those set out in Appendix 1 and Appendix 2, then the assessment of air quality impacts upon designated sites presented within the Norfolk Boreas ES will be revisited to ensure that the impact level upon designated sites remains not significant"*. NE [REP5-077] confirmed that, with these commitments, it would be content there will be no LSE on designated sites from air quality impacts.

3.8 Summary of screening outcomes during Examination

- 3.8.1 The sites, features and potential impacts for which a LSE was identified during the Examination are detailed in Table 3.2.

Table 3.2: European sites, qualifying features and potential impacts for which a LSE was agreed during the Examination

| Site type | European site | Feature | Impact |
|----------------------------------|------------------------------|--|----------------------------------|
| SPA / Ramsar sites (Ornithology) | Breydon Water SPA and Ramsar | Bewick's swan Pied avocet European golden plover Ruff Lapwing Black-tailed godwit Shoveler Wigeon White-fronted goose Cormorant Waterfowl assemblage | Collision mortality |
| | Broadland SPA and Ramsar | Great bittern Eurasian marsh harrier Bewick's swan | Collision mortality ⁹ |

⁷ Secured through Requirement 21 of the dDCO.

⁹ The Applicant has not provided an offshore screening matrix for collision risk, displacement/disturbance and barrier effects for the Broadland SPA and Ramsar site. However, the ExA notes from the integrity matrix [REP6-007] that a LSE has been screened in for all features listed on the NE conservation objectives.

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Site type | European site | Feature | Impact |
|-----------|------------------------------------|--|--|
| | | Whooper swan Ruff Gadwall Northern shoveler Eurasian wigeon Hen harrier Wildfowl assemblage ⁸ | |
| | | Bewick's swan Whooper Swan Tundra Swan Pink-footed goose ¹⁰ Greylag goose ¹¹ | Direct effects on ex-situ habitats Indirect effects on ex-situ habitats |
| | North Norfolk Coast SPA and Ramsar | Pied avocet Great bittern Common tern Little tern Eurasian marsh harrier Montagu's harrier Sandwich tern Dark-bellied brent goose Red knot Pink-footed goose Eurasian wigeon Bar-tailed godwit Pintail Assemblage | Collision mortality |

⁸ The Applicant's screening and integrity onshore matrices for Broadland SPA [REP6-006 and REP6-007] identify a wildfowl assemblage (although the offshore integrity matrix for the site does not). An assemblage is not listed on the NE conservation objectives for the site. The Applicant is invited to comment on its inclusion in the matrices.

¹⁰ The Applicant's onshore integrity matrix [REP6-007] identifies a LSE for pink-footed goose of the Broadland SPA (although the offshore integrity matrix for the site does not). This species is not listed as a qualifying feature on the NE conservation objectives for the SPA. The Applicant is invited to comment on its inclusion in the matrices.

¹¹ Greylag goose is identified as a Ramsar feature on the Applicant's screening and integrity matrices [REP6-006 and REP6-007] but does not appear on the Ramsar Information Sheet for the site. The Applicant is invited to comment on its inclusion in the matrices.

| Site type | European site | Feature | Impact |
|-----------|------------------|--|---|
| | FFC SPA | Seabird assemblage | Collision mortality Displacement during operation |
| | Greater Wash SPA | Common scoter | Displacement/ disturbance from offshore cable installation |
| Onshore | River Wensum SAC | Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation Desmoulin's whorl snail | Direct effects within the SAC boundary |

3.9 Conclusion of Screening (Stage 1) assessment

- 3.9.1 At the time of publication of this RIES, the ExA understands that the European sites, features and potential impacts for which a LSE has been agreed with NE comprise a combination of those listed in Tables 3.1 and 3.2 of this RIES.
- 3.9.2 The ExA also notes NE's advice to screen the potential for increased suspended sediment solids to impact on Annex I sandbanks of the HHW SAC; however this matter was not explicitly agreed by the Applicant at time of publication of this RIES (see Section 3.2 of this RIES).
- 3.9.3 The Applicant has updated the screening matrices [REP6-006] to reflect discussions during the Examination. The ExA notes the matrices do not however reflect:
- the discussions relating to air quality impacts at River Wensum SAC;
 - collision risk for the Broadland SPA and Ramsar site (but this potential impact is addressed in the integrity matrix for the site); and
 - NE's advice to screen the potential for increased suspended sediment solids to impact on Annex I sandbanks of the HHW SAC.
- 3.9.4 The ExA also notes some discrepancies between the qualifying features listed in the Applicant's matrices and those listed on NE's conservation objectives and/or Ramsar Information Sheets. Discrepancies have also

been identified by NE [REP7-050]. Where the Applicant has screened in a LSE on a species that does not appear to be qualifying features/part of the Ramsar criterion, these are noted in footnotes to Table 3.2 above.

- 3.9.5 At Deadline 7, NE provided comments on the Applicant's Deadline 6 matrices [REP7-050]. NE did not disagree with the overall conclusions drawn, with the exception of the potential for increased suspended sediment solids to impact on Annex I sandbanks of the HHW SAC (see Section 3.2 of this RIES). Given this level of agreement regarding the European sites and features to be screened in, the ExA has not provided any additional/revised screening matrices within this RIES; it has however included impacts of suspended sediment solids to Annex I sandbanks within the HHW SAC integrity matrix to reflect NE's advice (see Appendix 3 of this RIES).
- 3.9.6 IP's are invited to comment on the accuracy and findings in the Applicant's Deadline 6 screening matrices [REP6-006].

4 STAGE 2: ADVERSE EFFECTS ON INTEGRITY

4.1 Conservation Objectives

- 4.1.1 The conservation objectives for the European sites assessed by the Applicant at the point of the DCO application were included within the Applicant's HRA Report [APP-201], except for the Outer Thames Estuary SPA.
- 4.1.2 Conservation objectives for the Outer Thames Estuary SPA and the additional sites for which a LSE was identified during Examination (Broadland SPA and Ramsar site, Breydon Water SPA and Ramsar site and North Norfolk Coast SPA and Ramsar Site) were provided in [REP2-024].

4.2 The Applicant's Assessment

- 4.2.1 The Applicant's HRA Report [APP-201] presented an assessment of effects on integrity for the sites and features identified in Table 3.1 of this RIES. It concluded that the Proposed Development would not adversely affect the integrity of any European site, either alone or in-combination with other plans or projects.

4.3 Relevant Representations

- 4.3.1 NE's relevant representation [Section 4 of RR-099] stated that on the basis of the information submitted by the Applicant, NE was not satisfied that it can be concluded beyond all reasonable scientific doubt that the project would not have an AEoI of the:
 - Alde-Ore Estuary SPA and Ramsar;
 - FFC SPA;
 - Greater Wash SPA;
 - Outer Thames Estuary SPA;
 - Broadland SPA and Ramsar;
 - HHW SAC;
 - SNS SAC;
 - River Wensum SAC; and
 - Paston Great Barn SAC.
- 4.3.2 NE's relevant representation also highlighted concerns relating to Norfolk Valley Fens SAC, The Broads SAC and Broadland SPA although did not explicitly state it did not agree to no AEoI for these sites.

- 4.3.3 The RSPB [RR-054] also did not agree an AEoI could be ruled out for FFC SPA and the Alde-Ore Estuary SPA.
- 4.3.4 The Marine Management Organisation (MMO) [RR-069] highlighted concerns relating to the HHW SAC.
- 4.3.5 The Whale and Dolphin Conservation society (WDC) [RR-056] and The Wildlife Trust (TWT) [RR-040] raised concerns relating to impacts to harbour porpoise of the SNS SAC.

4.4 Positions at time of publication of the RIES

- 4.4.1 At the time of publishing the RIES, the Applicant remained of the view that an AEoI can be excluded for all qualifying features of all European sites identified in both Table 3.1 and Table 3.2 of this RIES.
- 4.4.2 A table summarising the positions of the Applicant and other IPs (at the time of publication of the RIES) relating to the assessment of effects on integrity is provided in Appendix 2 of this RIES.

4.5 Onshore sites for which there is agreement that AEoI can be ruled out for all features

- 4.5.1 The ExA understands that during the Examination, the Applicant submitted information which enabled NE to agree an AEoI can be ruled out for all features of all the onshore European sites, identified as follows:
 - River Wensum SAC;
 - Norfolk Valley Fens SAC;
 - The Broads SAC;
 - Paston Great Barn SAC;
 - Broadland SPA and Ramsar;
 - Breydon Water SPA and Ramsar; and
 - North Norfolk Coast SPA and Ramsar.
- 4.5.2 The issues discussed in relation to these sites are summarised below. The Applicant's Deadline 6 integrity matrices [REP6-007] for these sites reflect these discussions and have not been reproduced within this RIES.

River Wensum SAC, Norfolk Valley Fens SAC and The Broads SAC

Drilling fluid breakout

- 4.5.3 As detailed in Section 3.7 of this RIES, the Applicant agreed to screen in a LSE for direct effects from drilling fluid breakout. NE [RR-099] advised that the conservation objectives for the River Wensum SAC require supporting processes to be maintained and that the target for water quality is at least good chemical and biological status. It considered that there was insufficient detail in the OCoCP [APP-692] for measures to safeguard the designated sites in relation to drilling fluid breakout and

that further information on the HDD methodology and potential effects should be provided.

- 4.5.4 The Applicant submitted a clarification note on Trenchless Crossing and Potential Effects of Breakout on the River Wensum [REP1-039]. This concluded that a bentonite breakout would be unlikely to result in permanent significant changes in geomorphological conditions of the River Wensum and no deterioration in hydromorphological and physio-chemical quality elements of the waterbody. It acknowledged that an increase in turbidity could reduce light and affect physical habitat conditions for the biological communities and reduce quality of substrate for plants, however considered the risk to be low. The note stated that should a breakout occur, monitoring measures and a contingency plan in the OCoCP would reduce the volume of material released downstream to a negligible level.
- 4.5.5 The Applicant updated Section 11.1.6 of the OCoCP [REP1-019] to include additional pre-construction and construction phase controls that were identified in the clarification note. It further submitted a Method statement for crossing the River Wensum and adjacent watercourses [REP2-034].
- 4.5.6 NE [REP3-022] confirmed it was content with the detail in the OCoCP and that sufficient information had been provided with regards to design, methodology and mitigation to be confident that the Proposed Development would not adversely affect the integrity of the site.
- 4.5.7 The EA [REP5-070] also confirmed that it was content that trenchless crossings would not alter the current hydraulic continuity between aquifers and watercourses; that drilling fluids could be inert; and that monitoring is sufficient to stop any breakout as soon as possible.
- 4.5.8 NE's RR [RR-099] stated that its concerns regarding drilling fluid breakout related to the crossings of all water dependent designated sites, including Norfolk Valley Fens SAC and The Broads SAC; however, it subsequently confirmed that given the location of the HDD distance to these two sites, there is unlikely to be an AEoI from drilling fluid breakout [REP2-080].

River Wensum SAC

Watercourse crossing plans

- 4.5.9 NE [RR-099] noted that during the Norfolk Vanguard examination, the Applicant committed to producing site specific water crossing plans on which NE would be consulted; it highlighted a particular concern for the River Wensum SAC. The EA [RR-095] also considered that the applicant should prepare site specific water crossing plans and assessments.

- 4.5.10 The Applicant confirmed that there would be a scheme and programme¹² for each watercourse crossing, diversion and reinstatement, which would include site specific details regarding sediment management and pollution, to be submitted to and approved by the relevant planning authority in consultation with NE. It confirmed that this is secured through Requirement 25 of the draft DCO (dDCO) and also updated Section 11 of the OCoCP at Deadline 1 [REP1-018] to include this commitment.
- 4.5.11 Furthermore, it provided a Clarification Note and Method Statement for Crossing the River Wensum and adjacent Watercourses [REP2-034].
- 4.5.12 NE [REP7-050] confirmed that it was content with the information provided by the Applicant and that there is unlikely to be an AEoI on the site from Norfolk Boreas from operations as set out.

Site restoration

- 4.5.13 NE [RR-099] advised that restoration of the HDD compound on the flood plain of the River Wensum should be restored in accordance with the River Wensum Restoration Strategy and the River Wensum SAC conservation objectives Supplementary Advice. Where possible, appropriate soil/ground moisture conditions should be restored so that water levels are continuously at or just above the ground surface throughout the year.
- 4.5.14 The Applicant updated the OCoCP at Deadline 1 to reflect this approach [REP1-019].

Paston Great Barn SAC

Indirect effects on foraging Barbastelle bats

- 4.5.15 NE [RR-099] advised that the Applicant had not considered indirect effects on the Barbastelle bat feature of the Paston Great Barn SAC. It noted that the onshore cable route would pass through a number of medium to high importance feeding and foraging hedgerow corridor, which links core foraging areas to the south of the cable route. It advised that a hedgerow mitigation plan should be developed, and post-construction monitoring of hedgerows be undertaken, as had been proposed on the Norfolk Vanguard project.
- 4.5.16 The Applicant submitted a clarification note identifying core commuting and foraging areas [AS-025]. It updated Section 12.2.3 of the outline Landscape and Ecological Management Strategy (OLEMS) at Deadline 1 [REP1-021] to confirm that a hedgerow mitigation plan would be developed in consultation with NE, prior to the removal of hedgerows. This would detail the reinstatement approach, monitoring and maintenance. The OLEMS further confirmed post-construction monitoring for bats for 7 years or until the original hedgerow had fully recovered.

¹² The Applicant has not defined these terms, however the ExA understand the 'scheme' to be the design of the Proposed Development and the 'programme' to be the timeframes for implementation. The Applicant is invited to clarify.

- 4.5.17 NE confirmed it was content with the proposed mitigation and post-construction monitoring [REP2-080].
- 4.5.18 NE [REP7-050] confirmed it was satisfied that there is unlikely to be an AEoI on Barbastelle if the hedgerow mitigation outlined within the OLEMS, and Hedgerow Mitigation Plan can be implemented and secured.

Broadland SPA and Ramsar

Effects on ex-situ habitats to foraging swans and geese

- 4.5.19 As detailed in Section 3.4 of this RIES, during the Examination, the Applicant screened in a LSE for direct and indirect effects on ex-situ habitats to foraging swans and geese due to the temporary loss of crop stubble which provide overwintering habitat for these species during construction and decommissioning.
- 4.5.20 NE [RR-099] stated that without the mitigation that had been agreed on the Norfolk Vanguard project, it is not possible to rule out AEoI.
- 4.5.21 In response, the Applicant updated Section 10.3 of the OLEMS [REP1-020] at Deadline 1 to include the following mitigation:
- A possible additional year of wintering bird surveys in advance of construction to be supported by an assessment of future cropping regime. This would aid understanding of whether the affected areas would otherwise have been managed in a way that would support foraging swans and geese. A second year of surveys may be undertaken (to be discussed with NE).
 - Specific mitigation in the event that the surveys described are not undertaken or potential effects cannot be ruled out;
 - Between October and March only one of the two Sections within the site [identified on Plate 1 of REP1-020] would be worked at any one time with the other managed as suitable alternative feeding ground; or
 - Identification and management of a suitable area of land outside order limits (and no restriction on works within two areas).
- 4.5.22 Requirement 24 of the dDCO was also revised to stipulate that construction works within 5km of the Broadland SPA and Ramsar site must be carried out in accordance with the mitigation relating to onshore ornithology contained in the OLEMS.
- 4.5.23 NE confirmed that it was content with the mitigation proposed within the OLEMS and that there would be no AEoI of the Broadland SPA or Ramsar features from Norfolk Boreas alone or in-combination [REP3-022 and REP7-050].

**Breydon Water SPA and Ramsar, Broadland SPA and Ramsar and
North Norfolk Coast SPA and Ramsar**

Collision risk of non-seabird migrants

- 4.5.24 As detailed in Section 3.3 of this RIES, the Applicant agreed to screen in a LSE for collision mortality of non-seabird migrants. It explained [AS-005] that non-seabird migrant collision risk modelling presented in [APP-556] found that predicted collisions apportioned to these SPA's and Ramsar sites were very small, with none exceeding more than one individual per year for all three sites. These levels of additional mortality would not increase the background mortality rate by more than 1% and would therefore be undetectable against natural variations. In-combination collision mortality with the proposed adjacent Norfolk Vanguard and East Anglia THREE project were similarly very small (increases in background mortality rates remained less than 1%). The Applicant concluded no AEoI on these three sites as a result of collisions from the project alone or in-combination with other plans and projects.
- 4.5.25 NE confirmed that it had no outstanding concerns regarding non-seabird migrants of North Norfolk Coast SPA, Broadland SPA and Breydon Water SPA [REP5-077].
- 4.5.26 NE [REP7-050] confirmed that, notwithstanding some methodological issues, it did not anticipate an AEoI for the relevant features of these sites from collision risk from Norfolk Boreas alone or in-combination with other plans and projects.

4.6 Offshore sites for which there is agreement that AEoI can be ruled out for all features

- 4.6.1 NE [REP7-050] confirmed that it was satisfied there would not be an AEoI on Humber Estuary SAC or The Wash and North Norfolk Coast SAC from Norfolk Boreas alone or in combination
- 4.6.2 The Applicant's conclusion of no AEoI to Winterton-Horsey Dunes SAC has not been disputed by any IPs at any time during the Examination.
- 4.6.3 The ExA understands that during the Examination, the Applicant submitted information which enabled NE to agree an AEoI can be ruled out for all features of:
- Outer Thames Estuary SPA; and
 - Greater Wash SPA.
- 4.6.4 The issues discussed in relation to these sites are summarised below. The Applicant's Deadline 6 integrity matrices [REP6-007] for these sites reflect these discussions and have not been reproduced within this RIES.

Outer Thames Estuary SPA

RTD displacement during operation and maintenance

- 4.6.5 The Applicant confirmed that best practice vessel operations would be adopted to minimise disturbance to RTD during operational and maintenance activities¹³. NE subsequently agree an AEoI can be ruled out for all features of the Outer Thames Estuary SPA [REP7-050].

Greater Wash SPA

RTD displacement during construction

- 4.6.6 The Applicant concluded that there would be no AEoI of the Greater Wash SPA as a result of RTD displacement from cable laying [paragraph 346 of APP-201]. However, NE [RR-099] advised the predicted impacts both alone and in-combination for the upper density figure (when applying 100% displacement and 10% mortality rates) may result in an AEoI to RTD. It therefore advised the Applicant to consider mitigation options for RTD disturbance from offshore cable route laying, such as avoiding or reducing cable laying activities during the non-breeding season/period of peak RTD numbers. In response, the Applicant revised Schedules 11 and 12, Part 4, Condition 19 of the dDCO to include a restriction of one cable laying vessel at any one-time during January to March inclusive. NE [REP4-040 and REP7-050] subsequently agreed there would no AEoI from the project alone and in-combination, based on the Applicant's commitment to mitigation.

RTD displacement during operation

- 4.6.7 The Applicant's HRA Report [paragraphs 333-335 of APP-201] concluded that the addition of vessels transiting to and from the port and the wind farm (approximately 1.2 vessel movements per day) would have a negligible effect on the levels of shipping disturbance (an average of almost 100 vessel movements per day). The Applicant noted that despite this, NE still consider the potential for AEoI due to operation and maintenance vessels and stated that it would engage with NE to ensure that operational phase measures would be included in the DCO.
- 4.6.8 The Applicant [AS-024] confirmed that the following mitigation was included in the Outline PEMP [APP-705]¹⁴:
- avoid and minimise maintenance vessel traffic, where possible, during the most sensitive time period for RTD in January February/ March;
 - restrict vessel movements where possible to existing navigation routes;

¹³ As included in the outline Project Environmental Management Plan (PEMP) [APP-705]. Secured through Schedules 9 and 10, Part 4, Condition 9(d); Schedules 11 and 12, Part 4, Condition 9(d) of the dDCO; and Schedule 13, Part 4, Condition 7(d) of the dDCO

¹⁴ Secured through Schedules 9 and 10, Part 4, Condition 14(1)(d)(i); Schedules 11 and 12, Part 4, Condition 9(1)(d)(i); and Schedule 13 Part 4, Condition 7(1)(d)(i) of the dDCO.

- avoid over-revving of engines (to minimise noise disturbance); and
- avoid rafting birds either en-route to the array from operational port and/or within the array and where possible avoid disturbance to areas with consistently high diver density.

4.6.9 NE [REP4-040 and REP7-050] subsequently agreed that there would be no AEoI of the Greater Wash SPA due to operation and maintenance vessel traffic.

4.7 Offshore sites and features for which there is not agreement that AEoI can be ruled out

4.7.1 The ExA understands that NE and some other IPs do not agree AEoI can be ruled out for the following offshore European sites and features:

- Alde-Ore Estuary SPA – LBBG;
- FFC SPA – kittiwake, gannet*, guillemot*, razorbill* and seabird assemblage*;
- SNS SAC – harbour porpoise; and
- HHW SAC – reef and sandbanks.

* NE has, however, been able to conclude no AEoI if Hornsea Project Three and Hornsea Project Four are excluded from the in-combination assessment for the features denoted with an asterix [REP4-040]. (See also Appendix 2 of this RIES).

