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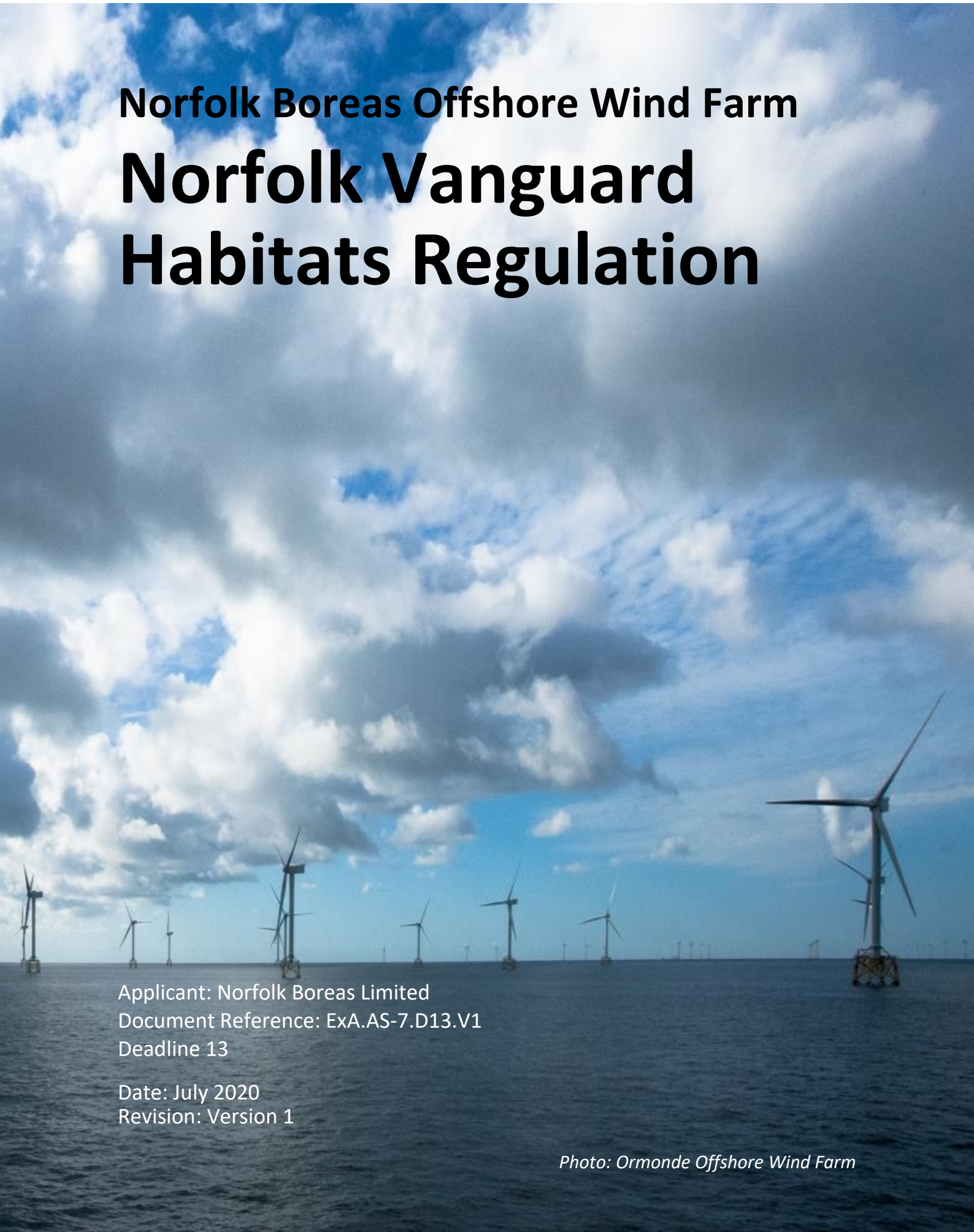

Norfolk Boreas Offshore Wind Farm

Norfolk Vanguard Habitats Regulation

Applicant: Norfolk Boreas Limited
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Department for
Business, Energy
& Industrial Strategy

NORFOLK VANGUARD HABITATS REGULATION

Regulation 63 of the Conservation of Habitats and Species Regulations 2017, and

Regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017

June 2020

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1 Introduction

1.1 Background

This is a record of the Habitats Regulations Assessment ("HRA") that the Secretary of State for Business, Energy and Industrial Strategy has undertaken under the Conservation of Habitats and Species Regulations 2017 ("the Habitats Regulations") and the Conservation of Offshore Marine Habitats and Species Regulations 2017 ("the Offshore Habitats Regulations") in respect of the Development Consent Order ("DCO") and Deemed Marine Licences ("dMLs") for Norfolk Vanguard and its associated infrastructure (the "Project"). For the purposes of these Regulations the Secretary of State is the competent authority (under the Habitats Regulations).

The planning application ("the Application") consent for the construction and operation of an offshore wind generating station of up to 1,800 MW installed capacity, situated off the coast of Norfolk. The Project would comprise of up to 158 wind turbine generators, and associated development including onshore and offshore underground and subsea electrical connections to an extension of the existing Necton National Grid substation and a modification to a short stretch of overhead line.

The Project constitutes a nationally significant infrastructure project (NSIP) as defined by s.14(1)(a) of the Planning Act 2008 as it is for an offshore generating station of over 100MW.

The Project was accepted by the Planning Inspectorate ("PINS") on 24 July 2018 and a four-member Panel of Inspectors ("the Panel") was appointed as the Examining Authority ("ExA") for the application. The Examination of the Project application began on 10 December 2018 and completed on 10 June 2019. The Panel submitted its report of the Examination, including its recommendation ("the ExA's Report"), to the Secretary of State on 10 September 2019.

On 6 December 2019, following the close of Examination, the Secretary of State invited interested parties to provide additional updates or information regarding certain issues including those relating to potential impacts on qualifying features of Natura 2000 sites [1].

1.2 Habitats Regulations Assessment (HRA)

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") and Council Directive 2009/147/EC on the conservation of wild birds ("the Birds Directive") aim to ensure the long-term conservation of certain species and habitats by protecting them from possible adverse effects of plans and projects.

The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation ("SACs"). The Birds Directive provides for the classification of sites for the protection of rare and vulnerable birds and for regularly occurring migratory species within the EU. These sites are called Special Protection Areas ("SPAs").

[1] BEIS (2019). *Application by Norfolk Vanguard Limited ("the Applicant") for an Order granting Development Consent for the proposed Norfolk Vanguard Offshore Wind Farm and associated offshore and onshore infrastructure ("the Norfolk Vanguard project"): Request for information and notification of the secretary of state's decision to set a new date for determination of the application*. Letter dated 6 December 2019.

SACs and SPAs are collectively termed European sites and form part of a network of protected sites across Europe. This network is called Natura 2000.

The Convention on Wetlands of International Importance 1972 ("the Ramsar Convention") provides for the listing of wetlands of international importance. These sites are called Ramsar sites. Government policy is to afford Ramsar sites in the United Kingdom the same protection as European sites.

In the UK, the Habitats Regulations and the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into national law as far as the 12nm limit of territorial waters. Beyond territorial waters, the Offshore Marine Habitats Regulations serve the same function for the UK's offshore marine area. The application covers areas within and outside the 12nm limit, so both sets of Regulations apply.

Regulation 63 of the Conservation of Habitats and Species Regulations 2017 provides that:

….before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in-combination with other plans or projects), and (b) is not directly connected with or necessary to the management of that site, [the competent authority] must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.

And that: In the light of the conclusions of the assessment, and subject to regulation 64 [IROPI], the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).

Regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 contains similar provisions:

Before deciding to undertake, or give any consent, permission or other authorisation for, a relevant plan or project, a competent authority must make an appropriate assessment of the implications of the plan or project for the site in view of that site's conservation objectives.

And that:

In the light of the conclusions of the assessment, and subject to regulation 29 [IROPI], the competent authority may agree to the plan or project only if it has ascertained that it will not adversely affect the integrity of the European offshore marine site or European site (as the case may be).

This application is not directly connected with, or necessary to, the management of a European site or a European marine site. The Habitats Regulations require that, where the project is likely to have a significant effect ("LSE") on any such site, alone or in-combination with other plans and projects, an appropriate assessment ("AA") is carried out to determine whether or not the project will have an adverse effect on the integrity of the site in view of that site's Conservation Objectives. In this document, the assessments as to whether there are LSEs, and, where required, the AAs, are collectively referred to as the HRA.

1.3 RIES and Statutory Consultation

Under the Habitats Regulations and the Offshore Habitats Regulations the competent authority must, for the purposes of an AA, consult the appropriate nature conservation body and have regard to any representation made by that body within such reasonable time as the authority specifies.

Natural England ("NE") is the Statutory Nature Conservation Body ("SNCB") for England and for English waters within the 12 nm limit. The Joint Nature Conservation Committee ("JNCC") is the SNCB beyond 12 nm, but this duty has been discharged by NE following the 2013 Triennial Review of both organisations

(Defra, 2013). However, JNCC retains responsibility as the statutory advisor for European Protected sites that are located outside the territorial sea and UK internal waters (i.e. more than 12 nautical miles offshore) and as such continues to provide advice to NE on the significance of any potential effects on interest features of such sites.

The ExA prepared a RIES, with support from the Planning Inspectorate's Environmental Services Team. The RIES was based on matrices provided by the Applicant and relevant information provided by Interested Parties. The RIES documented the information received during the Examination (up until 2 May 2019) and presented the ExA's understanding of the main facts regarding the HRA to be carried out by the Secretary of State.

The RIES was published on PINS planning portal website and the ExA notified Interested Parties that it had been published. Consultation on the RIES was undertaken between 9 May 2019 and 30 May 2019. The RIES was issued to ensure that Interested Parties, including the SNCBs, were consulted formally on habitat regulations matters, as required under regulation 63(3) of the Habitats Regulations and regulation 28(4) of the Offshore Habitats Regulations.

The Secretary of State is content to accept the ExA's recommendation that the RIES, and consultation on it, represents an appropriate body of information to enable the Secretary of State to fulfil his duties in respect of European sites.

In addition, this HRA has been compiled using evidence from the application documents and consultation responses, which are available on the Planning Inspectorate's Nationally Significant Infrastructure Project web pages[2]. In particular:

- The ExA's Report
- The Applicant's ES
- The Applicant's Report to Inform the Appropriate Assessment

Key information from these documents is summarised in this HRA.

[2] https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs

2 Development description

The offshore component of the Project would be situated off the coast of Norfolk, approximately 47 km from the shore at the nearest point (Figure 1). It would comprise two distinct offshore array areas, Norfolk Vanguard (NV) East and NV West occupying an area of roughly 592 km^2. The Southern North Sea SAC encompasses Norfolk Vanguard and the offshore cable corridor passes through the Haisborough, Hammond and Winterton SAC.

The main offshore components comprise:

- Up to 158 offshore wind turbines and their associated foundations;
- offshore electrical platforms;
- accommodation platforms to house offshore workers as required;
- up to two meteorological masts;
- measuring equipment (LiDAR and wave buoys);
- array cables;
- interconnector cables; and
- export cables to a connection point at Happisburgh on the Norfolk coast.

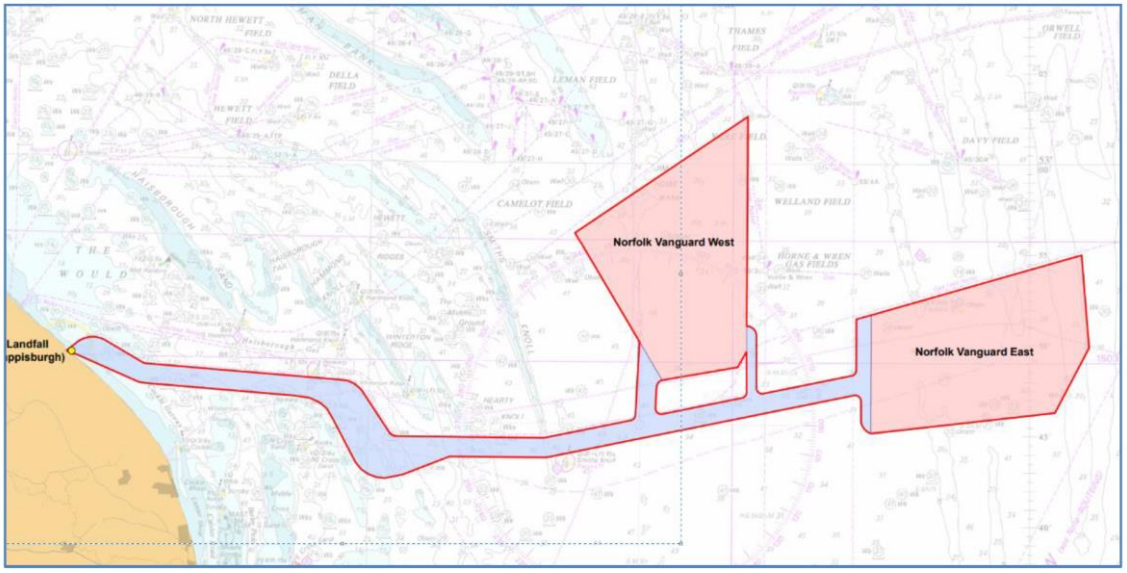

Figure 1: Proposed location of the Project (offshore works)

The buried export cable corridor would connect the offshore development to a landfall at Happisburgh South, Norfolk. The buried onshore cable corridor would run between the landfall and the proposed onshore project substation. The route is approximately 60 km long, running through predominantly agricultural land and nearby towns and villages include Happisburgh, North Walsham, Aylsham, Reepham, Dereham and Necton. The substation would be located to the east of the existing National Grid substation at Necton (Figure 2).

The key onshore components of the Project would comprise:

- landfall works including ducts installed under the cliff by horizontal directional drilling (HDD) and onshore transition pits;
- sets of ducting for Norfolk Vanguard cables and up to four sets for Norfolk Boreas cables through which the onshore cables would be pulled;
- surface water management, bunding, embankments, boundary treatments and landscaping
- trenchless crossing points at sensitive locations such as some roads, railways and sensitive habitats;
- mobilisation areas;
- highway works;
- onshore project substation; and
- extension to the Necton National Grid substation and overhead line modifications.

Figure 2: Proposed location of the Project (onshore works)

The parent company of Norfolk Vanguard Limited (Vattenfall Wind Power Ltd) is also developing Norfolk Boreas (Planning Inspectorate Case ref: EN010087) which would share a grid connection location as well as much of the offshore and onshore cable corridors with Norfolk Vanguard. As a result, the Development Consent Order application also includes some enabling works for Norfolk Boreas including:

- installation of ducts to house the Norfolk Boreas cables along the entirety of the onshore cable route from the landward side of the transition pit at the landfall to the onshore project substation; and
- overhead line modifications at the Necton National Grid substation for both projects.

The project design envelope sets out a series of design options for the project and has a reasoned minimum and maximum extent for a number of key parameters. The final design would lie between the minimum and the maximum extent of the consent sought for all aspects of the project. The final detailed design of the project, which would occur post-consent, would fall within this 'envelope'. In addition, post-consent/pre-construction site investigation would further inform the detailed design.

3 Likely Significant Effects Test

Under regulation 63 of the Habitats Regulations and regulation 28 of the Offshore Habitats Regulations, the Secretary of State must consider whether a development is likely to have a significant effect (LSE), either alone or in combination with other plans or projects on any European site.

The Secretary of State has applied a coarse filter to identify LSEs. He considers that any impact on a European site, from the Project alone or in-combination with other plans or projects, should be classified as an LSE unless impacts have been demonstrated to be trivial and inconsequential. In view of the evidence presented to him, he has identified LSEs on 15 sites. These sites, their features and the potential impact that is likely to have a significant effect is provided in Table 1. All the impacts listed have the potential to arise from the Project alone and in-combination with other plans and projects.

Table 1: European sites for which significant effects cannot be excluded, when the Project is considered alone or in combination with plans or projects, on the listed qualifying features (summarised from the ExA's Report and the RIES).

European Site	Distance from the Project	Feature(s)	Potential Impact
SPAs and Ramsar			
Alde-Ore Estuary SPA	92 km	Lesser black-backed gull	Collision with turbines during operation leading to mortality.
Breydon Water SPA and Ramsar	53 km	Avocet Bewick's swan Golden plover Assemblage Ramsar Criterion 5 and 6	Migrating birds colliding with turbines leading to mortality.[3]
Broadland SPA and Ramsar	3.6 km	Bewick's swan Whooper swan Ramsar Criterion 6	Impacts to *ex-situ* habitats.
		Great bittern Bewick's swan Whooper swan Eurasian wigeon Gadwall Northern shoveler Eurasian marsh harrier Hen harrier Ruff Ramsar Criterion 6	Migrating birds colliding with turbines leading to mortality.[3]
Flamborough and Filey Coast SPA	205 km	Gannet (breeding) Kittiwake (breeding)	Collision of foraging birds with turbines during operation leading to mortality.
		Gannet	Displacement from the array of foraging birds leading to mortality.

[3] The ExA's report stated that displacement/disturbance and barrier effects were likely to be significant, but no evidence has been presented by the Applicant or any other interested party to support this.

		Razorbill Guillemot Seabird Assemblage	
Greater Wash SPA	0 km from export cable, 36 km from array	Red-throated diver Common scoter	Disturbance and displacement of overwintering birds during cable laying.
		Little gull	Collision of overwintering birds with turbines during operation leading to mortality.
North Norfolk Coast SPA and Ramsar	80 km	Great bittern Pink-footed goose Dark-bellied brent goose Eurasian wigeon Eurasian marsh harrier Pied avocet Red knot Montagu's harrier Ramsar Criterion 5 and 6	Migrating birds colliding with turbines leading to mortality.[3]
Outer Thames SPA	21 km	Red-throated diver (non-breeding)	Disturbance and displacement of overwintering birds during cable laying.
SACs			
Haisborough, Hammond and Winterton SAC	0 km (cable route intersects SAC)	Sandbanks slightly covered by seawater at all times Reef	Permanent loss (and introduction of new substrate where applicable). Temporary physical disturbance. Smothering due to increased suspended sediment. Re-mobilisation of contaminated sediments.
Norfolk Valley Fens SAC [4]	0.6 km	Alkaline fens Northern Atlantic wet heaths with *Erica tetralix* European dry heaths; Molinia meadows on calcareous, peaty or clayey-silt-laden soils	Indirect effects on features present within *ex-situ* habitats of the SAC arising from air quality and groundwater / hydrology effects.

[4] Although a number of potential effects on Norfolk Valley Fens SAC were identified within the ExAs RIES, during Examination only impacts relating to groundwater/hydrology effects were considered. Having considered the ExA report and representations made by NE, the Secretary of State does not accept that the Project will have an LSE arising from air quality on the qualifying features of the site.

		Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* Semi-natural dry grasslands and scrubland facies on calcareous substrates Narrow-mouthed whorl snail Desmoulin's whorl snail	
Paston Great Barn SAC[5]	2.9 km	Barbastelle bats	Direct effects in *ex-situ* habitats of SAC. Indirect effects in *ex-situ* habitats from light and groundwater/hydrology effects. Construction Phase noise disturbance.
Southern North Sea SAC	0 km	Harbour Porpoise	Auditory injury and disturbance from underwater noise during piling operations. Vessel disturbance and collision. Changes to prey resource. Changes to water quality.
River Wensum SAC [6]	0 km	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Direct effects within the *ex-situ* habitats of the SAC. Indirect effects within the *ex-situ* habitats from geology/contamination/groundwater/hydrology effects.

[5] Although a number of potential effects on Paston Great Barn SAC were identified within the ExAs RIES, during Examination only construction phase noise disturbance was identified as having the potential to cause an LSE (Table 6.3 of ExA Report). Having considered the ExA report and representations made by NE, the Secretary of State disagrees with this conclusion and considers the direct effects in *ex-situ* habitats as having an LSE on the qualifying features of the site.

[6] Although a number of potential effects on River Wensum SAC were identified within the ExAs RIES, during Examination only Direct effects (e.g. habitat loss) on land within the SAC boundary was identified as having the potential to cause an LSE (Table 6.3 of ExA Report). Having considered the ExA report and representations made by NE, the Secretary of State agrees with this conclusion and considers the Direct effects within the *ex-situ* habitats of the SAC as having an LSE on the qualifying features of the site. The Project will not cause an LSE from Indirect effects within the *ex-situ* habitats from geology/contamination/groundwater/hydrology effects or Indirect effects within the SAC from geology/contamination/groundwater/hydrology.

		Desmoulin's whorl snail	Indirect effects within the SAC from geology/contamination/groundwater/hydrology effects. Direct effects (e.g. habitat loss) on land within the SAC boundary.
The Broads SAC	3.6 km	Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*; Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation; Transition mires and quaking bogs; Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae; Alkaline fens; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae); Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Desmoulin's whorl snail; Fen orchid; Ramshorn snail	Indirect effects upon habitats and species within the SAC boundary arising from changes in local groundwater / hydrology conditions. Direct effects (e.g. habitat loss) on land within the SAC boundary.
		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.
The Humber Estuary SAC	112 km from export cable,	Grey Seal	Disturbance at haul out sites and at sea collision with vessels leading to mortality.

	150 km from array area		
The Wash and North Norfolk SAC	33 km from export cable, 82 km from array	Harbour (Common) Seal	Disturbance at haul out sites and at sea collision with vessels leading to mortality.

4 Appropriate Assessment Methodology

The purpose of this AA is to determine whether or not adverse effect on the integrity of the features of the 15 sites identified can be ruled out as a result of the Project alone or in combination with other plans and projects in view of the site's conservation objectives and using the best scientific evidence available.

If the competent authority cannot ascertain the absence of an adverse effect on integrity within reasonable scientific doubt, then under the Habitats Regulations, alternative solutions should be sought. In the absence of an acceptable alternative, the project can proceed only if there are imperative reasons of overriding public interest ("IROPI") and suitable compensation measures identified.

4.1 Conservation objectives

Guidance from the European Commission indicates that disturbance to a species or deterioration of a European site must be considered in relation to the integrity of that site and its conservation objectives (European Commission, 2000). Section 4.6.3 of that guidance defines site integrity as:

…the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified.

Conservation objectives outline the desired state for a European site, in terms of the interest features for which it has been designated. If these interest features are being managed in a way which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation.

Conservation objectives have been used by the Secretary of State to consider whether the Project has the potential for having an adverse effect on integrity, either alone or in-combination on European Sites. The potential for the Project to have an adverse effect on site integrity is considered for each site in turn.

4.2 Marine Ornithology

The Secretary of State's Appropriate Assessment begins with a focus on SPA sites containing seabird populations upon which the project is likely to have a significant effect. Several aspects of the Applicant's approach to ornithological impact assessment remained unresolved among Interested Parties by the close of Examination. Disagreements remained on seabird matters relating to the Flamborough and Filey Coast SPA, the Alde Ore Estuary SPA. Following the close of Examination the Secretary of State requested further information in relation to certain impacts including in-combination impacts on the qualifying kittiwake feature of the Flamborough and Filey Coast Special Protection Area ("SPA") and the qualifying lesser black-backed gull feature of the Alde-Ore Estuary SPA (BEIS 2019)[7].

Before undertaking an Appropriate Assessment for these sites, the Secretary of State has summarised the various positions expressed both during the Examination on seabird matters, as reported in the ExA

[7] BEIS (2019). *Application by Norfolk Vanguard Limited ("the Applicant") for an Order granting Development Consent for the proposed Norfolk Vanguard Offshore Wind Farm and associated offshore and onshore infrastructure ("the Norfolk Vanguard project"): Request for information and notification of the secretary of state's decision to set a new date for determination of the application*. Letter dated 6 December 2019

report and in the RIES and in subsequent responses to the request for further information made by the Secretary of State.

4.2.1 Bird Density

Throughout the Examination, NE advised that the upper 95% confidence intervals (CIs) on density be applied to the species abundance estimates to give a range of predicted mortalities. The Applicant believes that the 95% CIs are heavily weighted by a small proportion of the survey data whereas the mean is more representative of all the years' data. As such the Applicant contends that the use of 95% CIs without full consideration of the underlying distributions has the potential to introduce very strong precaution.