4.7.2 It should be noted, that an agreement of no AEoI has been reached for some of the features and impacts of the above sites. These are identified in Appendix 2 of this RIES.

4.7.3 Integrity matrices have been reproduced within this RIES for the above sites and include details of IPs positions of whether AEoI can or cannot be ruled out. These are provided in Appendix 3 of this RIES.

4.7.4 A number of methodological matters and/or overarching issues relating to the Applicant's assessment of effects on integrity for offshore ornithology applied to more than one site/feature. A summary is provided below in Section 4.8 of this RIES.

4.7.5 A brief overview of the positions of IPs in relation to HHW SAC is provided in Section 4.9 of this RIES.

4.8 Offshore ornithology

Updated assessments

4.8.1 Throughout the Examination, the Applicant responded to concerns raised by IPs through written representations, hearings and responses to questions. These are detailed throughout the RIES. The Applicant also

submitted detailed updates to its offshore ornithological assessment at Deadlines 2, 5 and 6, as described below.

Deadline 2

- 4.8.2 At Deadline 2, the Applicant submitted an updated offshore ornithological assessment [REP2-035] to address a number of issues raised by NE [RR-099 and AS-029] and the RSPB [RR-054] in their relevant representations. The Applicant confirmed that the conclusions of the revised assessment remains the same as the original HRA Report.
- 4.8.3 The updated assessment included the following:
- presentation of 95% confidence intervals on abundance data to account for variability/uncertainty in the input parameters;
 - undertaking baseline mortality calculations using the adult colony figures and adult mortality rates for gannet of FFC SPA;
 - presentation of an additive assessment of displacement plus collision risk for gannet of FFC SPA within its assessment of impacts from Boreas alone;
 - presentation of a range of breeding season collision risk apportionment rates up to 100% for kittiwakes of the FFC SPA;
 - revision of the method used to apportion in-combination collisions of LBBG of the Alde-Ore Estuary SPA in the breeding season;
 - a review of the figures used in the in-combination collision risk assessment – to address incorrect figures and missing offshore wind farms;
 - revision of the assessment of in-combination displacement effects for RTDs;
 - using apportionment rates agreed during the assessments of individual wind farm projects, rather than a generic 30% apportionment rate for the in-combination collision assessment for LBBG of Alde-Ore Estuary SPA¹⁵; and
 - presentation of the in-combination assessments with and without the inclusion of Hornsea Project Three and Hornsea Project Four (due to uncertainty around their in-combination contributions resulting from the lack of a full baseline dataset).

¹⁵ NE [REP4-040] had some outstanding concerns with the Applicant's approach presented in [REP2-035], however it confirmed that the Applicant's revised approach considers the distance of each of the relevant offshore wind farms and the other colonies within foraging range of the wind farms which is more appropriate than the original approach.

- 4.8.4 The Applicant's original assessment [APP-201] had used the Band (2012) collision risk model. NE [RR-099] initially advised that the Marine Scotland Science (MSS) model be used for any further modelling. However, it was subsequently noted by both the Applicant [AS-024] and NE [REP2-080] that there were issues with the MSS model. As such, NE confirmed that the Applicant's use of the Band (2012) model was appropriate [REP2-080 and REP4-039].

Deadlines 5 and 6

- 4.8.5 On a number of occasions during the Examination, NE [RR-099, REP2-080, REP4-039 and REP4-043] and RSPB [RR-054] advised that raising the turbine draught height would reduce the collision mortality from Norfolk Boreas and minimise its contribution to the in-combination collision totals by as much as is possible.
- 4.8.6 At Deadline 5, the Applicant [REP5-001] confirmed that it had committed to removing the 10MW and 11MW turbines from the project design envelope, therefore the smallest turbine would be 11.55MW. This resulted in changes to the dDCO parameters including:
- reduction in the maximum total number of turbines to be installed from 180 to 158;
 - an increase in minimum spacing between wind turbine generators from 760 metres to 800 metres; and
 - an increase in minimum draught height from 22m to 30m for turbines rated at 14.7MW and above, and 25m for turbines up to and including 14.6MW¹⁶.
- 4.8.7 The Applicant revised its collision risk modelling to reflect these parameters (and incorporating the revisions to the assessment made at Deadline 2) for the project alone at Deadline 5 [REP5-059]¹⁷ and in-combination at Deadline 6 [REP6-024]. The Applicant stated that the new worst-case option of the 14.7MW turbine at 30m draught height substantially reduces collision risks, with reductions of 74% for gannet, 73% for little gull, 72% for kittiwake and 64% for LBBG from the project alone. NE [EV9-003 and REP7-048] subsequently confirmed it had verified the CRM and agreed with the annual collision predictions from the project alone.
- 4.8.8 The Applicant reported reduced in-combination collision risks for all species [REP6-024]. The revised modelling also responded to NE's concerns raised in [REP4-040] by using consented estimates for gannet and kittiwake for Dogger Bank Creyke Beck A and B in place of those in the project's non-material change application and adding estimates for little gull from East Anglia ONE North and East Anglia TWO. Furthermore,

¹⁶ Secured through DCO Part 3 Requirement 2(1)(e)

¹⁷ The Applicant submitted an update to the Deadline 5 project alone collision risk document at Deadline 7 [REP7-029] to include input parameter values used in the collision risk model. The collision estimates and windfarm design remained unchanged.

it included revised figures for Norfolk Vanguard, which resulted from the same design change commitments as those proposed by Norfolk Boreas and had been submitted to the Secretary of State.

- 4.8.9 The Applicant [REP6-024] also noted that the Hornsea Project Three had recently submitted revised collision predictions for kittiwake to the Secretary of State. It confirmed that whilst they are discussed in the assessment, following advice from NE, the revised figures have not been used in the tabulated estimate of cumulative and in-combination collisions.

Integrity matrices

- 4.8.10 The integrity matrices reproduced within this RIES are based on those provided by the Applicant in [REP6-007] and take into account the updated assessments referred to above.

Precaution

- 4.8.11 The Applicant considered that many of the methodological updates requested by NE added further layers of precaution to an already precautionary assessment. The Applicant considered that not applying NE's recommendations would reduce collision estimates by 42% for large gulls, 32% for kittiwake and 19% for gannet [REP2-035].
- 4.8.12 The issues discussed in relation to precaution are summarised in paragraphs 4.8.13 to 4.8.48 below.

Consented vs as-built wind farms

- 4.8.13 The Applicant's HRA Report [APP-201] highlighted that applying as-built wind farm designs to the in-combination collision risk assessment would reduce predicted mortality by at least 40% when compared to using consented figures.
- 4.8.14 The RSPB [RR-054 and REP2-096] and NE [REP2-080 and REP4-039] suggested that it is not appropriate to consider as-built wind farms unless the outcome is legally secured and the CRM is re-run with final design parameters.
- 4.8.15 The Applicant [REP6-021] confirmed that it was not reliant on such headroom to reach conclusions of no AEoI, but that it is an important source of over precaution in the in-combination assessment. It noted that project design revisions often occur post consent as technological developments mean generating capacities can be attained with fewer, larger dimension turbines; therefore consented values do not reflect the reality of seabird collision risk. It stated [REP2-021 and REP3-003] that a developer would require additional planning consent for further construction work, noting that construction is defined in the dDCO and once completed further construction works would require a new marine licence and updated ES. It explained that new turbines would not be installed between existing ones (due to impacts on air flow) and that order limits can only be extended with a new application. It therefore considered headroom to be legally secured [REP6-021].

- 4.8.16 The Applicant [REP2-035] considered there to be a straightforward method for calculating change in collisions with a correction rate and provided a worked example for Hornsea Project One [Appendix 4 of REP4-014] and Triton Knoll [Annex 1 of REP6-021] based on a Crown Estate 2016 paper on calculating ornithological headroom.
- 4.8.17 NE [REP6-049 and REP7-051] recognised there is likely some headroom, but that the extent is not agreed. It agreed in principle that if a non-material change or Section 36 variation has reduced consented parameters, this could be considered legally secured. However, it noted [REP4-043 and REP6-049] that the projects referred to by the Applicant do not have a condition requiring information on as-built parameters on completion to be submitted, or to clearly specify that the as-built project becomes fixed for lifetime, and that there are no limitations for timings of subsequent phases.
- 4.8.18 NE [REP6-049, REP7-047 and REP7-051] identified a number of concerns with the Applicant's proposed approach, including potential issues with the age of data, how it was collected and its compatibility with current survey platforms and modelling approaches. It considered that the developers of the projects in question should have a right to reply on what they think the as-built collision risk is for their project and that CRM should be re-run to generate updating collision figures against any agreed changes to turbine design layouts, with full calculation details for any correction factors.
- 4.8.19 NE considered that until uncertainties have been addressed and an industry wide approach is agreed, the default approach of using consented designs should be applied. It also noted that even if there is headroom, there are projects ahead of Norfolk Boreas in the examination process that are not yet consented, therefore the headroom is not necessarily Norfolk Boreas's to utilise.
- 4.8.20 RSPB [AS-041] considered that the Crown Estate report upon which the Applicant's proposed approach was based was flawed and not designed for use in assessment.
- 4.8.21 The Applicant [REP7-017] acknowledged collision mortalities from as built windfarms could also increase for some windfarms but stated that the effect of this is very small and is far outweighed by reductions for other sites. It believed that it had demonstrated Triton Knoll and Hornsea One alone create sufficient headroom for both Norfolk Vanguard and Norfolk Boreas. However, it recognised that it was unlikely that agreement on the extent of available headroom would be reached during the examination. It stated that its assessment was not reliant upon headroom but considered it to be one example of over precaution in NE's approach.

Nocturnal activity

- 4.8.22 The Applicant [REP2-021 and REP2-035] explained that tagging studies showed that most wind farm collision assessments have used over-estimates of nocturnal activity and that adjustments for these for consented wind farms would reduce collision risks by up to 30%.

- 4.8.23 NE [REP4-039] stated that offshore surveys would have missed peak activity around dawn and dusk, therefore it is not appropriate to apply empirically derived rates from tracking studies to offshore survey recorded results. It also considered it not appropriate to adjust CRM for other OWFs without re-running the CRM.
- 4.8.24 RSPB [REP3-028 and AS-041] considered that the nocturnal activity parameters preferred by the Applicant do not all take into account seasonal fluctuations in temporal activity patterns, do not account for the lack of survey effort during crepuscular peaks in activity and do not account for the differences in how the Band model defines daylight with other definitions of twilight and night time, particularly how these affect behaviour.
- 4.8.25 Although the Applicant [REP5-051] considered there to be a robust evidence base to using revised nocturnal rates, it confirmed that it had followed NE's advice on selection of nocturnal activity rates in its assessments.

Predictions using upper 95% CIs

- 4.8.26 The Applicant [REP1-042 and REP2-035] considered NE's request to use 95% confidence intervals (CIs) for project alone collision impacts fails to acknowledge the low likelihood (2.5%) of the upper prediction occurring. It noted [REP5-051] that an emphasis tends to fall on upper CI predictions without the balance of the lower prediction and that this is not statistically justified
- 4.8.27 However, NE [REP4-039, REP4-040 and REP4-043] stated that the distribution of birds in marine environments are highly variable and that 24 days survey effort over 2 years would not likely capture the full extent of variation density/abundance of seabirds present; therefore it is appropriate for lower and upper CIs to be presented to address uncertainty. It further stated that it understood [REP5-077] that the central predicted value is carried forward to in-combination assessment, rather than upper figures for collision. It did not agree this resulted in over-estimated impact magnitudes.
- 4.8.28 The RSPB [AS-041] supported NE's request for an indication of uncertainty around estimates of abundance in order to give consideration of the variability in the underlying annual population estimates.

Kittiwake flight speeds

- 4.8.29 The Applicant [REP2-035] noted that recent studies have reported slower flight speeds for kittiwake which would reduce the predicted number of collisions. The RSPB [AS-041] advised that the speeds suggested by the Applicant should not be used in isolation as they resulted from a single study on a single wind farm distant from kittiwake breeding colonies.
- 4.8.30 The Applicant submitted a review of flight speed data [REP5-060] and considered it appropriate to reduce flight speed to 10.8m/s which would reduce collisions by 11%. The Applicant considered it would be appropriate to apply this to all wind farms in the in-combination assessment.

- 4.8.31 NE [REP4-039 and REP7-051] recognised the need to review evidence base for flight speeds. However, it noted that the evidence presented by the Applicant in [REP5-060] has not been peer reviewed and that as there is uncertainty in the appropriate flight speeds to use, the currently used value from the literature (i.e. 13.1m/s) and the value from the work undertaken by the Norfolk Boreas consultants in [REP5-060] are used in the CRM, subject to some minor caveats it described in [REP7-051].

Kittiwake breeding season apportionment to FFC SPA

- 4.8.32 The Applicant's HRA Report [APP-201] estimated that 26.1% of the kittiwake observed on the wind farm during the breeding season were potentially from the FFC SPA. However, NE [RR-099] advised a range of apportionment rates (up to 100%) for the breeding season be considered in the assessment and recommended a precautionary rate of 86% [REP4-039]. It noted that although tracking data up until 2015 suggests low connectivity of the Norfolk Boreas site with foraging birds from the colony, further tagging of kittiwakes from the FFC SPA colony undertaken in 2017 indicates that birds from the FFC SPA do forage within the Boreas site. The RSPB [RR-054, REP2-096 and REP3-028] also advised an apportionment of 86% to take into account kittiwake tracking data from 2017.
- 4.8.33 The Applicant [REP1-042] stated that that presumption of up to 100% kittiwakes are breeding adults from FFC SPA is based on a limited dataset. It highlighted concerns with the kittiwake tracking data referred to by RSPB and NE and considered the 26.1% estimate used in its assessment to be appropriate [REP2-021, REP3-007].

Avoidance rates

- 4.8.34 The Applicant [REP2-035] considered that currently advised avoidance rates used in CRM are too low. NE [REP4-039] agreed that some evidence suggests this is the case and noted that SNCBs are currently reviewing this; nevertheless, its position remained to use those advocated in SNCB guidance note JNCC et al. (2014).
- 4.8.35 The RSPB [AS-041] highlighted limitations in the evidence presented by the Applicant and advised that avoidance rates could go up as well as down.
- 4.8.36 The RSPB also did not agree with the Applicant's use of a 98.9% avoidance rate for gannet [RR-054, REP2-095, REP3-028 and AS-041]. It advised a 98% rate be applied for the breeding season when there are time and energy constraints of foraging birds. It noted that the 98.9% rate was based on avoidance behaviour from non-breeding gannets. The Applicant [REP2-021, REP3-003, AS-041 and REP5-051] explained that the 98.9% rate was advised by NE and considered there was robust evidence to support its use. The Applicant did not amend the avoidance rate used in its updated assessments and NE [REP2-080] confirmed that it agreed with the Applicant's 98.9% rate.

Extent of auk displacement

- 4.8.37 The Applicant [REP2-035 and REP5-051] considered NE's advice to assess displacement rates of 30% to 70% across the wind farm and a 2km buffer to be over precautionary. It concluded that an evidence-based, but still precautionary, assessment of displacement of auks by offshore wind farms might assume that their densities would be reduced inside offshore wind farms by 50% relative to densities in the surrounding area, and by 30%, on average, across a 1km buffer zone surrounding the wind farm. It also considered that increasing space between larger turbines will likely reduce displacement rates as there would be considerable opportunity for species to forage between turbines.
- 4.8.38 However, NE [REP4-039] noted that evidence for auk displacement is variable, therefore reiterated its advice that consideration should be given to a range of displacement rates. It did not agree that there was evidence to support a position that spacing and turbine size has a bearing on displacement and considered that turbine spacing may be one of several variables that could affect displacement effects.
- 4.8.39 The RSPB [AS-041] cited additional studies which supported the values in the range recommended by NE.

Mortality resulting from displacement

- 4.8.40 The Applicant [REP2-035 and REP5-051] acknowledged that the consequences of displacement are less well understood than rates of displacement and noted that NE adopts precautionary values in the range of 1 to 10%. However, it considered realistic levels of mortality for displaced birds would be less than 1% for all species considered.
- 4.8.41 NE [RR-099, REP2-080, REP4-039] stated that definitive mortality rates are not known and that mortality rates are a crude method of capturing the range of potentially deleterious effects that could arise from displacement, including reduced fitness for migration and reduced productivity during the breeding season. It stated that empirical evidence of energetic consequences of displacement is limited and the role of overwinter survival on population dynamics is poorly understood. It considered there to be no evidence to suggest 10% is precautionary.
- 4.8.42 In respect of auks however, NE stated that although mortality is likely to be at the low end of the range, it did not agree the Applicant's approach was sufficiently precautionary. Similarly, it did not agree that a 1% mortality rate for RTD from offshore export cable laying to be sufficiently precautionary.
- 4.8.43 The RSPB [REP2-095 and REP2-096] supported NE's position. It noted [AS-041] that the Applicant's evidence does not acknowledge energetic bottlenecks in winter and that higher weights in non-breeding period can be seen as recovery and preparatory period and do not suggest that birds can be subjected to greater disturbance without consequence.
- 4.8.44 The RSPB also noted that the Applicant suggests current estimates of RTD mortality include occurrences because of shipping activity and that

additional mortality arising from displacement from wind farms is likely to be small. The RSPB stated that recent evidence suggests that the extent of displacement caused by offshore wind farms is far greater than that arising from shipping traffic.

- 4.8.45 The Applicant's assessments presented both its own preferred rate and NE's range of rates.

Combining displacement mortality and collision mortality for gannet

- 4.8.46 Although the Applicant's HRA Report [APP-201] considered the in-combination effects of the two impacts of collision and displacement to gannet, NE [RR-099] advised that this should be summed for the project alone. The Applicant considered collision risk and displacement to be two mutually exclusive events and that this approach leads to potential double counting [REP1-042].

- 4.8.47 NE [REP4-040] explained that the number of birds at risk of reduced individual fitness (i.e. mortality and productivity losses) as a result of displacement is based on the numbers of birds present within a development area and buffer both on the water and in flight. Assessment of the number of birds at risk of mortality as a result of collisions (e.g. with wind turbines) is based on the number of birds present within a development area that are in flight only. The mortality impacts estimated from CRM are assumed to be in addition to any mortality caused by displacement impacts (because the collision estimates take account of birds that avoid the wind farm). Productivity impacts due to displacement would be a further addition (but this is not currently quantitatively accounted for under existing methods/advice). Therefore, it regards the two impacts (collision and displacement) as additive and advised that they should be summed. NE acknowledged that this simplistic approach will incorporate a degree of precaution, the level of which is difficult to gauge.

Additive precaution

- 4.8.48 The Applicant [REP1-042, REP4-014 and REP6-014] acknowledged that individual components of precaution may be justified, but the combination of these generates predictions which are highly over precautionary.

Population modelling

Models used

- 4.8.49 The Applicant [APP-201] assessed the significance of the predicted in-combination collision impacts by reference to the population viability analysis (PVA) undertaken during the Norfolk Vanguard examination for LBBG at the Alde-Ore Estuary SPA; and the PVAs undertaken during the Hornsea Project Three examination for gannet, kittiwake, razorbill and guillemot of the FFC SPA.
- 4.8.50 NE [RR-099 and REP4-039] highlighted concerns with the Hornsea Project Three PVA relating to the number of simulations and demographic data. It also identified concerns with the LBBG PVA, namely regarding the adjustment of the productivity to take account of the

proportion of birds that miss breeding each year. Nevertheless, it considered these models to represent the best available evidence on which to base an assessment but recommended the Hornsea Project Three models be updated using the NE commissioned Seabird PVA Tool once updates to it are completed.

- 4.8.51 At Deadline 7, NE confirmed the update was available as of 3 March 2020 and advised the models be re-run. However, the Applicant [REP7-018] referred to NE's comments at Deadline 5 [REP5-077] that NE was not aware that updates to the model would make a significant difference to the counterfactual metric outputs of models run using the previous/currently available versions of the tool. The Applicant therefore considered the current outputs in [REP2-035]¹⁸ to be robust and appropriate.

Density dependence and independence

- 4.8.52 The Applicant's HRA Report [APP-201] presented population modelling results for both density dependent and density independent models. It considered that the density dependent model was more realistic for gannet and kittiwake. For guillemot, razorbill and LBBG, the Applicant drew its conclusions using the density independent model, which it considered to be more precautionary.
- 4.8.53 The Applicant [REP2-035, REP3-003, REP5-051] considered that density independent models are biologically unrealistic as they permit unlimited population growth. It explained that density dependence is known to exist in seabird populations and that a density dependent PVA generates more realistic predictions. It presented outputs from both models in its Deadline 2 ornithology update [REP2-035]¹⁹.
- 4.8.54 NE [REP4-039, REP5-007] and the RSPB [AS-041] both acknowledged that density dependence is likely operating at seabird colonies. However, they considered the density independent model outputs to be the most appropriate as there is no clear evidence to support the application of any particular form or magnitude of density dependence; therefore, there is no way of known whether predictions from a density dependent model are robust or accurate.

Counterfactuals

- 4.8.55 The Applicant's HRA Report [APP-201] presented both the counterfactual of growth rate and the counterfactual of population size.
- 4.8.56 NE [REP4-039] recommended that both metrics of the counterfactual of population growth rate and the counterfactual of population size be considered to quantify the relative changes in a population in response to

¹⁸ Note the Applicant provided PVA outputs for guillemot of FFC SPA obtained using the NE Seabird PVA tool in [REP2-035].

¹⁹ Note that the Applicant's Deadline 5 [REP5-059] and Deadline 6 [REP6-024] ornithology updates provided revised collision risk modelling outputs which were compared to the outputs and conclusions provided in the HRA Report [APP-201] and the Deadline 2 Ornithology update [REP2-035]; they did not include the detailed discussions relating to population modelling and effects on integrity that were included in [REP2-035].

anthropogenic impacts. It reported on both metrics in its ornithology advice [REP4-040].

- 4.8.57 The RSPB [REP2-035 and AS-041] advised that the counterfactual of population size is most appropriate for a density independent PVA (which it advocated), as the counterfactual of growth rate does not account for a high probability that future population growth rate will be different from the current growth rate.
- 4.8.58 The Applicant [REP3-003 and REP5-051] agreed that counterfactual of population size is most appropriate for the density independent model but considered that a counterfactual of population growth is the more robust metric to use for its preferred density dependent model. It presented both outputs in its Deadline 2 ornithology update [REP2-035]¹⁹.

In-combination assessments

- 4.8.59 Throughout the Examination, NE [RR-099 and REP7-047] noted concerns regarding incomplete baseline surveys for the Hornsea Project Three and the associated level of uncertainty as regards the potential impacts of that project. It also noted [REP7-047] that the best currently available figures for Hornsea Project Four are those from the Preliminary Environmental Information Report (PEIR) for this project and that these figures and the methodologies to produce them are subject to ongoing discussions and therefore have an element of uncertainty associated with them and a likelihood of being subject to change.
- 4.8.60 As noted above in this RIES, the Applicant's assessment of in-combination effects was therefore presented with and without the inclusion of Hornsea Project Three and Hornsea Project Four. NE [REP7-045] confirmed that this has clarified that for some SPA qualifying features, it is possible to rule out an AEoI in-combination when Hornsea Projects Three and Four are excluded from the assessment. However, it explained that as there is uncertainty in the figures included in the in-combination assessment totals for Hornsea Projects Three and Four, there will be uncertainty in the assessment totals presented when these two projects are included; therefore it is unable to advise on, or rule out, AEoI, based on the actual in-combination impact magnitudes as presented when Hornsea Projects Three and Four are included in the totals.

4.9 Benthic Ecology - Haisborough, Hammond and Winterton SAC

HHW SAC Control Document

- 4.9.1 The Applicant concluded no AEoI of the HHW SAC, however acknowledged the ephemeral nature of *Sabellaria spinulosa* and its potential for recovery within the HHW SAC between the point of consenting and cable installation. It therefore originally proposed wording for Condition 9(1)(m) of Schedules 11 and 12 (the Transmission DMLs) of the dDCO, that construction could not commence until the MMO

was satisfied, in consultation with NE, that there was 'no adverse effect beyond reasonable scientific doubt' on the HHW SAC. The condition required that a HHW SAC Site Integrity Plan (SIP), in accordance with the Outline HHW SAC SIP [APP-711]²⁰, was agreed with the MMO in consultation with NE prior to construction.

- 4.9.2 However, both the MMO [RR-069, AS-027, REP1-058, REP3-017, REP4-035] and NE [RR-099, AS-028, REP4-041, REP4-043] raised concerns regarding the use of a SIP stating it is not appropriate to use as a worst case scenario can be identified and assessed at the pre-application stage. They also considered the Applicant's proposed condition does not allow for the project to proceed under derogation.
- 4.9.3 The MMO [REP4-035] was concerned that the SIP would result in extra regulatory governance near to activity commencing and that it may have to issue a stop notice should SIP conditions not be met.
- 4.9.4 NE [REP4-041 and REP4-043] stated that the SIP was predicated on the view that it would be possible to avoid AEoI by adjusting methods within the redline, however they also considered that this cannot be concluded in absence of information about the presence of reef, the methods to be used and the cable route. It explained [REP7-051] that the Applicant points out that the purpose of the Grampian condition is to "verify previous assessments" and noted that there is a possibility that the condition's mechanism will not verify previous assessments, because previous assessments may be superseded by events.
- 4.9.5 The Applicant [AS-024, REP1-042, REP4-014] considered that it had assessed a worst case scenario of potential effects and had concluded that the proposed mitigation was sufficient to conclude that there would be no AEoI of the SAC; therefore it was not deferring an appropriate assessment. It stated it was not reliant on the Grampian condition, however the SIP provided added comfort, control and confidence to NE and the MMO to verify that the assessment undertaken at this point remain accurate at the point of cable installation. It considered that it will not be known until construction whether any impacts will actually arise and that if NE's position was accepted, it would never be possible to rule out AEoI to *Sabellaria spinulosa* due its ephemeral nature.
- 4.9.6 Nevertheless, at Deadline 6, the Applicant proposed an alternative version of the condition which does not require any further consideration of AEoI by the MMO, but still secures all mitigation originally proposed in the HHW SAC SIP, via a new HHW SAC Cable Specification Installation and Monitoring Plan (an outline of which was provided in [REP6-017]).
- 4.9.7 A revised SIP was also submitted [REP6-011] to reflect a refined worst case scenario, commitments that have been made for Norfolk Vanguard²¹, and additional mitigation measures committed to by the

²⁰ Subsequently updated during the Examination at Deadline 1 [REP1-033] and again at Deadline 6 [REP6-011] to reflect discussions during the Examination discussed in the HHW SAC Integrity matrix.

²¹ Submitted to the Department for Business, Energy and Industrial Strategy (BEIS) on the 28th February 2020 in response to a letter requesting further information.

Applicant during the Examination; including no cable protection in priority areas to be managed as reef and the decommissioning of cable protection at the end of the project life.

- 4.9.8 The Applicant referred to the SIP and the CSIMP as together comprising 'the SAC Control Document'; both of which are referenced within the HHW SAC Integrity matrix.
- 4.9.9 NE [REP7-051] stated that the proposal to use a CSIMP does not resolve the problems of uncertainty. For legal purposes a future CSIMP would represent a plan or project that would have to be subjected to Appropriate Assessment during the process of approval by the MMO. Depending on circumstances existing at the time of submission of a CSIMP to the MMO the Appropriate Assessment is capable of concluding that AEoI will be caused, exactly as with the SIP process.

5 ALTERNATIVES, COMPENSATION AND IROPI

FFC SPA and Alde-Ore Estuary SPA

- 5.1.1 RSPB [REP2-096] did not consider mitigation measures would be possible to avoid the increased mortality from Norfolk Boreas and as such expected the Applicant to provide information relating to alternative solutions, imperative reasons of overriding public interest and compensatory measures.
- 5.1.2 However, the Applicant [REP2-021] maintained that AEoI could be ruled out and that NE and the RSPBs conclusions were reached through highly precautionary methods that over-estimate the magnitude of impacts.

HHW SAC

- 5.1.3 NE [RR-099] advised that alternatives and/or compensation should be secured for the HHW SAC. However, it considered that it was unlikely an agreement could be found on compensation for permanent loss of Annex I reef.
- 5.1.4 The Applicant maintained that an AEoI could be excluded and that added comfort was provided through the SIP. It therefore initially stated [AS-024] that it is not proposing compensation as the project has committed to ensuring no AEoI, recognising the project cannot proceed to construction if this cannot be agreed with the MMO.
- 5.1.5 The Applicant [REP2-021 and REP6-025] stated that NE has not yet explained to what extent (in its opinion) there is an AEoI, therefore compensation cannot be addressed by the Applicant as this can only be done if the precise nature and quantified extent of any contended AEoI is identified.
- 5.1.6 NE [REP4-041 and REP4-043] noted that developing compensation could take time and should be secured in the event that consent is given and put in place before harm is caused. It advised that compensation should be addressed now in case the Grampian condition cannot be met; if this occurred the Applicant would need to apply for a DCO change which would likely be material and require further examination and result in the same position again.

Applicant's derogation case

- 5.1.7 At Deadlines 6 and 7, the Applicant reasserted its conclusion of no AEoI for all European sites. Nevertheless, it submitted information on derogation should the SoS be minded to disagree and conclude an AEoI following Appropriate Assessment. At Deadline 6, it submitted a position statement on derogation [REP6-025] providing information on potential alternatives (Appendix 1) and potential compensation measures (Appendix 2). At Deadline 7 it submitted an In Principle Habitats Regulations Derogation case [REP7-024 to REP7-028] which comprised the Applicant's submission in relation to alternative solutions (section 4),

IROPI (section 5) and in-principle compensatory measures (section 6 and Appendices 1 – 3).

- 5.1.8 In summary, the document [REP7-024 to REP7-028] addressed:
- kittiwake of FFC SPA (for collision risk) – with construction of artificial nest sites considered to be the most deliverable within the timescales required for Norfolk Boreas;
 - LBBG of Alde-Ore Estuary SPA (for collision risk) – with measures to improve breeding success (likely predation control) considered the most appropriate measure; and
 - reef and sandbanks of HHW SAC (for habitat loss due to cable protection) – with an extension to the HHW SAC considered to be the most deliverable within the timescales required for Norfolk Boreas.
- 5.1.9 The Applicant proposed to secure these measures in a newly drafted Schedule 19 of the dDCO [REP7-004].
- 5.1.10 The Applicant [REP7-024] explained that gannet, razorbill and guillemot from the FFC SPA have not been addressed in the derogation case. This is because the area of disagreement with NE (with respect to conclusions on AEoI) relates primarily to the uncertainties introduced by Hornsea Project Three (for which NE is in disagreement with the project about baseline data) and Hornsea Project Four (for which only the preliminary assessment is available). It noted that NE cannot rule out AEoI for gannet, razorbill and guillemot only when the two Hornsea projects are included. On this basis, the Applicant did not consider there to be a requirement to consider in principle compensation options for gannet, razorbill and guillemot, and noted that these had not been requested by the SoS in its request for further information (see section 2.3 of this RIES) for either Hornsea Project Three or Norfolk Vanguard.
- 5.1.11 The Applicant did not address the SNS SAC in the In Principle Habitats Regulations Derogation case.
- 5.1.12 At Deadline 7, NE [REP7-043] explained that it had been unable to provide comment on the Position Statement on Derogations (ie the Applicant's Deadline 6 submissions). It explained that it was providing comment to the SoS on the Norfolk Vanguard and Hornsea Project Three derogation documents and did not wish to prejudice its advice; it therefore confirmed it would comment after publication of the RIES.

ANNEX 1: EUROPEAN SITES AND NATURA 2000 SITES CONSIDERED BY THE APPLICANT AT THE SCREENING STAGE

Taken from [REP6-005]

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|---|-------------|-------------------|---------------------|------|-------------|
| 1 | Abberton Reservoir SPA & Ramsar | ✓ | | | | |
| 2 | Abers - Côtes des légendes SAC | | ✓ | | | |
| 3 | Agger Tange, Nisum Bredning, Skibsted Fjord og Agerø SAC | | ✓ | | | |
| 4 | Ålborg Bugt, Randers Fjord Og Mariager Fjord SAC | | ✓ | | | |
| 5 | Alde, Ore and Butley Estuaries SAC | | | ✓ | | |
| 6 | Alde-Ore Estuary SPA & Ramsar | ✓ | | | | |
| 7 | Anholt og havet nord for SAC | | ✓ | | | |
| 8 | Archipel des Glénan SAC | | ✓ | | | |
| 9 | Baie De Canche Et Couloir Des Trois Estuaires SAC | | ✓ | | ✓ | |
| 10 | Baie de Morlaix SAC | | ✓ | | | |
| 11 | Baie de Seine Occidentale SAC | | ✓ | | | |
| 12 | Baie de Seine Occidentale SPA | ✓ | | | | |
| 13 | Baie de Seine Orientale SAC | ✓ | ✓ | | | |
| 14 | Baie du Mont Saint-Michel SAC | | ✓ | | | |
| 15 | Balgö SAC | | ✓ | | | |
| 16 | Bancs Des Flandres SAC | | ✓ | ✓ | | |
| 17 | Bancs Des Flandres SPA | ✓ | | | | |
| 18 | Bassurelle Sandbank SAC | | | ✓ | | |
| 19 | Benfleet and Southend Marshes SPA & Ramsar | ✓ | | | | |
| 20 | Berwickshire and North Northumberland Coast SAC | | ✓ | ✓ | | |
| 21 | Blackwater Estuary (Mid-Essex Coast Phase 4) SPA & Ramsar | ✓ | | | | |
| 22 | Borkum-Riffgrund SCI | | ✓ | | ✓ | |
| 23 | Borkum-Riffgrund SPA | ✓ | | | | |
| 24 | Braemar Pockmarks SAC | | | ✓ | | |
| 25 | Breydon Water SPA & Ramsar | ✓ | | | | |
| 26 | Broadland SPA & Ramsar | ✓ | | | | |
| 27 | Bruine Bank pSPA | ✓ | | | | |

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|---|-------------|-------------------|---------------------|------|-------------|
| 28 | Buchan Ness to Collieston Coast SPA | ✓ | | | | |
| 29 | Calf of Eday SPA | ✓ | | | | |
| 30 | Cap Gris Nez SPA | ✓ | | | | |
| 31 | Cap Sizun SAC | | ✓ | | | |
| 32 | Chausey SAC | ✓ | ✓ | | | |
| 33 | Chaussée de Sein SAC | | ✓ | | | |
| 34 | Chesil Beach and The Fleet SPA & Ramsar | ✓ | | | | |
| 35 | Chichester and Langstone Harbours SPA & Ramsar | ✓ | | | | |
| 36 | Colne Estuary (Mid-Essex Coast Phase 2) SPA & Ramsar | ✓ | | | | |
| 37 | Copinsay SPA | ✓ | | | | |
| 38 | Coquet Island SPA | ✓ | | | | |
| 39 | Côte de Granit Rose-Sept Iles SAC | ✓ | ✓ | | | |
| 40 | Côtes de Crozon SAC | | ✓ | | | |
| 41 | Cromarty Firth SPA & Ramsar | ✓ | | | | |
| 42 | Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA & Ramsar | ✓ | | | | |
| 43 | Deben Estuary SPA & Ramsar | ✓ | | | | |
| 44 | Dengie (Mid-Essex Coast Phase 1) SPA & Ramsar | ✓ | | | | |
| 45 | Doggerbank SCI | | ✓ | | | |
| 46 | Doggersbank SCI | | ✓ | | | |
| 47 | Dornoch Firth and Loch Fleet SPA & Ramsar | ✓ | | | | |
| 48 | Dornoch Firth and Morrich More SAC | | ✓ | | | |
| 49 | Dråby Vig SAC | | ✓ | | | |
| 50 | Duinen Ameland SAC | | ✓ | | | |
| 51 | Duinen en Lage Land Texel SAC | | ✓ | | | |
| 52 | Duinen Goeree & Kwade Hoek SAC | | ✓ | | | |
| 53 | Duinen Terschelling SAC | | ✓ | | | |
| 54 | Duinen Vlieland SAC | | ✓ | | | |
| 55 | Dünenlandschaft Süd-Sylt SAC | | ✓ | | | |
| 56 | Dunes De La Plaine Maritime Flamande SAC | | ✓ | ✓ | | |
| 57 | Dunes de l'Authie et Mollières de Berck SAC | | ✓ | | | |
| 58 | East Caithness Cliffs SPA | ✓ | | | | |
| 59 | Essex Estuaries SAC | | | ✓ | | |
| 60 | Estuaire de la Canche, dunes picardes plaquées sur | | ✓ | | | |

Report on the Implications for European Sites for Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|--|-------------|-------------------|---------------------|------|-------------|
| | l'ancienne falaise, forêt d'Hardelot et falaise d'Equihen SAC | | | | | |
| 61 | Estuaire de la Seine SCI | | ✓ | | | |
| 62 | Estuaires et Littoral Picards (baies de Somme et d'Authie) SAC | | ✓ | | ✓ | |
| 63 | Exe Estuary SPA & Ramsar | ✓ | | | | |
| 64 | Fair Isle SPA | ✓ | | | | |
| 65 | Falaise du Bessin Occidental SPA | ✓ | | | | |
| 66 | Falaises du Cran Aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant SAC | | ✓ | ✓ | | |
| 67 | Falaises et Pelouses du Cap Blanc Nez, du Mont d'Hubert, des Noires Mottes, du Fond de la Forge et du Mont de couple SCI | | | ✓ | | |
| 68 | Faray and Holm of Faray SAC | | ✓ | | | |
| 69 | Farne Islands SPA | ✓ | | | | |
| 70 | Fetlar SPA | ✓ | | | | |
| 71 | Firth of Forth SPA & Ramsar | ✓ | | | | |
| 72 | Firth of Tay & Eden Estuary SPA & Ramsar | ✓ | | | | |
| 73 | Firth of Tay & Eden Estuary SAC | | ✓ | | | |
| 74 | Flamborough and Filey Coast SPA | ✓ | | | | |
| 75 | Flamborough Head SAC | | | ✓ | | |
| 76 | Forth Islands SPA | ✓ | | | | |
| 77 | Foula SPA | ✓ | | | | |
| 78 | Foulness (Mid-Essex Coast Phase 5) SPA & Ramsar | ✓ | | | | |
| 79 | Fowlsheugh SPA | ✓ | | | | |
| 80 | Frisian Front pSPA | ✓ | | | | |
| 81 | Gibraltar Point SPA & Ramsar | ✓ | | | | |
| 82 | Great Yarmouth North Denes SPA | ✓ | | | | |
| 83 | Greater Wash SPA | ✓ | | | | |
| 84 | Grevelingen SAC | | ✓ | | | |
| 85 | Gule Rev SCI | | ✓ | | | |
| 86 | Gullmarsfjorden SAC | | ✓ | | | |
| 87 | Haisborough, Hammond and Winterton SAC | | | ✓ | | |
| 88 | Hallands Väderö SAC | | ✓ | | | |

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|---|-------------|-------------------|---------------------|------|-------------|
| 89 | Hamburgisches Wattenmeer SCI | | ✓ | | | |
| 90 | Hamford Water SPA & Ramsar | ✓ | | | | |
| 91 | Havet og kysten mellem Præstø Fjord og Grønsund SAC | | ✓ | | | |
| 92 | Havet omkring Nordre Rønner SAC | | ✓ | | | |
| 93 | Helgoland mit Helgoländer Felssockel SAC | | ✓ | | | |
| 94 | Hermaness, Saxa Vord and Valla Field SPA | ✓ | | | | |
| 95 | Hesselø med omliggende stenrev SAC | | ✓ | | | |
| 96 | Hirsholmene, havet vest herfor og Ellinge Å's udløb SAC | | ✓ | | | |
| 97 | Hornsea Mere SPA | ✓ | | | | |
| 98 | Hoy SPA | ✓ | | | | |
| 99 | Humber Estuary SAC | | ✓ | ✓ | ✓ | |
| 100 | Humber Estuary SPA & Ramsar | ✓ | | | | |
| 101 | Hund und Paapsand SCI | | ✓ | | | |
| 102 | Imperial Dock Lock, Leith SPA | ✓ | | | | |
| 103 | Inner Dowsing, Race Bank and North Ridge SCI | | | ✓ | | |
| 104 | Inner Moray Firth SPA & Ramsar | ✓ | | | | |
| 105 | Isle of May SAC | | ✓ | | | |
| 106 | Klaverbank SAC | | ✓ | | | |
| 107 | Kosterfjorden-Väderöfjorden SAC | | ✓ | | | |
| 108 | Kungsbackafjorden SAC | | ✓ | | | |
| 109 | Küsten- und Dünenlandschaften Amrums SAC | | ✓ | | | |
| 110 | Lindisfarne SPA & Ramsar | ✓ | | | | |
| 111 | Littoral Seino-Marin SPA | ✓ | | | | |
| 112 | Loch of Strathbeg SPA & Ramsar | ✓ | | | | |
| 113 | Løgstør Bredning, Vejlerne og Bulbjerg SAC | | ✓ | | | |
| 114 | Lovns Bredning, Hjarbæk Fjord og Skals, Simested og Nørre Ådal, Skravad Bæk SAC | | ✓ | | | |
| 115 | Malmöfjord SAC | | ✓ | | | |
| 116 | Marais du Cotentin et du Bessin - Baie des Veys SAC | | ✓ | | | |