NE [REP9-057] notes that surveys are unlikely to capture the full extent of variation in density/abundance of seabirds and this uncertainty in the survey dataset needs to be properly addressed. NE considers it entirely appropriate for the Applicant to present values from both upper and lower confidence limits for consideration.

The RSPB [REP9-063] also considers that whilst the mean or other measures of central tendency are the figures used in the assessment, the confidence levels allow consideration of the variability and therefore the uncertainty. Consequently, not to express such uncertainty would not be in accordance with the precautionary principle.

The Applicant subsequently presented bird density data including the confidence intervals in subsequent submissions.

The ExA is of the view that it is appropriate to consider the upper confidence level due to the inherent degree of uncertainty that is likely to exist in the ornithological data.

4.2.2 Collision Risk Modelling (CRM)

4.2.2.1 Model Used

The Applicant's CRM calculations [APP-217] were produced using scripted versions (in R) of the Band (2012) model (hereafter referred to as the Applicant's stochastic CRM). During Examination concerns were raised by NE [RR-106][REP1-088] and RSPB [RR-197] over the suitability of the CRM. In particular the suitability of the Applicant's stochastic model over the NE and RSPB preferred deterministic model.

Further to discussions during Examination, and as a result of change to the worst case scenario, the Applicant provided a number of revisions to the CRM; firstly at Deadline 6 [REP6-021], secondly as an additional submission between Deadline 6 and 7 [AS-043] which was accepted at the discretion of the examining authority, and at Deadline 7 [REP7-062] (see below for further details). These were based on the Band (2012) deterministic model.

At Deadline 9 the Applicant and NE agreed to use the following for CRM:

- Band option 2 deterministic CRM, presenting results for mean seabird density (and 95% CI),
- NE advised species specific avoidance rates (+/- 2 SD),
- BTO flight height estimates (and 95% CI) and
- NE advised nocturnal activity rates [REP9-046].

Additional CRM was undertaken by the Applicant during the post-Examination period following a reduction in the number of turbines and an increase in the minimum draught heights (Vattenfall 2020a)[8] (see section 4.2.2.3). Natural England agrees with the revised CRM figures calculated by the Applicant for the Project for both kittiwakes from the Flamborough and Filey Coast SPA and for lesser black-backed gulls from the Alde-Ore Estuary SPA (Natural England 2020)[9].

4.2.2.2 Median Bird Density Values

NE ([RR-106][REP1-088], comments on Appendix 3.2 in [REP3-051],[REP4-062) and RSPB [RR-197][REP1-110] raised concerns over the use of median bird density values within the CRM and advised that mean values were used, as had previously been used for offshore wind farm assessments.

Further to these discussions, the Applicant's revised CRM assessments [REP6-021] [AS-043] and [REP7-062] were presented based on mean values.

4.2.2.3 Revision of Worst-Case Scenario

At Deadline 4, the Applicant (Q23.64 of [REP4-040]) explained that it had removed the option to use the smallest and most numerous 9 MW turbine. The increase in minimum turbine size was welcomed by the RSPB [REP6-038] and the Applicant's Deadline 6 updated CRM [REP6-021] used parameters for the 10 MW turbine as a worst-case scenario. The Applicant explained that this reduced collision risk for the project by approximately 10% [REP7-059].

Following a review of the project design, the Applicant revised the wind turbine layouts (in addition to exclusion of the 9 MW turbine) and subsequently submitted an update to seabird collision risk estimates in an additional submission [AS-043]. The revised wind turbine layout would be based on the following maximum proportion of turbines which could be installed in either site with two alternative scenarios:

(a) the maximum proportion of turbines in NV West would be two-thirds (with one-third in NV East); or

(b) the maximum proportion of turbines in NV East would be half (with the other half in NV West).

The Applicant presented collision estimates for both scenario (a) and (b) for each species in order to identify the species-specific worst-case design, which reflected differences in the densities of a particular species across NV East and NV West; it confirmed that the higher estimate in each case represented the worst case for assessment. The Applicant stated that in all cases significantly lower collisions were estimated than those presented in the Deadline 6 CRM [REP6-021] and the average reduction in collision mortality was 34%.

The Applicant provided a revised assessment of effects (including an in-combination assessment) at Deadline 7 [REP7-062], which was based on the collision risk estimates presented in [AS-043].

[8] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020.

[9] Natural England (2020). *Norfolk Vanguard – Applicant's submission to Secretary of State Consultation Request for further information*. Letter dated 27 April 2020.

Subsequent to Examination the Applicant has further refined the turbine layouts at Norfolk Vanguard East and Norfolk Vanguard West, including a reduction in the number of turbines from 180 to 158 and an increase in the minimum draught heights of turbines to either:

- 35m above MHWS for turbine models of up to and including 14.6MW capacity; and
- 30m above MHWS for turbine models of 14.7MW and above (Vattenfall 2020a)[10].

The revised turbine layout is secured a an offshore parameters throughout the DCO.

4.2.2.4 Gannet Avoidance Rate

RSPB [RR-197][REP1-112][REP4-070][REP6-038][REP7-083] disagreed with the 98.9% avoidance rate used by the Applicant for gannet during the breeding season, stating that a 98% avoidance rate is more appropriate. However, the 98.9% avoidance rate was advocated by NE [RR-106][REP1-088]. The RSPB [REP7-083] confirmed that it would base its conclusions on the use of a 98% avoidance rate for the breeding season, although it did not submit any calculations using this rate.

4.2.2.5 Nocturnal Activity Factors

For breeding gannet and kittiwake of the FFC SPA, the Applicant's CRM (described in [APP-217]) used nocturnal activity rates derived from tracking studies undertaken by Furness *et al*. (2018). NE [RR-106] did not agree with their use as the studies had not been published nor were publicly available; instead it advocated the use of nocturnal activity factors as per Garthe & Hüppop (2004)[11]. RSPB [RR-197][REP1-110] also disagreed with the rates used by the Applicant and considered they would result in inaccurate underestimates of collision risk as they did not consider the potential interaction between survey timing and diurnal behavioural patterns.

Further to these discussions, the Applicant's Deadline 7 updated CRM [REP7-062] used a nocturnal activity rate of 25% for gannet and 50% for kittiwake and the Applicant and NE were in agreement in the use of its preferred nocturnal activity rates [REP9-046].

Regarding gannet, the RSPB [REP7-083] acknowledged that surveys had been spread through daylight hours, however noted that there was very little survey effort at first and last light, thereby likely missing the peak foraging times, and thereby peak mortality risk for several species. Regarding kittiwake, the RSPB stated the peer-reviewed data is extremely limited and patchy and cannot be relied upon.

4.2.2.6 Collision Risk Modelling Conclusions

The ExA is satisfied that further to the revisions made by the Applicant during the Examination, the CRM presented in the Applicant's final assessments which were in-line with the NE preferred approach to CRM [AS-048 and AS-049] is sufficiently robust and appropriate.

The Secretary of State recognises the precautionary approach to CRM being proposed and is satisfied that his conclusions in the Appropriate Assessment can be based on outputs from CRM based on the Applicant's revised project design.

[10] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020.

[11] Garthe, S. and Hüppop, O. (2004) Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. *J. Appl. Ecol.* 41: 724–734

4.2.3 Apportioning

4.2.3.1 Lesser Black-backed Gull to Alde-Ore Estuary SPA

NE [REP1-088][REP7-075] confirmed it was content with the apportioning rates used by the Applicant for the non-breeding season. However, NE [RR-106][REP1-088] queried the robustness of the evidence supporting the approach to apportion 25% of impacts to lesser black-backed gull during the breeding season, stating that the Applicant had not taken account of the distance each colony is from the Project site, or segregation; that there may be some colonies within the foraging range that should be considered; and that the Applicant had doubled the summed urban colonies figure based on the age of the data. It advised [REP7-075] that tracking data and the Applicant's original submission documents show evidence of potential connectivity between lesser black-backed gulls from the Alde-Ore Estuary SPA and the Project. RSPB [RR-197][REP1-110] similarly disagreed with the Applicant's methods and considered it unlikely that urban gulls would forage offshore to the same extent as those breeding at coastal 'natural' colonies and that the inclusion of urban birds therefore dilutes the potential significance of the impact. NE and the RSPB advocated the approach in Scottish Natural Heritage (SNH) guidance 2018 which is based on foraging range and colony factors [REP1-112][REP7-083].

The Applicant (response to Q23.35 of [REP1-007] and WQ 23.71 of [REP4-040]) responded stating that tracking data indicated very low connectivity between breeding lesser black-backed gull at Alde-Ore Estuary SPA and the Project site. It concluded that less than 3.5% of the lesser black-backed gulls at the Project during chick-rearing period are likely to originate from the Alde-Ore Estuary SPA and therefore considered apportioning 25% of breeding season impacts to the SPA as highly precautionary.

However, NE (Q23.35 [REP2-036] [REP3-051][REP4-062]) advised that tracking data would vary between years and that the foraging behaviour of town colonies still required consideration. RSPB [REP2-035][REP4-070] did not agree that diets from urban and rural coastal colonies would be similar and its position on apportionment remained unchanged.

At Deadline 6, the Applicant (Section 2.4 of [REP6-021]) explained that the lesser black-backed gull mean breeding season foraging range is 72 km from colonies; the mean maximum foraging range is 141 km; and a maximum recorded foraging range is 181 km. The Alde-Ore Estuary SPA is 92 km and is the only British lesser black-backed gull SPA colony within maximum foraging range from the Project; non-SPA lesser black-backed gull colonies also exist, including urban colonies in Suffolk & Norfolk and it is likely birds from these are present at the Project. It stated that data shows urban colony numbers have been increasing, whilst SPA colony numbers have been decreasing since 2000. The Applicant concluded:

- For the breeding season – based on relative population sizes and colony distance, combined with age ratios, the breeding adults from Alde-Ore Estuary SPA would comprise less than 17% of the on-site birds, while tracking data suggests this percentage would most likely be less than 3%.
- During migration – birds associated with the Alde-Ore Estuary SPA represent about 3.3% of the BDMPS; therefore, it is likely that about 3.3% of the estimated collision mortality during the autumn and spring migration periods would affect birds associated with the Alde-Ore SPA population, of which around 60% would be breeding adults (i.e. 2% of the total collision mortality would be breeding adults from Alde-Ore Estuary SPA).
- During winter – the proportion of birds from the Alde-Ore Estuary SPA would be approximately 5% of the BDMPS populations; hence, no more than 5% of the estimated collision mortality on the lesser black-backed gull population during winter would be apportioned to the Alde-Ore Estuary SPA breeding population.

Further to these discussions, the Applicant's Deadline 7 updated CRM [REP7-062] was presented based on the above seasonal apportionment figures. (Both breeding season values have been used in the

assessment for the breeding season and represent upper and lower limits on apportioning rates, derived from the available evidence). The Applicant provided further detailed justification for these apportioning rates in [REP7-062].

NE [REP7-075] acknowledged that the variable ecology of lesser black-backed gull between individuals within a colony and between seasons and years had made it difficult to determine an actual figure for use in apportionment. Therefore, it advised a full range of apportionment rates for the breeding season be considered, with a focus on rates between 10 and 30% to provide a realistic worst-case scenario of the proportion of birds from the SPA. The RSPB [REP7-083] noted that the Applicant's approach does not conform with NE's advice and did not agree with the apportioning out of juveniles. It argued that doubling the 17% breeding season apportioning value would be reasonable and appropriate and has based its conclusions on that value.

On a related matter, the was also some discussion on how to define the breeding season. NE [RR-106][REP1-088] advised that as the Project is located within the mean-maximum foraging range of lesser black-backed gull from the Alde-Ore Estuary SPA, the breeding season should be defined as the full breeding season presented in Furness (2015). The Applicant confirmed that the assessment for lesser black-backed gull considered both the migration free and extended breeding season [REP2-036]. However, NE [RR-106][REP1-088][REP4-062] stated that it was unclear whether the Applicant had adjusted the migration seasons to account for overlapping months. The Applicant [REP6-021],stated that it considered the migration free season to be more appropriate for assigning collisions to the SPA; nonetheless it also presented the full breeding season in its Deadline 7 revised CRM [REP7-062].

NE also disputed the Applicant's approach to apportioning of in-combination impacts. It confirmed [REP7-075] the Applicant's approach to apportion 4% of in-combination impact in the non-breeding season was acceptable but considered that the generic rate of 30% apportionment to the total breeding season collision predictions from all wind farms within 141 km of the SPA was overly simplistic; it advised using the apportionment rates used by the other wind farms in their assessments.

At Deadline 9 the Applicant maintained the position that there was no justification for the assessment to be based on a range of percentages for which, in their opinion, there was no justification [REP9-031].

The ExA did not consider the level of precaution applied to the Applicant's assessment as a result of NE's advice to be excessive and supported NE's preferred approach to apportioning impacts of lesser black-backed gull.

4.2.3.2 Kittiwake to FFC SPA

The Applicant's HRA Report [APP-045] apportioned 16.8% of birds present during the breeding season to the FFC SPA colony. However, NE had concerns over the Applicant's use of a 16.8% apportionment figure [RR-106][REP1-049][REP3-051]. Both NE [RR-106][REP1-088] and RSPB [RR-197][REP1-112][REP6-038] advised that the Applicant should consider RSPB kittiwake tagging data from 2017 which indicates that birds from the FFC SPA do forage within the the Project, particularly NV West, and then revisit the breeding season apportionment.

The Applicant [REP2-003] expressed concerns about the RSPB kittiwake data and explained (Q23.72 of [REP4-040]) that it had followed the approach adopted for the Dogger Bank Creyke Beck, Dogger Bank Teesside and East Anglia Three projects.

Nevertheless, at Deadline 6, the Applicant incorporated the RSPB kittiwake tagging data into its assessment to inform the estimates of connectivity between the FFC SPA and the Project. It concluded that a precautionary upper value of 26.1% of kittiwakes at the Project could be from the FFC SPA adult (breeding) population and considered this to be a precautionary figure as it does not allow for the

presence of breeding adults from closer colonies, nor of Russian and Norwegian immatures. The Applicant refuted NE's suggestion that a wider range of possible breeding season connectivity percentages should be considered (including up to 100% of birds at the Project during the breeding season being treated as birds from the FFC SPA) [REP6-021].

The 26.1% breeding season apportioning rate was further justified by the Applicant in the Deadline 7 revised assessment (see below); NE was unable to comment on this justification before publication of this RIES. However, it advised [REP7-075] the Applicant to present data on the proportions of adult kittiwakes recorded in their baseline surveys in order to provide some level of confidence in the assumption that kittiwakes in the breeding season at NV would be predominantly immatures. It continued to advise presentation of a range of apportionment rates due to the difficulties in determining an apportionment figure. It highlighted concerns that the 26.1% value was not suitably precautionary and considered the 86% value obtained from the SNH tool should be applied by the Applicant.

The RSPB [REP6-038] also did not agree with the apportioning rates used by the Applicant and was concerned with the assumption of a 250 km foraging range given that the current maximum foraging range is 350 km (based on recent tag recoveries). It suggested [REP7-083] doubling the Applicant's 26.1% value would be a reasonable approach; it therefore based its conclusions on that value.

At deadline 8 the Applicant also provided a review of kittiwake demographic and distribution data [REP8-067] to explore the likely proportions of adult (breeding) and immature birds present at sites offshore and in relation to proximity to breeding colonies in the SNS.

4.2.3.3 Gannet to FFC SPA

The HRA Report [APP-045] apportioned 100% of the total collisions to the FFC SPA in the breeding season. However, NE [RR-106] noted that only the migration-free breeding season (May to July) had been used for gannet assessments. It advised [RR-106][REP1-088] that as the Project is located within the mean-maximum foraging range of gannets from the FFC SPA colony, the breeding season should be defined as the full breeding season presented in Furness (2015); this could alter the number of collisions in each season and hence the overall annual figure apportioned to the FFC SPA. This concern was shared by RSPB [RR-197][REP1-112].

The Applicant (response to Q23.36 [REP1-007]) noted differences in the interpretation of the breeding season amongst studies. It justified the use of the migration-free breeding season on the basis that tracking data suggests gannets breeding at FFC SPA do not normally forage in the vicinity of the Project. It stated that peak gannet numbers seen at the Project occur during autumn migration but are most likely to be birds from different colonies; and that gannet numbers at the Project during breeding season are low and most likely to be birds migrating through the area rather than breeding adults from FFC SPA.

Nevertheless, the Applicant stated that using the Furness (2015) breeding season of March to September, there would be an increase in background mortality by 0.36% and stated that this would not alter the conclusions.

The Applicant also applied the JNCC breeding season of May to September and concluded that this would result in slightly lower collision mortality than the Applicant had originally calculated.

For Autumn and Spring, the HRA Report apportioned 4.2% and 5.6% of the total collisions to the FFC SPA, respectively. The Applicant (response to Q3.11 [REP1-007]) confirmed that the gannet BDMPS used in the non-breeding season apportionment of gannets to the FFC SPA were those presented in Furness (2015). However, NE [REP2-037] stated that it did not calculate the same apportionment figures as the Applicant and advised figures of 4.8% for autumn and 6.2% for spring (which were slightly higher than those used by the Applicant of 4.2% for autumn and 5.6% for spring). It considered that if the

Applicant wishes to use their preferred values, clarification was required as to how they were calculated. [REP2-036][REP3-051][REP4-062].

NE [RR-106] also raised concerns that the Applicant had applied a colony figure of birds of all ages in the gannet apportionment. It noted that as the existing PVAs were on adult currency, the calculations of baseline mortality should also be undertaken on adult currency. The Applicant (response to Q3.11 [REP1-007]) confirmed that it had used an all ages survival rate and that if an adult mortality rate was used, this would increase background mortality by 0.06% and 0.024% - below the 1% increase threshold at which effects are considered detectable and therefore would not alter the conclusions of the assessment.

The Applicant (Q23.72 of [REP4-040]) explained its approach to seasonal apportionment followed that adopted for the Dogger Bank Creyke Beck, Dogger Bank Teesside and East Anglia Three projects.

By the close of Examination, NE and the Applicant agreed that the methods used to define seabird breeding seasons were appropriate [REP9-046].

4.2.3.4 Razorbill to FFC SPA

NE [REP7-075] advised that data in Appendix A of Furness (2015) should be used for the relevant species BDMPS for each season. It advised that razorbill abundance figures for NV East and NV West were incorrect and that the Applicant should update the assessment using the following apportionment rates before conclusions can be drawn:

- 3.4% for autumn/post-breeding season
- 2.7% for winter/non-breeding season
- 3.4% for spring/pre-breeding season

Subsequently [REP8-069], the Applicant revised the assessment based on the NE preferred apportionment rates.

4.2.3.5 Guillemot to FFC SPA

NE advised the Applicant apportioned 100% for projects within mean maximum foraging range (Teesside, Westermost Rough, Humber Gateway, Triton Knoll), 46.3% for Hornsea One and Two; 35% for Dogger Bank Creyke Beck and Dogger Bank Teesside. It advised a non-breeding season apportionment rate of 4.4%.

The Applicant presented a revised assessment on displacement of guillemots based on the NE preferred apportionment rates [REP8-069].

4.2.3.6 Puffin to FFC SPA

NE advised the Applicant should apportion:

- 100% for projects within mean maximum foraging range (Humber Gateway, Teesside, Westermost Rough, Triton Knoll), except for Hornsea Project Two where 38% apportioning applied based on proportion of adults in baseline surveys during the breeding season;
- 38% for Hornsea Project One;
- 30% for Dogger Bank Creyke Beck and Dogger Bank Teesside; and
- 50% for Hornsea Project Three

The Applicant presented a revised assessment on displacement of puffins based on the NE preferred apportionment rates [REP8-069].

4.2.4 Population Models

4.2.4.1 Gannet and Kittiwake at FFC SPA

In considering the implications of collision mortality from the Project in-combination with other plans and projects, the Applicant referred to threshold levels of annual mortality that gannet and kittiwake populations could sustain, derived using Potential Biological Removal (PBR) [APP-045].

Both NE [RR-106][REP1-088] and RSPB [RR-197][REP1-112][REP4-070] argued against the use of PBR, recommending that Population Viability Analysis (PVA) is used as an alternative as it allows the effects of factors such as density dependence, population trends and demographic parameters to be investigated and enables comparison of the change in population size with and without a windfarm project.

The Applicant explained that the PBR outputs had been referred to as an additional source of predictions about population consequences but are not relied upon to support the assessment (Q3.3 [REP2-044]).

In reaching its conclusions the Applicant had referred to the PVA model undertaken for the Hornsea Project Two (paragraphs 213 and 248 of [APP-045]). NE [RR-106][REP1-088] and RSPB [REP1-112] argued that PVA model was not adequate and listed a number of issues with the modelling approach.

The Applicant (Q23.26 of [REP1-007]) noted that the PVA models had previously been considered robust and explained that NE's advice had changed regarding how models are run and how results are presented. It asserted that that the models remain reliable, despite being produced before NE adopted the matched-pair advice. It argued (Q23.27 [REP2-004]) that:

- since the models were produced, the cumulative effects have not increased beyond the span of mortalities assessed and therefore the results remain valid; and
- the methods used are either identical, or very slightly modified, when compared with those currently recommended by NE and therefore there is no justification for model revisions.

The Applicant further referred to the updated PVA produced for the Hornsea Project Three which presented a comparison of outputs obtained with NE's preferred 'matched run' methods with the previous 'non-matched runs' and demonstrated that there is no difference in the median (or mean) result. The Applicant considered this reduced NE's justification to revise the PVA and that the remaining aspects which NE raised were not sufficient to warrant re-running the PVA.

Nevertheless, NE [REP4-062] continued to argue that the PVA results referred to by the Applicant are not reliable and advised [REP4-051] consideration of outputs from PVA models should be presented for any impacts where background mortality rate is increased by more than 1%. It advised that updated PVA may be required for species/populations for which current outputs were not conducted following current guidance to use a matched run approach, with counterfactual outputs and for a 30-year simulation period and that PVAs for Hornsea Project Three could be used to support the assessment.

Both RSPB [REP6-038] and NE [REP6-032][REP7-075] advised that density independent models should be used to interpret the population scale impacts of the CRM.

The Applicant acknowledged the challenges in estimating density dependence, however considered this did not prevent exploration of alternative methods for simulating density dependence in PVA models ([REP7-059]). Its Deadline 6 and Deadline 7 updated assessments [REP6-021] and [REP7-062] presented both density dependent and density independent values to enable the difference in predictions to be seen. It used the Hornsea Project Three PVA for FFC SPA.

NE clarified it's position with regard to use of density dependent population models at Deadline 9. In that it was not the case that Natural England advised that density dependent regulation should be excluded

from PVA models but where there is no clear evidence to support the application of any particular form or magnitude of density dependence in a given model, Natural England based its advice on the outputs of the density independent PVA model, as these make no assumptions about the form or strength of any density dependent effects.

The ExA considers that there is currently insufficient certainty about exactly how density dependence operates within the relevant populations. Until more detailed analysis of the factors governing density dependence is available the EXA considers it prudent to use a density independent approach.

The Secretary of State recognises that both approaches to population modelling have their merits and that both could justifiably be used. However, for the purposes of this assessment the Secretary of State has followed the recommendations made by the ExA and the results from density independent PVA model have been considered.

4.2.4.2 Lesser Black-backed Gull to Alde-Ore Estuary SPA

For lesser black-backed gull, the Applicant originally proposed to refer to the PVA produced for the Galloper windfarm. However, NE [RR-106] argued that the Galloper PVA model was not adequate due to several issues with the models. It advised that these issues should be considered by the Applicant before any conclusions can be made regarding the significance of in-combination collision impacts on lesser black-backed gull.

RSPB also recommended that a that a full assessment, including PVA, should be carried out [RR-197][REP1-110][REP1-112].

The Applicant therefore developed a PVA for the lesser black-backed gull population [REP6-020] at Deadline 6 using demographic rates taken from a review conducted by British Trust for Ornithology (BTO) and run 1,000 times for both density dependent and density independent versions. NE [REP7-075] confirmed that the model had been run as per its advice. However, it advised that a larger number of simulations would potentially be needed to generate reliable results (i.e. 5,000 simulations) and requested the Applicant to set out how it had calculated the metrics. NE did not consider there was evidence to support the Applicant's assumption in [REP6-020] that baseline population growth would be in excess of 10% and stated that it could not validate the Applicant's conclusion.