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|--|-------------|-------------------|---------------------|------|-------------|
| 117 | Margate and Long Sands SCI | | | ✓ | | |
| 118 | Marwick Head SPA | ✓ | | | | |
| 119 | Måseskär SAC | | ✓ | | | |
| 120 | Medway Estuary and Marshes SPA & Ramsar | ✓ | | | | |
| 121 | Minsmere-Walberswick SPA & Ramsar | ✓ | | | | |
| 122 | Montrose Basin SPA & Ramsar | ✓ | | | | |
| 123 | Moray and Nairn Coast SPA & Ramsar | ✓ | | | | |
| 124 | Mousa SPA | ✓ | | | | |
| 125 | Mousa SAC | | ✓ | | | |
| 126 | Nationalpark Niedersächsisches Wattenmeer SAC | | ✓ | | | |
| 127 | Nibe Bredning, Halkær Ådal og Sønderup Ådal SAC | | ✓ | | | |
| 128 | Nidingen SAC | | ✓ | | | |
| 129 | Noordzeekustzone SAC | | ✓ | ✓ | ✓ | |
| 130 | Nordre älvs estuarium SAC | | ✓ | | | |
| 131 | Nordvästra Skånes havsområde SAC | | ✓ | | | |
| 132 | Norfolk Valley Fens SAC | | | | | ✓ |
| 133 | North Caithness Cliffs SPA | ✓ | | | | |
| 134 | North Norfolk Coast SPA & Ramsar | ✓ | | | | |
| 135 | North Norfolk Sandbanks and Saturn Reef SAC | | | ✓ | | |
| 136 | Northumbria Coast SPA & Ramsar | ✓ | | | | |
| 137 | Noss SPA | ✓ | | | | |
| 138 | NTP S-H Wattenmeer und angrenzende Küstengebiete SAC | | ✓ | | | |
| 139 | Oosterschelde SAC | | ✓ | | | |
| 140 | Orfordness - Shingle Street SAC | | | ✓ | | |
| 141 | Östliche Deutsche Bucht SPA | ✓ | ✓ | | | |
| 142 | Ouessant-Molène SAC | | ✓ | | | |
| 143 | Outer Thames Estuary SPA | ✓ | | | | |
| 144 | Papa Stour SPA | ✓ | | | | |
| 145 | Papa Westray (North Hill and Holm) SPA | ✓ | | | | |
| 146 | Paston Great Barn SAC | | | | | ✓ |
| 147 | Pater Noster-skärgården SAC | | ✓ | | | |
| 148 | Pentland Firth Islands SPA | ✓ | | | | |
| 149 | Portsmouth Harbour SPA & Ramsar | ✓ | | | | |

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|--|-------------|-------------------|---------------------|------|-------------|
| 150 | Presqu'ile de Crozon SAC | | ✓ | | | |
| 151 | Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete SPA | ✓ | | | | |
| 152 | Récifs et marais arrière- littoraux du Cap Lévi à la Pointe de Saire SAC | | ✓ | | | |
| 153 | Récifs Gris-Nez Blanc-Nez SAC | | ✓ | ✓ | | |
| 154 | Ridens et dunes hydrauliques du détroit du Pas-de-Calais SAC | | ✓ | ✓ | | |
| 155 | River Derwent SAC | | | | ✓ | |
| 156 | River Wensum SAC | | | | | ✓ |
| 157 | Roches de Penmarch SAC | | ✓ | | | |
| 158 | Ronas Hill - North Roe and Tingon SPA | ✓ | | | | |
| 159 | Rousay SPA | ✓ | | | | |
| 160 | Sälöfjorden SAC | | ✓ | | | |
| 161 | Sanday SAC | | ✓ | | | |
| 162 | SBZ 1 / ZPS 1 SAC | | ✓ | | | |
| 163 | SBZ 2 / ZPS 2 SAC | ✓ | | | | |
| 164 | SBZ 3 / ZPS 3 SAC | ✓ | | | | |
| 165 | Scanner Pockmark SAC | | | ✓ | | |
| 166 | Seevogelschutzgebiet Helgoland SPA | ✓ | | | | |
| 167 | Skagens Gren og Skagerrak SAC | | ✓ | | | |
| 168 | Solent and Southampton Water SPA & Ramsar | ✓ | | | | |
| 169 | Soteskär SAC | | ✓ | | | |
| 170 | Southern North Sea SAC | | ✓ | | | |
| 171 | St Abb`s Head to Fast Castle SPA | ✓ | | | | |
| 172 | Steingrund SAC | | ✓ | | | |
| 173 | Store Rev SCI | | ✓ | | | |
| 174 | Stour and Orwell Estuaries SPA & Ramsar | ✓ | | | | |
| 175 | Strandenge på Læsø og havet syd herfor SAC | | ✓ | | | |
| 176 | Sumburgh Head SPA | ✓ | | | | |
| 177 | Sydlig Nordsø SAC | | ✓ | | | |
| 178 | Sylter Außenriff SCI | ✓ | ✓ | | | |
| 179 | Teesmouth and Cleveland Coast SPA & Ramsar | ✓ | | | | |
| 180 | Thames Estuary and Marshes SPA & Ramsar | ✓ | | | | |
| 181 | Thanet Coast and Sandwich | ✓ | | | | |

Report on the Implications for European Sites for
Norfolk Boreas Offshore Wind Farm

| Norfolk Boreas Reference Number | Designated site | Ornithology | Marine Mammals | Benthic Habitats | Fish | Terrestrial |
|---------------------------------------|--|-------------|-------------------|---------------------|------|-------------|
| | Bay SPA & Ramsar | | | | | |
| 182 | Thanet Coast SAC | | | ✓ | | |
| 183 | The Broads SAC | | | | | ✓ |
| 184 | The Swale SPA & Ramsar | ✓ | | | | |
| 185 | The Wash and North Norfolk Coast SAC | | ✓ | ✓ | | |
| 186 | The Wash SPA & Ramsar | ✓ | | | | |
| 187 | Tregor Goëlo SAC | | ✓ | | | |
| 188 | Troup, Pennan and Lion`s Heads SPA | ✓ | | | | |
| 189 | Unterems und Außenems SCI | | ✓ | | | |
| 190 | Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde SAC | | ✓ | | | |
| 191 | Venø, Venø Sund SAC | | ✓ | | | |
| 192 | Vlaamse Banken SAC | | ✓ | ✓ | ✓ | |
| 193 | Vlakte van de Raan SCI/SAC | | ✓ | | ✓ | |
| 194 | Voordelta SAC and SPA | ✓ | ✓ | ✓ | ✓ | |
| 195 | Vrångöskärgården SAC | | ✓ | | | |
| 196 | Waddenzee SPA | ✓ | | | | |
| 197 | Waddenzee SAC | | ✓ | ✓ | | |
| 198 | West Westray SPA | ✓ | | | | |
| 199 | Westerschelde & Saeftinghe SAC | | | | ✓ | |
| 200 | Winterton – Horsey Dunes SAC | | ✓ | | | |
| 201 | Yell Sound Coast SAC | | ✓ | | | |
| 202 | Ythan Estuary, Sands of Forvie and Meikle Loch SPA | ✓ | | | | |

ANNEX 2: SUMMARY OF POSITIONS IN RELATION TO ADVERSE EFFECTS ON INTEGRITY

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|----------------------------------|-------------------------------------|---------------------|--|--|---|
| | | | | Project alone | In-combination |
| SPA / Ramsar sites (Ornithology) | Alde-Ore Estuary SPA and Ramsar | LBBG (breeding) | Collision mortality | No Agreed with NE [REP4-040 and REP7-050] Not agreed with RSPB [REP6-038] | No NE unable to rule out in-combination AEoI excluding or including H3 and H4 ²² [REP4-040 and REP7-050] |
| | Outer Thames Estuary SPA | RTD (non-breeding) | Displacement due to operation and maintenance vessel movements | Yes Agreed with NE [REP4-040] | |
| | Flamborough & Filey Coast (FFC) SPA | Gannet (breeding) | Collision mortality | No Agreed with NE [REP4-040 and REP7-050] RSPB cannot rule out AEoI for collision | No NE unable to rule out in-combination AEoI when H3 & H4 is included [REP4-040 and REP7-050] |
| | | | Displacement during operation | | |
| | | | Combined collision mortality + displacement | | |

²² Hornsea Project Three and Hornsea Project Four

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|---------------------|----------------------|--|--|---|
| | | | | Project alone | In-combination |
| | | | | mortality [REP6-038] | |
| | | Kittiwake (breeding) | Collision mortality | Yes Agreed with NE [REP4-040 and REP7-050] | No NE unable to rule out in-combination AEoI excluding or including H3 and H4 [REP4-040 and REP7-050] RSPB cannot rule out AEoI [AS-041] |
| | | Guillemot (breeding) | Displacement during operation | Yes Agreed with NE [REP4-040 and REP7-050] | No NE unable to rule out in-combination AEoI when H3 & H4 is included [REP4-040 and REP7-050] RSPB cannot rule out AEoI [AS-041] |
| | | Razorbill (breeding) | Displacement during operation | | |
| | | Seabird assemblage | Collision mortality | | |
| | | | Displacement during operation | | |
| | Greater Wash SPA | RTD (non-breeding) | Displacement/ disturbance from offshore cable installation | Yes Agreed with NE [REP4-040, REP7- 047 and REP7-050] | |
| | | | Displacement due to operation and maintenance | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|------------------------------|----------------------------|--|---|----------------|
| | | | | Project alone | In-combination |
| | | | vessel movements | | |
| | | Little gull (non-breeding) | Collision mortality | | |
| | | Common scoter | Displacement/ disturbance from offshore cable installation | | |
| | Breydon Water SPA and Ramsar | Bewick's swan | Collision mortality | Yes Agreed with NE [REP4-040] | |
| | | Pied avocet | | | |
| | | European golden plover | | | |
| | | Ruff | | | |
| | | Lapwing | | | |
| | | Black-tailed godwit | | | |
| | | Shoveler | | | |
| | | Wigeon | | | |
| | | White-fronted goose | | | |
| | | Cormorant | | | |
| | | Waterfowl assemblage | | | |
| | Broadland SPA and | Great bittern | Collision mortality | Yes Agreed with NE [Q2.8.2.1 of REP5- | |
| | | Eurasian marsh harrier | | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|---------------|---------------------|--------------------------------------|--|----------------|
| | | | | Project alone | In-combination |
| | Ramsar | Ruff | | 077 and REP7-050] | |
| | | Gadwall | | | |
| | | Northern shoveler | | | |
| | | Eurasian wigeon | | | |
| | | Hen harrier | | | |
| | | Wildfowl assemblage | | | |
| | | Bewick's swan | Collision mortality | Yes Agreed with NE [REP3-022 and REP7-050] | |
| | | | Direct effects on ex-situ habitats | | |
| | | | Indirect effects on ex-situ habitats | | |
| | | Whooper Swan | Direct effects on ex-situ habitats | | |
| | | | Indirect effects on ex-situ habitats | | |
| | | Tundra Swan | Direct effects on ex-situ habitats | | |
| | | | Indirect effects on ex-situ habitats | | |
| | | Pink-footed goose | Direct effects on ex-situ habitats | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|------------------------------------|--------------------------|--------------------------------------|---|----------------|
| | | | | Project alone | In-combination |
| | | | Indirect effects on ex-situ habitats | | |
| | | Greylag goose | Direct effects on ex-situ habitats | | |
| | | | Indirect effects on ex-situ habitats | | |
| | North Norfolk Coast SPA and Ramsar | Pied avocet | Collision mortality | Yes Agreed with NE [Q2.8.2.1 of REP5-077] | |
| | | Great bittern | | | |
| | | Common tern | | | |
| | | Little tern | | | |
| | | Eurasian marsh harrier | | | |
| | | Montagu's harrier | | | |
| | | Sandwich tern | | | |
| | | Dark-bellied brent goose | | | |
| | | Red knot | | | |
| | | Pink-footed goose | | | |
| | | Eurasian wigeon | | | |
| | | Bar-tailed godwit | | | |
| | | Pintail | | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|----------------------|--|---|--|--|---|
| | | | | Project alone | In-combination |
| | | Assemblage | | | |
| Benthic habitat SACs | Haisborough, Hammond and Winterton (HHW) SAC | Sandbanks slightly covered by seawater at all times | Temporary physical disturbance | No Not agreed with NE [REP6-051] | |
| | | | Permanent habitat loss | | |
| | | | Introduction of new substrate | Yes Conclusion not disputed during Examination | |
| | | | Smothering due to increased suspended sediment | Unclear Not assessed by the Applicant and NE's position is not clear with regard to AEoI | |
| | | Reef | Temporary physical disturbance | No Not agreed with NE [REP6-051] | |
| | | | Permanent habitat loss | | |
| | | | Introduction of new substrate | Unclear NE is invited to confirm its position | |
| | | | Smothering due to increased suspended sediment | | |
| Marine mammal SACs | Southern North Sea (SNS) SAC | Harbour porpoise | Underwater noise (auditory injury and disturbance) | ? Agreed with NE [AS-028] Not agreed with | No Not agreed with NE [RR-099, REP6-051 and |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|--------------------------------------|---------------------|---|--|---|
| | | | | Project alone | In-combination |
| | | | | TWT [REP2-098 and REP6-040] and WDC [REP2-048 and REP2-112] | REP7-050], TWT [REP2-098 and REP6-040], WDC [REP2-048 and REP2-112] |
| | | | Collision mortality (vessel interactions) | Yes Applicant's conclusion not disputed by any IPs | |
| | | | Changes to prey resource | | |
| | | | Changes to water quality | | |
| | Humber Estuary SAC | Grey seal | Disturbance from underwater noise | Yes Agreed with NE [REP7-050] | |
| | | | Collision mortality (vessel interactions) | | |
| | | | Changes to prey resource | | |
| | | | Changes to water quality | | |
| | | | Disturbance at haul-out sites | | |
| | The Wash and North Norfolk Coast SAC | Harbour seal | Disturbance from underwater noise | Yes Agreed with NE [REP7-050] | |
| | | | Collision mortality (vessel interactions) | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|----------------------------|---------------------|---|--|----------------|
| | | | | Project alone | In-combination |
| | | | Changes to prey resource | | |
| | | | Changes to water quality | | |
| | | | Disturbance at haul-out sites | | |
| | | Grey seal | Disturbance from underwater noise | | |
| | | | Collision mortality (vessel interactions) | | |
| | | | Changes to prey resource | | |
| | | | Changes to water quality | | |
| | | | Disturbance at haul-out sites | | |
| | Winterton-Horsey Dunes SAC | Grey seal | Disturbance from underwater noise in cable corridor | Yes Applicant's conclusion not disputed by any IPs | |
| | | | Collision mortality (vessel interactions) in cable corridor | | |
| | | | Changes to prey resource in cable corridor | | |
| | | | Changes to water quality in cable corridor | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|------------------|------------------|---|--|--|----------------|
| | | | | Project alone | In-combination |
| | | | Disturbance at haul-out sites | | |
| Terrestrial SACs | River Wensum SAC | Watercourse of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation | Direct effects within the SAC boundary | Yes Agreed with NE [REP3-022 and REP7-050] Applicant's conclusion of no AEoI from other potential impacts not disputed by any IPs | |
| | | | Direct effects within the ex-situ habitats of the SAC | | |
| | | | Indirect effects within the SAC from geology/contamination/gro groundwater/hydrology effects | | |
| | | | Indirect effects within ex-situ habitats of the SAC from geology/contamination/groundwater/hydrology effects | | |
| | | Desmoulin's whorl snail | Direct effects within the SAC boundary | | |
| | | | Direct effects within the ex-situ habitats of the SAC | | |
| | | | Indirect effects within the SAC from geology/contamination/gro | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|-------------------------|---|--|---|----------------|
| | | | | Project alone | In-combination |
| | | | undwater/hydrology effects | | |
| | | | Indirect effects within ex-situ habitats of the SAC from geology/contamination/groundwater/hydrology effects | | |
| | Paston Great Barn SAC | Barbastelle bats | Direct effects on bats present in ex-situ habitats of SAC (hedgerows/watercourses) | Yes Agreed with NE [REP2-080 and REP6-051] | |
| | | | Indirect effects on bats present in ex-situ habitats from light and groundwater/hydrology effects | | |
| | Norfolk Valley Fens SAC | Alkaline fens | Indirect effects on features present within ex-situ habitats of the SAC arising from air quality and groundwater / hydrology effects | Yes No AEoI from drilling fluid breakout agreed by NE in [REP2-080] Applicant's conclusion of no AEoI from other potential impacts not disputed by any IPs | |
| | | Northern Atlantic wet heaths with <i>Erica tetralix</i> | | | |
| | | European dry heaths | | | |
| | | Molinia meadows on calcareous, peaty or clayey-silt-laden soils | | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|----------------|--|---|---|----------------|
| | | | | Project alone | In-combination |
| | | Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> | | | |
| | | Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> | | | |
| | The Broads SAC | Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara spp</i> ; | Indirect effects upon habitats and species within the SAC boundary arising from changes in local groundwater / hydrology conditions | Yes No AEoI from drilling fluid breakout agreed by NE in [REP2-080] Applicant's conclusion of no AEoI from other potential impacts not disputed by any IPs | |
| | | Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation | | | |
| | | Transition mires and quaking bogs | | | |
| | | Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> | | | |
| | | Alkaline fens | | | |
| | | Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno- | | | |

| Site type | European site | Feature screened in | Impact screened in | Agreement of no AEoI with IPs? | |
|-----------|---------------|--|--|--------------------------------|----------------|
| | | | | Project alone | In-combination |
| | | <i>Padion, Alnion incanae, Salicion albae)</i> | | | |
| | | <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) | | | |
| | | Desmoulin's whorl snail | | | |
| | | Fen orchid | | | |
| | | Ramshorn snail | | | |
| | | Otter | Direct effects upon ex-situ habitats which may support the qualifying feature otter, due to suitable ex-situ habitats for this feature being present | | |
| | | | Indirect effects upon ex-situ habitats which may support the qualifying feature otter, arising from changes in groundwater / hydrology conditions | | |

ANNEX 3: INTEGRITY MATRICES

Integrity matrices key

The following abbreviations/symbols are used within the integrity matrices:

- **?** = Applicant and Interested Parties do not agree that an AEoI can be excluded
- **✕** = Applicant and Interested Parties agree that an AEoI can be excluded
- C = construction
- O = operation
- D = decommissioning

Where effects are not applicable to a particular feature they are greyed out.

1) ALDE-ORE ESTUARY SPA

| EU Code: UK9009112 | | | | | | | | | | | | |
|--------------------------------------|-----------------------------|------------|----------|---------------------------|----------|----------|----------------|----------|----------|----------------|------------|----------|
| Distance to NSIP: 92km | | | | | | | | | | | | |
| European site features | Adverse effect on integrity | | | | | | | | | | | |
| | Collision mortality | | | Displacement/ disturbance | | | Barrier effect | | | In-combination | | |
| | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> |
| Lesser black-backed gulls (breeding) | | ? e | | | | | | | | | ? b | |

LESSER BLACK-BACKED GULLS (LBBG)

a) Collision mortality (project alone)

Mortality estimates - The Applicant's Deadline 5 CRM predicted a maximum of 14.3 LBBG collisions per year from the project alone (95% confidence intervals (CIs) 1.4 – 38.9) [Table 2.1 of REP5-059].

- Breeding season collisions - The Applicant presented a range of apportionment values from 10-30%, which Natural England (NE) confirmed was appropriate [REP4-040 and REP5-077]. However, the Applicant suggested that 21% of the breeding season collisions at Norfolk Boreas would be attributed to the Alde Ore Estuary SPA population, based on a review of population estimates in Norfolk and Suffolk, combined with use of the Scottish Natural Heritage (SNH) apportioning method [REP2-035]. The Applicant apportioned 1.3 breeding season collisions to the SPA (95% CIs 0.3 - 3.2) using the 21% rate; this would be 1.9 individuals (95% CIs 0.4 – 4.6) using NE's preferred upper apportioning rate of 30% [Table 2.7 of REP5-059].

The RSPB [REP2-096] considered that it is not safe to assume birds from urban colonies forage at sea to the same extent as rural coastal colonies; it suggested apportioning rates of 24.1% if urban birds are included and 38.8% if excluded. Therefore, it recommended [REP3-028 and REP5-083] a range of rates up to 40% be provided to capture the full extent of the population from Alde-Ore Estuary SPA foraging within Norfolk Boreas and to take into consideration different behaviours of urban birds and coastal breeding birds.

- Non-breeding season collisions - The Applicant concluded that during the autumn and spring migration periods, birds from Alde-Ore Estuary SPA make up 3.3% of the Biologically Defined Minimum Population Scales (BDMPS), and in winter these birds make up 5% of the BDMPS [paragraph 194 of APP-201]. The Applicant's Deadline 5 CRM calculated the total non-breeding season mortality apportioned to the SPA as 0.2 individuals (95% CIs 0-0.6) [Table 2.7 of REP5-059].
- Total annual collisions - The Applicant's Deadline 5 CRM [REP5-059] predicted a total annual collision mortality of between 1.6 (95% CI 0.3-3.9) using the Applicant's breeding season figures, and 2.1 (95% CIs 0.4-5.3) using NE's breeding season figures. The Applicant's integrity matrices [REP6-007] stated that natural mortality for the SPA population (assuming approximately 4,000 adults) would be around 460 individuals at an average adult mortality rate of 11.5%. A total additional worst case mean annual mortality of up to 1.6 (using the Applicant's preferred breeding season rate of 21%) or 2.1 (using NE's preferred rate of 30%) birds due to collisions at the Norfolk Boreas site would increase the mortality rate by 0.3% to 0.4%.

Population modelling - The Applicant's population modelling of 15 adult mortalities per year [REP2-035] (higher than the number of collisions predicted in [REP5-059], as noted above) predicted the population growth rate would be 0.4% lower (0.996) than the baseline using the density independent model, and 0.1% lower (0.999) using the density dependent model. The Applicant considered these levels of mortality would be unlikely to have a detectable effect on the population [paragraphs 75-76 of REP2-035].

Conclusions - NE [EV9-003 and REP7-048 and REP7-050] agreed with the Applicant's conclusion [paragraph 77 of REP2-035] that there would be no AEoI of the Alde-Ore Estuary SPA as a result of LBBG collisions at the proposed Norfolk Boreas from the project alone.

However, the RSPB [REP2-069, AS-041 and REP6-038] could not rule out an AEoI from the impact of collision mortality on the LBBG population of the Alde-Ore Estuary SPA from the project alone, as it did not consider that the method of apportioning birds present on the development site to the SPA to be correct and it is likely to underestimate the number of SPA individuals affected.

b) Collision mortality (in-combination)

Mortality estimates - The Applicant's Deadline 6 in-combination CRM [REP6-024] calculated collision mortality of up to 54.2 birds attributable to the Alde-Ore SPA population of LBBG. The Applicant's integrity matrix [REP6-007] stated that compared with estimated natural mortality of about 460 birds per year, the additional in-combination mortality would increase the mortality rate by 11.8%. Accounting for built vs. consented wind farm designs, the Applicant stated that this would reduce collision estimates to around 60% of the unadjusted values [paragraph 84 of REP2-035].

Population modelling - The Applicant's population model calculated that at an adult mortality of 55, the growth rate of the population would be reduced by 0.3% to 1.4% (for density dependent and density independent simulations respectively), and

that at a mortality of 35 (reflecting the Applicant's as-built estimate) the growth rate of the population would be reduced by 0.2% to 0.9% (for density dependent and density independent simulations respectively) [paragraph 87 of REP2-035].

The Applicant concluded that even at the more precautionary, density independent prediction for a higher mortality of 55, based on consented rather than built wind farms and using over-estimated nocturnal activity rates, the growth rate reduction would be less than 1.5%; it considered that this is very unlikely to cause a population decline [paragraph 88 of REP2-035].

Conclusions - The Applicant acknowledged that the SPA population is much smaller than the designated size (and has been since 2001), apparently as a consequence of various factors including changes in farming practice in the region and a shift of rural gull populations to urban locations. Thus, while there is a risk that the in-combination mortality would delay the time for the population to achieve the stated aim (to restore the population to 14,000 pairs), the actual contribution to this delay resulting from the in-combination mortality would be very small. It considered other factors have reduced the population and are likely to continue to be the primary drivers in determining the population status [paragraph 89 of REP2-035]. It considered that this aspect, taken together with the degree of precaution in reported collision assessments for other offshore wind farms, using much higher mortality predictions estimated for consented rather than for the as-built wind farm designs, means the likelihood of an AEoI of the SPA due to in-combination collisions of LBBG is considered sufficiently small that it can be ruled out [REP6-007]. The Applicant also noted that the current in-combination estimate of 54 is well below that of the consented Galloper wind farm with an in-combination collision risk estimate of 85.

However, based on the population modelling presented in [REP2-035], NE advised [REP4-040, REP7-045 and REP7-047] that it is not possible to rule out an AEoI of the LBBG feature of the Alde-Ore Estuary SPA from in-combination collision impacts with other plans and projects, irrespective of whether Hornsea Projects Three and Four are included in the assessment (no birds are apportioned to these projects, so the contribution is the same even if these projects are included in the in-combination total). It noted that the Conservation Objective for the LBBG population of the Alde-Ore Estuary SPA is to restore the size of the breeding population whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent and that any additional mortality from the wind farms should be considered in addition to any existing impacts on the colony. It stated that the population is currently stable at best and that there is no evidence to suggest that the future population trend would be significantly different from the current trend. It considered the additional mortality from the wind farm would reduce population growth rate which would be counter to the restoration conservation objective, even if more optimistic assumptions about the population trend of the colony are made.

The RSPB [AS-041 and REP5-083] stated that irrespective of whether 40% apportionment is applied, it cannot conclude there will be no adverse effect on integrity in-combination with other offshore projects as the Applicant predicts up to a 33.1% reduction in the LBBG population of the Alde-Ore Estuary SPA as a result of in-combination collision impacts, in comparison with the unimpacted population, during the lifetime of the wind farm (based on the Applicant's calculations in REP2-035).

2) FLAMBOROUGH AND FILEY COAST (FFC) SPA

| EU Code: UK9006101 | | | | | | | | | | | | |
|---------------------------------------|-----------------------------|----------------|----------|------------------------------|----------------|----------|--|----------------|----------|----------------|----------------------|----------|
| Distance to NSIP: 205km | | | | | | | | | | | | |
| European site features | Adverse effect on integrity | | | | | | | | | | | |
| | Collision mortality | | | Displacement/ disturbance | | | Combined collision mortality and displacement | | | In-combination | | |
| | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> |
| Black-legged kittiwake (breeding) | | ✗ _a | | | | | | | | | ? _b | |
| Northern gannet (breeding) | | ? _c | | | ✗ _e | | | ✗ _g | | | ? _{d,f,h,i} | |
| Razorbill | | | | | ✗ _j | | | | | | ? _k | |
| Common guillemot | | | | | ✗ _l | | | | | | ? _m | |
| Seabird assemblage (including puffin) | | ✗ _n | | | ✗ _n | | | | | | ? _o | |

KITTIWAKE

a) Collision mortality (project alone)

Mortality estimates - The Applicant's Deadline 5 CRM estimated collision mortality of kittiwakes at the Norfolk Boreas site as 57.5 birds per year [Table 2.1 of REP5-059]. As noted in section 4.8 of this RIES, the Applicant advocated a breeding season apportioning rate of 26.1%, whereas NE and RSPB advocated a rate of 86%. Using the Applicant's rate of 26.1% for the breeding season, the number of kittiwakes apportioned to the FFC SPA population was 6.1 (95% CIs 2.1 – 11.5), while using NE's preferred methods the estimate was 14.0 (95% CIs 4.2 – 27.9) [Table 2.6 of REP5-059]. The background mortality for this population, calculated using the adult mortality rate of 0.146 is 13,000. The Applicant concluded that the addition of 6.1 to 14.0 increases the background mortality by <0.1% to 0.1%, which represents a negligible addition to natural mortality, even allowing for NE's preferred apportioning rate of 86%.

NE [EV9-003, REP7-047 and REP7-048] agreed with the Applicant's conclusion [REP5-059 and paragraph 44 of REP2-035] that there would be no AEoI of the FFC SPA as a result of kittiwake collisions at the proposed Norfolk Boreas site from the project alone.

b) Collision mortality (in-combination)

Mortality estimates - The Applicant's Deadline 6 in-combination CRM predicts a collision mortality of between 701 (including Hornsea Projects Three and Four) and 362 (without Hornsea Projects Three and Four) [Table 2.2 of REP6-024]. At the adult mortality rate of 0.146, the natural mortality of the population is 13,000. A collision mortality increase from 362 to 701 would increase the mortality rate by 2.8% to 5.4%.

Population modelling - The Applicant's population modelling found that mortality of 750 would reduce the median population growth rate by a maximum of 0.8% (density independent) or 0.2% (density dependent) [paragraph 51 of REP2-035]. It concluded that these reductions represent a very small risk to the population, which has grown over the last 20 years [REP2-035].

NE [REP4-040] stated there is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling; therefore, it based its advice on the outputs of the density independent PVA model.

Conclusions - The Applicant concluded that when allowance is made for the over-precaution in the assessment (e.g. consented designs compared with as-built, over-estimated nocturnal activity rates and density independent model predictions) the predicted impacts on the population are very small (no more than a 0.1% reduction in the population growth rate). Therefore, it concluded that, even with what it considered to be highly precautionary assumptions, there would be no AEoI of FFC SPA from impacts on kittiwake due to Norfolk Boreas in-combination with other plans and projects [paragraph 58 of REP2-035]. The Applicant also noted that Hornsea Project Three has submitted further design mitigations which reduce that project's contribution to the in-combination total by over 100 collisions per year (https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-003194-HOW03_CON02_Appendix4%20Annexes_Mitigation.EnvelopeModifications.pdf).

NE [REP4-040] noted that the Conservation Objective for the kittiwake population of the FFC SPA is to restore the size of the breeding population at a level which is above 83,700 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. It stated that the FFC SPA colony growth rate is <1% per annum. The Applicant [REP2-035] considered that the population estimate in 1987 was recorded in error and in fact represented the estimate of breeding individuals and not of pairs. NE refuted this argument [REP4-040 and REP7-045].

NE [REP4-040] advised that, based on REP2-035, if the population growth rate is reduced by 0.8%, this would mean that the population would be 20.5-21.8% lower than the current population size. In the context of a population trajectory that is currently stable or increasing at <1% per annum an additional mortality of 350-400 adults per annum (i.e. excluding Hornsea Projects Three and Four) causing a reduction in growth rate of 0.4%, or of 700-750 adults per annum (i.e. including Hornsea Projects Three and Four) over 30 years causing a reduction in growth rate of 0.8% would further harm the population and make it more difficult to restore the population to a favourable condition. NE therefore advised it is not possible to rule out AEoI

of the kittiwake feature of the FFC SPA for collision impacts from in-combination with other plans and projects, both including and excluding Hornsea Projects Three and Four [REP4-040 and REP7-048]. In response to the Applicant's revised CRM at Deadline 6, NE [REP7-047] noted that in-combination totals have increased since [REP2-035] and confirmed its position remained.

NE further advised [REP7-050] that with regard to the Hornsea Project Three further design mitigations, whilst any amendments to the Hornsea Project Three design envelope (i.e. lower tip height and reduction in turbine numbers) would result in a proportional reduction in the collision estimates, NE would most likely be unable to agree on what the absolute level of reduction would be as the issues with the underlying baseline data have not been resolved.

The RSPB [AS-041] noted the Applicant predicts up to a 21.7% reduction in the kittiwake population of the FFC SPA as a result of in-combination collision impacts, in comparison with the unimpacted population, during the lifetime of the wind farm. It therefore could not rule out an AEoI.

GANNET

c) Collision mortality (project alone)

Mortality estimates - The Applicant's Deadline 5 CRM estimated collision mortality of gannet at the Norfolk Boreas site as 30.7 birds per year (95% CIs 8.5 – 62.6) [Table 2.1 of REP5-059]. Apportioning to the FFC SPA gives an annual mortality of 15.1 individuals (95% CIs 1.1 – 36.3) [Table 2.5 of REP5-059], from a population of approximately 22,122 birds. At an adult natural mortality rate of 0.081, the baseline mortality is approximately 1,792. An addition of 15.1 to this increases the mortality rate by 0.8%, which is below the 1% threshold of detectability.

NE [EV9-003 and REP7-048] agreed with the Applicant's conclusion that there would be no AEoI of the FFC SPA as a result of gannet collisions at the proposed Norfolk Boreas from the project alone. However, the RSPB [REP2-069, AS-041 and REP6-038] could not rule out an AEoI from the impact of collision mortality on the gannet population of the FFC SPA from the project alone (based on the Applicant's original assessment [APP-201]), as if it applied its preferred Avoidance Rate in the breeding season there would be a decline in the SPA population of up to 18% as a result of the project alone.

d) Collision mortality (in-combination)

Mortality estimates - The Applicant's in-combination assessment suggests a maximum collision mortality of 359 birds from FFC SPA population per year with the inclusion of Hornsea Projects Three and Four and 288 without these two projects [Table 2.1 of REP6-024].

Population modelling - The Applicant's density independent population modelling for higher levels of 325 and 400 [Table 3.4 of REP2-035] found that these levels of mortality would reduce the median population growth rate by a maximum of 1.8%, which compares with the actual annual growth rate of this population over the last 25 years of 10% [paragraph 24 of REP2-035].

NE [REP4-040] stated there is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling; therefore, it based its advice on the outputs of the density independent PVA model.

Conclusions – The Applicant concluded that this level of in-combination mortality represents a negligible risk to this population; the number of predicted in-combination gannet collisions attributed to the FFC SPA is not at a level which would trigger a risk of population decline, and in fact population modelling indicates that the in-combination mortality predicted would not halt but only slow the population increase currently seen at this colony. Therefore, the Applicant concluded that there would be no AEoI of FFC SPA from impacts on gannet due to Norfolk Boreas in-combination with other projects, even with what it considered to be a highly precautionary assessment [paragraph 27 of REP2-035].

NE [REP4-040] advised that based on [REP2-035], assuming exclusion of Hornsea Projects Three and Four, the population of FFC SPA after 30 years would be 34.9-37% lower than it would have been in the absence of the additional mortality and the population growth rate would be reduced by 1.5-1.6%. The colony would be predicted to reduce from its current size of 24,594 adults with a growth rate of 1% but would still be above the Conservation Objective population size of the 8,469 pairs or 16,938 adults. The colony would be predicted to continue to grow above the current mean population of 24,594 adults under any growth rate scenario from 2% to 5% per annum. NE therefore agreed an AEoI can be ruled out if Hornsea Projects Three and Four are excluded from the in-combination totals. However, it was not in a position to advise that an AEoI can be ruled out if Hornsea Projects Three and Four are included in the in-combination totals. See footnote (i) for more details. In response to the Applicant's revised CRM at Deadline 6, NE [REP7-047] noted that in-combination totals have decreased since [REP2-035] but confirmed its position remained.

The RSPB [AS-041] noted the Applicant predicts up to a 41.1% reduction in the gannet population of the FFC SPA as a result of in-combination collision impacts when compared with the unimpacted population, during the lifetime of the wind farm (based on the Applicant's calculations in REP2-035). It therefore could not rule out an AEoI.

e) Displacement (project alone)

Mortality estimates - The Applicant estimated mortality of gannet at Norfolk Boreas apportioned to the FFC SPA population as 10.8 (95% CIs of 0.5 - 17) for 80% displacement and 1% mortality and as 8.1 (95% CIs 0.7 - 23) for 60% displacement and 1% mortality [Table 4.14 of REP2-035]. This would increase the background mortality by a maximum of 1.3%, with the more precautionary combination of parameters (80% displacement, 1% mortality and upper 95% CI) [paragraph 239 of REP2-035].

Population modelling – The Applicant's density independent population modelling found that this level of mortality would reduce the median population growth rate by a maximum of 0.01%, which compares with the actual annual growth rate of this population over the last 25 years of 10% [paragraph 242 of REP2-035].

Conclusions – The Applicant concluded that this level of mortality represents a negligible risk to this population and that there would be no AEoI of FFC SPA as a result of gannet displacement from Norfolk Boreas alone [paragraph 246 of REP2-035]. NE [REP4-040] agreed with this conclusion.

f) Displacement (in-combination)

Mortality estimates - The Applicant's in-combination displacement mortality of gannets apportioned to the FFC SPA population was estimated at between 61 (60% displacement and 1% mortality) and 82 (80% displacement and 1% mortality) when Hornsea Projects Three and Four are included and between 41 and 55 with these projects omitted [Table 4.18 of REP2-035]. This would increase the background mortality by a maximum of between 2.3% and 3.1% (without Hornsea Projects Three and Four) and between 3.4% and 4.6% (including Hornsea Projects Three and Four) [paragraph 255 of REP2-035].

Population modelling - The Applicant's density independent population modelling found that these levels of mortality would reduce the median population growth rate by a maximum of 0.03%, which compares with the actual annual growth rate of this population over the last 25 years of 10% [paragraph 259 of REP2-035].

Conclusions - The Applicant concluded that this level of in-combination mortality represents a negligible risk to this population and that even with what it considered to be a highly precautionary assessment, there would be no AEoI of FFC SPA as a result of gannet displacement from Norfolk Boreas in-combination with other plans and projects [paragraph 262 of REP2-035].

Based on the Applicant's Deadline 2 calculations in [REP2-035], NE [REP4-040] advised that excluding Hornsea Projects Three and Four, the population of FFC SPA after 30 years would be 6.4-9.4% lower than it would have been in the absence of the additional mortality and the population growth rate would be reduced by 0.2-0.3%. The colony would still be predicted to grow above the current mean population of 24,594 adults under any growth rate scenario from 1% to 5%; this would allow the conservation objective to be met. NE therefore agreed an AEoI can be ruled out if Hornsea Projects Three and Four are excluded from the in-combination totals.

However, it was not in a position to advise that an AEoI can be ruled out if Hornsea Projects Three and Four are included in the in-combination totals due to NE's significant concerns regarding the incomplete baseline surveys for Hornsea Project Three, and the associated level of uncertainty regarding the potential impacts of that project, together with the inevitable uncertainty associated with the figures for Hornsea Project Four from the PEIR.

See footnote (i) for more details.

g) Combined annual gannet displacement and collision mortality (project alone)

Mortality estimates - The Applicant calculated a combined annual gannet displacement and collision mortality for Norfolk Boreas alone for the FFC SPA population of up to 26 (8.1-10.8 from displacement [Table 4.14 of REP2-035] plus 15.1 from collisions [Table 2.5 of REP5-059]). This would increase the background mortality rate by 1.4%.

Population modelling - The Applicant's density independent population modelling found that a mortality of 75 (i.e. three times higher) would reduce the median population growth rate by a maximum of 0.3%, which compares with the actual annual growth rate of this population over the last 25 years of 10% [REP6-007].

Conclusions – The Applicant concluded that this level of mortality represents a negligible risk to the population; the number of predicted project alone gannet collisions and displacement mortalities attributed to the FFC SPA is not at a level which would trigger a risk of population decline, and population modelling indicates that the predicted mortality would only slow, rather than halt, the population increase currently seen at this colony. Therefore, the Applicant concluded that there would be no AEoI of FFC SPA from impacts on gannet from combined displacement and collision risk from Norfolk Boreas alone [paragraph 275 of REP2-035]. NE [EV9-003 and REP7-048] agreed with this conclusion.

h) Combined annual gannet displacement and collision mortality (in-combination)

Mortality estimates – The Applicant estimated the combined annual gannet displacement and collision mortality for all projects with potential connectivity to the FFC SPA as 343 to 441 (displacement of 41-55 without Hornsea Projects Three and Four and 61-82 with Hornsea Projects Three and Four [REP2-035]; and collisions of 288 without Hornsea Projects Three and Four and 359 with Hornsea Projects Three and Four [Table 2.1 of REP6-024]). These would increase the background mortality rate by more than 1%.

Population modelling - The Applicant's density independent population modelling for 375 and 500 [Table 4.24 of REP2-035] found that the median population growth rate would be reduced by a maximum of 2.3%, which compares with the actual annual growth rate of this population over the last 25 years of 10% [paragraph 291 of REP2-035].

Conclusions – The Applicant concluded that this level of in-combination mortality represents a negligible risk to this population's status; the number of predicted in-combination gannet collisions and displacement mortalities attributed to the FFC SPA is not at a level which would trigger a risk of population decline, and population modelling indicates that the in-combination mortality predicted would only slow, rather than halt the population increase currently seen at this colony. Therefore, the Applicant concluded that there would be no AEoI of FFC SPA from combined displacement and collision risk for Norfolk Boreas in-combination with other projects [paragraph 294 of REP2-035].

Based on the Applicant's Deadline 2 calculations in [REP2-035], NE [REP4-040] advised that, assuming exclusion of Hornsea Projects Three and Four, the population of FFC SPA after 30 years would be 39.1-41.1% lower than it would have been in the absence of the additional mortality caused by the Proposed Development and the population growth rate would be reduced by 1.7-1.8%. It concluded the following:

- with a growth rate of 1% the colony would be predicted to reduce from its current size of 24,594 adults but would still be above the size of the 8,469 pairs or 16,938 adults; and
- under any growth rate scenario from 2% to 5% per annum the colony would be predicted to continue to grow above the current mean population of 24,594 adults.

NE therefore agreed an AEoI can be ruled out if Hornsea Projects Three and Four are excluded from the in-combination totals.

However, it was not in a position to advise that an AEoI can be ruled out if Hornsea Projects Three and Four are included in the in-combination totals due to NE's significant concerns regarding the incomplete baseline surveys for Hornsea Project Three, and the associated level of uncertainty as regards the potential impacts of that project, together with the inevitable uncertainty associated with the figures for Hornsea Project Four from the PEIR.

i) In-combination effects

NE [REP4-040] explained that the Conservation Objective for the gannet population of the FFC SPA is to maintain the size of the breeding population at a level which is above 8,469 pairs (16,938 adults), whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. The latest mean count is 24,594 adults based on the mean of the 2012, 2015 and 2017 counts.

It considered a range of plausible future growth rate scenarios of 1, 2, 3, 4 and 5% per annum, but advised that the annual growth rate is unlikely to be as low as 1%. NE advised that if the colony were to experience an annual growth rate of 2% or more per annum over the next 30 or so years, then the integrity of the site for this feature is high, with high rates for self-repair, and self-renewal under dynamic conditions with minimal external management. Therefore, the FFC gannet population is believed to be robust enough to allow the conservation objective to maintain the population at (or above) designation levels and sustain additional alone and in-combination mortalities from the offshore wind farms if Hornsea Projects Three and Four are excluded from the in-combination totals.