At Deadline 7, the Applicant provided updated graphs of counterfactuals of population size and population growth rate, estimated across 5,000 simulations and the inclusion of 95% confidence intervals to respond to NE's concerns [REP7-063].

The RSPB [REP7-083] also undertook its own calculations presenting Counterfactuals of Population size as percentage reduction in population after 30 years. It concluded that in-combination mortality has the potential to cause significant declines in the Alde-Ore Estuary SPA lesser black-backed gull population and that AEOI cannot be excluded as result of predicted in-combination collision mortality with other plans and projects.

Although NE had some reservations over the PVA models for lesser black-backed gull, it considered that they represent the best available evidence on which to base an assessment [REP8-104].

4.2.5 Consideration of Fishing in-combination

The Applicant's assessment considered fishing as part of the environmental baseline. However, The Wildlife Trust (TWT) [RR-172][REP1-062][REP1-123][REP3-063] considered that fishing should not be part of the baseline but should be included in the in-combination assessment for all offshore European sites as a 'project'. It considered the Waddenzee [2004] ECR judgement and Defra policy11 supported this position.

In response, the Applicant [REP3-004] referred to the draft HRA for the Review of Consents (RoC) for the Southern North Sea SAC from which it inferred that the inclusion of commercial fisheries would have no effect on the conclusions reached in the in-combination assessment. It also referred to NE's response to a similar question on the Hornsea Three Project which it considered suggested that commercial fisheries would usually be captured as part of baseline unless activity is too variable to be adequately affected. The Applicant did not update its assessment as requested by TWT.

On the authority of C127/02 Waddenzee [2004] ECR I-7405 the Secretary of State accepts that fishing is a plan or project that should be subject to assessment each time an application for a licence is considered. From a technical point of view, each new fishing licence renewal is a new plan or project and he therefore accepts that the potential for new fishing plans or projects should be considered in any in combination assessment.

However, from a practical point of view, if the effects of the on-going activity have already been assessed in the baseline then it would not serve the purpose of the legislation to assess the effects of a continuing, existing activity for a second time unless there is evidence to suggest that a new licence is being applied that will seek to intensify or extend the fishing.

As the Secretary of State has no such evidence and no indication of future fishing activity he concludes that fishing activity should not be considered as an in combination effect.

4.2.6 Consideration of Hornsea Three and Thanet Extension in-combination

The HRA Report [APP-045] utilised 'preliminary estimates' of collision mortality for Hornsea Project Three and Thanet Extension wind farms. The Applicant updated the in-combination assessment [AS-006], following submission of DCO applications for these projects, stating that the overall conclusion of no AEOI remains.

The provision of the revised in-combination assessment was welcomed by NE. However, they noted methodological issues and uncertainties associated with the baseline data and assessments completed by Hornsea Project Three and some methodological issues identified with the assessments for Thanet Extension. On that basis NE was unable to reach conclusions on the scale of in-combination displacement and collision risk impacts [RR-106][REP1-088][REP2-038].

NE subsequently confirmed [REP6-032] that the Hornsea Project Three Examination had closed on 2 April 2019 and that due to insufficient baseline surveys it is not possible to rule out AEOI from the project. It therefore advised the Applicant to ensure that the assessment and figures presented for the project alone are as robust as possible and that the Applicant should consider opportunities to minimise the project alone impacts as much as possible. It suggested the Applicant could base their in-combination assessment on where there is some degree of certainty in the figures presented, e.g. for East Anglia Three cumulative totals, and then adding the figures for both the Project and Thanet Extension. The Applicant could also run a separate assessment which includes Hornsea Project Three and present both figures. The RSPB [REP6-038] supported NE's concerns regarding the baseline data and their recommended approach to the use of Hornsea Three figures.

The Applicant's updated in-combination assessments [REP6-021], which was subsequently replaced by [REP7-062], therefore comprised two sets, one including and one excluding the Hornsea Project Three datasets (from the Hornsea Project Three Environmental Statement). They also included Thanet Extension values from the Thanet Deadline 3 submission.

Ørsted (the Hornsea Project Three Applicant) argued [REP7-081] that its ornithological baseline is robust, and its assessment is highly precautionary; therefore, it considered an AEOI could be excluded for the

Hornsea Three Project. It did not agree that there is any basis upon which to depart from the normal approach of assessing in-combination effects and that until the Hornsea Three Project is determined, it must be considered within the the Project in-combination assessment.

The Secretary of State has considered the concerns raised over the incomplete baseline ornithology data raised during Examination of the Hornsea Three project. He is also aware of the supplementary aerial survey data collected between January and March 2019 which was obtained in order to determine whether there was variability in the density of key species that was significantly different to that assumed in the application and examination of Hornsea Three. The subsequent assessment showed that the predicted number of gannet collisions incorporating the additional data were identical to those previously assessed (Ørsted 2019)[12]. Consequently, he does not agree with the concerns raised regarding the incomplete baseline surveys and their use in the in-combination impact assessment.

[12] Ørsted (2019*). Hornsea Project Three Offshore Wind Farm Ornithology Baseline Data Comparison*. 31 July 2019.

5 Appropriate Assessment

5.1 Appropriate Assessment: Alde-Ore Estuary SPA

The Alde-Ore Estuary is located on the Suffolk coast in eastern England. It comprises the estuarine complex of the rivers Alde, Butley and Ore, including Havergate Island and Orfordness. There is a variety of habitats including intertidal mud-flats, saltmarsh, vegetated shingle (including the second-largest and best-preserved area in Britain at Orfordness), saline lagoons and semi-intensified grazing marsh. The Orfordness/Shingle Street land form is geomorphologically unique within the UK in combining a shingle spit with a cuspate foreland. The diversity of wetland habitat types present is of particular significance to the birds occurring on the site as these provide a range of opportunities for feeding, roosting and nesting within the site complex. At different times of the year, the site supports notable assemblages of wetland birds including seabirds, wildfowl and waders. As well as being an important wintering area for waterbirds, the Alde-Ore Estuary provides important breeding habitat for several species of seabird, wader and raptor. During the breeding season, gulls and terns feed substantially outside the SPA.

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of several wetland and marine species listed on Annex I of the Directive. The site also qualifies under Article 4.2 of the Directive for supporting assemblages of over 20,000 wetland and marine birds.

One of the features protected by this site is the breeding population of lesser black-backed gull. As stated in Table 1, the Secretary of State has identified that the Project is likely to have a significant effect on this species, as individuals could collide with the turbines within the array.

The site's Conservation Objectives are available on the NE website Table 2[13]. Due to the potential for collision mortalities, the appropriate conservation objective to focus this assessment is the restoration of the lesser black-backed gull population. The current breeding population is estimated to be 2,000 pairs. The population has reduced from 14,000 pairs at the time of the original designation.

Table 2: Conservation objectives for the Alde-Ore Estuary SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The impact of collision on seabird populations can be predicted using collision risk modelling (CRM) techniques. CRM predicts the number of mortalities, that can then be apportioned to a SPA. Following

13 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9009112&HasCA=1&NumMarineSeasonality=8&SiteNameDisplay=Alde-Ore%20Estuary%20SPA#hlco

apportionment, population models are constructed to assess the impact of the predicted mortalities on the SPA population. The evidence base behind CRM, apportioning and population modelling is an evolving subject area and disagreements among the Interested Parties remain on the right approach to apply. Section 4 summarises the positions expressed by the Royal Society for the Protection of Birds (RSPB), NE and the Applicant on collision risk impact assessment for this SPA's breeding lesser black-backed gull population.

5.1.1 Lesser Black-backed Gull: Alone

During Examination the Applicant's final CRM and assessment [AS-048 and AS-049] used a breeding season apportionment rate of 17% and predicted that most collisions would occur during the second half of the breeding season and during early autumn (June to August). It calculated:

- up to 2.9 collisions for the full breeding season (35.1 using the upper 95% CI); and
- this would result in an increase in mortality of 0.6% (1.3% using the upper 95% CI).

The Applicant concluded that the annual number of collisions at Norfolk Vanguard is very small and would not materially alter the natural mortality rate for the population. As the increased mortality predicted as a result of mean collisions at Norfolk Vanguard is below the threshold of 1% at which increases in mortality are detectable, and the upper confidence limit only just exceeds this level, it concluded that there would be no AEoI of the Alde-Ore Estuary SPA as a result of lesser black-backed gull collisions at the proposed Norfolk Vanguard from the project alone.

NE [REP8-104] based its own calculations on the 10-30% seasonal apportionment range. It acknowledged that a breeding season apportionment of 30% is likely to be overly precautionary and that using this rate the collision prediction only just exceeds 1% of baseline mortality. NE therefore agreed with the Applicant that there would be no AEoI for the lesser black-backed gull for collision impacts from the project alone. The ExA agreed with this assessment.

Following Examination the Applicant has undertaken CRM based on the revised turbine layout and specification, namely a reduction in the number of turbines from 180 to 158 and an increase in minimum draught height to at least 30 m above MHWS. The results from the revised modelling, based on the NE preferred approach, predict a total of between 2.1 (CI 0.7 - 5.8) for the 11.55 MW turbine and 2.6 (0.1-7.1) for the 14.7 MW turbine option (Vattenfall 2020a)[14]. This is a 46% decrease in the predicted number of collisions at the close of Examination.

Both NE and RSPB welcomed the revised wind farm layout and turbine parameters and agreed that the there would not be an AEoI for lesser black-backed gull of the Alde-Ore Estuary SPA (NE 2020, RSPB 2020)[15] [16].

Having considered the number of predicted mortalities, the Secretary of State agrees that the Project alone will not have an adverse effect on the lesser black-backed gull feature of the Alde-Ore Estuary SPA.

[14] Vattenfall (2020a). Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020.

[15] Natural England (2020). *Norfolk Vanguard Offshore Wind Farm post examination consultation. Planning Inspectorate Reference: EN010079.* 27th April 2020.

[16] RSPB (2020). *Written Submission for The Royal Society for the Protection of Birds. Response to the Secretary of State's December 2019 Consultation*. 27 February 2020.

5.1.2 Lesser Black-backed Gull: In-combination

At the end of Examination the Applicant's final CRM and assessment [AS-048] calculated:

- an annual mortality of 35 (25.6 using as-built wind farm designs);
- an increase in mortality of 7.6% (5.5% using as-built wind farm designs); and
- with a worst-case adult mortality of 40, the population growth rate would be 1.3% lower than the baseline (density independent) or 0.4% (density dependent) (<0.9% using as-built wind farm designs).

The Applicant considered that the reduction in growth rate is very unlikely to have a detectable effect on the population and that the breeding success and hence population trend of lesser black-backed gull appeared to be mainly determined by the amount of predation, disturbance and flooding at the site. The Applicant ultimately concluded that there would be no AEoI from collision impacts on lesser black-backed gull in-combination with other plans and projects.

In undertaking its own calculations, NE [REP8-104] produced an annual in-combination total of 39 lesser black-backed gull collisions per year.

NE advised [REP8-104] that the Alde-Ore lesser black-backed gull population is at best currently stable. It concluded that if the additional mortality from the windfarm is 35 - 40 adults per annum, then the population growth rate would be reduced by 0.9 - 1% which, assuming that the population is stable, would mean that the population would be 22.5-25.2% lower than the current population size; this would result in the population declining below its current level. It stated that the population is likely to be hindered from restoration to target levels even when more optimistic assumptions about the population trend of the colony are made. Therefore, NE advised that it is not possible to rule out AEoI of the lesser black-backed gull feature of the Alde-Ore Estuary SPA for collision impacts from in-combination with other plans and projects and that the Project makes a meaningful contribution to the in-combination effects. [REP8-104 and REP9-057].

The RSPB [REP8-109] also did not agree an AEoI from in-combination collision mortality could be ruled out and considered that the population reduction after 30 years would be 31%.

The ExA was not persuaded that an AEoI on the lesser-black backed gull of the Alde-Ore Estuary SPA from in-combination collision risk can be excluded.

Both NE and RSPB maintain that an AEoI cannot be ruled out (Natural England 2020, RSPB 2020) [17] [18].

Having considered the information presented following closure of Examination, the Secretary of State does not agree that the Project in-combination will have an adverse effect on the lesser black-backed gull feature of the Alde-Ore Estuary SPA. Using NE's preferred collision risk modelling approach, the Secretary of State has concluded that the potential loss of a relatively very small number of birds through collision does not contribute in a significant way to the total number of birds predicted to be impacted in-combination. Although, the site has a 'restore' objective the potential loss of an additional three birds per year as part of an in-combination total will have a *de minimus* effect on that objective. The Secretary of State has therefore concluded that collision risk to lesser-black-backed gull from the proposed Development alone and in-combination would not represent an AEoI.

[17] Natural England (2020). *Norfolk Vanguard Offshore Wind Farm post examination consultation. Planning Inspectorate Reference: EN010079.* 27th April 2020.

[18] RSPB (2020). *Written Submission for The Royal Society for the Protection of Birds. Response to the Secretary of State's December 2019 Consultation*. 27 February 2020.

5.2 Appropriate Assessment: Breydon Water SPA and Ramsar Site

The Breydon Water SPA supports the following qualifying features

- Bewick's swan (Non-breeding)
- Pied avocet (Non-breeding)
- European golden plover (Non-breeding)
- Common tern (Breeding)
- Waterbird assemblage

Given the overlap in designation, the following Appropriate Assessment gives consideration to the Breydon Water Ramsar site, which protects:

- Ramsar criterion 5: assemblages of international importance
- Ramsar criterion 6: species/populations occurring at levels of international importance (including tundra swan, northern lapwing, and identified for possible future consideration: pink-footed goose, Eurasian wigeon, northern shoveler, European golden plover and black-tailed godwit).

The conservation objectives of the site are presented in Table 3.

Table 3: Conservation objectives for the Breydon Water SPA

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

The Secretary of State has identified an LSE on the above listed features due to due to the potential for migrating birds (migrating to and from the SPA/Ramsar) to collide with turbines.

5.2.1 All Features: Alone

5.2.1.1 Collision risk to migrating Birds

The Applicant provided a document called migrant non-seabird collision risk modelling at Deadline 6 [REP6-022]. The species assessed were those that are considered to have the potential to cross the Project array area. The list of species were agreed to be appropriate by NE. For each species, collision risk modelling predicted that more than 1 individual would collide each year. Such low numbers meant that background mortality would not go over the 1% threshold, which would ordinarily require the Applicant to undertake further population modelling. On this basis NE agreed that there would be no AEoI. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk from the Project alone will not have an AEoI on the protected species of the Breydon Water SPA/Ramsar.

5.2.2 All Features: In-combination

5.2.2.1 Collision risk to migrating Birds

At the request of NE the Applicant also considered the combined mortality of the Project and East Anglia Three offshore windfarm. However, whilst a slight increase was predicted, the increase in background mortalities remained below the 1% threshold. On this basis NE agreed that there would be no AEoI in-combination. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk from the Project in-combination with other plans and projects will not have an AEoI on the protected species of the Breydon Water SPA/Ramsar.

5.3 Appropriate Assessment: Broadland SPA and Ramsar Site

The Broadland SPA support the following qualifying features.

- Bewick's Swan (non-breeding)
- Bittern (breeding)
- Hen Harrier (non-breeding)
- Marsh Harrier (breeding)
- Ruff (non-breeding)
- Whooper Swan (non-breeding)
- Gadwall (non-breeding)
- Shoveler (non-breeding)
- Widgeon (non-breeding)

Given the overlap in designation, the following Appropriate Assessment gives consideration to the Broadland Ramsar site, which protects:

- Ramsar criterion 2: rare species and habitats within the biogeographical zone context
- Ramsar criterion 6: species/populations occurring at levels of international importance (tundra swan, Eurasian wigeon, gadwall, Northern shoveler, pink-footed goose and greylag goose)

The conservation objectives of the site are presented in Table 4.

Table 4: Conservation objectives for the Broadland SPA

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

The Secretary of State has identified an LSE due to the potential for impacts to occur on *ex-situ* habitats (i.e. habitats outwith the SPA, but used.by mobile SPA/Ramsar features). An LSE has also been identified due to the potential for migrating birds (migrating to and from the SPA/Ramsar) to collide with turbines

5.3.1 Impacts on overwintering birds: Alone

The Applicant's HRA Report [APP-045] noted that wintering qualifying features of the Broadland SPA are likely to utilise a range of supporting habitats outside the boundary of the SPA (*ex-situ* habitats) over the winter months. However, wintering bird surveys of the *ex-situ* habitats recorded waterbird counts that are not of national or greater importance, or a significant component of the Broadland SPA and Ramsar [APP-045] and [AS-044]. The Applicant's considered that the wintering bird survey baseline collected in 2016/2017 is sufficient to conclude that the qualifying features of the Broadland SPA and Ramsar site are not present within functionally-linked land located within an identified study area (comprising land located both within 5km of the Broadland SPA and Ramsar site and 300m of the onshore project area.

However, NE requested an assessment of impacts of cropping rotation on bird species to confirm whether the low numbers of birds in the Applicant's survey was due to the cropping regime of that particular year or genuinely represents low usage of those areas. NE advised that mitigation would be required in terms of crop rotations that would be in place at the time of construction. [RR-106, REP5-017 and REP6-032].

The Applicant [REP1-007] considered that the majority of crops were in place over winter within the wintering bird survey area and therefore the surveys provided a robust estimate of the use of these habitats by qualifying features of the Broadland SPA and Ramsar site. It explained that a single year of surveys was agreed with NE during the evidence plan process; this was acknowledged by NE [REP5-017].

Notwithstanding the above the Applicant later stated that, following consent, it would potentially undertake a second year of wintering bird surveys and undertake an assessment of predicted crop patterns to re-assess the potential bird use of the affected areas. Should it be required, suitable alternative foraging opportunities will be provided (by introducing feed) for potentially displaced qualifying species associated with Broadland SPA / Ramsar site elsewhere within the Order limits or (subject to separate landowner agreements) within nearby fields. The Applicant also stated that, alternatively, it may progress to delivering the additional suitable foraging oppertunities without the additional survey work. This was captured in the Outline Landscape and Ecological Management Strategy ("OLEMS") at deadline 9 [REP9-014, which].

NE subsequently agreed that there would be no AEoI for features of the SPA/Ramsar due to impacts on *ex-situ* habitats [REP9-046 and REP9- 057]. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate and that the impacts on *ex-situ* habitats from the Project alone will not have an AEoI at the Broadland SPA/Ramsar. His conclusion is strengthened by the provision of additional suitable foraging opportunities for SPA/Ramsar features (if necessary), as captured in the OLEMS, which the Applicant's Ecological management plan must accord with (Requirement 24 of the DCO).

5.3.2 Impacts on overwintering birds: In-combination

No other plans or project were identified that could contribute to an in-combination effect.

On this basis, the Secretary of State has concluded that the impacts on *ex-situ* habitats from the Project in-combination with other plans and projects will not have an AEoI at the Broadland SPA/Ramsar.

5.3.3 Collision risk to migrating birds: Alone

The Applicant provided a document called migrant non-seabird collision risk modelling at Deadline 6 [REP6-022]. The species assessed were those that are considered to have the potential to cross the Project array area. The list of species were agreed to be appropriate by NE. For each species, collision risk modelling predicted that more than one individual would collide each year. Such low numbers meant that background mortality would not go over the 1% threshold, which would ordinarily require the Applicant to undertake further population modelling. On this basis NE agreed that there would be no AEoI. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk will not have an AEoI on the protected birds of the Broadland SPA/Ramsar.

5.3.4 Collision risk to migrating birds: In-combination

At the request of NE the Applicant also considered the combined mortality of the Project and East Anglia Three offshore windfarm.

Whilst a slight increase in mortality was predicted, the increase remained below the 1% background mortality threshold. On this basis NE agreed that there would be no AEoI in-combination. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk from the Project in-combination with other plans and projects will not have an AEoI at the Broadland SPA/Ramsar.

5.4 Appropriate Assessment: Flamborough and Filey Coast SPA

The Flamborough and Filey Coast SPA is a coastal site covering an area of approximately 8,040ha which spans the East Riding of Yorkshire, North Yorkshire and Scarborough. Its marine extent covers approximately 7,472ha and it is located approximately 149 km from the Project. The SPA citation has a designated kittiwake population of 44,520 pairs in addition to gannet (8,469 pairs), guillemot (41,607 pairs) and razorbill (10,570 pairs), and a breeding seabird assemblage of 215,750 individuals. As part of a breeding seabird assemblage the SPA also supports 1,447 pairs of fulmar (a listed component of the assemblage) and 980 pairs of puffin (a non-listed component of the assemblage).

The conservation objectives of the site are presented in Table 5.

Table 5: Conservation objectives for the Flamborough and Filey Coast SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the population of each of the qualifying features • the distribution of qualifying features within the site

The Secretary of State has identified an LSE from the Project alone and in-combination due to the risk of collision leading to mortality for kittiwake and gannet populations, and displacement leading to mortality for razorbill, guillemot, puffin and gannet populations.

5.4.1 Kittiwake Collision Mortality: Alone

Using the 26.1% breeding season apportioning rate, the Applicant calculated [AS-048]:

- the maximum annual collisions apportioned to the FFC SPA using the full breeding season is 9.6; and
- this would increase mortality rate by 0.07%.

The Applicant concluded that this would be undetectable against natural variation and there would be no AEoI from the project alone.

NE [REP8-104] undertook its own calculations applying an 86% breeding season apportionment rate. It calculated:

- an annual total of 43 kittiwake collisions (CI 2 - 120); and
- an increase in baseline mortality of 0.33% (CI 0.02% - 0.93%) using the designated population, or 0.29% (CI 0.02-0.80%) using the mean 2016 - 2017 population.

Despite the differences compared to the Applicant's figures, NE advised that a conclusion of no AEoI of the kittiwake feature of the FFC SPA from collision risk from Norfolk Vanguard alone can be reached [REP8-104 and REP9-046].

The RSPB also agreed that a conclusion of no AEoI for the kittiwake population of FFC SPA due to collisions from the project alone was appropriate [REP8-089 and REP8-109].

Subsequent to Examination the Applicant updated the CRM to account for the reduction in the number of turbines and changes in the turbine parameters. The results from the modelling reduced the predicted number of kittiwake collisions by 50%, from the 43.8 (CI 2.0 - 120.0) at the end of Examination to between 13.9 (CI 1 - 39.9) and 21 (CI 1.2 - 60.2) depending on the final turbine size.

Both NE and RSPB agreed that there would not be an AEoI from the Project alone for kittiwake of the Filey and Flamborough Cliffs SPA (NE 2020, RSPB 2020)[19] [20].

In view if the predicted number of collisions from the Project alone the Secretary of State has concluded that collision mortalities from the Project alone, will not have an adverse effect on the kittiwake feature of the FFC SPA.

5.4.2 Kittiwake Collision Mortality: In-combination

Throughout the Examination, NE advised [REP2-038, REP4-062, REP6- 032 and REP8-104] that the in-combination threshold for kittiwake from FFC SPA had already been reached for previous offshore wind farms, dating back to the Hornsea Project Two Examination; consequently, all subsequent projects would continue to add to this cumulative collision total.

Nevertheless, the Applicant's revised assessment [AS-048] concluded no AEoI from in-combination collision mortality to kittiwakes of FFC SPA. It calculated:

- an in-combination total, all age class, annual FFC SPA kittiwake population collision estimate of 490 individuals (332.1 individuals without Hornsea Three);
- an increase in background mortality of 3.8% (2.5% without Hornsea Three); and at an adult mortality of 500, a maximum reduction in the population growth rate of 0.6% (0.4% without Hornsea Three) using the density independent model and 0.1% (both with and without Hornsea Three) using the density dependent model.

The Applicant concluded that this would represent a very small risk to the population's conservation status. It concluded that there is a small risk that further population growth would be restricted when considering a density independent model, but that the density dependent model (which argued to be appropriate) suggests only a very slight reduction in the growth rate. The Applicant concluded that there would be no AEoI of FFC SPA from collision impacts on kittiwake due to the proposed Norfolk Vanguard project in combination with other plans and projects.

[19] Natural England (2020). *Norfolk Vanguard Offshore Wind Farm post examination consultation. Planning Inspectorate Reference: EN010079.* 27th April 2020.