RAZORBILL

j) Operational displacement (project alone)

Mortality estimates – The Applicant's Deadline 2 assessment [REP2-035] estimated annual displacement mortality of razorbills at Norfolk Boreas apportioned to the FFC SPA population as between 0.1 (30% displacement, 1% mortality and 95% CIs 0-0.2) and 3.5 (70% displacement, 10% mortality and 95% CIs 1.0-5.7); its 'evidence-based' estimate was 0.2 (50% displaced, 1% mortality and 95% CIs 0.1-0.4) [Table 4.9 and paragraph 207 of REP2-035].

Conclusions – The Applicant concluded that this would increase the background mortality by a maximum of 0.26% [paragraph 207 of REP2-035] which is less than the threshold for detectability (1%). It therefore concluded that there would be no AEoI of FFC SPA as a result of razorbill displacement from Norfolk Boreas alone [paragraph 207 of REP2-035]. NE agreed with this conclusion [REP2-080 and REP4-040].

k) Operational displacement (in-combination)

Mortality estimates - The Applicant's Deadline 2 assessment [REP2-035] estimated in-combination displacement mortality of razorbills apportioned to the FFC SPA population as between 21 (30% displacement and 1% mortality) and 497 (70% displacement and 10% mortality); its 'evidence-based' estimate was 35 (50% displacement and 1% mortality) [Table 4.12 of REP2-035]. This would increase the background mortality by a maximum of 18.9% [paragraphs 216-217 of REP2-035].

Population modelling - The Applicant's density independent population modelling found that mortality up to 500 would reduce the median population growth rate by a maximum of 2.4%, which compares with the actual annual growth rate of this population between 2000 and 2017 of 7.2% [Table 4.13 of REP2-035].

NE [REP4-040] stated there is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling, therefore it based its advice on the outputs of the density independent PVA model.

Conclusions - The Applicant concluded that this level of in-combination mortality represents a negligible risk to this population's status and that the number of predicted in-combination razorbill displacement mortalities attributed to the FFC SPA is not at a level which would trigger a risk of population decline. Therefore, the Applicant concluded that there would be no AEoI of FFC SPA from displacement impacts on razorbill due to Norfolk Boreas in-combination with other plans and projects, even with what it considered to be a highly precautionary assessment [paragraphs 216-226 of REP2-035].

NE [REP4-040] explained that the Conservation Objective for the razorbill population of the FFC SPA is to maintain the size of the breeding population at a level which is above 10,570 breeding pairs whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. It stated that colony productivity is higher than the national average and that the 2017 colony count indicated approximately 40,506 breeding adults across the site. NE confirmed that it did not anticipate razorbill mortality rates to be at the top of the range considered and it did not expect the mortality to exceed a level where the population growth rate would decline by more than approximately 0.5% per annum; this would approximate to the population being 13% lower after 30 years when compared to the unimpacted population (based on 100 birds annual adult mortality). Based on this, the current population trend and productivity levels for the colony, NE agreed an AEoI on the razorbill feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects when Hornsea Projects Three and Four are excluded from the in-combination total.

However, due to NE's significant concerns regarding the incomplete baseline surveys for Hornsea Project Three, and the associated level of uncertainty regarding the potential impacts of that project, together with the inevitable uncertainty associated with the figures for Hornsea Project Four from the PEIR, NE was not in a position to advise that an AEoI can be ruled out for the razorbill feature of the FFC SPA for displacement in-combination with other plans and projects when the Hornsea Projects Three and Four are included in the in-combination total. [REP4-040].

The RSPB [AS-041] noted the Applicant predicts up to a 50.1% reduction in the razorbill population of the FFC SPA as a result of in-combination displacement impacts, in comparison with the unimpacted population, during the lifetime of the wind farm (based on the Applicant's calculations in REP2-035). It therefore could not rule out an AEoI.

GUILLEMOT

l) Operational displacement (project alone)

Mortality estimates - The Applicant's Deadline 2 assessment [REP2-035] estimated annual displacement mortality of guillemots at Norfolk Boreas apportioned to the FFC SPA population as between 1.8 (30% displacement, 1% mortality and 95% CIs 1.1-2.6) and 42.4 (70% displacement, 10% mortality and 95% CIs 25.1-60.5); its 'evidence-based' estimate was 3.0 (50% displacement, 1% mortality and 95% CIs 1.8-4.3) [Table 4.3 of REP2-035]. This would increase the background mortality by a maximum of 1.2% [REP2-035].

Population modelling - The Applicant's density independent population modelling found that a mortality of 100 would reduce the median population growth rate by a maximum of 0.1% [Table 4.4 of REP2-035], which compares with the actual annual growth rate of this population between 2000 and 2008 of 3% and between 2008 and 2017 of 4% (paragraph 168 of REP2-035).

Conclusions - The Applicant concluded that there would be no AEoI of FFC SPA as a result of guillemot displacement from Norfolk Boreas alone [paragraph 171 of REP2-035]. NE agreed with this conclusion [REP2-080 and REP4-040].

m) Operational displacement (in-combination)

Mortality estimates - The Applicant's Deadline 2 assessment [REP2-035] estimated in-combination displacement mortality of guillemots apportioned to the FFC SPA population at between 130 (30% displacement and 1% mortality) and 3,037 (70% displacement and 10% mortality); its evidence base was 217 (50% displacement and 1% mortality) [Table 4.7 of REP2-035]. This would increase the background mortality by between 2.6% and 60%.

Population modelling - The Applicant's density independent population modelling estimated that at a mortality of 3,050 the median population growth rate would be reduced by a maximum of 4.1% [Table 4.8 of REP2-035]. With the Hornsea Project Three and Project Four wind farms omitted, the total in-combination mortality would be 1,697 (at 70% displacement and 10% mortality, Table 4.7), which would reduce the population growth rate by 2.3% [Table 4.8 of REP2-035]. These compare with the actual annual growth rate of this population between 2000 and 2008 of 3.0% and between 2008 and 2017 of 4.0% [paragraph 188 of REP2-035].

NE [REP4-040] stated there is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling, therefore it based its advice on the outputs of the density independent PVA model.

Conclusions - The Applicant concluded that Norfolk Boreas would make a small contribution to an in-combination impact and that although the most precautionary prediction would reduce the population growth rate, this would not trigger a risk of population decline. It considered that NE's methods and 10% mortality potentially over-estimates the impact by a factor of ten and it is very probable that the effect on the population would be considerably smaller and would not prevent future growth. The Applicant concluded that the number of predicted in-combination guillemot displacement mortalities attributed to the FFC

SPA is not at a level which would trigger a risk of population decline and there would be no AEoI of FFC SPA from displacement impacts on guillemot due to Norfolk Boreas in-combination with other projects [paragraphs 181-191 of REP2-035].

NE [REP4-040] explained that the Conservation Objective for the guillemot population of the FFC SPA is to maintain the size of the breeding population at a level which is above 41,607 breeding pairs whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. It stated that the 2017 colony count indicated approximately 121,754 breeding adults across the site. NE confirmed that it did not anticipate razorbill mortality rates to be at the top of the range considered and it did not expect the mortality to exceed a level where the population growth rate would decline by more than approximately 0.5% per annum. Based on this, the current population trend and productivity levels for the colony, NE agreed an AEoI on the guillemot feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects when Hornsea Projects Three and Four are excluded from the in-combination total.

However, due to NE's significant concerns regarding the incomplete baseline surveys for Hornsea Project Three, and the associated level of uncertainty as regards the potential impacts of that project, together with the inevitable uncertainty associated with the figures for Hornsea Project Four from the PEIR, NE was not in a position to advise that an AEoI can be ruled out for the razorbill feature of the FFC SPA for displacement in-combination with other plans and projects when the Hornsea Projects Three and Four are included in the in-combination total. [REP4-040]

The RSPB [AS-041] noted the Applicant predicts up to a 72.56% reduction in the guillemot population of the FFC SPA as a result of in-combination displacement impacts, in comparison with the unimpacted population, during the lifetime of the wind farm (based on the Applicant's calculations in REP2-035). It therefore could not rule out an AEoI.

SEABIRD ASSEMBLAGE

n) Collision mortality and operational displacement

The seabird assemblage comprises gannet, fulmar, kittiwake, guillemot, razorbill, puffin, herring gull, shag and cormorant. The Applicant stated that four of these species have been assessed as individual named features (gannet, kittiwake, guillemot and razorbill) and that there would be no AEoI for these species due to Norfolk Boreas alone.

The remaining assemblage species (herring gull, shag and cormorant) are considered to either have no likelihood of connectivity to the site due to limited foraging ranges or coastal preferences, are not considered to be at risk of impacts at wind farms (eg fulmar, which fly at very low levels and therefore has negligible collision risk and is not considered to be at risk of displacement); or were recorded in such low numbers that there is no risk of an impact on the population (eg puffin, with observations in February and March only and wind farm plus 2km abundances of 6 and 23 in these months respectively, which gives an apportioned FFC SPA population of <0.1 individual).

Therefore, on the basis that there are not considered to be any risks of AEoI of the FFC SPA due to impacts on the individual components of the seabird assemblage feature, the Applicant concluded that there would be no risk of AEoI on the seabird assemblage feature itself [Section 4.6.1 of REP2-035]. NE [REP4-040] agreed with this conclusion.

o) In-combination effects

The Applicant [REP2-035] stated that since it has been concluded that Norfolk Boreas would not have an in-combination AEoI on any of the individual components of the seabird assemblage feature for which individual assessments have been undertaken (gannet, kittiwake, guillemot and razorbill), and the additional species (herring gull, fulmar, puffin, shag and cormorant) are not considered to be at risk of adverse effects (as outlined in footnote (n)), it can therefore be concluded that there would not be an AEoI of the FFC SPA due to an in-combination effect on the seabird assemblage feature. [Section 4.6.2 of REP2-035].

NE [REP4-040] explained that impacts to the assemblage feature should be assessed against the Conservation Objectives for abundance and diversity of the feature. It concluded that the abundance target of the assemblage would be met and that the assemblage diversity is not at risk from the in-combination collision and displacement impacts from offshore wind farms when the Hornsea Projects Three and Four are excluded from the in-combination totals. Therefore, it advised that an AEoI of the seabird assemblage feature of the FFC SPA can be ruled out for collision and displacement impacts in-combination with other plans and projects when the Hornsea Projects Three and Four are excluded from the in-combination totals.

However, due to NE's significant concerns regarding the incomplete baseline surveys for the Hornsea Project Three, and the associated level of uncertainty as regards the potential impacts of that project, together with the inevitable uncertainty associated with the figures for Hornsea Project Four from the, NE was not in a position to advise that an AEoI can be ruled out for the assemblage feature of the FFC SPA for collision and displacement in-combination with other plans and projects when the Hornsea Projects Three and Four are included in the in-combination total.

The RSPB [REP-059] also did not agree that an AEoI on the assemblage could be ruled out.

4) HAISBOROUGH, HAMMOND AND WINTERTON (HHW) SAC

| | | | | | | | | | | | | | | | |
|--|--------------------------------|-----|-----|--------------|--------|---|---------------|-----|---|---|---|-----|----------------|--------|-----------|
| EU Code: UK0030369 | | | | | | | | | | | | | | | |
| Distance to NSIP: 0km (cable route intersects the SAC) | | | | | | | | | | | | | | | |
| European Site Features | Adverse effect on integrity | | | | | | | | | | | | | | |
| | Temporary physical disturbance | | | Habitat loss | | | New substrate | | | Increased suspended sediment and smothering | | | In-combination | | |
| | C | O | D | C | O | D | C | O | D | C | O | D | C | O | D |
| Annex I Sandbank slightly covered by seawater all the time | ? a | ? c | ? k | | ? d, e | | | x g | | ? j | | | ? l, m | ? l, m | ? k, l, m |
| Annex I Reef (<i>Sabellaria spinulosa</i> reefs) | ? b | ? c | ? k | | ? d, f | | | ? h | | ? i | | ? k | ? l, n | ? l, n | ? k, l, n |

a) Temporary physical disturbance during construction - sandbanks

The Applicant's HRA Report [APP-201] stated that the maximum area of temporary physical disturbance (2.45km²) due to cable laying operations, including pre-sweeping equates to 0.37% of the sandbanks¹ and 0.17% of the total area of the SAC². Any additional area associated with sediment disposal would be a factor of the disposal areas to be agreed with the MMO in consultation with NE.

The Applicant's HRA Report stated the following:

¹ The area of the Annex 1 Sandbank feature in the HHW SAC is 668.928km² (66,892.8ha) as quoted in the Natura 2000 Standard Data Form <http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK0030369>

² The HHW SAC is 1,467.59 km²

- *Sandbank extent, topography and sediment composition* – As the cable corridor is oriented in most cases transverse to the sand wave crests which require levelling, only a small width of each sand wave would be disturbed with the sand wave continuing to evolve and migrate along most of its length. It concluded that the governing sediment transport processes within the SAC occur at a much larger scale than the temporary physical disturbance which would occur as a result of cable installation. The sediment volume that would be affected is small in comparison to the volume of sediment within the local sandbank systems and the SAC as a whole. As all the sediment would be deposited within the boundaries of the SAC³, presenting minimal impacts on local sediment availability, there would be no significant change to sandbank extent, topography and sediment composition. Once re-deposited on the seabed at the proposed disposal site, the sediment would immediately re-join the local and regional sediment transport system and would not affect the form or function of the sandbanks. [Paragraphs 455-466 of APP-201]
- *Sandbank communities* - Communities found within low diversity dynamic sand are largely composed of opportunistic species and can re-establish relatively quickly following disturbance, usually within a few tidal cycles. It concluded that given this capacity for recoverability, combined with the small total area of the SAC that would be temporarily affected by Norfolk Boreas cable installation, temporary physical disturbance would not give rise to any significant alteration to the communities of the sandbanks feature of the SAC. [Paragraphs 467-472 of APP-201]

As a result, the Applicant concluded that there would be no AEoI [section 7.4.1.2 and 7.4.2.2 of APP-201].

The Applicant's HRA Report [section 7.3.1.5 of APP-201] confirmed that all seabed material arising from the HHW SAC during cable installation would be placed back into the SAC to ensure the sediment is available to replenish the sandbank features. It confirmed [REP4-014] that final sediment disposal strategy would be agreed with the MMO in consultation with NE and included within the final HHW SIP⁴. The MMO [REP4-034] and NE [REP4-043] agreed this approach was appropriate.

NE [RR-099] agreed that it is likely sediments would recover from cable installation, assuming that the sediments are what is stated by the Applicant and if no protection/ sand wave clearance occurs. However, it stated that in coarser sediment areas of scarring would remain.

NE [RR-099] was generally content with the sandwave levelling assessment and acknowledged that the mobile nature of this particular sandbank system would make it more likely to recover from changes in structure than less mobile ones. However, it noted that there is no empirical data that relates to interventions of similar spatial and temporal scale to the proposals and for this particular sandbank system to support the modelling. It therefore had residual concerns in relation to the overall impacts to the form and function of the Annex I sandbank sandwave fields and their potential ability to recover.

³ Secured through section 5.4 of the SIP [REP6-011] / section 4.4 of the CSIMP [REP6-017])

⁴ Secured through section 5.4.1 of the SIP [REP6-011] / section 4.4.1 of the CSIMP [REP6-017]

Furthermore, NE [RR-099] advised that removing material (ie from dredging) would affect the structure of Annex I sandbanks and potentially change sediment extent and distribution and/or result in a change in biological composition. The Applicant [AS-024] stated that it would dispose of all sediment within the SAC and therefore the total volume of sediment would not change (excavated sediment is 0.05% of total sandbank volume); that the overall area of sandbank habitat would not change; and that any morphological changes are likely to be within the existing range (any disposal mounds higher would be re-distributed and lowered by tidal currents to levels like the existing bedforms). It noted that biological communities are relatively species poor, that cable installation works and cable protection would not significantly alter community, and that the site would not be without biological communities expected for the designated feature.

The Applicant [AS-024] confirmed that the cable installation strategy must be agreed with the MMO in consultation with NE before works can commence and would be informed by any available evidence regarding recovery from other relevant projects⁵. NE welcomed the commitment to a cable installation strategy but stated that it does not alter its advice that it cannot rule out an AEoI [REP7-053].

Additional commitments

During the Examination, the Applicant committed to not using Jack-up vessels within the HHW SAC⁶ to reduce the footprint associated with vessel stabilisation disturbance to the seabed.

Monitoring

NE [AS-028] and the MMO [REP2-051] advised that sandbank recovery should be monitored. The Applicant [REP1-042] confirmed that monitoring for sandbanks would be agreed with the MMO, in consultation with NE, prior to construction⁷.

NE [REP7-053] noted that the Applicant had committed to a single post construction survey and then "*Further surveys may be required at a frequency to be agreed with the MMO (e.g. 3 years non-consecutive e.g. 1, 3 and 6 years or 1, 5 and 10 years). If evidence of recovery is recorded and agreed with the MMO, monitoring will cease*" within the In Principle Monitoring Plan [REP5-032]⁸. However, it noted that there is no mention of a specific pre-construction survey and/or timeframes for the post-construction survey. It considered that what is meant by post construction is too ambiguous to appropriately capture the ability of sandbanks to recover.

⁵ Secured through Section 5.4 of the SIP [REP6-011] / section 4.4 of the CSIMP [REP6-017]

⁶ Secured through Section 5.4.1 of the SIP [REP6-011] / section 4.4.1 of the CSIMP [REP6-017]

⁷ Secured through Table 6.1 of the SIP [REP6-011] / Table 5.1 of the CSIMP [REP6-017]

⁸ Secured through Schedules 9 and 10, Part 4, Conditions 14(1)(b), 18, 19 and 20; Schedules 11 and 12, Part 4, Conditions 9(1)(b) 13, 14 and 15; and Schedule 13 Part 4, Conditions 7(1)(b), 11, 12 and 13 of the dDCO.

b) Temporary physical disturbance during construction - reefs

Applicant's assessment

The Applicant's HRA Report states that should *S. spinulosa* reef be identified on the proposed cable routes during the pre-construction surveys⁹, micrositeing will be undertaken where possible to avoid potential impacts. It stated that approximately 1.05km to 3.75km may be available for micrositeing, therefore it is likely that no temporary physical disturbance to the feature would occur in the offshore cable corridor. Based on the scenario that micrositeing is possible, the Applicant concluded that there would be no AEoI of the HHW SAC. [Paragraphs 510-515 of APP-201].

The Applicant's HRA Report also considered a worst-case scenario whereby the *S. spinulosa* reef does span the entire width of the cable corridor. It noted that *S. spinulosa* reefs have varying levels of vulnerability to disturbances and are particularly vulnerable to physical anthropogenic disturbances. However, it highlighted high recruitment rates of *S. spinulosa* allow for rapid recovery and regrowth of reefs in the right conditions and that due to low sensitivity to substrate type, *S. spinulosa* is often one of the first species to settle on newly exposed and suitable surfaces. It suggested that recovery of reefs from significant impacts (such as physical loss or abrasion of the substratum surface) may take between 2 and 10 years for full pre-impact recovery and that the regional environmental conditions are well-suited to reef development and rapid recovery rates may be possible within the export cable corridor. Based on a maximum disturbance width of 74m, the Applicant concluded that the proportion of temporary disturbance across the width of the offshore cable corridor would be 3.7% or 1.6%. However, the proportion of *S. spinulosa* reef disturbance would be significantly lower in the context of reef extent within the entire SAC. The Applicant's HRA Report concluded that given the small proportion of temporary disturbance and the high recoverability, the conservation objective of maintaining or restoring extent would be sustained; therefore there would be no AEoI of the HHW SAC. [Paragraphs 516-535 of APP-201].

Micrositeing of export cable

NE [RR-099] and EIFCA [REP6-027] stated that if the Applicant is able to microsite, it agreed with the Applicant's assessment of magnitude. NE acknowledged [REP5-081] that there is currently potentially sufficient space to microsite around reef and features of archaeological interest. However, it stated that this does not take account of uncertainties as to what archaeological features are, the ability to remove them and the likely discovery of further areas of reef which could result from the following fisheries management areas being implemented to aid the recovery of Annex I reef which overlap with the export cable corridor:

⁹ Secured through Schedules 11 and 12, Part 4, Condition 13(2)(a) of the dDCO. Also referenced in Sections 4.2.1 and 5.1.2 of the SIP [REP6-011] / section 4.1.2 of the CSIMP [REP6-017].