[20] RSPB (2020). *Written Submission for The Royal Society for the Protection of Birds. Response to the Secretary of State's December 2019 Consultation*. 27 February 2020.

By the close of Examination, NE [REP9-046] and RSPB [REP8-089] did not agree with the Applicant's conclusion. NE's own calculations and assessment of in-combination mortality, using a precautionary 86% breeding season apportionment rate and the density independent PVA outputs, were [REP8-104]:

- 547 annual collisions (366 without Hornsea Three);
- the population growth rate would be reduced by 0.6% (0.4% without Hornsea Three);
- the population of FFC SPA after 30 years would be 15.1-16.5% lower than it would have been in the absence of the additional mortality (10.8% without Hornsea Three); and
- Norfolk Vanguard's contribution to the in-combination total is 7.86% (11.76% without Hornsea Three).

NE's calculations were undertaken using a higher apportioning rate than the Applicant (86% compared to 26.1%) which has resulted in a greater number of in-combination collisions. However, both the Applicant and NE have reached the same conclusion regarding the reduction in population growth rate regardless of the method applied (i.e. a 0.6% reduction with Hornsea Three).

The Applicant presented arguments [REP9-031] that the predicted 0.6% reduction in population growth was very minor compared to a trend of around 7% growth over the last 20 years.

NE concluded that both with or without Hornsea Three, in-combination collision mortality to kittiwake of FFC SPA would be counter to the restore conservation objective for this feature at the site and that it could not advise beyond reasonable scientific doubt that this level of impact would not result in an AEoI. It further considered that the Project makes a meaningful contribution to the in-combination effects [REP8-104, REP9-046 and REP9-057].

The RSPB [REP7-083, REP8-089, REP8-109 and REP9-063] similarly considered that an AEoI exists from in-combination collision mortality irrespective of whether or not mortality from Hornsea Three is included. It argued that the Hornsea Three PVA demographic rates do not account for recent decline in kittiwake productivity at FFC SPA and did not agree the population can be considered to be at favourable conservation status. It maintained that the breeding season apportionment is too low and disagreed over the Applicant's exclusion of Norfolk Vanguard East during the breeding season. NE [REP9-057] similarly was of the view that kittiwake could travel as far as Norfolk Vanguard East

The Applicant challenged NE's conservation objective to 'restore the population to 83,700' as the Applicant considered that the figure mistakenly identified the population as pairs when in fact it referred to individuals. The population in 1987 is reported to have been 83,700 pairs, subsequent counts have reported between 40,000 to 50,000 pairs; approximately half that counted in 1987. NE maintain the population count in 1987 is accurate and does relate to pairs and not individuals. Consequently, the conservation objective is to restore the population to 83,700 pairs (NE 2020)[21].

The Secretary of State has noted that NE and RSPB both state that no AEoI for in-combination collision mortality cannot be concluded irrespective of whether Hornsea Three is included.

The Secretary of State has taken on board the results from the revised CRM and notes the 50% reduction in the predicted number of collisions per year to either 13.9 (CI 1 - 39.9) or 21 (CI 1.2 - 60.2), depending on the final turbine size.

The Secretary of State has considered the information presented by the Applicant during and post-Examination, along with the advice from NE and the views expressed by the RSPB and the

[21] Natural England (2020). *Norfolk Vanguard Offshore Wind Farm post examination consultation. Planning Inspectorate Reference: EN010079.* 27th April 2020.

recommendations of the ExA. He recognises the precautionary nature of the NE approach to CRM upon which this assessment is based. He is also aware of the potential for lower numbers of predicted collisions than previously calculated based on built scenarios as opposed to the assessed or consented scenarios (the 'head room'). He considers the potential loss of no more than 21 kittiwakes per year is *de minimus* in that it will not have any material effect to predicted total of in-combination impacts nor alter the significance or the likelihood of an adverse effect on the integrity of the SPA.

On the basis of the above, the Secretary of State has concluded that the project will not have an adverse in-combination effect on the integrity of the kittiwake feature of the Flamborough and Filey Coast SPA.

5.4.3 Gannet Displacement and Collision: Alone

5.4.3.1 Displacement

The Applicant submitted an assessment of displacement risk for gannet [REP6-021]. This presented a range of displacement rates between 60% and 80% displacement and 1% mortality. Apportioning 100% of gannet displacement mortality to the FFC SPA and using NE's preferred rates in spring and autumn, it calculated:

- a worst-case mortality of between 2.5 and 3.3; and
- this would result in an increase to the mortality rate by up to a maximum of 0.04% (designated population).

The Applicant and NE agreed that operational displacement of gannet from the project alone would not have an AEoI on FFC SPA [REP8-104 and REP9-046].

The Secretary of State agrees with this conclusion.

5.4.3.2 Collision

Using NE's preferred apportioning rates, the Applicant [AS-048] calculated that for the project alone:

- mortality would be 19.9 adults (5.8-39.2 using 95% CIs);
- this would increase mortality rate by 1.1% (designated count) (2.2% using 95% CIs) and 0.9% (2017 count) (1.8% using 95% CIs); and
- the maximum reduction in the population growth rate, at an adult mortality of 50, would be 0.2% using the density independent model (0.1% using the density dependent model).

The Applicant concluded that the collisions attributed to the FFC SPA are not at a level which would trigger a risk of population decline but would only result in a slight reduction in the growth rate seen at the colony and concluded no AEoI for the project alone.

NE [REP8-104] agreed with the apportioned figure of 20 gannet collisions per annum, however, it calculated a broader range of 1 to 56 collisions.

NE confirmed 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 advised that under a range of plausible future growth rate scenarios the colony would still be predicted to grow above the current mean population with the addition of collision mortality to FFC SPA gannets from the project alone. It therefore agreed no AEoI can be concluded. [REP8-104 and REP9-046].

The RSPB also agreed with a conclusion of no AEoI for gannet population due to collision from the project alone [REP8-089 and REP8-109].

The Secretary of State agrees with this conclusion.

5.4.3.3 Collision and Displacement

It also noted that the Applicant did not consider the combined impact of collision risk and displacement from Vanguard alone in its submissions in [AS-048] which NE calculated to be:

- 23 mortalities (range of up to 2-64);
- an increase of around 1% of baseline mortality of the colony;
- the population of FFC SPA after 30 years would be 3.2% lower than in the absence of the additional mortality (6.4-9.4% lower using the upper range of 64 mortalities); and
- the population growth rate would be reduced by 0.1% (0.2-0.3% using the upper range of 64 mortalities).

NE confirmed 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 advised that under a range of plausible future growth rate scenarios the colony would still be predicted to grow above the current mean population with the addition of collision and displacement mortality to FFC SPA gannets from the project alone. It therefore agreed no AEoI can be concluded. [REP8-104 and REP9-046].

The Secretary of State agrees with this conclusion.

5.4.4 Gannet Displacement and Collision: In-combination

5.4.4.1 Displacement

The Applicant's Deadline 6 assessment of displacement risk for gannet [REP6-021] calculated the total annual in-combination displacement mortality apportioned to the FFC SPA to be between 49.1 and 65.5. This would result in an increase in background mortality of the FFC SPA all age class population between 0.64% and 0.85% (designated) and between 0.53% and 0.70% (2017 population). The Applicant concluded there would be no AEoI for the FFC SPA gannet population due to in-combination displacement mortality.

The Secretary of State agrees with this conclusion.

5.4.4.2 Collision

The Applicant's revised assessment [AS-048] concluded no AEoI from in-combination collision mortality to gannets of FFC SPA. It calculated:

- an in-combination total, all age class, annual FFC SPA gannet population collision estimate of 231 individuals (212 individuals without Hornsea Three);
- an increase in background mortality of between 12.9% (designated population) and 10.6% (2017 count) (11.8% and 9.8% without Hornsea Three); and
- at an adult mortality of 250, a maximum reduction in the population growth rate of 1.1% (0.4% without Hornsea Three) using the density independent model and 0.7% using the density dependent model.

In considering in-combination effects without Hornsea Three, NE [REP8-104] advised that under a 1% colony growth rate scenario, the additional mortalities would result in a reduction from the current colony size, but above the breeding population size. Under a 2% to 5% growth rate scenario, the colony would be predicted to grow at about the current mean count. NE considered a growth rate as low as 1% would

be unlikely, therefore agreed that an AEoI of the gannet feature of the FFC SPA can be ruled out for collisions impacts from in-combination with other plans and projects if Hornsea Three is excluded from the in-combination total.

However, NE explained that it had significant concerns regarding the incomplete baseline surveys for Hornsea Three, and the associated level of uncertainty as regards the potential impacts of that project. NE therefore stated it was not in a position to advise that an AEoI can be ruled out for the gannet feature of the FFC SPA for collision in-combination with other plans and projects when Hornsea Three is included in the in-combination total.

RSPB similarly did not agree that an AEoI can be excluded from in-combination collision plus displacement mortality to gannets when Hornsea Three is included [REP8-089 and REP8-063].

The Secretary of State is aware of the concerns raised over the incomplete baseline ornithology data raised during Examination of the Hornsea Three project. He is also aware of the supplementary aerial survey data collected between January and March 2019 which was obtained in order to determine whether there was variability in the density of key species that was significantly different to that assumed in the application and examination of Hornsea Three. The subsequent assessment showed that the predicted number of gannet collisions incorporating the additional data were identical to those previously assessed (Ørsted 2019)[22]. Consequently, he does not agree with the concerns raised regarding the incomplete baseline surveys and their use in the in-combination impact assessment.

The Secretary of State is content that an AEoI on gannet of the FFC SPA from collision mortality can be ruled out from the project in-combination.

5.4.4.3 Displacement and Collision

The Applicant further combined the annual in-combination gannet collision estimate to the in-combination annual displacement prediction to give:

- a combined SPA mortality estimate of 280 to 296; and
- at an adult mortality of 275-300, a maximum reduction in the population growth rate of 1.4% using the density independent model and 0.9% using the density dependent model.

It concluded that in-combination gannet collisions and displacement would result in a slight reduction in the growth rate currently seen at this colony but would not be at a level which would trigger a risk of population decline, and so would not have an AEoI of the SPA. The Applicant also highlighted the precaution in its assessment.

NE [REP7-075] confirmed that the approach to the in-combination assessment had addressed its methodological concerns. It noted [REP8- 104] that combining predicted in-combination mortality from collision risk and displacement would equate to more than 1% of baseline mortality of the colony. It advised that at an adult mortality of 275 - 300 per annum, the population of FFC SPA after 30 years would be 30.4 - 32.7% lower than it would have been in the absence of the additional mortality.

In considering in-combination effects without Hornsea Three, NE [REP8-104] advised that under a 1% colony growth rate scenario, the additional mortalities would result in a reduction from the current colony size, but above the breeding population size. Under a 2% to 5% growth rate scenario, the colony would be predicted to grow at about the current mean count. NE considered a growth rate as low as 1% would be unlikely, therefore agreed that an AEoI of the gannet feature of the FFC SPA can be ruled out for

[22] Ørsted (2019*). Hornsea Project Three Offshore Wind Farm Ornithology Baseline Data Comparison*. 31 July 2019.

collisions plus displacement impacts from in-combination with other plans and projects if Hornsea Three is excluded from the in-combination total.

NE maintained its concerns in relation to the Hornsea Three surveys, but as explained above, the Secretary of State has concluded that the use of the Hornsea Three data within the in-combination assessment is appropriate.

On this basis the Secretary of State is content that an AEoI on gannet of the FFC SPA from collision mortality and displacement combined can be ruled out from the project in-combination.

5.4.5 Razorbill Displacement: Alone

During the Examination, NE raised concerns with the apportionment rates used by the Applicant [REP7-075] (as detailed in Integrity Matrix 2 of the RIES [PD-016]), which led the Applicant to provide a revised assessment in [REP8-069].

This calculated:

- worst-case displacement mortality would be 5.8 adults (2.4 to 9.9 using the 95% CIs);
- this would increase the baseline mortality by 0.2% (0.1% to 0.4% using the 95% CIs), which is below the 1% threshold of detectability; and
- the maximum reduction in the population growth rate at a mortality of 50 would be 0.2% (density independent) which would represent a negligible risk for the population.

It is noted that displacement mortality was apportioned to the SPA on the basis of no connectivity in the breeding season (as the wind farm is located beyond the mean maximum foraging range of 48.5 km for this species) and an even distribution in the non-breeding season.

The Applicant and NE agreed that operational displacement from the project alone would not result in an AEoI on razorbill of FFC SPA [REP7-075, REP9-046 and REP9-057].

The Secretary of State agrees with this conclusion.

5.4.6 Razorbill Displacement: In-combination

The Applicant [REP8-069] calculated:

- the combined displacement mortality of razorbill across the whole year would be in the range 18 to 418 adults;
- this would increase the baseline mortality rate of the population (adults) by 0.8% to 19% (using NE's preferred displacement and mortality rates) or 1.3% (using the Applicant's preferred evidence based rates);
- the contribution to this from Norfolk Vanguard was estimated to comprise 1.3%; and
- the maximum reduction in the population growth rate at a mortality of 400 would be 1.9% which would still permit population growth at over 5.3% per year.

The Applicant concluded that in-combination razorbill displacement would result in a slight reduction in the growth rate currently seen at this colony but would not be at a level which would trigger a risk of population decline, and so would not have an AEoI of the SPA.

NE's own calculations [REP9-057] using alternative abundance figures, calculated an annual in-combination mortality of 17 to 403 excluding Hornsea Three and 18 to 422 including Hornsea Three. Based on the current population trend for the colony and productivity levels for the colony and a predicted decline in growth rate of less than 0.5% per annum, NE advised that an AEoI on the razorbill feature of

the FFC SPA can be ruled out from displacement in-combination with other plans and projects if Hornsea Three is excluded from the in-combination total.

However, as with gannets of the FFC SPA, NE stated it was not in a position to advise that an AEoI can be ruled out for the Razorbill feature of the FFC SPA when Hornsea Three is included in the in-combination total, due to concerns over the Hornsea Three data [REP9-046 and REP9-057].

The Hornsea Three supplementary aerial survey data collected between January and March 2019 showed population estimates of razorbill recorded in 2019 were higher in January and February compared with the same period in 2017, but marginally lower in March (Ørsted 2019) [23]. Displacement analysis indicated that the additional data increased the estimated mortality during the pre-breeding period from zero to one.

The Secretary of State is content that the inclusion of the Hornsea Three data does not affect the conclusions of the in-combination assessment without Hornsea Three. On this basis an AEoI on razorbill of the FFC SPA from displacement can be ruled out from the Project in-combination.

5.4.7 Guillemot Displacement: Alone

The Applicant considered that guillemot breeding numbers have shown strong growth over the last 20 years and are therefore in favourable conservation status [REP7-035]. It noted that the relevant conservation objective is to maintain favourable conservation status of the guillemot population, subject to natural change [REP8-069].

NE [REP9-057] acknowledged the FFC SPA guillemot colony increased by 2.8% per annum between 1987-2008; that the designated population size is 83,214; and that the 2017 count indicated approximately 121,754 breeding adults. It confirmed that it did not expect the population growth rate to decline by more than approximately 0.4% per annum.

The Applicant's displacement assessment [REP8-069] used NE's preferred 70% displacement and 10% mortality rates and calculated:

- worst case displacement would be up to 10 adults (8 to 23.2 using
- 95% CIs);
- this would increase the background mortality by 0.3% (0.15% to
- 1.46% using the 95% CIs); and
- the maximum reduction in the population growth rate at a mortality of 50 would be 0.1% which would represent a negligible risk for the population.

It is noted that displacement mortality was apportioned to the SPA on the basis of no connectivity in the breeding season (as the wind farm is located beyond the mean maximum foraging range of 82.4 km for this species) and an even distribution in the non-breeding season.

The Applicant and NE agreed that operational displacement of guillemot from the project alone would not have an AEoI on FFC SPA. [REP7-075, REP9-046 and REP9-057].

The Secretary of State agrees with this conclusion.

[23] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm Ornithology Baseline Data Comparison* . 31 July 2019.

5.4.8 Guillemot Displacement: In-combination

The Applicant [REP8-069] calculated:

- the combined displacement mortality of guillemot across the whole year would be in the range 71 to 1,649 individuals;
- this would increase the baseline mortality rate of the population (all ages) by 1.3% to 3.2% (using NE's preferred 70% displacement and 10% mortality rates) or 2.3% (using the Applicant's preferred evidence based 50% displacement and 1% mortality rates);
- the contribution to this from Norfolk Vanguard was estimated to comprise 0.8%; and
- the maximum reduction in the population growth rate at a mortality of 1,600 would be 1.9% which would represent a negligible risk for the population.

It is noted that displacement mortality was apportioned to the SPA on the basis of no connectivity in the breeding season (as the wind farm is located beyond the mean maximum foraging range of 105 km for this species) and an even distribution in the non-breeding season

The Applicant concluded that in-combination guillemot displacement would result in a slight reduction in the growth rate currently seen at this colony but would not be at a level which would trigger a risk of population decline, and so would not have an AEoI on the guillemot population of the FFC SPA.

NE [REP9-057] calculated an annual in-combination mortality of 68 to 1,595 excluding Hornsea Three and 71 to 1,654 including Hornsea Three.

Based on the current population trend for the colony and the restore conservation objective, and on the basis of predicted displacement mortality for the project in-combination with other plans and projects resulting in a decline in growth rate of no more than 0.4%, NE advised that an AEoI on the guillemot feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects if Hornsea Three is excluded from the in-combination total.

However, NE stated it was not in a position to advise that an AEoI can be ruled out for the guillemot feature of the FFC SPA when Hornsea Three is included in the in-combination total, due to concerns over the Hornsea Three data. [REP9-046 and REP9-057].

The Hornsea Three supplementary aerial survey data collected between January and March 2019 showed population estimates of guillemot recorded in 2019 were higher in January and February compared to the same period in 2017, but lower in March. The estimated mean seasonal peak populations remain unchanged and, consequently, with the inclusion of the additional data, the predicted level of mortality arising from displacement remained unchanged (Ørsted 2019) [24].

The Secretary of State is content that the inclusion of the Hornsea Three data does not affect the conclusions of the in-combination assessment. On this basis an AEoI on guillemot of the FFC SPA from displacement can be ruled out from the Project in-combination.

5.4.9 Puffin Displacement: Alone

Further to NE's comments on apportionment rates and CIs for puffin [REP7-075], the Applicant's initial displacement assessment [REP6-021] was revised [REP8-069]. It calculated that using NE's preferred 70% displacement and 10% mortality rates, there would be up to 0.02 additional mortalities which would

[24] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm Ornithology Baseline Data Comparison*. 31 July 2019.

increase the background mortality rate by 0.01%. The Applicant concluded that this would not result in an AEoI.

Although NE calculated slightly different predicted impact figures [REP9- 057], it confirmed that the predicted mortality is significantly closer to zero than a single bird, even at the upper 95% CIs. It therefore advised that an AEoI of the puffin component of the FFC SPA assemblage feature can be ruled out for predicted displacement impacts from the project alone.

The Secretary of State agrees with this conclusion.

5.4.10 Puffin Displacement: In-combination

The Applicant considered [REP7-035] that there is no requirement to undertake an in-combination assessment for puffin given the level of mortality attributable to Norfolk Vanguard. It also noted that the FFC SPA population is almost certainly significantly underestimated due to its inaccessibility and puffin nesting habits. Nevertheless, it provided an in-combination displacement assessment at Deadline 6 [REP6-021] which was subsequently revised [REP8-069] in response to NE's comments regarding apportioning of impacts [REP7-075].

The Applicant [REP8-069] calculated that the number of puffins apportioned to the FFC SPA population at risk of displacement on North Sea wind farms to be 907 in the breeding season (none from Norfolk Vanguard) and 95 in the non-breeding season (0.3 from Norfolk Vanguard). Overall, of the 1,002 puffins (including Hornsea Three) at risk of displacement annually, 0.03% were birds on Norfolk Vanguard.

The Applicant considered that Norfolk Vanguard's contribution to any in-combination effect would make no difference and considered that the SPA population could be significantly underestimated due to difficulties to census puffin populations. The Applicant and NE agreed that an AEoI could be excluded for in-combination displacement impacts on the puffin component of the seabird assemblage feature [REP9-057].

The Secretary of State agrees with this conclusion.

5.5 Appropriate Assessment: Greater Wash SPA

The Greater Wash SPA is located between Bridlington Bay, East Yorkshire and the area just north of Great Yarmouth on the Norfolk coast. The SPA has a landward boundary at Mean High Water and an offshore extent of around 30 km at its furthest point. The site was classified in March 2018 and covers an area of approximately 3,536 km^2

When the SPA was classified, six features were identified (Natural England and JNCC, 2016)[25]:

- Sandwich tern, common tern and little tern – all use relatively restricted areas around their breeding colonies for foraging.
- Over-wintering common scoter and red-throated diver.

Conservation Objectives are presented in Table 6[26].

Table 6: Conservation objectives for the Greater Wash SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect has been determined to be likely.

5.5.1 Red-throated diver Disturbance and Displacement: Alone

The Secretary of State has identified an LSE on over-wintering red-throated diver from displacement during construction and operation of the Project. This effect has the potential to occur along areas of the cable route that see an increase in vessel activity during construction and also from vessels carry out operational and maintenance activities.

[25] Natural England and JNCC (2016) Departmental Brief: Greater Wash potential Special Protection Area. [Online] Available from: https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjw8Mu1yojUAhVJAsAKHf8uC3UQFggmMAA&url=https%3A%2F%2Fconsult.defra.gov.uk%2Fnatural-england-marine%2Fgreater-wash-potential-special-protection-area-com%2Fsupporting_documents%2FV9%2520FINAL%2520Greater%2520Wash%2520Departmental%2520Brief%252017%2520October%25202016%2520ready%2520for%2520consultation.pdf&usg=AFQjCNGY6lziuiPze4KTTbsKo-dYNb8SGg.

[26] http://publications.naturalengland.org.uk/file/4597105251581952

5.5.1.1 Disturbance and Displacement during construction of the cable route

The impact of displacement on divers can be quantified by applying a displacement rate and then a mortality rate to the relevant diver population. The evidence base from which these rates are derived is an evolving subject area and disagreements among the Interested Parties remain on which rate to use.

The Applicant's initial assessment [APP-045 and REP1-010] assumed 80% displacement and 5% mortality of red-throated diver, however, NE advised a worst case scenario of up to 100% displacement and up to 10% mortality out to 2 km from the cable route should be applied which could result in an AEoI [REP1-088, REP3-051 and REP4-062]. For this reason, NE [RR-106, REP1-088 and REP7-075] advised that measures, such as avoiding cable laying activities during the nonbreeding season/period of peak diver numbers, should be considered to mitigate disturbance.

Although the Applicant presented a review of published evidence to justify the use of 90% displacement and 1% mortality within 2 km of the windfarm boundary [REP1-008], RSPB [REP2-035] and NE [REP3-051] did not agree there was compelling evidence to warrant a change to NE's recommended rates.

The Applicant subsequently provided an updated assessment using NE's preferred rates (100% displacement and 10% mortality from 2 vessels) [REP6-021]. This calculated between 4 to 8 additional mortalities during a single year from the project alone this would increase baseline mortality by approximately 1.3% to 2.6%.

Although NE [REP7-075] agreed with the Applicant's calculations, it noted the cable route traverses an area of high red-throated diver density compared to elsewhere in the Greater Wash SPA and that displacement would mean the loss of habitat in an important area of the SPA for approximately 40 days during a winter/non breeding season. It did not agree to no AEoI.

In response, whilst the Applicant explained that export cable installation is not planned to occur during the winter, it agreed that only one main cable laying vessel would be used should installation through the SPA be unavoidable during the most sensitive period for divers (January to March inclusive) [REP8-064]. This commitment is included in Condition 18 of the Transmission DMLs (Schedules 11 and 12 of the DCO) [REP8-003]. NE [REP7-075] confirmed that such restriction would allow a conclusion of no AEoI both for the project alone.

It is noted that the Applicant also stated it would avoid construction in the SPA during these months if possible, however this avoidance was not secured, therefore NE placed no weight on this aspect of the Applicant's position [REP9-046]. The ExA agreed with this position in its recommendation.