- Eastern Inshore Fisheries Conservation Authority (EIFCA) byelaw (Area 36) - selected as one of two top priority sites for management of reef and shown in green in Figure 1 of [REP4-022]. NE [RR-099] and EIFCA [RR-035, REP2-045 and REP5-069] both requested micro-siting around the area. The Applicant [REP5-051] noted the byelaw area represented 1.5% of the section of the offshore cable corridor within the SAC and that there was sufficient space to micro-site around it. However, it did not commit to avoiding cable installation altogether within Area 36 as the results of the preconstruction surveys may show that there is no or limited Annex I *S. spinulosa* reef within the byelaw area and yet there is Annex I reef in the area to the south of the byelaw. Under this scenario cable installation within Area 36 would not affect the conservation objectives of the site, however if the cable were routed to the south, the objectives of the site could be affected. [REP6-014]
- A Defra byelaw, which is shown in dark purple on Figure 1 of [REP4-022]. NE [RR-099] advised that as a minimum, the area of high confidence reef within the byelaw area should be avoided in its entirety. However, it confirmed [REP5-081] that reef within fisheries management areas are no more important than any other areas of reef and that all reef should be conserved. The Applicant [REP5-051 and REP6-013] acknowledged that the large area of fisheries management does span the cable corridor but stated that the cable corridor is wider at this location therefore there is greater space to micro-site. It noted that the byelaw is not anticipated to be implemented in advance of offshore construction and that there is no guarantee that it would lead to reef recovery. It considered that a 4.7km stretch of reef would be exceptional and did not believe that the Defra proposed fisheries management closure would result in a significant reduction in fishing pressure (as vessel monitoring shows little fishing activity in the majority of the offshore cable corridor) and therefore a significant increase in reef extent. Furthermore, it highlighted recent research finding reef in areas with high levels of fishing pressure and considered that if reef has extended across the full width of the cable route, the small scale and temporary impacts would be *de minimis*.

NE [RR-099, REP5-081 and REP7-051] highlighted Triton Knoll Offshore Wind Farm as an example of where micro-siting around reef has not been possible. NE stated that the concept of *de minimis* is not found in the relevant law or guidance and the correct approach is to consider the existence, or not, of adverse effects on the integrity of the site, rather than whether adverse effects are large or small. It considered the worst-case scenario should be assessed and on this basis, it could not rule out an AEoI. It acknowledged that the areas of reef affected would be small when expressed as a percentage of site area and actual or potential areas of reef within the site, but any loss of protected habitat is a matter of significance. It did not agree with the Applicant's caveat of avoiding reef 'where possible' as there are no parameters to assess and agree what is possible [RR-099]. It noted [REP2-080] that the site is already in unfavourable condition with a restore objective and that the project would only be consistent with conservation objectives if all areas of Annex I reef are avoided. It stated [REP4-043 and REP7-051] that the whole site is made up of habitats that support designated features, with no site fabric (except an old pipeline) and that in order to have regard to the objective of restoring the site to favourable condition it is necessary to protect not only existing reef, but also areas where it is likely to return.

NE [REP7-051] acknowledged it has taken a precautionary approach in its conclusions regarding the extent and distribution of reef, the spatial extent and impact of fishing and the recover objective, but stated this is consistent with its approach in all other plans or projects affecting the HHW SAC.

The Applicant [AS-024, REP2-021, REP4-022, REP4-014, REP6-013, REP6-016] asserted throughout the Examination that micro-siting is likely to be possible, but noted that the 'where possible' caveat is necessary as it is not possible to be absolutely certain of reef extent in the future. It confirmed that the cable installation strategy must be agreed with the MMO in consultation with NE before works can commence and would be informed by any available evidence regarding recovery from other relevant projects¹⁰. The Applicant stated that as the current extent of reef is unknown, it is not possible to quantify what would constitute favourable condition. It agreed that the distribution of reef may change prior to construction but considered it unlikely that the overall extent would change. It considered that should micro-siting not be possible, temporary disturbance would be very small and that once disturbance has ceased, *S. spinulosa* can settle and form reef aggregations. It stated that known areas of reef may change due to its ephemeral nature and that the extent to which Annex I reef would recover in areas to be managed as reef or where fisheries byelaws are proposed is not known, therefore the proposed Grampian condition and use of the HHW SAC SIP would ensure no AEoI.

NE welcomed the commitment to a cable installation strategy but stated that it does not alter its advice that it cannot rule out an AEoI [REP7-053]. It highlighted evidence to demonstrate that there is a higher probability for Norfolk Boreas (NB) to have Annex I *S. spinulosa* reef within the cable corridor than at Triton Knoll (where micro-siting has not been possible); it continued to advise that an AEoI, both now and post consent, cannot be ruled out.

Reef recovery

The Applicant [AS-024 and REP4-014] noted that *Sabellaria* reef is very common within the southern North Sea and Channel and stated that there is strong evidence for rapid recolonisation of reef. It noted that NE expects the reef within the fisheries management areas to recover following extensive and repeated commercial dredging therefore it considers the same logic would apply to short term and localised installation and maintenance activities. It acknowledged [REP6-013] that it was not aware of any direct evidence of the habitat's ability to recover where cables have been installed through existing or established Annex I *S. spinulosa* reef (e.g. through post-installation monitoring). However, it considered there to be evidence of *S. spinulosa* rapidly recolonising areas in dense aggregations after one-off disturbance events (e.g. following aggregate dredging off Hastings) as well as for development of *Sabellaria* reef in locations where reef had not been previously recorded (e.g. off Thanet wind farm).

However, NE [RR-099, REP2-080, REP5-078] advised that the evidence presented in the Applicant's HRA Report to support conclusions on recoverability predominantly relates to individuals/abundance and does not take into account repeated Operation

¹⁰ Secured through Section 5.4 of the SIP [REP6-011] / section 4.4 of the CSIMP [REP6-017]

and Maintenance (O&M) impacts or cable protection. Whilst it did not disagree there is evidence that reef can develop on disturbed grounds (including where cables have been installed), it stated that there is no evidence to support recovery of existing/established Annex I reef from cable installation. It also highlighted that evidence from the Wadden Sea that recovery has not occurred from impacts caused by bottom trawling activities. NE advised that until it can be demonstrated reef can recover, there remains a sufficient degree of uncertainty that AEOI can be ruled out beyond all scientific doubt.

The Applicant [REP4-014] considered that given the level of scientific uncertainty in determining the extent of the reef and its current condition (noting that scientific certainty is not possible to obtain) and the mitigation now agreed by the Applicant, the assertion that NE cannot be confident of no AEOI for Annex I habitat is not proportionate to the risk of potential small effects on the site in the worst-case scenario.

Additional commitments

During the Examination, the Applicant committed to not using Jack-up vessels within the HHW SAC¹¹ to reduce the footprint associated with vessel stabilisation disturbance to the seabed.

c) Temporary physical disturbance during operation – sandbanks and reef

Applicant's assessment

- *Cable reburial* - The Outline HHW SAC control document (section 5.3 of the SIP [REP6-011] / section 4.3 of the CSIMP [REP6-017]) shows that the aim of the installation strategy for cables in the SAC would be to bury cables below the mobile sandwaves (to a "seabed reference level", below which sediment is not mobile) to avoid or minimise the requirement for routine re-burial of cables during the operational phase. The Applicant's HRA report [APP-201] considered a worst-case scenario disturbance area (which assumes cables have not been buried to the seabed reference level) for cable reburial activities within the SAC which equates to 0.4km² over the life of the project (0.03% of the total area of the SAC or 0.07% of the sandbank area); however, if reburial is required, it is likely that this would be for shorter sections (e.g. 1km) at any one time [paragraph 476 of APP-201]. The Applicant considered that recovery of both *S. spinulosa* reef and Sandbanks would occur following reburial operations.
- *Cable repair* - While it is not possible to determine the number and location of any repair works that may be required during the life of the project, an estimated average of one export cable repair every 10 years within the SAC is included in the Applicant's HRA Report [APP-201]. It estimated that 300m sections would be removed and replaced per repair with a disturbance width of 10m and therefore an area of 3,000m² (0.003km²) per repair combined with approximately 150m² for any anchor placement associated with repair works (based on 6 anchors per vessel). A protocol for undertaking

¹¹ Secured through Section 5.4.1 of the SIP [REP6-011] / section 4.4.1 of the CSIMP [REP6-017]

repairs would be agreed with the MMO in consultation with NE¹². The Applicant considered that due to the short-term, temporary and small-scale nature of any maintenance works (if required) there would be no effect on the form or function of the sandbank systems and the sandbank communities and *S. spinulosa* reef would rapidly recover.

- *Conclusion* - The Applicant concluded there would be no AEoI to sandbanks and reef of the HHW SAC from operation and maintenance activities [section 7.4.1.1.2 and 7.4.2.1.2 of APP-201].

NE [RR-099] noted that sandwave levelling does not ensure that cables remain buried. The Applicant [AS-024] explained that the worst-case scenario for the O&M phase is based upon the potential for suboptimal burial in the absence of sandwave levelling.

NE is invited to clarify its position in relation to AEoI of HHW SAC from temporary physical disturbance during the operation phase.

d) Cable protection

The Applicant's analysis of geophysical data showed that the substrate along the vast majority of the offshore cable corridor is expected to be suitable for cable burial. However, the Applicant's HRA Report assumed a worst-case scenario footprint of 10% of export cables within the SAC to remain unburied and therefore requiring protection. The maximum footprint of new substrate would therefore be 40,000m² for unburied cable and 12,000m² for cable crossings [section 7.3.3.2.5 and Table 7.4 of APP-201]; this would represent 0.004% of the total area of the HHW SAC.

During the Examination, the Applicant committed to the following measures relating to cable protection:

- Reduction of the amount of cable protection from 10% of the cable route to 5%¹³; this arose following completion of an interim cable burial study (Appendix 2 of the HHW SAC SIP [REP6-011]) which demonstrated that at least 95% of the export cable within the SAC could be buried. The reduction in the amount of cable protection would result in total habitat loss within the SAC of 0.03km², equating to 0.002% of the SAC [Table 3.1 of REP6-011].
- To attempt to rebury cables that become exposed within the SAC during operation prior to the installation of any cable protection¹⁴.

¹² Secured through Section 5.5.5 of the SIP [REP6-011] / section 4.5.5 of the CSIMP [REP6-017]

¹³ The maximum volume of cable protection within the SAC is specified in Section 5.5.3. of the SIP [REP6-011] / section 4.5.3 of the CSIMP [REP6-017].

¹⁴ Secured through Section 5.5.7 of the SIP [REP6-011] / section 4.5.7 of the CSIMP [REP6-017]

- The requirement for a separate Marine Licence should new areas of cable protection be required during maintenance¹⁵; and
- To decommission cable protection at the end of the project's life where it is associated with unburied cables due to ground conditions (where required for crossings this would be left in situ)¹⁶.

However, NE [Appendix 2.5 of RR-099, REP4-014 and REP4-043] considered that the addition of any hard substrata is often incompatible with the conservation objectives for Annex I sandbanks and reef features and could result in lasting change to the sandbanks and *Sabellaria*. It stated [REP1-057] that it would usually consider permanent, long-lasting and irreversible loss to be an adverse effect unless the following can be demonstrated:

- 1) That the loss is not on the priority habitat/feature/ sub feature/ supporting habitat; and/or
- 2) That the loss is temporary and reversible; and/or
- 3) That the scale of loss is so small as to be de minimus alone; and/ or
- 4) That the scale of loss is inconsequential including other impacts on the site/ feature/ sub feature.

NE [REP4-043] recognised that the area of cable protection may be quite small-scale in relation to the whole SAC site, but considered the amount of rock is still large and could impact ecological functioning. It considered there to be a high probability that the conservation objectives would be hindered, and that cable protection within 5% of the cable corridor route would have a lasting effect. Furthermore, it highlighted the importance of areas in-between protected features for the functioning of those features [REP4-038, REP4-041, REP4-043, REP5-078 and REP5-081].

The Applicant [REP6-016] considered it had met NE's listed advice above and was confident that a conclusion of no AEoI can be made pre-consent, however NE's Risk and Issues Log [REP7-053] showed that NE still does not agree an adverse effect can be ruled out from the placement of cable protection in HHW SAC.

e) Permanent habitat loss during operation - sandbanks

A worst-case scenario of 10% cable protection within the SAC would potentially affect 0.008% of the area of sandbanks within the SAC. Due to the very small extent of potential persistent loss of Sandbank within the SAC, the Applicant concluded that there would be no change to the physical processes associated with the sandbank form and function and no significant loss of the low abundance and low diversity sandbank communities. As a result, the Applicant concluded that there would be no AEoI on the Annex 1 Sandbank [paragraphs 485-487 of APP-201].

¹⁵ Appendix 1 of the Offshore Operations and Maintenance Plan [REP5-030], secured through Schedules 11 and 12, Part 4, Condition 9(1)(j) of the dDCO.

¹⁶ Secured through Section 5.5.4.2 of the SIP [REP6-011] / section 4.5.4.2 of the CSIMP [REP6-017]

Following the reduction in the amount of cable protection to 5%, this would equate to 0.005% of the area of sandbanks within the SAC (Table 3.1 of REP6-011]. The Applicant [AS-024] stated that cable protection would only likely be required on hard substrate (where there would not be sandbanks).

f) Permanent habitat loss during operation - reefs

The Applicant's HRA Report [APP-201] does not assess impacts of habitat loss on *S. spinulosa* reef. The Applicant [REP6-005] considered that permanent habitat loss for *S. spinulosa* reef should be screened out because if cable protection is required, there is evidence to suggest that it could be colonised by *S. spinulosa* reef, therefore, the installation of cable protection would not represent a loss of habitat. Furthermore, it considered that Annex I reef would be avoided by micro-siting.

However, NE [Appendix 2.5 of RR-099 and REP4-014] did not agree that an AEOI can be ruled out from the permanent loss of Annex I reef from cable protection.

During the Examination, the Applicant committed to not install any cable protection in the fisheries management priority areas to be managed as *S. spinulosa* reef within the HHW SAC (shown as dark Purple in Figure 5.1 of the SIP [REP6-011] / Figure 4.1 of the CSIMP [REP6-017]), unless otherwise agreed with the MMO in consultation with NE¹⁷. NE [REP7-045 and REP7-051] confirmed that no area of reef is more important than any other and that this commitment does not address its concerns about the wider SAC.

The Applicant [REP6-007] considered that an AEOI could be concluded without this and the commitment to decommission cable protection at the end of the project life¹⁸, but that these additional measures would ensure that areas to be managed as *S. spinulosa* reef would be avoided and that there would be no permanent habitat loss as a result of cable protection.

g) New substrate during operation - sandbanks

The Applicant concluded that the extremely small areas associated with the new substrate (cable protection) would have no significant effect on the governing processes of the SAC and that the extent of any change that could arise from colonisation of the cable protection by communities not present within the sandbanks would be limited to less than 0.004% of the total area of the HHW SAC and 0.008% of the area of sandbanks within the SAC (based on cable protection along 10% of the cable route). It therefore concluded that there would be no AEOI in relation to the conservation objectives for Annex I Sandbanks (i.e. effects on extent, topography, sediment composition and communities) due to the introduction of new substrate [para 490 of APP-201].

This conclusion was not disputed during the Examination.

¹⁷ Secured through Section 5.5.4.1 of the SIP [REP6-011] / section 4.5.4.1 of the CSIMP [REP6-017]

¹⁸ See footnote (d) of this matrix

h) New substrate during operation - reefs

The Applicant's HRA Report [APP-201] noted that *S. spinulosa* reef has been found to colonise new hard substrate rapidly, including some forms of cable protection. It stated that any new substrata created by cable protection may provide a larger area of substrate suitable for *S. spinulosa* colonisation than was previously present. Therefore, the Applicant concluded there would be no AEoI of the SAC in relation to the conservation objectives for Annex I *S. spinulosa* reefs due to introduction of a new substrate during operation [paragraphs 549 to 558 of APP-201].

NE [RR-099 and REP7-051] agreed that *S. spinulosa* could colonise rock protection but did not consider the establishment of *S. spinulosa* reef on artificial substrate as "counting" towards favourable condition of the feature and/or site. This is because it is not a replacement for Annex I *S. spinulosa* reef on natural site sediment as set out at the time of designation and within the conservation advice package for the site.

The Applicant [AS-024] maintained that any reef, regardless of what it is growing on, would have the same effect on biodiversity and would also provide spawning stock of *S. spinulosa* which would help to ensure re-establishment of reef on nearby natural substrates. It noted that the large area to be managed as reef (in Defra's proposed fisheries byelaw area) is located on existing pipelines and that NE's advice to the MMO for protecting designated features in HHW SAC states that "*Sabellaria spinulosa* reef extent is identified along the Baird Bacton pipeline, as in the HHW SAC SAD [Selection Assessment Document] and Regulation 35 package".

NE is invited to clarify whether it considers the introduction of new substrate would result in an AEoI of HHW SAC.

i) Increased suspended sediment and smothering during construction – reef

The Applicants HRA Report [paragraph 536 to 541 of APP-201] noted that approximately 500,000m³ of sediment would be deposited back into the SAC following pre-sweeping and approximately 1,200,00m³ would be disturbed in the SAC due to trenching. It stated that all sediment arising from within the SAC would be deposited within the offshore cable corridor, therefore all dredged sediment would be available within the sandbank system of the SAC. The material would be deposited within disposal locations agreed in consultation with the relevant SNCB following pre-construction surveys and would not be disposed of within 50m of *S. spinulosa* reef identified during pre-construction surveys¹⁹. The Applicant noted that *S. spinulosa* reefs are most frequently found in, and are adapted to moderate sediment loads and disturbed conditions which support their growth, therefore the species is not considered sensitive to increased suspended sediment loads or smothering through sediment deposition. The Applicant concluded that changes to the extent or structure of the reef due to increased suspended solids and smothering are not anticipated and therefore, the conservation objective of maintaining or restoring *S. spinulosa* reef in / to a favourable condition would be met and there would no AEoI of the HHW SAC.

¹⁹ Secured through section 5.4 of the SIP [REP6-011] / section 4.4 of the CSIMP [REP6-017]

As noted above, the Applicant's HRA Report [section 7.3.1.5 of APP-201] confirmed that sediment from cable installation activities would not be disposed of within 50m of *S. spinulosa* reef. NE [RR-099] considered a 500m buffer to be more appropriate and noted that if sediment is surface released this needs to be taken account of to ensure the resting place of the bulk of material is a minimum of 50m from the *S. spinulosa* reef. The MMO [RR-069] also queried the sufficiency of this buffer zone.

Although the Applicant considers that the conclusion of no AEoI could be made [REP6-007], it agreed to further measures²⁰ designed to provide confidence that no AEoI of the HHW SAC can be concluded. These were:

- disposing of any material dredged from the seabed for sandwave levelling (also referred to as pre-sweeping) in a linear "strip" along the cable route;
- disposing of material close to the seabed via a fall pipe (also referred to as a down pipe) employed by the dredging vessel to ensure it remains more than 50m away from *S. spinulosa* reef; and
- applying specific criteria when determining the location of disposal areas within the SAC.

NE [RR-099] also suggested that dredged material should be >95% similar in particle size to disposal locations. However, the Applicant [REP4-014 and REP6-014] considered that the mitigation proposed is the most reliable and efficient way of ensuring that there is no overall change in sediment composition, and that with this mitigation there is no need for a condition specifying particle size. It noted that sampling all dredged sediment and areas within the disposal site in order to determine 95% similarity is unfeasible. However, NE [REP7-046] advised that that the proposed mitigation does not ensure that the sediment will be disposed of in areas of similar particle size and that discussion of potential wording of a condition regarding sediment size is ongoing.

NE is invited to confirm its position in relation to AEoI of HHW SAC suspended sediment and smothering during construction.

j) Increased suspended sediment and smothering during construction – sandbanks

As noted in the section 3.2 of the RIES, NE considered a LSE should be screened in as the ES has considered deposition effects from sandwave levelling so there is an impact pathway and therefore a LSE during construction.

The Applicant did not have the opportunity to respond to this matter before the publication of the RIES, however is of the view that an AEoI can be ruled out for the HHW SAC. NE is invited to confirm its position in relation to AEoI.

²⁰ Secured through section 5.4 of the SIP [REP6-011] / section 4.4 of the CSIMP [REP6-017]

k) Decommissioning

The Applicant's HRA Report concludes that the potential effects during decommissioning would be no worse than construction. No sandwave levelling would be required, however removal of offshore export cables could result in temporary physical disturbance in a very small extent of the SAC. The Applicant concluded no AEoI of the HHW SAC [sections 7.4.1.1.3 and 7.4.2.1.3 of APP-201].

The effect of leaving infrastructure *in-situ* was captured in the Applicant's assessment of permanent impacts. However, during the Examination, the Applicant made the commitment to decommission cable protection at the end of the project's life where it is associated with unburied cables due to ground conditions and therefore removing any permanent effects²¹.

NE is invited to clarify its position in relation to AEoI of HHW SAC from decommissioning activities.

l) In-combination effects

The only project screened into the Applicant's in-combination assessment is Norfolk Vanguard. It is likely that the installation of the Norfolk Boreas export cables would follow the Norfolk Vanguard export cables with no temporal overlap. Export cable installation would be undertaken over a maximum period of approximately 18 months and this would be the same for Norfolk Vanguard, therefore the total period over which effects could occur would be up to four years.

There would be a minimum separation of 75m between cable and the maximum width of disturbance from pre-sweeping is 37m, therefore there would be no repeated disturbance of the same footprint during construction. The spatial footprint of installation works for both Norfolk Boreas and Norfolk Vanguard is likely to be double that of Norfolk Boreas alone as a worst-case scenario.

NE [REP7-051 and REP7-053] stated that there is a high probability of an AEoI of HHW SAC Annex I sandbanks and reef features both alone and in-combination, therefore it is unable to agree with the conclusions within the Habitats Regulation Assessment.

m) In-combination effects - sandwaves

The HRA Report states the following [section 7.4.1.2 of APP-201]:

- *Temporary physical disturbance* – Given the minimum spacing required between export cables from the two projects and the likely timing of construction there should be no additional impact on the sand waves due to the in-combination effect of both projects. The likelihood of altering the form and function of the sandwave field and the wider sandbank system is considered to be minimal and would not be beyond that described for each individual project.

²¹ Secured through Section 5.5.4.2 of the SIP [REP6-011] / section 4.5.4.2 of the CSIMP [REP6-017]

- *Permanent habitat loss* - The extent of potential habitat loss is very small in comparison to the total area available within the SAC and therefore there would be no change to the physical processes associated with the sandbank form and function or the sandbank communities either at the scale of an individual sandbank or across the entirety of the SAC.
- *Introduction of new substrate* - The areas associated with the new substrate would be small enough to be considered de minimus alone and therefore have no significant effect on the governing processes or sandbank communities either at the scale of an individual sandbank or across the entirety of the SAC.

The Applicant concluded no AEOI of the HHW SAC from in-combination effects of Norfolk Boreas with Norfolk Vanguard.

n) In-combination effects - reef

The HRA Report states the following [section 7.4.2.2 of APP-201]:

- *Temporary physical disturbance*:
 - Construction - Micrositing is likely to be possible to avoid the *S. spinulosa* reef as currently recorded within the shared cable corridor. The export cable corridor is approximately 4km wide at the point where *S. spinulosa* reef has been recorded to date. A total width of approximately 1.35km is required for Norfolk Vanguard and Norfolk Boreas, therefore, 2.65km is likely to be available for micrositing for both projects at this location within the cable corridor. If *S. spinulosa* has colonised the full width of the cable corridor at the location where an area of reef is currently present (approximately 4km), this would result in a disturbance to 3.7% of the *S. spinulosa* reef. Should *S. spinulosa* reef colonise a 2km wide section of the offshore cable corridor or a 4.5km wide section, the proportion of temporary reef disturbance resulting from the 148m wider area of disturbance would be 7.4% or 3.3%, respectively. In the context of reef growth that would have occurred relative to the extent of reef recorded in 2016, the conservation objective of maintaining or restoring extent would have been met and exceeded. In addition, there could be a gap of three to nine months between the installation of the Norfolk Vanguard export cables and the installation of the Norfolk Boreas cables which may allow recovery of *S. spinulosa* to occur.
 - Operation - The area affected would be a very small extent of the total area of the SAC and the likelihood of cable repairs being required in an area of reef is relatively low given the small extent of *S. spinulosa* reef compared within the cable corridor area. In addition, *S. spinulosa* shows good ability to recover from disturbance.
- *Increased suspended sediment and smothering* - Based on the worst-case scenario, approximately 1,000,000m³ of sediment would be deposited back into the HHW SAC following pre-sweeping for both Norfolk Boreas and Norfolk Vanguard. Approximately 2,400,000m³ of sediment would be deposited back into the SAC due to trenching. All sediment arising from within the SAC would be deposited within the offshore cable corridor and within the SAC boundaries. Installation works would not be concurrent and *S. spinulosa* is resilient to increased sediment loads and is most frequently found in disturbed conditions.

- *Introduction of new substrate* - Any new substrata created by cable protection may provide a larger area of suitable reef substrate than was previously present.

The Applicant concluded no AEOI of the HHW SAC from in-combination effects of Norfolk Boreas with Norfolk Vanguard.

5) SOUTHERN NORTH SEA (SNS) SAC

| EU Code: UK0030395 | | | | | | | | | | | | | | | | | | |
|------------------------------|------------------------------------|----------------|----------------|----------------|------------------|-------------------|---------------------|-------------------|-------------------|--|-------------------|-------------------|--------------------------|----------|------------------|----------------|----------------|-------------------|
| Distance to NSIP: 0km | | | | | | | | | | | | | | | | | | |
| European site feature | Adverse effect on integrity | | | | | | | | | | | | | | | | | |
| | Underwater noise from construction | | | Vessel noise | | | Vessel interactions | | | Indirect effects through effects on prey species, including habitat loss | | | Changes to water quality | | | In-combination | | |
| | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> | <i>C</i> | <i>O</i> | <i>D</i> |
| Harbour porpoise | ? a | x _b | x _c | x _d | x _{b,d} | x _{c, d} | x _e | x _{b, e} | x _{c, e} | x _f | x _{b, f} | x _{c, f} | x _g | | x _{c,g} | ? h | x _h | x _{c, h} |

a) Underwater noise - construction phase

Auditory injury

The Applicant states that the commitment to the MMMP for piling [APP-704] and a MMMP for UXO clearance (to be developed pre-construction) would reduce the risk of permanent auditory injury and therefore there would be no AEoI (paragraphs 773-790 and 806-813 of APP-201].

Disturbance

The Applicant [APP-201] assessed the potential for disturbance from underwater noise during construction from:

- UXO clearance (paragraphs 791-803);
- activation of proposed mitigation (eg acoustic deterrent devices) (paragraphs 814-816);
- single piling installation (paragraphs 817-833);
- two concurrent piling events (paragraphs 834-844); and
- construction activities other than piling (paragraphs 845-861).

For each activity, the Applicant's assessment concluded that temporary disturbance of harbour porpoise would not result in displacement that would exceed 20% of the seasonal component of the SNS SAC at any one time or 10% of the seasonal component of the SNS SAC over the duration of that season. The Applicant therefore concluded there would be no AEoI.

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

However, The Wildlife Trust (TWT) and the Whale and Dolphin Conservation (WDC) did not agree with the Applicant's assessment for the following reasons:

- *Use of piling:* WDC [RR-056 and REP2-112] highlighted the potential effects of underwater water noise on harbour porpoise. It recommended that monopile or pin pile foundations are not used due to the noise levels generated by pile driving, or that strict limits on noise levels be put in place during construction. The Applicant [REP2-021, REP3-009 and REP4-014] explained that the inclusion of piled foundations is important to the commercial viability of the Proposed Development and that a worst-case assumption regarding noise impacts from foundation installation had been made. It explained that it could not commit to a particular foundation type but confirmed that a range of foundation options are being considered, of which monopiles, jackets and TetraBase foundations may require piling.
- *Assessment approach:* TWT [RR-040, AS-031, REP2-057] and WDC [REP2-048] highlighted concerns regarding SNCB advice for underwater noise assessments. TWT stated the science underpinning the advice is weak and that the proposed approach would be difficult to deliver and WDC did not agree with the threshold approach. The Applicant [AS-024] stated that the assessment of effects was undertaken based on current advice from the SNCBs and noted that the responsibility of providing advice on how to conduct underwater noise assessments lies with the SNCBs and the Regulator.

WDC [REP2-048 and REP2-112] and TWT [RR-040, AS-031, REP2-057] also highlighted concerns that the Applicant's assessment was based on the population of the North Sea Management Unit (NSMU), rather than the populations of the SNS SAC. The Applicant stated that this approach was in accordance with advice from NE during the Evidence Plan Process and the Conservation Objectives [AS-031, REP2-057].

- *UXO clearance:* Although UXO clearance does not form part of the authorised works, the Applicant's HRA Report [APP-201] assessed the potential effects of noise from such activities. TWT [RR-040, AS-031, REP2-098, REP5-084] advocated that conditions analogous to those included for piling impacts should be included in the DCO for UXO clearance and that it should also be made explicit in the Site Integrity Plan (SIP) (see below footnote (h) of this matrix for further details) that the document is required to mitigate against in-combination impacts from both piling and UXO clearance. It considered that mitigation should be described at this stage. The Applicant [AS-024 and REP3-007] explained that formal licensing and identification of mitigation for UXO clearance would take place during pre-construction, once accurate information on the location and size is known. The MMO supported the Applicant's approach [RR-069].

The following relevant matters were also discussed during the Examination:

- *Concurrent piling*: The Applicant assessed a maximum of two concurrent piling events at any one time [APP-201]. The MMO [RR-069 and AS-027] requested a condition to prevent concurrent piling between Norfolk Boreas and Norfolk Vanguard. The Applicant [AS-024] considered it was not appropriate to have a condition in the DCO that relates to another project, however it stated that the SIP (see below footnote (h) of this matrix for further details) would ensure adequate mitigation and would require piling to be scheduled.
- *Maximum hammer energies*: The Applicant's assessment [APP-201] assumed maximum hammer energies of 5,000kJ for monopile foundations and 2,700kJ for pin piles. Schedules 9 and 10 Condition 14(3) and Schedules 11 and 12 Condition 9(3) of the application version of the dDCO [APP-020] secured the maximum hammer energy for monopiles only; this was noted by both NE [AS-028] and MMO [REP3-016]. At Deadline 4, the Applicant amended the dDCO to include maximum energies for pin pile.

b) Operation and maintenance

The Applicant concluded that operational and maintenance impacts are likely to be highly localised around the project infrastructure, and any maintenance impacts would be intermittent and temporary, therefore no AEOI would occur [Section 8.3.1.2 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

c) Decommissioning

The Applicant expects that the activity levels and potential effects during decommissioning would be no worse than construction (with no pile driving) [Section 8.3.1.3 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

d) Vessel noise

Auditory injury

The Applicant stated that underwater noise generated by vessels would not be sufficient to cause Permanent Threshold Shift or other injury to marine mammals. The Applicant's underwater noise modelling [APP-550] shows that potential for Temporary Threshold Shift is only likely if the animal remains in very close proximity to either a medium or large vessel (within 100m) for a prolonged period of time (of at least 24 hours), which is considered to be highly unlikely.

Disturbance

The Applicant stated that the maximum number of vessels on site at any one time during construction is estimated to be 57 vessels of various sizes and types. This could therefore represent up to a 27% increase in the number of vessels during the

summer period and 43% increase in the number of vessels during the winter periods, compared to current baseline vessel numbers. It is estimated that there could be up to 445 support vessel round trips per year during operation and maintenance, with an average of 1-2 vessel movements per day.

The Norfolk Boreas offshore project area (1,178km²) is approximately 4% of the summer SNS SAC area and 1.31% of the winter SAC area. The Applicant considered this assessment to be conservative as it is unlikely that vessels would cause disturbance from the whole project area. It concluded that disturbance from vessels is likely to be localised to areas of activity, thus displacement of harbour porpoise would not exceed 20% of the seasonal component of the SNS SAC at any one time or 10% of the seasonal component of the SNS SAC over the duration of that season. The Applicant therefore concluded there would be no AEOI [Sections 8.3.1.1.4, 8.3.1.2.3 and 8.3.1.3.2 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

e) Vessel interactions

The Applicant estimated approximately 1,180 two-way vessel movements over the two to four year indicative offshore construction window, an average of approximately two vessel movements per day. The maximum number of vessels on site at any one time would be 57. Indicative operational and maintenance vessel movements suggests that there could be up to a total of 445 vessel movements per year, with an average of approximately 1-2 vessel movements per day. However, as a precautionary approach, the Applicant assessed a worst-case scenario during operation/maintenance activities based on the construction vessel movements.

The Applicant's assessment assumed that 5-10% of individuals would be at increased risk of collision. It indicates that 0.04% or less of the North Sea MU reference population could be at increased collision risk based on the worst-case scenario. However, the Applicant expects that harbour porpoise would be able to detect the presence of vessels and, given that they are highly mobile, would be able to largely avoid vessel collision, therefore there would be no AEOI [Sections 8.3.1.1.5, 8.3.1.2.4 and 8.3.1.3.3 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

f) Indirect effects through effects on prey species, including habitat loss

The Applicant's HRA Report [APP-201] identified the potential indirect effects on fish species during construction as physical disturbance, loss or changes of habitat, increased suspended sediment concentrations, and underwater noise. During operation and maintenance, potential effects on fish species could result from permanent loss of habitat; introduction of hard substrate; operational noise; and electromagnetic fields (EMF). None of these potential effects were assessed as being significant in the ES.

The Applicant anticipated that as a worst-case scenario, effects from the Norfolk Boreas offshore project area (1,178km²) would impact approximately 4% of the SNS SAC area, and 1.31% of the winter SAC area. However, the Applicant considered it is highly unlikely that any changes in prey resources could occur over the entire offshore project area during construction; it is more likely that effects would be restricted to an area around the working sites. Similarly, potential operational effects would likely be small and localised.

The Applicant's assessment concluded that any changes to prey availability resulting in the displacement of harbour porpoise would not exceed 20% of the seasonal component of the SNS SAC at any one time or 10% of the seasonal component of the SNS SAC over the duration of that season. The Applicant therefore concluded there would be no AEoI. [Sections 8.3.1.1.6, 8.3.1.2.5 and 8.3.1.3.4 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

g) Changes to water quality

The Applicant's HRA Report stated that the risk of accidental release of contaminants during construction (e.g. through spillage) would be mitigated through appropriate contingency planning and remediation measures for the control of pollution. An outline PEMP was submitted with the DCO application [APP-705] which includes the appropriate mitigation measures to reduce the risk of any accidental spills or release of contaminants. In addition, a Marine Pollution Contingency Plan (MPCP) would be developed and agreed post-consent²².

The Norfolk Boreas offshore project area (1,178km²) would impact approximately 4% of the SNS SAC area, and 1.31% of the winter SAC area. The Applicant considered it is highly unlikely that any changes in water quality (suspended sediment) could occur over the entire offshore project area during construction; any changes in suspended sediment concentrations during construction are anticipated to be low due to the localised and short-term nature of the predicted sediment plumes.

The Applicant's assessment concluded that any changes to water quality resulting in the displacement of harbour porpoise would not exceed 20% of the seasonal component of the SNS SAC at any one time or 10% of the seasonal component of the SNS SAC over the duration of that season. The Applicant therefore concluded there would be no AEoI. [Sections 8.3.1.1.7, 8.3.1.2.6 and 8.3.1.3.5 of APP-201].

NE [REP6-033] agreed that the conclusions of the Applicant's HRA Report [APP-201] are appropriate for Norfolk Boreas alone.

²² Secured through Schedules 9 and 10, Part 4, Condition 14(1)(d)(i); Schedules 11 and 12, Part 4, Condition 9(1)(d)(i); and Schedule 13 Part 4, Condition 7(1)(d(i)) of the dDCO.

h) In-combination effects

Underwater noise - piling

The Applicant's in-combination assessment [Section 8.3.1.5.3 of APP-201] was undertaken based on the potential worst-case scenario of four other offshore wind farm developments (Dogger Bank Creyke Beck A, Dogger Bank Teesside A, Hornsea Project Three and East Anglia ONE North) piling at the same time as Norfolk Boreas. The assessment indicates that:

- if single piling at the five offshore wind farms was undertaken at the same time, less than 20% of the SNS SAC summer area and SNS SAC winter area would be affected, based on the minimum and average overlap of the potential worst-case scenario, and less than 20% of the SNS SAC winter area could be affected based on the maximum overlap; and
- if concurrent piling took place at each of the five offshore wind farms, there is the potential for more than 20% of the SNS SAC summer area to be affected based on the maximum potential overlap for single or concurrent piling; or more than 20% of the SNS SAC winter area could be affected.

The Applicant considered it unlikely that concurrent piling would occur at all five sites at exactly the same time. Therefore, it considered the assessment based on the concurrent piling scenario to be highly conservative.

The Applicant proposed a SNS SAC Site Integrity Plan (SIP) to mitigate in-combination impacts of underwater noise from construction and decommissioning. The SIP would set out the approach for Norfolk Boreas Limited to deliver any project mitigation or management measures in relation to the SNS SAC in agreement with the Marine Management Organisation (MMO) and relevant Statutory Nature Conservation Bodies (SNCBs) to an extent whereby no AEoI is expected [Section 8.3.1.5.3 of APP-201]. The SIP would be an adaptive management tool to ensure that the most adequate, effective and appropriate measures are put in place to reduce disturbance of harbour porpoise. An In Principle SIP was submitted with the application [APP-708] and would be a certified document within the dDCO. A final SIP is to be submitted for approval in the event that piled foundations are used, as required under Condition 14(1)(m) of dDCO Schedules 9 and 10 (the Generation Deemed Marine Licences (DMLs) and Condition 9(1)(l) of dDCO Schedules 11 and 12 (the Transmission DMLs).

NE advised [RR-099, AS-028, REP4-043 and REP7-050] that based on the SNCBs noise threshold guidance (20% of the SNS seasonal area per day, 10% over the relevant season) and the information currently available to feed in to cumulative impact assessments, an AEoI cannot be ruled out at this stage. It acknowledged that the production of a SIP allows for the HRA to be revisited when more information is available regarding all the relevant plans and projects and that the implementation of the most appropriate mitigation methods at that time and the regulation of projects could ensure works do not overlap to breach thresholds. However, until a mechanism to ensure in-combination impacts would be appropriately managed to ensure they remain within the site thresholds is developed, NE stated that the approach is not sufficient to address in-combination impacts and therefore the risk of AEoI on the SNS SAC cannot be fully ruled out.

TWT [RR-040, AS-031 and REP2-098] and WDC [REP2-048 and REP2-112] welcomed the Applicant's commitment to the production of a SIP, however they considered that the In Principle SIP lacks detail and more detail is required on the effectiveness of mitigation. TWT advised that the SIP should include referenced examples of how mitigation would reduce noise and that noise modelling should be undertaken to demonstrate the degree of noise reduction which could be achieved through mitigation. It was unable to conclude no AEOI due to the lack of a regulatory mechanism to manage in-combination underwater noise impacts.

WDC [REP2-048 and REP2-112] acknowledged that mitigation would be determined post-consent to make use of the latest research but highlighted a lack of detail in the In Principle SIP. It raised concerns that the SIP does not contain a commitment to proven mitigation methods or an assessment of the effectiveness of proposed mitigation methods. Furthermore, it noted that the in-combination assessment demonstrates the potential for large areas of the SNS SAC where harbour porpoise could be disturbed by piling activities. This could disturb a high percentage of the population from feeding and potential breeding activity and has the potential to cause barrier to movements to access other areas of the SNS SAC. Until the detail is decided, WDC considered it inaccurate to claim no AEOI beyond scientific doubt.

The Applicant considered [REP3-007] that the SIP would enable use of the most appropriate project related measures to be confirmed based on best knowledge, evidence and proven available technology at the time of construction and confirmed that mitigation would be agreed with the MMO, NE and where appropriate TWT and WDC. It agreed with NE that a strategic mechanism from the regulator is required to ensure that disturbance from in-combination effects can be limited to an acceptable level to ensure no AEOI [REP4-014]. The Applicant [AS-024] explained that further underwater noise modelling would be conducted pre-construction, if required.

The Applicant's approach was supported by the MMO [RR-069 and REP1-058] who explained that realistic in-combination information would only be available near the time of proposed activities, therefore a SIP is an appropriate control mechanism. It explained [REP3-016, REP4-035, REP6-045, REP7-040] that the MMO is part of a SNS SAC Underwater noise regulator group which is developing a management tool for all noise activity in the SNS. All regulators would input data into the tool with timetables and spatial impacts of noise generating activities in the SNS which would be publicly available to inform HRAs. It confirmed that progress was being made on the tool but funding applications are yet to be secured.

Underwater noise – other activities

The Applicant concludes that there would be no AEOI to harbour porpoise from in-combination noise disturbance with other activities (UXO clearance, seismic surveys, offshore Wind Farm construction activities and vessels (excluding piling) and offshore Wind Farm operation and maintenance, including vessels) [Section 8.3.1.5.4 and 8.3.1.5.5 of APP-201]. This conclusion has not been disputed by any IPs.

Indirect effects

The Applicant's assessment assumed there would be no additional effects other than those assessed for harbour porpoise, i.e. if prey are disturbed from an area as a result of underwater noise, harbour porpoise would be disturbed from the same or greater area, therefore any changes to prey availability would not affect harbour porpoise as they would already be disturbed from the same area. It concluded that any effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity. Any permanent loss or changes of prey habitat would typically represent a small percentage of the potential habitat in the surrounding area. The Applicant therefore concluded there would be no AEOI. [Section 8.3.1.5.6 of APP-201] This conclusion has not been disputed by any IPs.

Vessel interaction

The Applicant's assessment determined that the number of harbour porpoise that could have a potential increased collision risk with vessels in Offshore Wind Farm sites in the North Sea MU during construction would be 243 individuals, which represents 0.07% of the North Sea MU reference population (Table 8.54). The Applicant concluded no AEOI in relation to the conservation objectives for harbour porpoise. [Section 8.3.1.5.7 of APP-201]. This conclusion has not been disputed by any IPs.

Commercial fisheries

The HRA Report [APP-201] explained that potential impacts from commercial fishing (including by-catch and loss of prey species) are considered to be a part of the environmental baseline and are not considered further in the assessment for Norfolk Boreas. TWT [RR-040, AS-031 and REP2-098] considered that fishing should be included in the in-combination assessment and not the baseline as it is an ongoing licensable activity that has the potential to have an adverse impact on the marine environment. The Applicant [AS-024] stated that fishing has occurred within the SAC for many years and there is no reason to suggest it would increase beyond the baseline. NE [REP2-080] considered that the impact of ongoing fishing activity has been adequately captured for the purposes of HRA.