5.5.1.2 Disturbance and Displacement during operation

In view of a potential 1% increase to the baseline of vessel movements in the area during the operational phase, NE advised that mitigation measures such as those agreed for East Anglia Three moving boats should be adhered to [REP1-088, REP3-051 and REP6-021]).

In response the Applicant updated the dDCO to require "procedures to be adopted within vessels transit corridors to minimise disturbance to red-throated diver during operation and maintenance activities" (Condition 14(1)(d)(vi) of Schedules 9 and 10) [AS-038].

The outline Project Environmental Management Plan [REP7-022] was also revised to include the following mitigation measures to minimise disturbance to red-throated diver:

- avoiding and minimising maintenance vessel traffic, where possible, during the most sensitive time period in January/ February/ March;
- restricting vessel movements where possible to existing navigation routes (to areas where red-throated diver density is likely to be lowest);
- maintaining direct transit routes (to minimise transit distances through areas used by red-throated diver);
- avoidance of over-revving of engines (to minimise noise disturbance); and
- avoiding rafting birds either in-route to array from operational port and/or within the array (dependent on location) and where possible avoid disturbance to areas with consistently high diver density.

Following the Applicant's agreement to adopt best practice vessel operation measures whilst traversing the SPAs, NE [REP9-046] agreed there would be no AEoI from operational displacement to the red-throated diver population at the Greater Wash SPA from the project alone.

Having considered the above assessment, the Secretary of State agrees that, with the restrictions on cable laying vessel use secured for construction, and with best practice mitigation also secured for the operational phase, the Project alone will not have an adverse effect on the red-throated diver feature of the Greater Wash SPA.

5.5.2 Red-throated diver Disturbance and Displacement: In combination

5.5.2.1 Disturbance and Displacement during construction of the cable route.

Cable installation for Project has the potential to occur at the same time as cable installation for Hornsea Two. According the Applicant, other projects due to undertake installation or remedial works are highly unlikely to overlap.

NE [RR-106, REP7-075 and REP8-104] also initially advised that consideration should be given to the in-combination disturbance/ displacement effect on red-throated diver of cable laying with operational phase traffic from currently constructed or consented wind farms within the Greater Wash SPA. The Applicant [REP8-064 and REP9-038] argued that such an assessment would be inappropriate given the short duration of cable installation within the SPA (a maximum of six weeks would be required within the SPA), the limited area over which a cable laying vessel could exert an effect (even when a precautionary 2 km radius is applied) and the fact this would be a one-off event. This was agreed with NE by the close of Examination [REP9-046] and only the effects of the Project in-combination with Hornsea Two were assessed.

Assuming 100% displacement and 10% mortality at both project sites, 6 to 10 additional mortalities are expected in a single year. This would lead to an increase in baseline mortality between 2% and 3%.

However, in view of the restriction on vessel use committed to by the Applicant and secured in NE agreed with the applicant that disturbance during cable laying operations would not lead to an adverse effect on site integrity. The ExA agreed with this position in its recommendation.

5.5.2.2 Disturbance and Displacement during operation

Following the Applicant's agreement to adopt best practice vessel operation measures whilst traversing the SPAs, NE [REP9-046] agreed there would be no AEoI from operational displacement to the red-

throated diver population at the Greater Wash SPA from the project in-combination with other plans and projects.

Having considered the above assessment, the Secretary of State agrees that, with the restrictions on cable laying vessel use secured for construction, and with best practice mitigation also secured for the operational phase, the Project in-combination will not have an adverse effect on the red-throated diver feature of the Greater Wash SPA.

5.5.3 Common scoter Disturbance and Displacement: Alone and in-combination

The Secretary of State has identified an LSE on over-wintering common scoter from displacement during construction and operation of the Project. This effect has the potential to occur along areas of the cable route that see an increase in vessel activity during construction and also from vessels carry out operational and maintenance activities.

The Applicant provided a figure showing Greater Wash SPA common scoter distribution and the offshore cable route, using the data presented in NE and JNCC (2016) [REP2-030]. The Applicant concluded that the offshore cable route does not overlap with any concentrations of common scoter [REP2-030].

NE [REP8-104] confirmed that the provision of the map allowed it to reach a conclusion of no AEoI for the project alone or in-combination.

On the basis of the above the Secretary of State is content that the Project alone and in-combination will not have an adverse effect on the common scoter feature of the Greater Wash SPA.

5.5.4 Little Gull Collision Mortality: Alone

The Secretary of State has identified an LSE on over-wintering little gull due to the risk of collision. This effect has the potential to occur if little gull enter the array.

Despite methodological disagreement, the Applicant provided CRM calculations in a format compatible with NE's preferred approach. These figures were provided at the request of the ExA.

Collisions from the project alone are expected to result in 0.6 mortalities within the Greater Wash SPA cited population of 1,225 individuals, which represents an increase in background mortality of 0.24%. The Applicant considered this to be undetectable and NE agreed there would be no AEOI in-combination. The ExA also agreed with this analysis in its recommendation.

In view of the low mortalities predicted in this case, the Secretary of State has concluded the Project alone will not have an adverse effect on the little gull of the Greater Wash SPA

5.5.5 Little Gull Collision Mortality: In-combination

By tabulating all available CRM outputs from other windfarms, the Applicant calculated that little gull mortalities would increase to 7.6 individuals within the Greater Wash SPA population. The Applicant considered this to be undetectable and NE agreed. The ExA also agreed with this analysis in its recommendation.

In view of the low mortalities predicted in this case, the Secretary of State has concluded the Project in-combination will not have an adverse effect on the little gull of the Greater Wash SPA.

5.6 Appropriate Assessment: North Norfolk Coast SPA and Ramsar Site

The North Norfolk Coast SPA was classified in January 1996. It is a coastal site covering an area of approximately 78.87 km^2. The Ramsar Site was designated in January 1976 and covers a similar area of approximately 78.62 km^2. These overlapping designations are situated east of The Wash, along the northern coastline of Norfolk. They encompass approximately 40 km of coastline from Holme to Weybourne and comprise a wide variety of coastal and intertidal habitats [REP1-213].

The North Norfolk Coast Ramsar site is a notable example of marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes, brackish-water lagoons and extensive areas of freshwater grazing marsh and reed beds. The site also supports at least three British Red Data Book and nine nationally scarce vascular plants, one British Red Data Book lichen and 38 British Red Data Book invertebrates.

Natural England considers the Conservation Advice packages for the overlapping European site designations to be, in most cases, sufficient to support the management of the Ramsar interests. As such the Conservation Objectives of the North Norfolk Coast SPA are applied to the Ramsar site.

5.6.1 Features screened into assessment.

The North Norfolk Coast SPA encompasses much of the northern coastline of Norfolk in eastern England. It is a low-lying barrier coast that extends for 40 km from Holme to Kelling Hard and includes a variety of coastal habitats. The main habitats – found along the whole coastline – include extensive intertidal sand- and mud-flats, saltmarshes, shingle and sand dunes, together with areas of freshwater grazing marsh and reedbed, which has developed in front of rising land.

The North Norfolk Coast SPA and Ramsar site supports the following qualifying features

- Avocet (Breeding)
- Bittern (Breeding)
- Common Tern (Breeding)
- Dark-bellied brent goose (Non-breeding)
- Knot (Non-breeding)
- Little Tern (Breeding)
- Marsh Harrier (Breeding)
- Montagu's Harrier (Breeding)
- Pink-footed Goose (Non-breeding)
- Sandwich Tern (Breeding)
- Waterbird Assemblage (Non-breeding)
- Wigeon (Non-breeding)
- Ramsar criteria 5 and 6

Given the overlap in designation, the following Appropriate Assessment applies to the Ramsar site. The conservation objectives for the SPA are presented in Table 7.

Table 7: Conservation objectives for the North Norfolk SPA

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

The Secretary of State has identified an LSE on the above listed features due to due to the potential for migrating birds (migrating to and from the SPA/Ramsar) to collide with turbines.

5.6.2 All Migrating Features: Alone

The Applicant provided a document called migrant non-seabird collision risk modelling at Deadline 6 [REP6-022]. The species assessed were those that are considered to have the potential to cross the Project array area. The list of species were agreed to be appropriate by NE. For each species, collision risk modelling predicted that no more than one individual would collide each year. Such low numbers meant that background mortality would not go over the 1% threshold, which would ordinarily require the Applicant to undertake further population modelling. On this basis NE agreed that there would be no AEOI. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk will not have an AEOI at the North Norfolk Coast SPA/Ramsar.

5.6.3 All Migrating Features: In-combination

At the request of NE the Applicant also considered the combined mortality of the Project and East Anglia Three offshore windfarm. However, whilst a slight increase was predicted, the increase in background mortalities remained below the 1% threshold. On this basis NE agreed that there would be no AEOI in-combination. The ExA agreed with this conclusion.

The Secretary of State is satisfied that the above assessment is appropriate. He agrees with the Applicant, NE and the ExA and he has concluded that collision risk from the Project in-combination with other plans and projects will not have an AEOI at the North Norfolk Coast SPA/Ramsar.

5.7 Appropriate Assessment: Outer Thames SPA

The Outer Thames Estuary (OTE) SPA is a 392,451.66 km^2 area of marine and coastal habitat supporting wintering red throated diver off the coast of Kent, Essex, Suffolk and Norfolk and a foraging area for little tern and common tern during the breeding season. The SPA citation has a designated red-throated diver non-breeding population of 6,466 individuals in addition to common tern (266 breeding pairs) and little tern (373 breeding pairs).

NE published conservation objectives for the SPA in 2019[27]. These are set out in Table 8.

Table 8: Conservation Objectives for the Outer Thames Estuary SPA

Conservation Objectives	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect has been determined to be likely.

5.7.1 Red-throated diver Disturbance and Displacement: Alone

In view of a potential 1% increase to the baseline of vessel movements in the area during the operational phase, NE advised that mitigation measures such as those agreed for East Anglia Three moving boats should be adhered to [REP1-088, REP3-051 and REP6-021]).

In response the DCO requires "*procedures to be adopted within vessels transit corridors to minimise disturbance to red-throated diver during operation and maintenance activities*" (Condition 14(1)(d)(vi) of Schedules 9 and 10).

[27] http://publications.naturalengland.org.uk/file/6636505681887232

The outline Project Environmental Management Plan [REP7-022] was also revised to include the following mitigation measures to minimise disturbance to red-throated diver:

- avoiding and minimising maintenance vessel traffic, where possible, during the most sensitive time period in January/ February/ March;
- restricting vessel movements where possible to existing navigation routes (to areas where red-throated diver density is likely to be lowest);
- maintaining direct transit routes (to minimise transit distances) through areas used by red-throated diver);
- avoidance of over-revving of engines (to minimise noise disturbance);

and

- avoiding rafting birds either in-route to array from operational port and/or within the array (dependent on location) and where possible avoid disturbance to areas with consistently high diver density.

Following the Applicant's agreement to adopt best practice vessel operation measures whilst traversing the SPAs, NE [REP9-046] agreed there would be no AEoI from operational displacement to the red-throated diver population at the Outer Thames SPA from the project alone.

Having considered the above assessment, the Secretary of State agrees that, with best practice mitigation secured for the operational phase, the Project alone will not have an adverse effect on the red-throated Diver feature of the Outer Thames SPA.

5.7.2 Red-throated diver Disturbance and Displacement: In combination

Following the Applicant's agreement to adopt best practice vessel operation measures whilst traversing the SPAs, NE [REP9-046] agreed there would be no AEoI from operational displacement to the red-throated diver population at the Outer Thames SPA from the project in-combination with other plans or projects.

Having considered the above assessment, the Secretary of State agrees that, with the restrictions on cable laying vessel use secured for construction, and with best practice mitigation also secured for the operational phase, the Project in-combination will not have an adverse effect on the red-throated Diver feature of the Outer Thames SPA.

5.8 Appropriate Assessment: The Broads SAC

The Broads SAC supports the following qualifying features:

- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.; Calcium-rich nutrient-poor lakes, lochs and pools
- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows
- Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge)*
- Alkaline fens; Calcium-rich springwater-fed fens
- Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains*
- *Vertigo moulinsiana*; Desmoulin`s whorl snail
- *Lutra lutra*; Otter
- *Liparis loeselii*; Fen orchid
- *Anisus vorticulus*; Little whirlpool ram's-horn snail

The conservation objectives for the The Broads SAC are presented in Table 9.

Table 9: Conservation objectives for the The Broads SAC.

Conservation Objectives	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species. • The structure and function (including typical species) of qualifying natural habitats. • The structure and function of the habitats of qualifying species. • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely. • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The Secretary of State has identified an LSE on the above listed features due to the potential changes to groundwater flow and sedimentation

5.8.1 Changes to groundwater flow: Alone and in-combination

The Applicant's assessment [APP-045 and REP7-035] explains that The Broad Fen, Dilham SSSI is one of the 28 component SSSIs of The Broads SAC. The onshore cable route would cross the North Walsham

and Dilham Canal approximately 9.9 km upstream of The Broads SAC using trenchless crossing techniques. The Applicant concludes that as no work will take place within the watercourse, no potential effects are anticipated. [APP-045]

However, NE [RR-106] were concerned that no information was provided on the water supply mechanism for The Broads SAC. It advised that further information be obtained from the Environment Agency (eg WetMec data showing water supply mechanisms for all the component sites and/or EA's groundwater modelling) to undertake a detailed appraisal of groundwater effects on the SAC.

The Applicant's first clarification note regarding groundwater dependent designated sites [REP1-049] confirmed that the Broads SAC is predominantly surface water fed, but also partly groundwater fed from the underlying chalk aquifer. It concluded that there is no direct pathway between construction works and the underlying chalk aquifer; therefore a detailed groundwater assessment was not considered necessary [REP1-007]. However, NE [REP1-088 and REP2-036]) noted WetMec data had not been provided and considered that there remained insufficient information to provide a substantive response.

The Applicant's revised clarification note [REP6-013] included a conceptual model of groundwater flows using WetMec data to provide further clarity regarding groundwater flows. The note explained that the onshore cable trenching and trenchless crossing activities associated with the onshore project construction phase would remain at least 7 m above the chalk aquifer at any point and would be separated from the chalk aquifer by the boulder clay aquiclude. As such, the Applicant concluded there is no pathway between the onshore project area and any of the designated sites. The Applicant did not consider that an in-combination assessment with Hornsea Three was required [REP1-007 and REP4-040].

NE [REP9-046] subsequently confirmed that it was satisfied with the information supplied and that the design of all watercourse crossings, diversions and reinstatement would be submitted to and approved by the relevant planning authority in consultation with NE, prior to the commencement of each stage of the onshore transmission works (as secured through Requirement 25 of the DCO [REP9-007]). It agreed that there would be no AEoI on the Broads SAC either alone or in-combination with Hornsea Project Three.

Based on the above, the Secretary of State has concluded that changes to groundwater flow from the Project alone and in-combination will not have an AEOI on the Broads SAC.

5.8.2 Sedimentation: Alone and in-combination

NE raised concerns about the level of detail within the CoCP regarding measures to safeguard The Broads SAC in relation to sediment control and reinstatement of all work areas [RR-106 and REP1-088]. The Applicant responded with a note [REP6-013] to clarify its approach to onshore construction works within functional floodplains and identify mitigation measures to minimise the risk of sediment or pollutant release. It clarified its approach to grassland reinstatement and captured these commitments in the outline CoCP [REP7-006].

NE [REP7-075 and REP9-046] subsequently confirmed it had withdrawn its concerns. It agreed that the site-specific management plans required for each watercourse crossing (Requirement 25 of the DCO) would include site specific details regarding sediment management and pollution prevention measures and would lead to no AEoI on the Broads SAC.

Based on the above, the Secretary of State has concluded that sedimentation the Project alone and in-combination will not have an AEOI on the Broads SAC.

5.9 Appropriate Assessment: Haisborough, Hammond and Winterton SAC

The Haisborough, Hammond and Winterton SAC ("HHW SAC") is located to the west of NV West, and the offshore cable corridor passes through the SAC. The SAC is designated for Annex I Sandbanks which are slightly covered by seawater all the time and Annex I Reefs (*Sabellaria spinulosa*). The conservation objectives are presented in Table 10.

The sandbank ridges consist of sinusoidal banks which have evolved over the last 5,000 years and comprise of Haisborough Sand, Haisborough Tail, Hammond Knoll, Winterton Ridge and Hearty Knoll. Older sandbanks, Hewett Ridge and Smiths Knoll, are present along the outer site boundary and have formed over the last 7,000 years. The more geologically recent sandbanks of Newarp Banks and North and Middle Cross Sands lie on the south west corner of the SAC1.

The Joint Nature Conservation Committee (JNCC) HHW Site Details1 state that *S. spinulosa* reef has been recorded at Haisborough Tail, Haisborough Gat and between Winterton Ridge and Hewett Ridge. *S. spinulosa* reefs within the HHW SAC can have an elevation of 5cm to 10cm and in areas where reef has been recorded, this can have between 30% to 100% coverage.

The Norfolk Vanguard offshore cable corridor overlaps with the HHW SAC and therefore there is potential for the designated features of the SAC to be impacted during the construction and maintenance of Norfolk Vanguard.

Table 10: Conservation objectives for the Haisborough, Hammond and Winterton SAC.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • the extent and distribution of qualifying natural habitats and habitats of the qualifying species • the structure and function (including typical species) of qualifying natural habitats • the structure and function of the habitats of the qualifying species • the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • the populations of each of the qualifying species • the distribution of qualifying species within the site

During the Project Examination, Natural England advised that, due to a recent condition assessment of the features within HHW SAC, it is Natural England's view that the Annex 1 Reef and Sandbank features are in unfavourable condition and need to be restored to favourable condition.

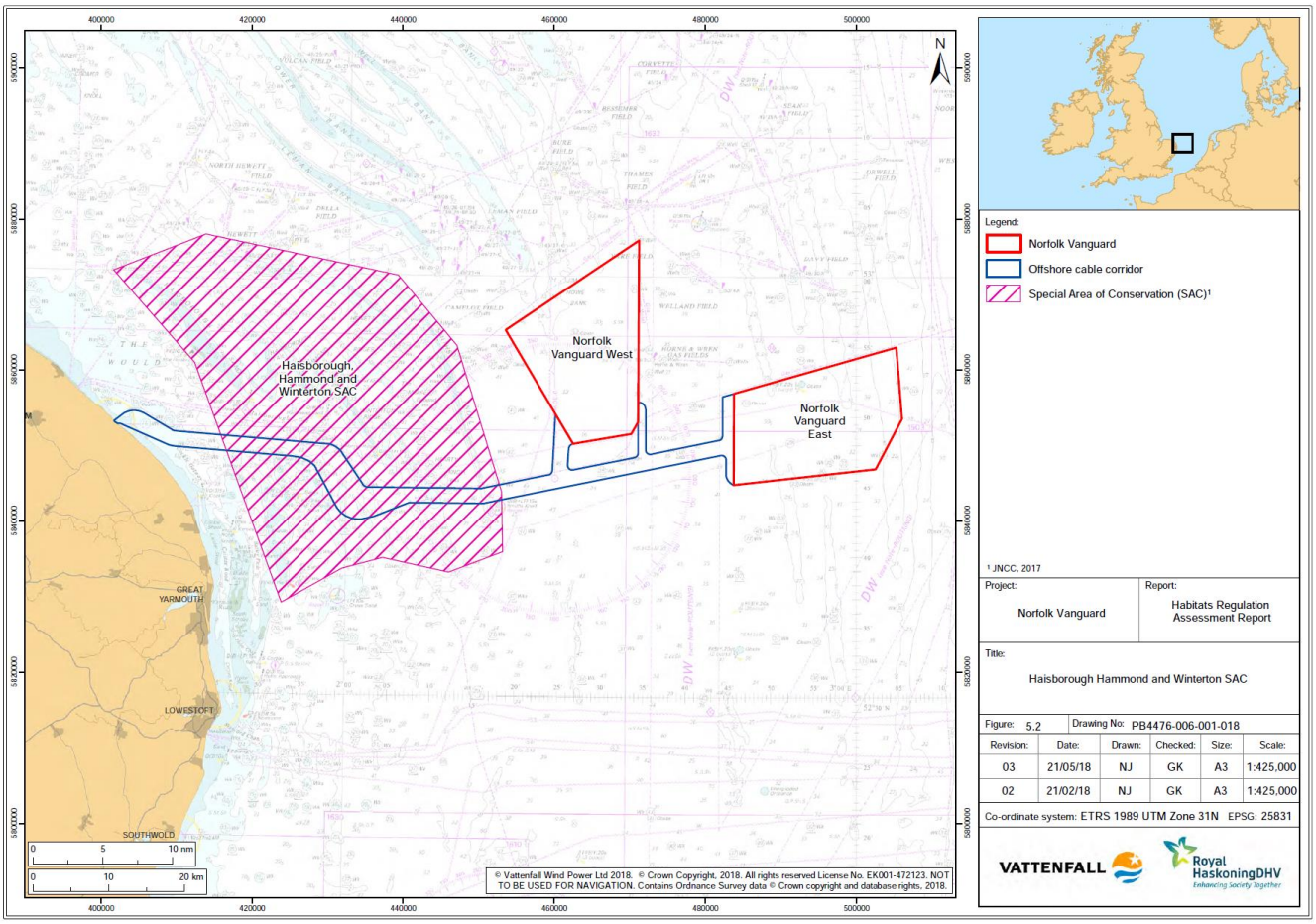

Figure 3 Norfolk Vanguard offshore cable corridor and Haisborough Hammond and Winterton SAC.

The Secretary of State has identified an LSE on the sandbank and reef feature due to the following

Annex I Sandbank

- Temporary physical disturbance during construction;
- Temporary physical disturbance during O&M;
- Habitat loss;
- Introduction of new substrate.

Annex I Reef

- Temporary physical disturbance during construction;
- Increased suspended sediment and smothering during construction;
- Temporary physical disturbance during O&M;
- Increased suspended sediment and smothering during O&M;
- Introduction of new substrate.

5.9.1 Annex I Sandbanks: Alone

The Applicant has estimated that overall area of impact within the SAC is equivalent to 0.002% of the site as a whole and 0.003% of the sandbank feature (Vattenfall 2020c)[28].

The Applicant's original assessment [App-045] concluded that the cable route would not have an adverse effect on the HHW SAC.

The ExA's report summarises the Applicant's assessment in relation to sandbanks as follows:

- the overall form and function of any particular sandwave, or the SAC sandbank system as a whole, would not be disrupted;
- the cable corridor is in an active and highly dynamic environment which is conducive for the development and maintenance of sandbanks;
- sediment would remain within the boundaries of the SAC so there would be no significant change to sandbank extent, topography and sediment composition; and
- once re-deposited on the seabed, the sediment would immediately re-join the local and regional sediment transport system and would not affect the form or function of the sandbanks or the sandbank communities which are adapted to natural disturbance and are therefore likely to be able to recover within a few tidal cycles.

Further to the above, NE advised, that the Applicant should also commit to depositing any dredged material in location within the SAC that contain benthic material of similar particle size. The Secretary of State consulted on this request. The Applicant has not been able to commit to ensuring that the particle size composition is within 95% of the similarity to the particle size composition of the seabed at the disposal location. This is on the basis that it is not feasible to extensively sample all sediments to enable a realistic analysis of 95% similarity (Vattenfall 2020b)[29]. The Applicant has committed to requiring the location and method for sediment disposal being agreed with the MMO in consultation with Natural England. This will be secured in the Haisborough, Hammond and Winterton SAC Site Integrity Plan (see below).

NE agreed that the physical processes associated with the Sandbanks has the potential to recover [REP5-007 and REP9-046]. However, despite this position, by the close of Examination NE was not able to advise that an AEOI could be excluded. This was due to the potential introduction of cable protection within a SAC, which NE views as a persistent loss of habitat.

To address NE's concerns the Applicant has refined the length of cable protection required within the SAC, excluding cable crossings, to 5% from 10% [REP6-004]. This change has been committed to in the Outline Haisborough, Hammond and Winterton SAC Site Integrity.

Notwithstanding the reductions made to cable protection length, the Applicant acknowledged the uncertainty relating to the HHW SAC. To address this, the Applicant proposed to secure mitigation with a commitment to produce an HHW Site Integrity Plan ("HHW SIP") prior to construction. This change has been secured through Conditions 9(1)(l) and 9(1)(m) of the Transmission DMLs (Schedules 11 and 12 of the DCO. The HHW SIP will set out the process for agreeing with the MMO and NE all works and mitigation measures associated with offshore cable installation and maintenance within the HHW SAC,

[28] Vatthenfall (2020c). *Norfolk Vanguard Offshore Wind Farm Summary Overview on Habitats Regulations Assessment (HRA)*. Document Ref. ExA; Sum; 11.D10.2. 28 February 2020.

to ensure there would be no AEoI on the HHW SAC. This was repeated within the Applicant's response to the Secretary of State's consultation where the Applicant committed to agree the cable route with the MMO in consultation with NE and agree the location, extent, type and quantity of any cable protection with the MMO in consultation with NE prior to deployment (Vattenfall 2020a)[30].

At the close of Examination, the SoCG between the Applicant and NE [REP9-046] identified NE's residual concerns in relation to the overall impacts to the form and function of the Annex I sandbank fields and their potential recoverability. However, NE agreed [REP9-046] that the commitment to complete a HHW SIP, allows a conclusion of no AEoI to be made at the consent stage on the basis that it restricts the commencement of construction until such time that mitigation measures can be adopted to contain the effects of the development to those already assessed and to rule out an AEoI.

In addition to the above commitments, the Secretary of State has also noted that the Applicant has drawn up a decommissioning plan that provides evidence on the removal of all cable protection at the time of decommissioning [31]. The Secretary of State considers that a successful decommissioning campaign will effectively remove any long-term impacts within the SAC. For this reason, the Secretary of State has concluded that it is necessary to secure the decommissioning of cable protection within the DCO (Condition 23 in Schedules 9 and 10, and condition 19 in schedules 11 and 12.). Consequently, although the impacts are long-term they will be temporary. NE welcome the potential to decommission but advise that it cannot be certain that the habitat will recover to its pre-impacted state after such a temporally long time [32].

The Secretary of State has considered the representations and commitments made by the Applicant, the concerns raised by NE (including those made subsequent to Examination) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential impact on Annex I Sandbanks which are slightly covered by seawater all the time as a result of the Project alone would not represent an adverse effect upon the integrity of the Haisborough, Hammond and Winterton SAC. This is on the basis of the information presented by the Applicant which has demonstrated to him that the area of the site affected will be relatively small, any affected reef is able to recover, and all cable protection that lies on or protrudes above the seabed shall be removed at the time of decommissioning. The Secretary of State also notes the Applicant's election to commit to producing a Haisborough, Hammond and Winterton Site Integrity Plan which the Secretary of State views as an additional safeguarding mechanism, but not one critical to his decision.

5.9.2 Annex I Reef: Alone

The Applicant's HRA report [App-045] focussed on the option of micrositing the cable route to avoid this feature. In the unlikely event of reef disturbance, the Applicant considered that reef was capable of recovery.

NE advised that, as the reef in the HHW SAC was currently in unfavourable condition, all reef must be microsited.

[30] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020.

[31] Vattenfall (2020b). *Norfolk Vanguard Offshore Wind Farm applicant's response to request for information Department for Business, Energy and Industrial Strategy (BEIS) Request for information.* Document Reference ExA; WQ; 11.D10.1. 28 February 2020.

[32] Natural England (2020). *Norfolk Vanguard Offshore Wind Farm post examination consultation. Planning Inspectorate Reference: EN010079.* 27th April 2020.

NE, the MMO and the Eastern Inshore Fisheries and Conservation Authority ("IFCA") all pointed to proposed fisheries byelaws in the area that could increase the extent of reef and thus make micrositing more difficult. However, the Applicant considers that there is significant uncertainty regarding what effect these measures will have prior to Project construction[33].

In a situation where micrositing is not possible, the Applicant concluded that, given the small proportion of temporary disturbance and the high recoverability of reef, there would be no AEOI.

However, NE [RR-106, REP1-088 and REP4-062] raised concerns over the evidence presented to support the ability of reef to recover if impacted through cable installation. In line with its advice for Sandbanks, it also recommended that cable protection should not be permitted anywhere within designated sites as it would result in a permanent change to reefs. It advised that a change of habitat is just as significant as loss of habitat, when that habitat is the designated feature [REP1- 088]. NE further advised that the deposition of material or other alteration of surface sediment would be likely to lead to a persistent change to substrate which is not suitable habitat for mixed sediment Annex I reef communities [REP1-088]. It did not consider that establishment of *S. spinulosa* on artificial substrate is Annex I reef as designated because it is not replacement for reef on natural site sediment as set out at the time of designation.

NE advised that without removal of cable protection at decommissioning, the impacts are likely to persist and depending on the location may hinder the conservation objectives of the designated sites [REP1-088]. NE also stated [RR-106, REP4-062 and REP6-032] that there is no empirical evidence of successful decommissioning where the habitat is returned to its pre-impact state and that it is not possible to rule out an AEoI.

The Applicant [REP1-007, REP2-003 and REP2-031] stated that *S. spinulosa* reef is ephemeral and opportunistic so can be expected to recover/recolonise within the range of natural variation. It considered that, once the disturbance has ceased, *S. spinulosa* could once again settle and form reef aggregations, including on cable protection, therefore the recovery potential of the SAC would not be limited. It noted [REP8-064] that post-construction surveys at Thanet Offshore Windfarm found a wider distribution of reef aggregation categorised as moderate patchy growth and dense growth compared to pre-construction surveys; less damage to reef where recorded (partially attributed to reduction in bottom fishing actives as a result of OWF presence); and that although there was a small decline of reef shortly after construction, these were found to be recovering five years after construction.

The Applicant suggested [REP3-004] that if reef has recovered to such an extent that it is not possible to route two 30 m swathes through the 2 to 4 km wide offshore cable corridor, then this would be an extremely large reef and the Applicant would propose that this would no longer require a restoration target. The Applicant considered that NE's position is disproportionate and inconsistent when NE also advises that micrositing may not be possible due to significant recovery of reef following around 100 years of extensive and repeated commercial fisheries dredging.

Furthermore, the Applicant cited studies supporting the assertion that cable protection is suitable habitat for Annex I reef communities [REP2- 003 and REP8-064] and maintained that *S. spinulosa* reef would provide the same benefits in terms of biodiversity, regardless of what it is growing on [REP3-004]. The Applicant also highlighted [REP7-039, REP7- 059 and REP8-064] that the large priority area within a proposed Defra byelaw area extensively tracks existing pipelines and that *S. spinulosa* is found on an existing pipeline within the SAC. It considered that any reef, regardless of what it is growing on, would

[33] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020.

have the same effect on biodiversity and cited publications which state *S. spinulosa* reef is not sensitive to habitat change and that substrate is not the critical factor for *S. spinulosa* recruitment.

The Applicant noted that NE was seeking complete avoidance of Annex I reef. It explained that in the unlikely event there is not sufficient space to do so, the HHW SIP would require the route through reef which would result in the least temporary disturbance to be subject to further assessment and agreement with the MMO in consultation with NE that the HHW SIP provides the necessary mitigation. The Applicant considered that if avoidance is not possible, cable installation works would be a localised and temporary disturbance to a large reef. If this could not be agreed, construction could not commence and the onus would be on the Applicant to consider alternative solutions in consultation with NE and the MMO. If a solution cannot be agreed, the Applicant would need to consider a DCO variation application or a Marine Licence application. [REP7-039 and REP7-064].

At the close of Examination, the SoCG between the Applicant and NE [REP9-046] identified a number of matters not agreed in relation to impacts to reef; NE considered that micrositing may not be possible and that it had limited confidence in the ability of reef to recover and it continued to advocate that reef should be avoided and that cable protection would result in permanent loss of habitat. However, in line with its position on sandbanks, NE agreed that the Outline HHW SIP [REP7-026] allows for a conclusion of no AEoI to be made at the consent determination stage.

Following request for further information by the Secretary of State the Applicant has, in the Outline HHW SIP, committed to use no cable protection in the priority areas to be managed as reef within the HHW SAC, unless otherwise agreed with the MMO in consultation with NE. This commitment will ensure there is no habitat loss in the priority areas that have been identified in order to facilitate the recovery of the *Sabellaria* reef feature to favourable condition. The Applicant shows that there is no overlap between the most likely areas where cable protection could be required and the areas to be managed as reef (Figure 4) [34].

[34] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020

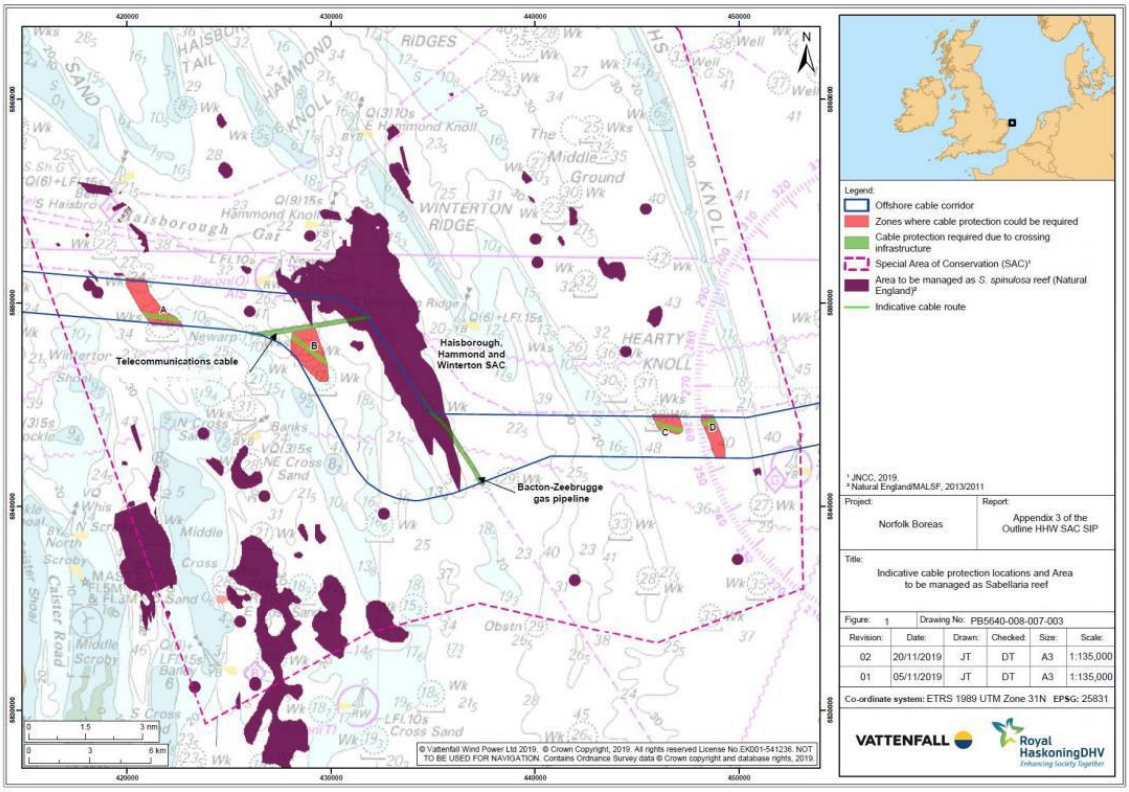

Figure 4: Cable protection locations to be assessed in the assessment of effects of habitat loss on Annex 1 Reef (Source Vattenfall 2020a)

Furthermore, the Applicant has committed to the removal of all cable protection at the time of decommissioning where it is associated with unburied cables due to ground conditions (where required for crossings this will be left *in situ*) (Vattenfall 2020a)[35]. As referered to above, the Secrteary has chosen to secure this commitment in the DCO. NE maintain that the placement of cable protection is considered to be having a lasting change on the habitat over a period of 30 years (life time of project) and beyond, as recovery will not be immediate. NE considers that no evidence has been presented that demonstrates what the impacts are likely to be on Annex I habitats and site conversation objectives from such a temporally long time and that habitat recovery is achievable to its pre-impacted state. Therefore, in NE's view, a 30 years change in habitat can't be considered to be a small scale loss/change. In addition, NE considers that no evidence has been presented on the potential for any wider surrounding area impacts from the presence of the cable protection and its removal. NE also advised that for decommissioning to be considered as mitigation then this would need to be restricted to concrete mattresses (or similar type product)[36].

The Secretary of State has considered the representations and the secured commitments made by the Applicant, the concerns raised by NE (including those made subsequent to Examination[37]) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential impact on

[35] Vattenfall (2020a). *Norfolk Vanguard Offshore Wind Farm Additional Mitigation Department for Business, Energy and Industrial Strategy (BEIS) Request for information*. Doc. Ref: ExA; Mit; 11.D10.2. 28 February 2020

[36] Natural England (2020). Natural England (2020). *Norfolk Vanguard – Applicant's submission to Secretary of State Consultation Request for further information*. 27 April 2020

[37] Natural England (2020). Natural England (2020). *Norfolk Vanguard – Applicant's submission to Secretary of State Consultation Request for further information*. 27 April 2020.

Annex I Reef as a result of the Project alone would be lasting (for the duration of the project) but temporary (reparable effect) and not represent an adverse effect upon the integrity of the Haisborough, Hammond and Winterton SAC. This is on the basis of the information presented by the Applicant which has demonstrated to him that the area of the site affected will be relatively small (kept to a minimum through micrositing), any affected reef is able to recover and all cable protection that lies on, or protrudes above, the seabed shall be removed at the time of decommissioning. The Secretary of State also notes the Applicant's election to commit to producing a Haisborough, Hammond and Winterton Site Integrity Plan which the Secretary of State views as an additional safeguarding mechanism, but not one critical to his decision.

5.9.3 Sandbanks and Reef: In-combination

The Applicant's in-combination assessment was restricted to Norfolk Boreas as no other projects/plans are considered to have the potential to affect the HHW SAC. The Applicant's assessment [APP-045] notes that installation of the Norfolk Boreas export cables would likely follow that of Norfolk Vanguard with no temporal overlap. The spatial footprint of installation works for both Norfolk Vanguard and Norfolk Boreas together is likely to be double that of Norfolk Vanguard alone as a worst-case scenario; although some elements of the seabed preparation may overlap and would therefore reduce the overall combined footprint.

In relation to sandbanks, the Applicant concludes that there would not be enough time for sandwaves levelled for Norfolk Vanguard to migrate into the area to be levelled for the Norfolk Boreas project; therefore, there should be no additional impact on the sandbanks due to the in-combination effect of both projects.

With regard to reef, the Applicant's HRA Report explained that the worst case scenario reflects reef extending across the full width of the offshore cable corridor, but nowhere else beyond the corridor. It considered that in reality, if reef has extended across the cable corridor, it would likely be a section of a much larger reef and therefore the proportion of temporary disturbance would be significantly smaller.

The Applicant [APP-045 and REP8-064] concluded there would be no AEoI from Norfolk Vanguard and Norfolk Boreas in-combination.

Although NE [REP1-088, REP2-036 and REP8-104] acknowledged that impacts would be temporary and spatially separate, it was concerned about the implications of the site being in unfavourable condition for 10+ years and that impacts occurring to the same sandbank from may hinder recoverability of the feature over a longer period.

At the close of Examination, the SoCG between NE and the Applicant [REP9-046] agreed that in-combination impacts with Norfolk Boreas must be considered when developing the HHW SIP. The Outline HHW SIP [REP9-028] requires consideration must be given to Norfolk Boreas to ensure mitigation solutions are compatible for both projects.

The Secretary of State has considered the representations and commitments made by the Applicant, the concerns raised by NE (including those made subsequent to Examination) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential impact on Annex I Sandbanks which are slightly covered by seawater all the time and Annex I Reef as a result of the Project in-combination would not represent an adverse effect upon the integrity of the Haisborough, Hammond and Winterton SAC. This is on the basis of the information presented by the Applicant which has demonstrated to him that the area of the site affected will be relatively small (in the case of reef, kept to a minimum through micrositing), any affected reef is able to recover, and all cable protection that lies on, or protrudes above the seabed, shall be removed at the time of decommissioning. The Secretary of State also notes

the Applicant's election to commit to producing a Haisborough, Hammond and Winterton Site Integrity Plan which the Secretary of State views as an additional safeguarding mechanism, but not one critical to his decision.

5.10 Appropriate Assessment: Humber Estuary SAC

The Humber Estuary SAC supports the following qualifying features:

- Atlantic salt meadows
- Coastal lagoons
- Dunes with *Hippophae rhamnoides*
- Embryonic shifting dunes
- Estuaries
- Fixed dunes with herbaceous vegetation ("Grey dunes")
- Grey seal
- Mudflats and sandflats not covered by seawater at low tide
- River lamprey
- Salicornia and other annuals colonising mud and sand
- Sandbanks which are slightly covered by sea water all the time
- Sea lamprey
- Shifting dunes along the shoreline with *Ammophila arenaria* ("White dunes")

The conservation objectives for the SAC are presented in Table 11.

Table 11: Conservation objectives for the Humber Estuary SAC

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • the extent and distribution of qualifying natural habitats and habitats of the qualifying species • the structure and function (including typical species) of qualifying natural habitats • the structure and function of the habitats of the qualifying species • the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • the populations of each of the qualifying species • the distribution of qualifying species within the site

The Secretary of State has identified an LSE on the grey seal features due to the potential for disturbance to occur at haul out sites and at sea foraging grounds. An LSE was also identified due to the risk of collision at sea with increased vessel traffic

5.10.1 Grey Seal: Alone

5.10.1.1 Disturbance at Haul out Sites

The Applicant's HRA report [APP-045] assessed the potential effect of vessels at haul out sites. It concluded that vessels would be highly unlikely to be within 300 m of the coast, in areas of close proximity to the seal haul-out sites within the Humber Estuary SAC. On this basis the Applicant concluded that there would be no potential for AEOI.

5.10.1.2 At Sea Disturbance

The Applicant's HRA report provided an estimate for the number of seals temporary disturbed in the array and cable corridor by activities occurring during the construction and operation of the Project. The maximum number of grey seals temporary disturbed was 5 in the wind farm area and 38 in the corridor. Assuming all seals were from the Humber Estuary, the Applicant calculated this would equate to 1% of the SAC population.

The Humber Estuary SAC is located 150 km from the Project sites and 112 km from the offshore cable corridor (at closest point). On this basis the Applicant considered that it would be highly unlikely, especially taking into account the movements of tagged seals, that all grey seal in the offshore development area are from the Humber Estuary SAC.

This position was not disputed by any interested party.

The Secretary of State is content that the risk of disturbance at haul sites is low. In relation to at-sea disturbance the Secretary of State has reviewed the worst case figures presented, and has noted the low likelihood of all seals originating from the Humber Estuary SAC. On this basis of this assessment the Secretary of State has concluded that disturbance from the Project will not have an AEOI of the grey seal feature of the Humber Estuary SAC.

5.10.1.3 Grey Seal Collision

The Applicant's HRA report provided approximate figures for the number of vessel movements expected from the Project's construction (operational movements are unlikely to be near the Humber Estuary SAC given the expected operation and maintenance ports are in East Anglia): 1,180 vessel movements over the two to four year indicative offshore construction window, with an average of approximately two vessel movements per day. However, the Applicant stated considered that it is expected that seals would be able to detect the presence of vessels and, given that they are highly mobile, would be able to largely avoid vessel collision. This conclusion was not disputed by any interested party.

The Secretary of State agrees with the above rational. On this basis, he has concluded that collision risk from the Project will not have an adverse effect on the grey seal population protected by the Humber Estuary SAC.

5.10.2 Grey Seal: In-combination

5.10.2.1 Disturbance at Haul Out Sites

The Applicant's HRA report [APP-045] assessed the potential effect of vessels at haul out sites. It concluded that vessels would be highly unlikely to be within 300m of the coast, in areas of close proximity to the seal haul-out sites within the Humber Estuary SAC. On this basis the Applicant concluded that there would be no potential for an in-combination AEOI.

5.10.2.2 At Sea Disturbance

The Applicant's HRA report provided an estimate for the number of seals temporary disturbed from the Project in-combination with other plans and projects by activities occurring during the construction and operation phases. The maximum number of grey seals temporary disturbed was 1,371[38]. Assuming all

[38] Note this figure includes UXO clearances and seismic surveys which are subject to separate licencing.

seals were from the Humber Estuary, the Applicant calculated this would equate to 34% of the SAC population.

However, the Applicant considered that given the wide range of plan/project locations over the Southern North Sea area used in this in combination assessment it is highly unlikely that all disturbed seals would be from the Humber Estuary SAC. Furthermore, given the distance between the projects offshore and their distance from the coast, it is not anticipated that foraging grey seal would be significantly displaced from foraging areas or moving between haul-out sites and foraging areas, On this basis the Applicant considered that there would not be an AEPOI on the Humber Estuary SAC.

This position was not disputed by any interested party.

The Secretary of State is content that the risk of disturbance at haul sites is low. In relation to at-sea disturbance the Secretary of State has reviewed the worst case figures presented, and has noted the low likelihood of all seals originating from the Humber Estuary SAC. On this basis of this assessment the Secretary of State has concluded that disturbance from the Project in-combination with other plans and Projects will not have an AEOI of the grey seal feature of the Humber Estuary SAC.

5.10.2.3 Grey Seal Collision

The Applicant's HRA report provided approximate figures for the number of vessel movements expected from the Project's construction (operational movements are unlikely to be near the Humber Estuary SAC given the expected operation and maintenance ports are in East Anglia): 1,180 vessel movements over the two to four year indicative offshore construction window, with an average of approximately two vessel movements per day. However, the Applicant stated considered that it is expected that seals would be able to detect the presence of vessels and, given that they are highly mobile, would be able to largely avoid vessel collision. This conclusion was not disputed by any interested party.

The Secretary of State agrees with the above rational. On this basis, he has concluded that collision risk from the Project will not have an adverse effect on the grey seal population protected by the Humber Estuary SAC.

5.11 Appropriate Assessment: Norfolk Valley Fens SAC

The Norfolk Valley Fens SAC supports the following qualifying features

- Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath
- European dry heaths
- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*); Dry grasslands and scrublands on chalk or limestone
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge)*
- Alkaline fens; Calcium-rich springwater-fed fens
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae);
- Alder woodland on floodplains*
- *Vertigo angustior*; Narrow-mouthed whorl snail
- *Vertigo moulinsiana*; Desmoulin`s whorl snail

The conservation objectives for the SAC are presented in Table 12.

Table 12: Conservation objectives for the Norfolk Valley Fens SAC.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The Secretary of State has identified an LSE on the above listed features due to the potential changes to groundwater flow and sedimentation.

5.11.1 Changes to groundwater flow: Project alone and in-combination

The Applicant's assessment [APP-045 and REP7-035] explains that Booton Common Site of Special Scientific Interest (SSSI), one of the five component SSSIs of the Norfolk Valley Fens SAC, has a functional connection to the onshore project area. The qualifying features present at Booton Common are water-sensitive and reliant on the Blackwater Drain to maintain their structure and function. The proposed onshore cable route is not located within the Blackwater Drain, but trenched crossing techniques are proposed at two of its tributaries. Following construction at these locations, reinstatement

of the trench would be conducted to the pre-construction depth of the watercourse and the dams removed. As water flow would be maintained and given the distance of these sites from Booton Common, the Applicant concludes that effects from trenching works at these locations upon the Blackwater Drain would be minimal.

However, NE [RR-106] considered that there was insufficient evidence to assess impacts of changes in groundwater flow to the qualifying features present at Booton Common SSSI. It advised that further information be obtained from the Environment Agency (eg WetMec data showing water supply mechanisms for all the component sites and/or EA's groundwater modelling) to undertake a detailed appraisal of groundwater effects at both Norfolk Valley Fens SAC.

The Applicant's first clarification note regarding groundwater dependent designated sites [REP1-049] confirmed that the Norfolk Valley Fens SAC is predominantly surface water fed, but also partly groundwater fed from the underlying chalk aquifer. It concluded that there is no direct pathway between construction works and the underlying chalk aquifer; therefore a detailed groundwater assessment was not considered necessary [REP1-007]. However, NE [REP1-088 and REP2-036]) noted WetMec data had not been provided and considered that there remained insufficient information to provide a substantive response.

NE [REP1-007 and REP4-040] also noted that the Hornsea Project Three cable route passes about 360 m to east of Booton Common and that construction periods may overlap. As such, it suggested that the in-combination assessment for Norfolk Valley Fens SAC be revisited.

The Applicant's revised clarification note [REP6-013] included a conceptual model of groundwater flows using WetMec data to provide further clarity regarding groundwater flows for the site. The note explained that the onshore cable trenching and trenchless crossing activities associated with the onshore project construction phase would remain at least 7 m above the chalk aquifer at any point and would be separated from the chalk aquifer by the boulder clay aquiclude. As such, the Applicant concluded there is no pathway between the onshore project area and any of the designated sites. The Applicant did not consider that an in-combination assessment with Hornsea Three was required [REP1-007 and REP4-040].

NE [REP9-046] subsequently confirmed that it was satisfied with the information supplied and that the design of all watercourse crossings, diversions and reinstatement would be submitted to and approved by the relevant planning authority in consultation with NE, prior to the commencement of each stage of the onshore transmission works (as secured through Requirement 25 of the DCO [REP9-007]). It agreed that there would be no AEoI on Norfolk Valley Fens SAC alone or in-combination with Hornsea Project Three.

Based on the above, the Secretary of State has concluded that changes to groundwater flow from the Project alone and in-combination will not have an AEOI on the Norfolk Valley Fens SAC.

5.11.2 Sedimentation: Project alone and in-combination

NE raised concerns about the level of detail within the CoCP regarding measures to safeguard the Norfolk Valley Fens SAC in relation to sediment control and reinstatement of all work areas [RR-106 and REP1-088]. The Applicant responded with a note [REP6-013] to clarify its approach to onshore construction works within functional floodplains and identify mitigation measures to minimise the risk of sediment or pollutant release. It clarified its approach to grassland reinstatement and captured these commitments in the outline CoCP [REP7-006].

NE [REP7-075 and REP9-046] subsequently confirmed it had withdrawn its concerns. It agreed that the site-specific management plans required for each watercourse crossing (Requirement 25 of the DCO)

would include site specific details regarding sediment management and pollution prevention measures and would lead to no AEoI on the Norfolk Valley Fens SAC.

Based on the above, the Secretary of State has concluded that sedimentation the Project alone and in-combination will not have an AEOI on the Norfolk Valley Fens SAC.

5.12 Appropriate Assessment: Paston Great Barns SAC

The Paston Great Barns SAC supports the following qualifying features:

- Barbastelle bat *Barbastella barbastellus*

The SAC lies 2.9 km from the onshore project area and holds the only known known example of a building supporting a maternity roost of barbastelle bats within the UK. The conservation objectives of the site are presented in Table 13.

Table 13: Conservation objectives for the Paston Great Barns SAC.

Conservation Objectives	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of the habitats of qualifying species, • The structure and function of the habitats of qualifying species, • The supporting processes on which the habitats of qualifying species rely, • The populations of qualifying species, and • The distribution of qualifying species within the site.

The Secretary of State has identified an LSE on the barbastelle bat feature due to the direct effects in *ex-situ* habitats.

5.12.1 Barbastelle Bat Disturbance: Alone

5.12.1.1 Direct effects in *ex-situ* habitats

The HRA Report [APP-045] explains that approximately 11 ha of habitat used by barbastelle bats of the Paston Great Barn maternity colony is anticipated to be isolated by hedgerow removal during the construction phase. This represents approximately 0.6% of the home range of the Paston Great Barn maternity colony. The Applicant considers that once replanted hedgerows have reached maturity (expected to be 3-7 years following planting on completion of construction), they would provide an improved commuting and foraging habitat for bats. The Applicant concludes that following mitigation, these small-scale, temporary effects would not result in an AEoI.

However, NE [RR-106, REP1-088 and REP2-037] considered that there was insufficient information to assess the significance of the loss and severance of foraging and commuting habitat for barbastelle bats over a construction period of at least seven years. It considered that the HRA Report did not recognise the heterogeneity of hedgerows and how they may be used by barbastelle bats [REP1-049]. It requested more information about each hedgerow to be removed and woodland to be fragmented, plus an estimate of recovery timescales [RR-106]. NE also suggested a requirement for a mitigation plan prior to hedgerow removal and that hedgerows should be monitored for seven years or until they have reached the same or better quality than before they were removed [RR-106, REP2-036 and REP6-032].

The Applicant provided a clarification note [REP1-049] which confirmed that 130 m of hedgerow within 5 km of Paston Great Barn SAC would be temporarily removed during construction; 82 m of which support

foraging barbastelle bats. The Applicant reiterated that detailed bat and hedgerow mitigation measures are captured within the OLEMS [APP-031] and secured through Requirement 24 of the DCO (Ecological Management Plan), which would require consultation with NE prior to discharge. Nevertheless, NE [REP2-036] advised that the development has the potential to affect the conservation objective to "Maintain the presence, structure and quality of any linear landscape features which function as flight lines".

The Applicant submitted an updated version of the clarification note [REP6-013] which included additional information regarding the extent of available alternative foraging habitat, the location of habitat potentially temporarily fragmented from construction and the location of hedgerows temporarily affected during construction. Further to a review of the note, NE [REP6-032 and REP7-075] confirmed that it had withdrawn its concerns and agreed with the Applicant's assessment of no AEoI of the barbastelle population of the Paston Great Barn SAC.

However, NE [REP6-032 and REP7-075] still advised that an OLEMS/EMP should include the improvement of hedgerows either side of the section to be removed and that the mitigation plan should be in place for 7 years or until hedgerow has fully recovered. The Applicant updated section 7.3.3 of the OLEMS [REP7-008], however NE [REP8-104] noted that a full hedgerow mitigation plan was not submitted, therefore it could not provide further comment.

Matters related to the Paston Great Barn SAC were noted as agreed in the final SoCG with NE [REP9-046].

On the basis that measures for hedgerow mitigation and monitoring have been adequately secured, the Secretary of State is content that an AEoI on Paston Great Barn SAC can be ruled out from the project alone.

5.12.2 Barbastelle Bat Disturbance: In-combination

5.12.2.1 Direct effects in *ex-situ* habitats

The Applicant identified potential for in-combination impacts with:

- Norfolk Boreas Offshore Wind Farm,
- Bacton Gas Terminal coastal protection,
- Bacton coastal protection scheme.

Both the Bacton Gas Terminal and the Bacton coastal protection schemes were due to be completed prior to any pre-construction work associated with the Project is due to commence.

Onshore works for the Norfolk Boreas Offshore Wind Farm would not entail any additional hedge removal, although a 6 m gap would be retained for an additional two years due to the project.

The Applicant determined that the in-combination impacts would not cause a AEoI of the site [APP-045].

As with the Project alone, matters related to the Paston Great Barn SAC were noted as agreed in the final SoCG with NE [REP9-046].

On the basis that measures for hedgerow mitigation and monitoring have been adequately secured, the Secretary of State is content that an AEoI on Paston Great Barn SAC can be ruled out from the project in-combination.

5.13 Appropriate Assessment: River Wensum SAC

The River Wensum SAC supports the following qualifying features:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot
- *Vertigo moulinsiana*; Desmoulin`s whorl snail
- *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish
- *Lampetra planeri*; Brook lamprey
- Cottus gobio; Bullhead

The conservation objectives are presented in Table 14.

Table 14: Conservation objectives for the River Wensum SAC.

Conservation Objectives	The objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The Secretary of State has identified an LSE on the above listed features due to the potential changes to sedimentation.

5.13.1 Sedimentation: Project alone and in-combination

NE raised concerns about the level of detail within the CoCP regarding measures to safeguard the River Wensum SAC in relation to sediment control and reinstatement of all work areas [RR-106 and REP1-088]. The Applicant responded with a note [REP6-013] to clarify its approach to onshore construction works within functional floodplains and identify mitigation measures to minimise the risk of sediment or pollutant release. It clarified its approach to grassland reinstatement and captured these commitments in the outline CoCP [REP7-006].

NE [REP7-075 and REP9-046] subsequently confirmed it had withdrawn its concerns. It agreed that the site-specific management plans required for each watercourse crossing (Requirement 25 of the DCO) would include site specific details regarding sediment management and pollution prevention measures and would lead to no AEoI on the Rover Wensum SAC.

Based on the above, the Secretary of State has concluded that sedimentation the Project alone and in-combination will not have an AEOI on the River Wensum SAC.

5.14 Appropriate Assessment: The Southern North Sea SAC

The Southern North Sea SAC was designated on 26 February 2019 for harbour porpoise. The site is located to the east of England and stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south, covering an area of approximately 36,951 km^2. A mix of habitats, such as sandbanks and gravel beds, cover the seabed and water depths range from mean low water to 75m. The majority of the site has water depths of less than 40m. The only qualifying feature is harbour porpoise (*Phocoena phocoena*). The SAC has two seasonal components that reflect harbour porpoise distribution in the winter and summer seasons (Figure 5).

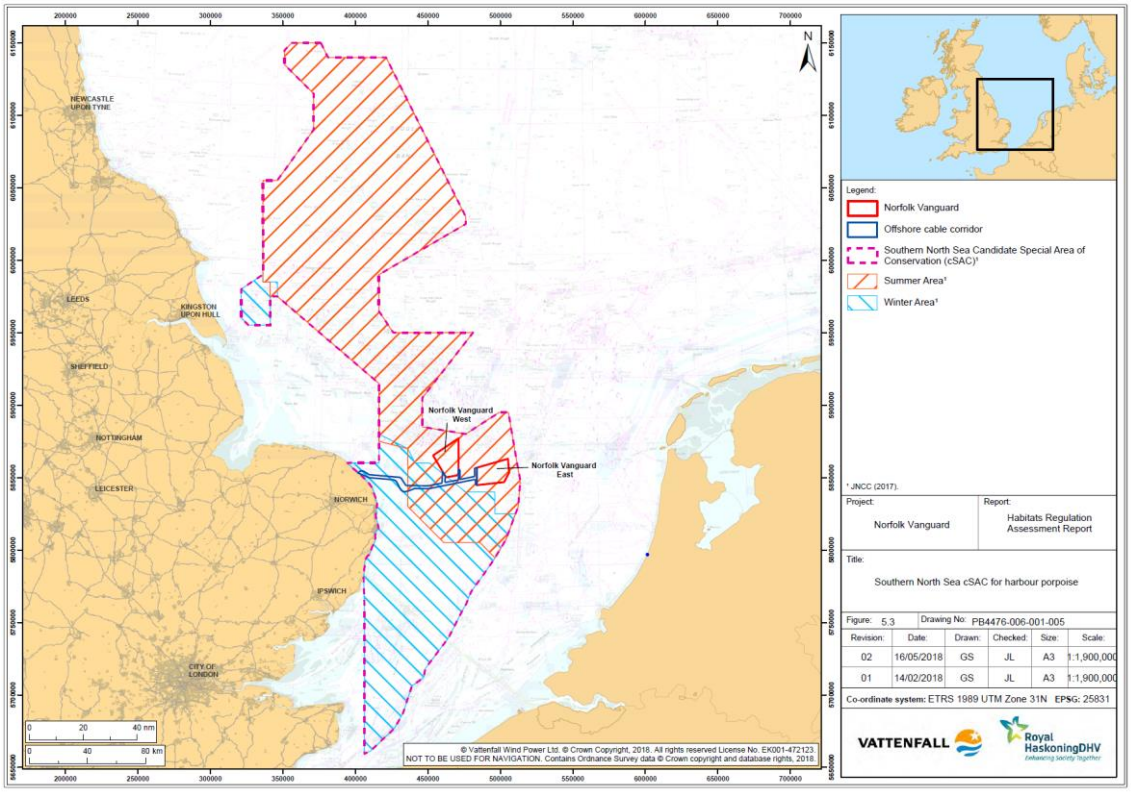

Figure 5: Southern North Sea SAC and location of Norfolk Vanguard offshore wind farm.

The conservation objectives (Table 15) for the site were released by the JNCC[39] in March 2019.

Table 15: Conservation objectives for the Southern North Sea SAC

Conservation Objectives	To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that: • Harbour porpoise is a viable component of the site; • There is no significant disturbance of the species; and • The condition of supporting habitats and processes, and the availability of prey is maintained.

[39] http://archive.jncc.gov.uk/pdf/SNorthSea_ConsAdvice.pdf

An LSE upon the harbour porpoise interest feature of the SAC was identified because of the potential for the Project alone and in-combination with other plans or projects to impact the harbour porpoise feature of the site from:

- Auditory injury from underwater noise,
- Disturbance from underwater noise,
- Vessel disturbance and collision,
- Changes to prey resource,
- Changes to water quality.

The Secretary of State considers each of these potential impacts below for the Project alone and in-combination with other plans and projects.

Note that UXO detonations have not been considered as part of this Appropriate Assessment. Whilst the Applicant provided information on expected UXO clearances, it was agreed by the MMO [REP9-045] and NE [REP9-046], that the matter of Unexploded Ordinance (UXO) clearance would be licenced separately by the MMO and is outwith the DCO process.

5.14.1 Harbour Porpoise: Alone Assessment

5.14.1.1 Auditory injury

Marine mammal auditory injury can occur at close proximities to the loud sounds created during piling. In some cases, severe injury can lead to mortality.

The Secretary of State notes that the Applicant screened the potential for auditory injury out for further assessment, based on the inclusion of a Marine Mammal Mitigation Protocol (MMMP). A final draft MMMP was provided at Deadline 9 [REP9-021], but there is a secured commitment to update this prior to construction through Condition 9(1)(f) of the Generation Asset DMLs (Schedules 9 and 10) and Condition 14(4) of the Transmission DMLs (Schedules 11 and 12) within the DCO).

Despite the Applicant's assurances on screening, the ExA has advised the Secretary of State that the 2018 ruling by the Court of Justice of the European Union (the CJEU) on the interpretation of the Habitats Directive in the case of People Over Wind and Sweetman vs Coillte Teoranta (2018) ('the People over Wind judgement'), confirmed that mitigation should not be taken into account when determining LSE for European sites.

The Secretary of State also notes and agrees with the ExA that, notwithstanding this point, sufficient information has been provided by the Applicant to enable an Appropriate Assessment to be undertaken. Therefore, the Secretary of State has proceeded to include the MMMP and its suitability as mitigation for marine mammal auditory injury in his Appropriate Assessment below.

In undertaking the Appropriate Assessment, the Secretary of State notes that a MMMP for piling operations can involve the establishment of a suitable measures such as the use of a mitigation zone around the piling location before the event, with use of soft starts, marine mammal observers and deployment of Acoustic Deterrent Devices (ADDs). The Applicant has committed to ensure that the mitigation measures are adequate to ensure no marine mammals are present within the mitigation zone prior to any piling event, to reduce the risk of auditory injury.

The final methods for achieving the mitigation zone will be agreed in consultation with the relevant SNCBs and secured as commitments within the final MMMP, based on the most suitable techniques and current guidance.

In relation to representations made on the MMMP, the Secretary of State notes that Whale and Dolphin Conservation (WDC) and The Wildlife Trust (TWT) raised concerns over effectiveness of soft-start piling to reduce potential effects on marine mammals, however NE confirmed that it considered that the proposed soft-start protocol would be fit for purpose and that the MMMP and the SIP will contain appropriate mitigation measures once they are agreed and finalised to address an AEoI alone [REP4-062].

In view of the MMMPs inclusion within the DMLs and DCO, the Secretary of state is satisfied that the risk of auditory injury from piling event has been sufficiently reduced. On this basis, the Secretary of State concludes that the potential for auditory injury from the Project alone to occur will not result in an AEOI of the Southern North Sea SAC.

5.14.2 Disturbance from underwater noise

The loud sounds generated during construction and operation of the Project are likely to disturb harbour porpoise. The Applicant assessed the level of disturbance in relation to several activities associated with the windfarm including piling.

Assessment of the potential level of disturbance from these activities followed the then draft guidance provided by Natural England, which advocated the following spatial approach[40].

- Displacement of harbour porpoise should not exceed 20% of the seasonal component of the SAC area at any one time and / or on average exceed 10% of the seasonal component of the SAC area over the duration of that season.
- The effect of the project should be considered in the context of the seasonal components of the SAC area, rather than the SAC area as a whole.
- A distance of 26 km from an individual percussive piling location should be used to assess the area of SAC habitat harbour porpoise may be disturbed from during piling operations.
- A buffer of 10 km (has since been increased to 12 km) around seismic operations and 26 km around UXO detonations used to assess the area of SAC habitat harbour porpoise may be disturbed.

The Applicant's assessment demonstrated that both the 20% and 10% thresholds would not be exceeded for any activity associated with the construction and operation of the Project [APP-045]. For information purposes, the Applicant also looked at this effect in the context of the North Sea Management Unit population of harbour porpoises and estimated that less than 1% of this population would be temporarily disturbed.

In view of the Applicant's assessment NE advised the ExA that the disturbance from the Project alone would not have an AEOI of the SNS SAC [RR-106, REP3-051].

Other Interested Parties did not support the position taken by NE and the Applicant. WDC and TWT did not agree with the SNCB guidance on noise management, stating that the area-based thresholds are not underpinned by evidence [REP1-061, REP1-062, REP1-123, REP4-072 and REP8-110]. Therefore, they

[40] The SNCBs have since issued the final version of the Guidance JNCC, NE and DAERA (2020). *Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland)*.

did not agree with the Applicant's conclusions and considered that the spatial and temporal thresholds would be breached. Both parties requested that limits were placed on noise levels during construction [RR-013 and RR-172]; TWT noted that this approach is based on scientific data and is used in Germany, the Netherlands and Belgium and should be applied to ensure consistency across the SNS [RR-172, REP3-063 and REP4-072].

The Applicant's response to this was that whilst other countries may place noise limits on the construction phase, at present there is a lack of evidence about how noise limits could be implemented effectively.

In its recommendation to the Secretary of State ExA did not consider there to be a persuasive argument for to depart from the approach outlined in NE's draft guidance. The ExA enquired in [PD-012] as to whether there existed any further relevant scientific evidence or justification that casts doubt on this approach, but no additional evidence was provided.

The Secretary of State has considered the representations made by the Applicant, NE, WDC and TWT, and the recommendation as made by the ExA. The Secretary of State notes that NE agree with the Applicant that disturbance from underwater noise from piling events and other construction/operational activities from the project alone would not lead to an adverse effect on the SNS SAC. The Secretary of State is satisfied that the potential impacts on harbour porpoise as a result of underwater noise from the Project alone would not represent an adverse effect upon the integrity of the Southern North Sea SAC.

5.14.3 Vessel collision.

It is possible that Harbour Porpoise could be disturbed by increased vessel activity. An increased number of vessels also increases the chance of collision.

Indicative daily vessel movements (return trips to a local port) during construction of the Project are estimated to be an average of two per day at both construction and operation phases. The maximum number of vessels on site at any one time would be 57.

It is expected 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. Nevertheless, for assessment purposes it was assumed that the number of animals that could be affected as a result of collision during construction and operation is the number of animals that could be present in the wind farm area and the cable route.

NV West area (295 km^2.) is approximately 1% of the summer Southern North Sea SAC area, the NV East area (297 $km^{2)}$ is also approximately 1% of the summer SAC area. The total offshore cable corridor area (237 km^2) is less than 1% of the summer SAC area and less than 2% of the winter SAC area. Displacement of harbour porpoise would not exceed 20% of the seasonal component of the Southern North Sea SAC at any one time, nor would it exceed the 10% seasonal component.

Assuming a 90-95% avoidance rate the Applicant predicted that 0.03% or less of the North Sea MU reference population could be at increased risk based on the worst-case scenario.

On this basis the Applicant concluded that vessel disturbance and collision from the project alone would not have an AEOI on the Harbour Porpoise of the SNS SAC. This conclusion was not disputed by any Interested Party. The Secretary of State agrees with this conclusion.

5.14.4 Changes to prey resource

Potential effects on fish species during construction can result from physical disturbance and temporary loss of seabed habitat; increased suspended sediment concentrations and sediment re-deposition; and underwater noise (that could lead to mortality, physical injury, auditory injury or behavioural responses).

Although, none of these potential effects were assessed as being significant (they were either negligible or minor adverse) in the ES.

For underwater noise, the Applicant took into account their wide distribution ranges of prey, including areas used as spawning grounds, in the context of the potential ranges where inury or distrubance could occur and determined that any potential effect would not be significant.

For physical disturbance and temporary loss of habitat to fish prey during construction, the Applicant calculated that there could be 15.7 km^2 in total for the Project and 13 km^2 for the offshore cable corridor. The Applicant considered that such low magnitude of impact, the impact on fish species, including sandeel and herring, would be of minor adverse significance (not significant).

Similarly, the magnitude of impact on prey from any increased suspended sediment concentrations and sediment re-deposition would be low, with only a small proportion of fine sand and mud staying in suspension long enough to form a passive plume.

Potential effects on fish species during operation and maintenance can result from permanent loss of habitat; introduction of hard substrate; operational noise; and electromagnetic fields (EMF). None of the potential effects were assessed as being significant (negligible or minor adverse) in the ES.

The introduction of hard substrate, such as turbines, foundations and associated scour protection as well as cable protection, associated with Norfolk Vanguard would increase habitat heterogeneity through the introduction of hard structures in an area predominantly characterised by soft substrate habitat. However, any hard substrate would occupy discrete areas and the relatively small areas of the infrastructure. During operation, the worst-case total area of habitat loss has been estimated to be up to 11.75km^2 in total.

The areas potentially affected by EMFs generated by the worst-case scenario offshore cables are expected to be small, limited to the area of the OWF sites and the offshore cable corridor and restricted to the immediate vicinity of the cables (i.e. within metres). In addition, EMFs are expected to attenuate rapidly in both horizontal and vertical plains with distance from the source. Therefore any potential effect of EMF on fish species would not be significant.

On this basis of the above, the Applicant considered it highly unlikely that changes to prey resources would occur over the entire windfarm area and cable route. However, for assessment purposes went on to calculate that the number of harbour porpoise that could be affected as a result of changes to prey resources during construction and operation is the number of animals that could be present in the wind farm area and the cable route.

The Applicant predicted 0.1% of the North Sea MU reference population could be at increased risk based on the worst-case scenario of all harbour porpoise within the wind farm area being impacted. This is precautionary as during construction harbour porpoise are predicted to be displaced by the impacts from construction noise as opposed to changes in prey availability [APP-336].

On this basis the Applicant concluded that changes to prey resources from the project alone would not have an AEOI on the Harbour Porpoise of the SNS SAC. This conclusion was not disputed by any Interested Party. The Secretary of State agrees with this conclusion.

5.14.5 Changes to water quality

The risk of accidental release of contaminants (e.g. through spillage) will be mitigated through appropriate contingency planning and remediation measures for the control of pollution. The Applicant has stated that it is committed to the use of best practice techniques and due diligence regarding the potential for pollution throughout all construction, operation, maintenance and decommissioning activities. A draft Project Environmental Management Plan (PEMP) submitted during the Examination includes mitigation

measures to reduce the risk of any accidental spills or release of contaminants. In addition, a Marine Pollution Contingency Plan (MPCP) will be developed and agreed post-consent. On this basis the Applicant considered, the risk of any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) is negligible.

Disturbance of seabed sediments during construction has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. However, data from the site specific surveys undertaken in 2016 indicates that levels of contaminants within NV East, NV West and the offshore cable corridor are very low. Two of the 13 locations sampled exceeded Cefas Action Level 1 for concentrations. These were for arsenic and only marginally exceeded the Action Level 1 concentration. All organotin and PCB results were below the limits of detection (0.004 mg/kg and 0.0001 mg/kg respectively). Therefore, the resuspension of contaminated sediment from construction activities is anticipated to be negligible.

There is the potential for increased suspended sediments as a result of construction activities, such as installation of foundations (for wind turbines, accommodation and electrical substation platforms), cable installation and during any levelling or dredging activities. However, modelling indicates that the majority of the sediment released during seabed preparation would be coarse and would fall within minutes/ tens of minutes) to the seabed as a highly turbid dynamic plume immediately upon its discharge (within tens of metres along the axis of tidal flow).

The small proportion of fine sand/mud would stay in suspension. for longer and form a passive plume. This plume (tens of mg/l) is likely to exist for around half a tidal cycle. Sediment would settle to the seabed within a few hundred metres up to around a kilometre along the axis of tidal flow, within a short period of time (hours).

Within the passive plume, suspended solids concentrations were predicted to be within the range of natural variability. Suspended solids concentrations rapidly returned to background levels after cessation of the release into the water column. The deposits across the wider seabed would be very thin (millimetres) and would occur within Norfolk Vanguard.

On this basis of the above, the Applicant considered it highly unlikely that changes to water quality would occur over the entire windfarm area and cable route. However, for assessment purposes went on to calculate that the number of harbour porpoise that could be affected as a result of changes to prey resources during construction and operation is the number of animals that could be present in the wind farm area and the cable route which equates to 0.3% of the Management Unit population. On this basis the Applicant concluded that changes to water quality from the project alone would not have an AEOI on the Harbour Porpoise of the SNS SAC. This conclusion was not disputed by any Interested Party. The Secretary of State agrees with this conclusion.

5.14.6 Harbour Porpoise: In-combination

5.14.6.1 Auditory injury

The Applicant's HRA report states that no other activities were identified that could lead to auditory injury and, as such, the Project would not contribute to an in-combination effect. This conclusion was not disputed by any interested part.

On this basis, the Secretary of State concludes that the potential for auditory injury from the Project in-combination with other plans and Projects to occur will not result in an AEOI of the Southern North Sea SAC.

5.14.6.2 Disturbance from underwater noise

The Applicant's HRA report states that there is a high level of uncertainty in relation to the in-combination scenarios that will arise by the time of the Project construction. The approach taken was therefore based on a range of indicative scenarios for in-combination piling activity, seismic surveys, vessels, seabed preparation, ploughing / jetting / pre-trenching or cutting for installation of cables and rock dumping for protection of the cable, and offshore windfarm operation and maintenance activities.

Of the activities assessed, piling had by far the biggest impact. By looking at potential construction schedules, the Applicant estimated that a worst case scenario would involve the Project piling at the same time as four other UK offshore windfarm projects (Creyke Beck B, Sofia, Hornsea Project 3 And East Anglia TWO). Together, these windfarms have the potential to disturb up to 17,667 harbour porpoises, which equates to 5.1% of the North Sea Management Unit reference population. Using NE's spatial approach, it was calculated that disturbance from in-combination piling has the potential to overlap with up to 36.17% and 27.06% of the winter and summer areas, respectively. Averaging disturbance across a season could overlap with up to 22% and 18% of the winter and summer areas, respectively.

Table 16 taken from of the Applicant's HRA report sums all the other activities together with piling considered by the Applicant in the assessment [41].

Table 16: Quantified in-combination disturbance effect on harbour porpoise

Potential noise sources during piling at Norfolk Vanguard	Potential number of harbour porpoise disturbed (% of reference population)	Area in summer cSAC area (km^2) (percentage of seasonal area)	Area in winter cSAC area (km^2) (percentage of seasonal area)	Seasonal average for summer cSAC area	Seasonal average for winter cSAC area
Piling at OWF projects, based on potential worst-case scenario of OWF projects that could be piling at the same time (Dogger Bank Teesside B (now Sofia), Dogger Bank Creyke Beck B, Hornsea Project Three, East Anglia TWO and Norfolk Vanguard West) for single pile installation at each site and average overlap with cSAC seasonal area (Table 8.34; Table 8.35 and Table 8.36)	8,833 (3%)	4,268km^2 (16%)	2,593km^2 (19%)	15%	16%
OWF construction activities, based on OWFs that are not piling but potential for other construction activities during piling at Norfolk Vanguard (Table 8.41; Table 8.42and Table 8.43) and 100% disturbance	1,925 (0.6%)	1,567km^2 (6%)	482km^2 (4%)	6%	4%
OWF operation and maintenance, based on constructed OWFs that could have O&M activities during piling at Norfolk Vanguard (**Table 8.44**; **Table 8.45** and **Table 8.46**) and 100% disturbance	1,495 (0.4%)	52km^2 (0.2%)	482km^2 (4%)	0.2%	4%
Sub-total (without UXO clearance and seismic surveys)	***12,253 (4%)***	***5,887km^2 (22%)***	***3,557km^2 (27%)***	***21%***	***24%***
UXO clearance, based on up two locations, one in each cSAC seasonal area (**Table 8.37** and **Table 8.38**)	2,210 (0.6%)	2,124km^2 (8%)	2,124km^2 (16%)	0.9%	2%
Seismic surveys, based on up two locations, one in each cSAC seasonal area (**Table 8.39** and **Table 8.40**)	326 (0.09%)	324km^2 (1%)	324km^2 (2%)	0.07%	0.1%
Total	**14,789 (4%)**	**8,335km^2 (31%)**	**6,005km2 (45%)**	**22%**	**26%**

Whilst the Applicant considered the worst case scenario to be highly unlikely, it was proposed that a Southern North Sea Site Integrity Plan (SNS SIP) should be produced to set out the approach to deliver any project mitigation or management measures to reduce piling disturbance to harbour porpoise from the in-combination effects of underwater noise with other plans or projects during the construction period. Construction would not be allowed to commence until the MMO is satisfied that the plan provides the

[41] It is noted that absolute worst case figures provided have not been used.

necessary mitigation. An In Principle SNS SIP was provided [APP-041] and it has been secured through Condition 14(1)(m) of the Generation Asset DMLs (Schedules 9 and 10) and Condition and 9(1)(l) of the Transmission DMLs (Schedules 11 and 12) of the DCO.

NE [REP9-046] recognised that the worst-case scenario assessed by the Applicant is unrealistic, but that it does remain probable that two or more projects may wish to undertake noisy activities at the same time. It agreed [REP1-049] that the draft SIP provided an appropriate framework to agree mitigation measures and that the scope of the measures within the In Principle SIP [APP-041] were appropriate; although it noted that as there has not yet been a need to adopt these measures, they have not been proven to be deliverable [REP1-088]. It also considered [RR-106, REP2-036 and REP9-046] there remained a lack of clarity on how SIP conditions would ensure that mitigation would be put in place to prevent exceedance of the SNCB thresholds for disturbance and that a mechanism would need to be developed by the regulators to ensure continuing adherence to the SNCB thresholds as multiple SIPs are developed over time.

The MMO [REP1-084 and REP4-059] considered a SIP could be used to demonstrate how in-combination underwater noise impacts would be mitigated to ensure that it would not cause an adverse effect. However, it stressed that this would require accurate project timetables and noted that there is currently no mechanism in place for a regulator to control the scheduling of piling operations [REP1-084].

The MMO also explained [REP4-059] that it has enforcement powers to issue a stop notice or to vary, suspend or revoke a licence. It envisages that construction plans would be assessed by the Applicant in-combination with other projects to ensure there would be no breach of proposed thresholds prior to submission to the MMO. It advised [REP6- 030 and REP7-071] that if the consent decision occurs prior to a mechanism being defined, it could vary the DML; however, the current SIP requirement is likely to be sufficient to allow any mechanism to be fully incorporated without need for variation.

The MMO [REP8-102] confirmed it believes the condition provides the best mechanism at this time to protect impedance of the conservation objectives.

The WDC and TWT agreed with the principle of a SIP but did not consider the In Principle SNS SIP [APP-041] contained enough information to give certainty of no AEoI beyond reasonable scientific doubt. TWT [REP1-123] advised that more evidence is required to detail how effective the mitigation outlined in the In Principle SNS SIP would be, and that noise modelling should be undertaken to demonstrate the degree of noise reduction which could be achieved through mitigation. It expressed concerns that there are no mechanisms in place to ensure regulation and compliance of the SIP; that monitoring to understand the effectiveness of mitigation to be delivered through the SIP was not adequate; and that UXO clearance should be included in the DMLs and the SIP conditions due to a lack of baseline data on the number and location of UXO clearances [REP8 110].

The Applicant stated that the In Principle SIP format follows that agreed for other consented projects and is based on information currently available, however it confirmed that the final SIP would be updated based on the final design and taking into account best scientific evidence at the time [REP1-004, REP2-003, REP2-004 and REP7-058].

It noted [REP4-038] that the BEIS Review of Consents draft HRA has identified a SIP as the most appropriate mechanism to manage the mitigation of potential AEoI of the SNS SAC and provided an explanation of the options to manage in-combination effects and mitigation for harbour porpoise [REP4-038 and REP4-040]. It provided an updated SNS SIP [REP9-026] at D9 to take into account comments received from NE and the MMO.

By the close of Examination, NE and the Applicant [REP9-046] agreed the draft SNS SIP provides an appropriate framework to agree mitigation measures for effects on the SNS SAC with SNCBs and the

MMO prior to construction. They also agreed that a strategic management mechanism is required from the Regulator and that the current requirement for a SIP is sufficient to allow any mechanism to ensure disturbance can be limited to an acceptable level to be fully incorporated without need for a variation. However, NE advised [REP8-104] that an AEoI from in-combination impacts cannot be ruled out until this mechanism is in place.

In the ExAs recommendation, it was noted that at the close of Examination, a number of matters described above remained unresolved. In particular, the residual concerns from WDC and TWT over the effectiveness of the Applicant's proposed mitigation. Nevertheless, the ExA were satisfied that through the MMMP and SNS SIP, the Applicant will use the most appropriate measures for the Project based on best knowledge, evidence and proven available technology at the time of construction. The ExA accepted that the SIP cannot be finalised until project design is determined but the ExA considered there to be sufficient detail on potential mitigation measures at this stage, whilst granting the Applicant a flexible approach until the extent and nature of mitigation becomes clear.

The ExA considered that as the final project design evolves, it is likely that better scientific evidence may become available to influence later activities in a positive sense. It also includes a mechanism whereby should new scientific information indicate an outcome beyond that which was assessed in the AA, there should be a review of the position and potentially changes made to the Project.

On this basis, the ExA were satisfied that there would not be an AEOI as a result of disturbance from in-combination piling event.

The ExA's recommendation also included a change to the DCO that had not been discussed during Examination with regard to the use of vibro-piling or 'blue-hammer' technology. In response to a request for information the Applicant has proposed alternative text that refers to all piled foundations irrespective of the technology used to install them [Vattenfall 2020b][42]. The Secretary of State is content that the text proposed by the Applicant captures all possible installation scenarios involving piling.

The Secretary of State has considered the representations made by the Applicant, NE, WDC and TWT, and the recommendation as made by the ExA. The Secretary of State is satisfied that through the SNS SIP, the Applicant will use the most appropriate measures for the Project based on best knowledge, evidence and proven available technology at the time of construction. On this basis the Secretary of State is satisfied that the potential impacts on harbour porpoise as a result of underwater noise from the Project in-combination with other plans and projects would not represent an adverse effect upon the integrity of the Southern North Sea SAC.

5.14.6.3 Vessel Collision

The Applicant's assessment of the number of harbour porpoise that could be at increased collision risk with vessels was based on the number of animals that could be present in the wind farm areas taking into account 95% avoidance rates.

This determined that the number of harbour porpoise that could have a potential increased collision risk with vessels in OWF sites in the North Sea MU during construction would be 214 individuals, which represents 0.06% of the North Sea MU reference population.

[42] Vattenfall (2020b). *Norfolk Vanguard Offshore Wind Farm applicant's response to request for information Department for Business, Energy and Industrial Strategy (BEIS) Request for information.* Document Reference ExA; WQ; 11.D10.1. 28 February 2020.

The Applicant's HRA report states that under these circumstances, there is no anticipated adverse effect on the integrity of the Southern North Sea SAC in relation to the conservation objectives for harbour porpoise.

This conclusion was not disputed by any Interested Party. The Secretary of State agrees with this conclusion.

5.14.6.4 Changes to Water Quality

Following a request for information the Applicant assessed the impacts on water quality to be highly localised and therefore there was no potential for any in-combination effects and no in-combination impact pathways have been identified and temporary.

The Applicant confirmed that the risk of accidental release of contaminants (e.g. through spillage) will be mitigated through appropriate contingency planning and remediation measures for the control of pollution. A draft Project Environmental Management Plan (PEMP) has been submitted with the DCO application. This includes the appropriate mitigation measures to reduce the risk of any accidental spills or release of contaminants. In addition, a Marine Pollution indicates that the Contingency Plan (MPCP) will be developed and agreed post-consent.

On this basis, the Secretary of State is satisfied that there will not be an AEOI as a result of changes in water quality.

5.14.6.5 Changes to Prey Resource

The Applicant's in-combination assessment on potential changes to prey availability has assumed that any potential effects on harbour porpoise prey species from underwater noise, including piling, would be the same or less than those for harbour porpoise as assessed for in-combination disturbance. Therefore there would be no additional effects other than those assessed harbour porpoise, i.e. if prey are disturbed from an area as a result of underwater noise, harbour porpoise will 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.

In the Applicant's view, effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity.

The Applicant considered that any permanent loss or changes of prey habitat will typically represent a small percentage of the potential habitat in the surrounding area. Consequently, thr Applicant determined that there would be **no** adverse effect on the integrity of the Southern North Sea SAC in relation to the conservation objectives for harbour porpoise arising from changes in prey resources.

This conclusion was not disputed by any Interested Party. The Secretary of State agrees with this conclusion.

5.15 Appropriate Assessment: The Wash and North Norfolk Coast SAC

The Wash and North Norfolk Coast SAC supports the following qualifying features:

- Atlantic salt meadows
- Coastal lagoons
- Harbour (common) seal
- Large shallow inlets and bays
- Mediterranean and thermo-Atlantic halophilous scrubs
- Mudflats and sandflats not covered by seawater at low tide
- Otter
- Reefs
- *Salicornia* and other annuals colonising mud and sand
- Sandbanks which are slightly covered by sea water all the time

The conservation objectives of the site are presented in Table 17.

Table 17: Conservation objectives for the Wash and North Norfolk Coast SAC

Conservation Objectives	The objectives are to ensure, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • the extent and distribution of qualifying natural habitats and habitats of the qualifying species. • the structure and function (including typical species) of qualifying natural habitats. • the structure and function of the habitats of the qualifying species. • the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely. • the populations of each of the qualifying species. • the distribution of qualifying species within the site.

The Secretary of State has identified an LSE on the harbour seal feature due to the potential for disturbance to occur at haul out sites and at sea foraging grounds. An LSE was also identified due to the risk of collision at sea with increased vessel traffic

5.15.1 Harbour Seal Disturbance: Alone

5.15.1.1 Disturbance at Haul Out Sites

The Applicant's HRA report [APP-045] assessed the potential effect of vessels at haul out sites. It concluded that vessels would be highly unlikely to be within 300 m of the coast, in areas of close proximity to the seal haul-out sites within the Wash and North Norfolk Coast SAC. On this basis the Applicant concluded that there would be no potential for AEOI.

5.15.1.2 At Sea Disturbance

The Applicant's HRA report provided an estimate for the number of seals temporary disturbed in the array and cable corridor by activities occurring during the construction and operation of the Project. The

maximum number[43] of harbour seals temporary disturbed was 0.2 in the wind farm area and 24 in the corridor. Assuming all seals were from the Wash and North Norfolk Coast, the Applicant calculated this would equate to 6.3% of the SAC population.

The Wash and North Norfolk Coast SAC is located 82 km from the Project site and 33 km from the offshore cable corridor (at closest point). On this basis the Applicant considered that it would be highly unlikely, especially taking into account the movements of tagged seals, that all seals in the offshore development area are from the Wash and North Norfolk Coast SAC.

This position was not disputed by any interested party.

The Secretary of State is content that the risk of disturbance at haul sites is low. In relation to at-sea disturbance the Secretary of State has reviewed the worst case figures presented and has noted the low likelihood of all seals originating from the Wash and North Norfolk Coast SAC. On this basis of this assessment the Secretary of State has concluded that disturbance from the Project will not have an AEOI of the harbour seal feature of the Wash and North Norfolk Coast SAC.

5.15.1.3 Harbour Seal Collision

The Applicant's HRA report provided approximate figures for the number of vessel movements expected from the Project's construction (operational movements are unlikely to be near the Wash and North Norfolk Coast SAC given the expected operation and maintenance ports are in East Anglia): 1,180 vessel movements over the two to four year indicative offshore construction window, with an average of approximately two vessel movements per day. However, the Applicant stated considered that it is expected that seals would be able to detect the presence of vessels and, given that they are highly mobile, would be able to largely avoid vessel collision. This conclusion was not disputed by any interested party.

The Secretary of State agrees with the above rational. On this basis, he has concluded that collision risk from the Project will not have an adverse effect on the harbour seal population protected by the Wash and North Norfolk Coast SAC.

5.15.2 Harbour Seal Disturbance: In-combination

5.15.2.1 Disturbance at Haul Out Sites

The Applicant's HRA report [APP-045] assessed the potential effect of vessels at haul out sites. It concluded that vessels would be highly unlikely to be within 300 m of the coast, in areas of close proximity to the seal haul-out sites within the Wash and North Norfolk Coast SAC. On this basis the Applicant concluded that there would be no potential for an in-combination AEOI.

5.15.2.2 At Sea Disturbance

The Applicant's HRA report provided an estimate for the number of seals temporary disturbed from the Project in-combination with other plans and projects by activities occurring during the construction and operation phases. The maximum number of harbour seals temporary disturbed was 209[44]. Assuming all seals were from the Wash and North Norfolk Coast, the Applicant calculated this would equate to 6% of the SAC population.

[43] The maximum figure referred here does not include UXO estimates as UXO clearance is subject to separate licencing.

[44] Note this figure includes UXO clearances and seismic surveys which are subject to separate licencing.

However, the Applicant considered that given the wide range of plan/project locations over the southern North Sea area used in this in combination assessment it is highly unlikely that all disturbed seals would be from the Wash and North Norfolk Coast SAC. Furthermore, given the distance between the projects offshore and their distance from the coast, it is not anticipated that foraging harbour seal would be significantly displaced from foraging areas or moving between haul-out sites and foraging areas, On this basis the Applicant considered that there would not be an AEOI on the Wash and North Norfolk Coast SAC.

This position was not disputed by any interested party.

The Secretary of State is content that the risk of disturbance at haul sites is low. In relation to at-sea disturbance the Secretary of State has reviewed the worst case figures presented and has noted the low likelihood of all seals originating from the Wash and North Norfolk Coast SAC. On this basis of this assessment the Secretary of State has concluded that disturbance from the Project in-combination with other plans and Projects will not have an AEOI of the harbour seal feature of the Wash and North Norfolk Coast SAC.

5.15.2.3 Harbour Seal Collision

The Applicant's HRA report provided approximate figures for the number of vessel movements expected from the Project's construction (operational movements are unlikely to be near the Wash and North Norfolk Coast SAC given the expected operation and maintenance ports are in East Anglia): 1,180 vessel movements over the two to four year indicative offshore construction window, with an average of approximately two vessel movements per day. However, the Applicant stated considered that it is expected that seals would be able to detect the presence of vessels and, given that they are highly mobile, would be able to largely avoid vessel collision. This conclusion was not disputed by any interested party.

The Secretary of State agrees with the above rational. On this basis, he has concluded that collision risk from the Project will not have an adverse effect on the harbour seal population protected by the Wash and North Norfolk Coast SAC.

6 Habitats Regulations Assessment Overall Conclusions

The Secretary of State has carefully considered all of the information presented before and during the Examination, including the RIES, the ES, representations made by Interested Parties, and the ExA's report itself. He considers that the Project has the potential to have an LSE on 15 European sites when considered alone and in-combination with other plans or projects. These sites are listed below:

- Alde-Ore Estuary SPA,
- Breydon Water SPA and Ramsar,
- Broadland SPA,
- Flamborough and Filey Coast SPA
- Greater Wash SPA
- North Norfolk Coast SPA/Ramsar site
- Outer Thames Estuary SPA
- Haisborough Hammond and Winterton SAC
- Humber Estuary SAC
- Norfolk Valley Fens SAC
- Paston Great Barns SAC
- River Wensum SAC
- The Broads SAC
- The Southern North Sea SAC
- The Wash and North Norfolk Coast SAC

The Secretary of State has undertaken an AA in respect of those 15 European sites' conservation objectives to determine whether the Project, either alone or in-combination with other plans or projects, will result in an adverse effect on integrity.

The Secretary of State has undertaken a robust assessment using all of the information available to him, not least the advice from the SNCBs, the recommendations of the ExA and the views of Interested Parties including the Applicant. Having considered all of the information available and the mitigation measures secured through the DCO and dMLs, the Secretary of State has concluded that the Project will not have an adverse effect on integrity on the relevant qualifying features of any of the sites listed above.

7 Transboundary Assessment

Given the potential for this Project to affect mobile features across a wide geographical area; the Secretary of State believes it important to consider the potential impacts on European sites in other European Economic Area ("EEA") states, known as transboundary sites, in further detail. The ExA also considered the implications for these sites, in the context of looking at the wider EIA considerations. The results of the ExA's considerations and the Secretary of State's own views on this matter are presented below.

Under Regulation 24 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, the ExA (on behalf of the Secretary of State) undertook two screenings. The first screening was undertaken on 16 February 2017 [OD-002]. It was concluded that significant effects on the environment of European Economic Area states were likely. A notice was placed in the London Gazette on 22 February 2017 and the following states were notified:

- Belgium;
- Denmark;
- France;
- Ireland;
- The Netherlands;
- Norway.

Belgium, Denmark, France, Germany and the Netherlands responded, requesting to be involved in further consultation in relation to the Project. Norway responded requesting to be kept informed of studies regarding birds but did not wish to participate in the consultation process. No response was received from Ireland.

Following the acceptance of the application for Examination, the second screening was undertaken on 8 August 2018. Consultation letters were sent to the states which had previously requested further involvement, offering the opportunity for them to register as Interested Parties. No additional states were identified as being likely to have significant effects on their environment.

France responded by noting the potential for impacts on marine mammals from noise during construction barrier effects on birds [OD-010]. Specific concerns raised by France related to impacts on qualifying features of the Bancs des Flandres and the Cap Gris-Nez SPAs. Furthermore, it requested the cumulative effects assessment be undertaken taking into account French wind farms; that ornithological monitoring be undertaken; and that the Applicant should implement mitigation techniques including clamping of turbines during heavy flows [REP1-074]. The Applicant responded to the concerns raised by the French Ministry in [REP1-007 and REP2-003] and submitted screening matrices for the Bancs des Flandres and Cap Gris-Nez SPAs [AS-044]. It noted that many of the named species at both Caps Griz-Nez and Bancs des Flandres SPAs have not been recorded on the Norfolk Vanguard site and are not ones associated with offshore locations. With respect to species named as nonbreeding features of the SPA, these consist of many of the seabird species which pass through the southern North Sea and English Channel on migration.

Given the relative size of the SPA population estimates for the migratory species compared with the total passage populations, the Applicant states that effects on the SPA populations due to Norfolk Vanguard would be negligible. Furthermore, the Applicant stated that due to the distances of the aforementioned sites from the Project (175 km and 210 km respectively) and the species concerned, then the potential

for connectivity is very small. The Applicant considered that cumulative impacts had been thoroughly assessed and confirmed that it had committed to monitoring seabirds through an Ornithological Monitoring Plan49. The Applicant concluded that LSEs can be ruled out.

In its 'Rule 17' Request for Further Information [PD-018] the ExA asked the French Government to provide any comments it wished to make in relation to the updated screening matrices [AS-044] for any of the Natura 2000 sites located in France. However, by the close of the Examination no further such responses had been received from the French Government.

The Netherlands requested that in-combination impacts on birds from future wind farms which are licensed and approved by official Government Policy should be included [OD-013]. Norway and Denmark had no additional comments.

Potential transboundary impacts were considered in the ES Transboundary Impacts Screening [APP-356] with relevant matters carried forward to the individual topic chapters of the ES.

The Secretary of State notes that the Applicant considered non-UK European sites in its Application and it concluded that there would be no likely significant effect from the Project alone and in-combination for all non-UK European sites. The Secretary of State has not been presented with any substantive evidence to demonstrate that transboundary impacts would be greater than negligible. As such, the Secretary of State considers that the Project either alone or in-combination would not give rise to any significant effects on any transboundary Natura 2000 sites.

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Date: