From:	Taylor, Jessica
To:	Norfolk Vanguard; Norfolk Vanguard
Subject:	RE: EN010079 Norfolk Vanguard Natural England Deadline 7 Submission (Ref: 280590)
Date:	02 May 2019 18:55:18
Attachments:	EN010079 280590 Norfolk Vanguard Natural England Comments on changes made to draft DCO at Deadline 6.5 Final.pdf EN010079 280590 Norfolk Vanguard Natural England comments on Vanguard deterministic CRM Final.pdf EN010079 280590 Norfolk Vanguard Natural England DAS Response to Unresolved Issues Clarification Notes Final.pdf EN010079 280590 Norfolk Vanguard Natural England Interim Position Statement at Deadline 7 for Offshore Ornithology Final.pdf EN010079 280590 Norfolk Vanguard Natural England"s Comments by species on Vanguard Deadline 6 (REP6-021) and Deadline 6.5 (AS-043) information.pdf EN010079 280590 Norfolk Vanguard Natural England"s comments on LBBG Alde-Ore Final.pdf EN010079 280590 Norfolk Vanguard Natural Englands comments on migrant non-seabird CRM Final.pdf

Dear Sirs,

Please find attached Natural England's submissions at Deadline 7 in relation to the Norfolk Vanguard Offshore windfarm Application, including:

- Natural England's Interim Position Statement at Deadline 7 for Offshore Ornithology
- Natural England's Comments by species on Vanguard Deadline 6 (REP6-021) and Deadline 6.5 (AS-043) information
- Natural England's Comments on Vanguard Deterministic Collision Risk Modelling (REP6-019)
- Natural England's Comments on Lesser Black-Backed Gull (LBBG) Alde-Ore Estuary Population Viability Analysis (PVA) (REP6-020)
- Natural England's Comments on Norfolk Vanguard Migrant Non-seabird Collision Risk Modelling (REP6-022)
- Natural England's Comments on changes made to draft Development Consent Order [AS-040]
- Copy of Natural England's Discretionary Advice Service (DAS) Response Letter to the Applicant on Outstanding Issues Raised by Natural England Following 18 March DAS Responses Clarification Note provided by the Applicant to Natural England on 15 April 2019

Best wishes,
Jess

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We are here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

In an effort to reduce Natural England's carbon footprint, I will, wherever possible, avoid travelling to meetings and attend via audio, video or web conferencing.

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NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Interim Position Statement at Deadline 7 for Offshore Ornithology

02 May 2019

1. Overview

1.1. This document sets out Natural England's current position on the predicted impacts of the Norfolk Vanguard proposal. This is set out in more detail in our full Deadline 7 submission. Our interim position is based on the information submitted by the Applicant at Deadline 6 and the additional submission on 16 April 2019. In particular, we have considered the Collision Risk Modelling (CRM) outputs presented in REP6-019, REP6-021 and AS-043.

1.2. Whilst there has been considerable progress regarding some of the methodological issues highlighted in Natural England responses from Relevant Representations onwards, some issues remain outstanding, and inevitably our assessments have also identified areas where further analysis or clarification is required. As such, these comments should be treated as a 'snapshot' of our current position. Natural England therefore reserves the right to revise our advice in the light of further information provided by the Applicant.

1.3. Natural England welcomes the revised worst case scenario and associated reductions in collision mortality set out in AS-043. However, following our review of AS-043, Natural England considers that further reductions in collision mortality through raising rotor blade heights will be needed to reduce impacts to acceptable levels.

2. Summary of Natural England's Advice on Key Offshore Ornithology Receptors

2.1. EIA – impacts alone – all species

2.1.1. Natural England advises that there will be no significant effects for all offshore ornithology receptors at the EIA scale from the Vanguard project alone, other than for red-throated diver, where we have previously advised a moderate adverse effect due to operational displacement.

2.2. EIA - cumulative impacts – gannet, kittiwake, large gulls, auks

2.2.1. Progress has been made regarding the assessment of cumulative EIA impacts. However, with the exception of herring gull, there are aspects of these assessments which require further work in order to allow robust conclusions to be drawn. This work is set out in our detailed advice. We note that the Applicant intends to submit updated cumulative assessments at Deadline 7.

2.2.2. However we can advise that there will not be an adverse cumulative impact on herring gull. Regarding cumulative displacement on red-throated diver we advise that there will be a moderate adverse cumulative impact at the EIA scale, although the relative contribution of Vanguard to this impact is small.

2.2.3. Natural England highlights the high likelihood of an adverse cumulative impact on great black-backed gull, and recommends consideration of impact mitigation through raised rotor blade heights.

2.3. HRA – Outer Thames Estuary SPA – red-throated diver

2.3.1. Natural England welcomes the commitment of the Applicant to adopt mitigation for impacts from operations and maintenance vessels, and the proposed addition in the DCO/DML as regards the Project Environmental Management Plan (PEMP). We seek an updated version of the PEMP that includes the measures proposed by the Applicant, so that Natural England is able to conclude whether an adverse effect on integrity (AEOI) will be ruled out.

2.4. HRA – Greater Wash SPA – red-throated diver

2.4.1. Natural England considers that a seasonal restriction from January to March inclusive for cable installation activities within or affecting the red-throated divers of the Greater Wash SPA would allow a conclusion of no Adverse Effect on Integrity (AEOI) both for the project alone and in-combination with other plans and projects as regards cable installation.

2.4.2. Natural England welcomes the commitment of the Applicant to adopt mitigation for impacts from operations and maintenance vessels, and the proposed addition in the DCO/DML as regards the Project Environmental Management Plan (PEMP), which is potentially relevant to Greater Wash SPA as well as Outer Thames Estuary SPA. Again, we seek an updated version of the PEMP so that Natural England is able to conclude whether an AEOI will be ruled out for operations and maintenance traffic.

2.5. HRA - Greater Wash SPA – little gull

2.5.1. Natural England concludes that there will not be an AEOI on the little gull population from Vanguard alone.

2.5.2. Natural England advises that the number of little gull collisions apportioned to the SPA in the light of the revised predictions for Vanguard alone in AS-043 is revised, and that this value is included in an in-combination assessment of collision risk impacts from other windfarms.

2.6. HRA – Alde-Ore Estuary SPA – lesser black-backed gull

2.6.1. Whilst progress has been made, further assessment is required regarding the apportioning of collision risk impacts to the SPA for the project alone, and regarding the apportionment of impacts to other windfarm projects in the collision risk in-combination assessment.

2.6.2. Natural England highlights the potential for an AEOI on Alde-Ore Estuary SPA lesser black-backed gull both from collision risk alone and in-combination with other plans and projects, and advises consideration of impact mitigation through raised rotor blade heights.

2.7. HRA – Flamborough & Filey Coast SPA (FFC SPA) – gannet

2.7.1. Whilst progress has been made, further assessment is required with respect to the Confidence Limits for the density/abundance data in the assessment of displacement from the project alone, and also the alone assessment for collision mortality and displacement combined. This is likely to have implications for the Vanguard figure to be used in the in-combination assessment.

2.7.2. This issue aside, the approach to the in-combination assessment has addressed Natural England's methodological concerns.

2.7.3. However, Natural England highlights the potential for an AEOI on FFC SPA gannet when Vanguard is considered in-combination with other plans and projects, and advises consideration of impact mitigation through raised rotor blade heights.

2.8. HRA – Flamborough & Filey Coast SPA – kittiwake

2.8.1. Whilst progress has been made, further assessment is required regarding the apportioning of collision risk impacts to the SPA for the project alone, which also has implications for the Vanguard figure to be used in the in-combination assessment.

2.8.2. Nevertheless, Natural England considers that there will not be an AEOI on the FFC SPA from collision risk from the project alone.

2.8.3. This issue aside, the approach to the in-combination collision risk assessment has addressed Natural England's methodological concerns. Notwithstanding the additional information required, Natural England's advice is that there is an AEOI on FFC SPA kittiwake when considered in-combination with other plans and projects. This is in line with our previous advice on Hornsea 2 and East Anglia 3, and our recent advice on Hornsea 3 and Thanet Extension.

2.8.4. Natural England advises consideration of impact mitigation through raised rotor blade heights.

2.9. HRA – Flamborough & Filey Coast SPA – guillemot

2.9.1. Whilst progress has been made, further assessment is required with respect to the lower and upper confidence limits for predicted displacement impacts from the project alone, which also has implications for the Vanguard figure to be used in the in-combination assessment.

2.9.2. Notwithstanding the additional information required, Natural England considers that there will not be an AEOI on FFC SPA from operational displacement from the project alone.

2.9.3. Natural England has identified some issues with the in-combination assessments for all three auk species associated with FFC SPA, which will need addressing before we can draw conclusions regarding the potential for AEOI.

2.10. HRA – Flamborough & Filey Coast SPA – razorbill

2.10.1. As well as the issues raised with respect to the alone and in-combination assessments for FFC SPA guillemot above, Natural England has identified potential issues with the values used in the razorbill alone and in-combination operational displacement assessments

which require addressing before we can draw firm conclusions regarding the impact from the project alone and in-combination.

2.11. HRA – Flamborough & Filey Coast SPA – assemblage (puffin)

2.11.1. The issues identified regarding the alone and in-combination assessments for FFC SPA guillemot also apply to puffin, which is a component of the seabird assemblage feature.

2.11.2. Notwithstanding the additional information required, Natural England considers that there will not be an AEOI on FFC SPA puffin from operational displacement from the project alone.

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NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Comments by species on Vanguard Deadline 6 (REP6-021) and Deadline 6.5 (AS-043) information

02 May 2019

1. Environmental Impact Assessment (EIA)

1.1. EIA collision risk modelling (CRM) impacts from Vanguard alone

1.1.1. Natural England has evaluated the CRM outputs presented by the Applicant in their Deadline 6 'Deterministic Collision Risk Modelling' document, REP6-019 and also those presented in the Deadline 6.5 'Deterministic Collision Risk Modelling for revised layout scenarios' document, AS-043 for each of the five key species considered to be at risk of collision impacts: gannet, kittiwake, lesser black-backed gull (LBBG), herring gull and great black-backed gull (GBBG).

1.1.2. As noted in our specific response to REP6-019, also provided at Deadline 7 (see Natural England Comments on Vanguard Deterministic Collision Risk Modelling document) we agree with the predicted collision figures (and ranges based on the CIs of the bird density data) for the 10MW turbine configuration.

1.1.3. With regard to the figures presented in the Deadline 6.5 CRM for the updated layout scenarios (AS-043), we understand that the input parameters used, including the mean bird densities and upper and lower 95% Confidence Intervals of this, are the same as those presented in Appendix 1 of REP6-019 (with the exception of the turbine revs per minute). We have therefore reviewed the CRM outputs for the revised layout scenarios using the updated figure for turbine rpm and turbine numbers in each of Vanguard West and East, but retaining the other parameters, including the mean bird densities and associated Confidence Intervals (CIs). We agree with the predicted figures given by the Applicant in Table 2 of AS-043 for the central (based on mean density) for both of the revised layout options, but we do not get the same ranges of figures based on the 95% CIs of the density data. Therefore, we suggest the Applicant checks these figures for all species. We do however agree that for each of the 5 key species the correct updated worst case scenario layout has been identified by the Applicant.

1.1.4. As noted in our specific response to REP6-019 also provided at Deadline 7 (see Natural England Comments on Vanguard Deterministic Collision Risk Modelling document) and as shown in Table 1 below, based on the updated figures for the 10MW turbine layout with worst case scenarios (WCS) of 100% of the turbines in either Vanguard East (WCS for gannet, kittiwake, herring gull and GBBG for CRM alone at EIA in REP6-019) or 100% of turbines in Vanguard West (WCS for LBBG for CRM alone at EIA in REP6-019), we agree with the Applicant that all the central CRM predictions (i.e. using mean density, mean avoidance rate, maximum likelihood flight height data and the standard nocturnal activity rates) equate to less than 1% baseline mortality of the largest BDMPS and biogeographic populations for all of the five key species (gannet, kittiwake, LBBG, herring gull and GBBG). This is also the case for the upper 95% confidence intervals of the bird density for all species except great black-backed gull (GBBG), where the predicted CRM figure of 340 equates to 2.01% of baseline mortality of the largest BDMPS for all turbines in Vanguard East and 0.78% of baseline mortality of the biogeographic population. **Therefore, based on these figures we agree with the Applicant's conclusion in REP6-019 that the collision risk from Vanguard alone would have no significant impact at the EIA scale for all species, although this conclusion can only be made with low confidence regarding impacts on GBBG at Vanguard East.**

1.1.5. We welcome the Applicant's revised layout mitigation updated CRM presented in AS-043, and agree that this does significantly reduce the numbers in an 'EIA alone' context. Based on the updated predictions for the WCS turbine layout option (namely 1/2 of the turbines in Vanguard West and 1/2 in Vanguard East for gannet, kittiwake, herring gull and GBBG and 2/3 of the turbines in Vanguard West and 1/3 in Vanguard East for LBBG), we note that based on the Natural England calculated ranges presented in Table 1 below, again all the central CRM predictions (i.e. using mean density, mean avoidance rate, maximum likelihood flight height data and the standard nocturnal activity rates) equate to less than 1% baseline mortality of the largest BDMPS and biogeographic populations for all of the

five key species. This is again also the case for the upper 95% confidence intervals of the bird density for all species except great black-backed gull (GBBG), where the predicted CRM figure of 206 equates to 1.22% of baseline mortality of the largest BDMPS for the WCS of 1/2 the turbines in Vanguard West and 1/2 in Vanguard East and to 0.47% of baseline mortality of the biogeographic population. **Therefore, based on these revised figures we again agree with the Applicant's conclusion in AS-043 that the collision risk from Vanguard alone would have no significant impact at the EIA scale for all species, although this conclusion can again only be made with low confidence regarding impacts on GBBG.**

Table 1 Percentage of baseline mortality for worst case scenario impact levels for Vanguard CRM alone for EIA, using average across all age class mortality rates, as used by the Applicant

	CRM prediction, Vanguard alone		**Largest BDMPS (North Sea) individuals, Furness (2015)**	**% baseline mortality largest BDMPS**		**Biogeographic population individuals (Furness 2015)**	**% baseline mortality biogeographic**	
	Deadline 6, Table 1 REP6-019	**Deadline 6.5,Table 2 AS-043**		**Deadline 6, REP6-019**	**Deadline 6.5, AS-043****		**Deadline 6, REP6-019**	**Deadline 6.5, AS-043**
Gannet	177 (29-431)	112 (20-270)	456,298	0.20 (0.03-0.49)	0.13 (0.02-0.31)	1,180,000	0.08 (0.01-0.19)	0.05 (0.01-0.12)
Kittiwake	318 (35-838)	186 (20-485)	839,456*	0.24 (0.03-0.64)	0.14 (0.02-0.37)	5,100,000	0.04 (0.004-0.11)	0.02 (0.003-0.06)
LBBG	40 (2-110)	32 (1-92)	209,007	0.15 (0.01-0.42)	0.12 (0.004-0.35)	864,000	0.04 (0.002-0.10)	0.03 (0.001-0.08)
Herring gull	37 (0-145)	18 (0-71)	466,511	0.05 (0-0.18)	0.02 (0-0.09)	1,098,000	0.02 (0-0.08)	0.01 (0-0.04)
GBBG	101 (2-340)	62 (1-206)	91,399	0.60 (0.01-2.01)	0.37 (0.01-1.22)	235,000	0.23 (0.005-0.78)	0.14 (0.002-0.47)

* Population estimate for all UK colonies within North Sea BDMPS scale (from Furness 2015)
** Note discrepancies in figures calculated by Applicant for the range based on 95% CIs of bird density and those calculated by Natural England. The figures calculated by Natural England are presented above

1.1.6. We note that following the revision to the WCS CRM figures for Vanguard alone at EIA, an updated assessment of gannet CRM combined with displacement from Vanguard alone should also be provided by the Applicant.

1.2. EIA cumulative collision risk modelling (CRM) impacts

1.2.1. We note that whilst updated cumulative CRM totals are provided by the Applicant in REP6-021, there are no assessments of these updated figures against baseline mortality of the relevant reference populations provided for any of the key species other than herring gull. However, we understand that the Applicant will be submitting updated cumulative CRM assessments at Deadline 7, so we assume that these will be updated to include the updated WCS predictions for Vanguard alone. Therefore, as these figures will be updated, we have not yet finalised any conclusions regarding levels of cumulative CRM impact (or in the case of gannet, for cumulative CRM and cumulative displacement combined) other than for herring gull. We will do so in our Deadline 8 response, subject to the Applicant's Deadline 7 submission containing the relevant information.

1.2.2. However, we do note the following points for consideration by the Applicant in updating the cumulative assessments:

a. We note that no updated cumulative CRM assessment is provided in REP6-021 GBBG – we advise that the updated cumulative assessment should take account of the updated figures for Vanguard and the updated figures for Thanet Extension and Hornsea Three and also include figures for Hywind, Kincardine and Moray West offshore wind farms (OWFs). This will be an important assessment, as at East Anglia 3 Natural England were unable to rule out significant effect from cumulative collision for GBBG at an EIA scale. We note that as there have been no updates to avoidance rates etc. and as additional figures are now being added (from Vanguard, Thanet Extension and Hornsea 3), it is likely that this conclusion will remain the same here.
b. We suggest that the figures included for the Hornsea Three project are those from our Deadline 7 response (Natural England 2019). These figures were used for an illustrative assessment of collision impacts based on the parameter values that were most closely aligned with the approach advised by Natural England. However, it should still be noted that Natural England have highlighted throughout our written and oral submissions for Hornsea Three that the lack of sufficient baseline information for the Hornsea Three Zone (i.e. the array area) means that there is a considerable degree of uncertainty (and thereby level of risk) associated with these figures and these should in no way be seen as Natural England's agreed position on the levels of impact from Hornsea Three.
c. We welcome that the cumulative totals have been presented both including Hornsea Three and excluding Hornsea Three. We note that the Hornsea Three examination has reached an end and as Natural England's significant concerns with the baseline data remain unresolved, we have not been able to agree final figures or conclusions for this project and this has implications for all cumulative and in-combination assessments presented by Vanguard, which should be made clearer by the Applicant as part of the explanation for why figures are presented both with and without Hornsea Three data.
d. In instances where cumulative predictions equate to greater than 1% baseline mortality of relevant population, further consideration should be given by the Applicant. For EIA scale assessments there are many uncertainties, particularly in terms of the most suitable population to use, e.g. biogeographic or Biologically Defined Minimum Population Scales (BDMPS). Discussions are still ongoing over the most appropriate population to use, and therefore, we would suggest that the following information analysis is undertaken in the first instance:
    - Calculate the total predicted impact (e.g. summed total cumulative collisions) within the defined spatial scale;
    - Estimate of the total number of birds expected to be in the area at the time;
    - Calculate what proportion of this total number of birds come from different colonies and countries using information in Furness (2015);
    - Then apportion the total impact that would be on birds from the different countries/colonies;
    - Evaluate the predicted impact against the context of the population the assessment is dealing with. This context should include consideration of the status of the population across the EIA population scale being considered (e.g. population trends across the defined spatial scale (including at colonies outside of the UK if applicable for a species), any threatened status classifications (e.g. IUCN Red List categories, Species of European Conservation Concern category (SPEC), Birds of Conservation Concern (Eaton et al. 2015)), a species' total range, distribution and population trends (including the proportion of the wider population that occurs outside of the EIA BDMPS scale), other threats across a species' range etc.

1.2.3. If it is not possible to determine the significance of the predicted impacts using this information, and the need for population modelling is identified, we would suggest consideration is initially given to existing population models unless there is any additional evidence to suggest the modelling should be undertaken in a different way. Existing models include those done for kittiwake and great black-backed gull for EIA for EA3 OWF and the SOSS gannet PVA. However, it should be noted that these may require amendments based on the issues highlighted previously in our Relevant Representations regarding use

of 'matched-runs', counterfactuals and run over 30 years. If there is not an existing model for a species and population where a requirement for further assessment through population modelling is identified, then we would recommend the Applicant considers how a population model could be developed that would allow the significance of the predicted impact to be determined.

1.2.4. Additionally, if for example the predicted collisions look to impact very heavily on a particular population which is something that could be defined, e.g. UK colonies, then we would suggest that the impacts on that population are considered in a model focused on that population.

1.3. Herring gull EIA cumulative collision risk modelling (CRM) impacts (Section 2.3.1.1 of REP6-021)

1.3.1. The Applicant has presented an updated cumulative herring gull CRM assessment in Section 2.3.1.1 of REP6-021. Whilst we understand that the Applicant will be submitting updated cumulative assessments at Deadline 7 and that the cumulative total presented in Table 15 of REP6-021 will likely change. However, we note the following regarding the assessment in REP6-021:

a. We welcome that the assessment in Table 15 of REP6-021 has essentially taken the figures presented in the East Anglia Three cumulative assessment and that the CRM figures included in the cumulative assessment for East Anglia One are the figures for the 150 turbine option (which is the legally secured design). We believe that all the figures presented in the cumulative table are for the 'Basic' Band model (i.e. Options 1 and 2) and for 99.5% avoidance rate, but clarification is required on this.
b. We welcome that the cumulative assessment includes figures for the Hywind, Kincardine and Moray West offshore wind farms (OWFs).
c. We suggest the Hornsea Three alone figures included in the cumulative assessment are updated to those presented in the Natural England Deadline 7 response (Natural England 2019) (although this only changes the figure by 1 bird). We also suggest that the figure included for Thanet Extension is checked and that it is the figure presented in Table 3 of Appendix 39 of the Deadline 3 submission for this project's examination. The approach taken for all species for the Thanet Extension figures should be consistent – the figures included for some species appears to be to include the upper figure from the Thanet Extension figures (e.g. gannet and kittiwake), whilst for others it appears to be different.
d. We note that based on the figures currently presented in Table 15 of REP6-021, the cumulative totals for collision of 785 (excluding Hornsea Three) or 793 (including Hornsea Three) herring gull mortalities per annum equates to 0.97% (excluding Hornsea Three) and 0.98% (including Hornsea Three) of baseline mortality of the largest BDMPS and to 0.41% (excluding Hornsea Three) and 0.42% (including Hornsea Three) of baseline mortality of the biogeographic population. Therefore, based on the current cumulative CRM figures presented in REP6-021, we could conclude no significant cumulative CRM impact at the EIA scale for herring gull. We note that the cumulative total is now approaching 1% of baseline mortality of the largest BDMPS, reinforcing the need for herring gull CRM to have been carried out, and the need for all future offshore wind farm projects in the North Sea to do similar. However, as the cumulative CRM figures may change, Natural England reserves the right to revise the advice provided here based on the best available evidence presented.

1.4. EIA auk operational displacement from Vanguard alone

1.4.1. ***Puffin, Section 2.6.1.1 of REP6-021:*** We agree with the figures presented for Vanguard alone based on the figures presented in Table 23 of REP6-021 using the mean puffin abundance/density data. As advised previously, assessments of Vanguard alone should consider the uncertainty/variability in the input parameters, and displacement assessments should therefore also consider the predictions using the upper and lower 95% CIs of the bird abundance/density data. As this has previously been considered by the Applicant in their updated auk displacement appendix, REP1-008, our position regarding operational

displacement of puffins from Vanguard alone remains that concluded in our response to the Applicant's previous updated auk displacement appendix, see REP1-008 in REP3-51, namely a negligible to minor adverse impact at the EIA scale from operational displacement from the Vanguard project alone for puffin.

1.4.2. ***Razorbill, Section 2.7.1.1 of REP6-021:*** It appears that the razorbill abundance figures presented for Vanguard East and West alone in Table 24 of REP6-021 are presented in the incorrect seasons, as Natural England calculates that these figures should be as follows:

- Vanguard East:
  - Spring: total abundance figure should be 752 (and not 599 as presented by the Applicant)
  - Breeding (migration free): total abundance figure should be 599 (and not 491 as presented by the Applicant)
  - Autumn: total abundance figure should be 491 (as presented by the Applicant)
  - Winter: total abundance figure should be 491 (and not 752 as presented by the Applicant)
- Vanguard West:
  - Spring: total abundance figure should be 172 (and not 280 as presented by the Applicant)
  - Breeding (migration free): total abundance figure should be 280 (and not 375 as presented by the Applicant)
  - Autumn: total abundance figure should be 375 (and not 348 as presented by the Applicant)
  - Winter: total abundance figure should be 348 (and not 172 as presented by the Applicant).

1.4.3. This has also meant that the incorrect seasonal figures are also presented for both Vanguard East and West in Table 25 of REP6-021 and hence the incorrect seasonal figures for the range of displacement and mortality rates. This needs addressing by the Applicant. However, the annual total figures and those for the range of displacement and morality rates for both Vanguard East and West and hence the two sites combined are presented in Table 25 of REP6-021. Based on these correct combined annual totals (Vanguard East + Vanguard West) of additional mortality due to operational displacement from Vanguard alone, an additional 11 (range 3-20) razorbills at 30% displacement and 1% mortality up to an additional 246 (range 96-495) razorbills at 70% displacement and 10% mortality equates to 0.01% (range 0.003-0.02%) baseline mortality of largest BDMPS at 30% displacement and 1% mortality and to 0.24% (range 0.09-0.45%) baseline mortality of largest BDMPS at 70% displacement and 10% mortality. Therefore, we can conclude a minor adverse impact at the EIA scale from operational displacement from the Vanguard project alone for razorbill.

1.4.4. ***Guillemot, Section 2.8.1.1 of REP6-021:*** We agree with the figures presented for Vanguard alone based on the figures presented in Table 28 of REP6-021 using the mean guillemot abundance/density data. As advised previously, assessments of Vanguard alone should consider the uncertainty/variability in the input parameters, and displacement assessments should therefore also consider the predictions using the upper and lower 95% CIs of the bird abundance/density data. As this has previously been considered by the Applicant in their updated auk displacement appendix, REP1-008, our position regarding operational displacement of guillemots from Vanguard alone remains that concluded in our response to the Applicant's previous updated auk displacement appendix, see REP1-008 in REP3-51, namely a minor adverse impact at the EIA scale from operational displacement from the Vanguard project alone for guillemot.

1.5. EIA auk cumulative operational displacement (Sections 2.6.1.2, 2.7.1.2 & 2.8.1.2 of REP6-021)

1.5.1. We welcome the inclusion of figures for Moray West, Kincardine and Hywind offshore wind farms in the cumulative displacement assessments for puffin, razorbill and guillemot in REP6-021.

1.5.2. We welcome that the Applicant has included figures for Hornsea Three in the assessment. However, we note that these are from the project's Environmental Statement (ES). We note that the during the examination phase for the Hornsea Three project discussions were held over the appropriateness of the baseline dataset for the project and hence the abundance estimates generated, there were also discussions regarding the seasonal definitions used. Therefore, we advise that the abundance estimates used in the auk cumulative displacement assessments for the Hornsea Three project are those presented for the 'alternative analysis' in Annex C of Appendix 28 of the Deadline 4 submission by the Hornsea Three Applicant (Hornsea Project Three Offshore Wind Farm 2019a) in Table 1.11 for guillemot, Table 1.15 for razorbill and Table 1.19 for puffin. We note that these are the figures used by Natural England in its Hornsea 3 Deadline 7 response for displacement. We again note that Natural England have highlighted throughout our written and oral submissions for Hornsea 3 that the lack of sufficient baseline information for the Hornsea Three Zone (i.e. the array area) means that there is a considerable degree of uncertainty (and thereby level of risk) associated with these figures and these should in no way be seen as Natural England's agreed position on the levels of impact from Hornsea 3.

1.5.3. As a result we recommend that the Applicant updates the cumulative assessment with the updated figures for Hornsea Three and that the Applicant also considers the predicted cumulative impacts excluding Hornsea Three as well as those with the inclusion of Hornsea Three, as has been done for collision risk.

1.5.4. We also welcome the correction to the Vanguard East puffin breeding season figure in the cumulative/in-combination assessment table in REP6-021 (Table 22).

1.5.5. Given the incorrect seasonal numbers presented for Vanguard East and West presented in Table 24 of REP6-021 for razorbill cumulative and in-combination numbers, we advise that the Applicant also checks that the figures for each of the other offshore wind farms are correct for each season.

1.5.6. We therefore advise that the above points are given consideration and any updates required undertaken by the Applicant before any conclusions can be reached regarding the level of impact to auks from cumulative operational displacement impacts.

1.6. EIA red-throated diver (RTD) cumulative displacement (Section 2.9.1.1. of REP6-021)

1.6.1. We welcome that the Applicant has undertaken the assessment using the approach undertaken at Thanet Extension (utilising SeaMast). We agree with the figures provided by the Applicant and note that if the assessment is conducted against the largest relevant BDMPS of 13,277 to calculate baseline mortality, then at 100% displacement and 10% mortality the cumulative total equates to 5.1% of baseline mortality, which is not insignificant and would be of moderate adverse significance. However, we note that Vanguard's contribution to the cumulative total is small at 0.1%.

2. Habitats Regulations Assessment (HRA)

2.1. HRA collision risk modelling (CRM) impacts from Vanguard alone – General Points

2.1.1. We welcome that assessments in REP6-021 for gannet (CRM and displacement), kittiwake (CRM) to FFC SPA and lesser black-backed gull (LBBG) (CRM) to the Alde-Ore Estuary SPA are presented for using both the migration free breeding season and the full breeding season with the migration seasons adjusted accordingly. We also welcome that the figures using the full breeding season and adjusted migration seasons are taken through to the HRA assessments.

2.1.2. Baseline mortality rates for HRA assessments for have been based on using an all age colony count and all age survival/mortality rate to calculate baseline mortality. We note that in our Relevant Representations (RR-106), which is actually repeated by the Applicant in Table 1 of REP6-021 that:

2.1.3. *'Given that the outputs of the existing PVAs tend to be on an adult currency, we also advise that calculations of baseline mortality used in the HRA are undertaken on an adult currency, therefore using the adult colony figure and the adult mortality rate rather than on all ages.'*

2.1.4. In addition, we note that the SPA colony population sizes for breeding seabirds are defined in terms of pairs (adult) or breeding adults and the baseline mortality calculations require a survival rate and typically survival rates for non-adult age classes are not available or are poor. Therefore, we advise again that assessments should be done using baseline mortality calculations using the adult colony figures and adult mortality rates.

2.1.5. We note that the CRM predictions in the HRA assessments have been adjusted to adult only currency by using the proportion of adults based on the age structure model in BDMPS report (Furness 2015) that was created in order to assess the numbers of immature birds that are predicted to be associated with breeding populations. We do not think it is appropriate to assume that the proportion of adults from this model will be representative of the proportion of adults recorded in the Vanguard areas. We recommend that this would be better undertaken based on the proportion of adults recorded in the baseline survey data for each season from Vanguard.

2.1.6. The HRA assessments of CRM impacts from Vanguard alone only consider the predictions for the central input parameters (i.e. using mean densities, recommended avoidance rates, maximum likelihood flight height distribution data and the currently recommended nocturnal activity factors). No consideration has been given to the uncertainty/variability in the input parameters. Consideration should also be given in the assessment to the range of CRM predictions from using the upper and lower 95% CIs of bird density (as these account for the greatest variation).

2.1.7. Likewise, for gannet displacement the assessment of impacts from Vanguard alone should also give consideration to the uncertainty/variability in the bird densities/abundances and therefore the range of predictions considering the upper and lower 95% confidence intervals of the bird density/abundances should also be considered in the assessment.

2.2. GANNET – Flamborough and Filey Coast (FFC) SPA, Vanguard alone (Section 2.1.1.1 of REP6-021)

2.2.1. For the impact from collision risk from Vanguard alone to gannets from the FFC SPA, we agree with the apportionment rates used by the Applicant in REP6-019 of 100% in the breeding season, 4.8% in autumn and 6.2% in spring. We also welcome that the full breeding season with adjusted migration seasons has also been presented. We agree with the apportioned figure of 49 gannet collisions from Vanguard alone set out by the Applicant in Table 3 and paragraph 8 of the Deadline 6 CRM document, REP6-019. However, as detailed in the headline points above, we do not consider it appropriate to adjust this figure to an adult only currency by using the 55% proportion of adults based on the gannet age

structure model in BDMPS report (Furness 2015). Therefore, in the absence of age structure information from the Vanguard baseline survey data, in our assessment below we have taken a precautionary approach of assuming all collisions are on adult birds.

2.2.2. We also agree with the apportioned figure of 33 gannet collisions from Vanguard alone set out by the Applicant in Table 3 of the Deadline 6.5 CRM document, AS-043. However, we do not get the same seasonal range of figures as the Applicant has presented in Table 6 of AS-043 for the upper and lower 95% CIs of the bird density data. We therefore suggest the Applicant revisits these figures.

Table 2 Percentage of baseline mortality for CRM impact levels for Vanguard alone for gannet for FFC SPA. Baseline mortality calculated using adult only colony size and adult mortality rate (8.8% from Horswill & Robinson 2015). As no information available on age classes of birds recorded in baseline data, precautionary assumption made that all birds were adult

	GANNET CRM VANGUARD ALONE, HRA: FFC SPA			
	CRM prediction (range based on 95% CIs of density data)	% of baseline mortality of FFC SPA designated population* (used by Applicant)	% of baseline mortality of FFC SPA 2017 count** (used by Applicant)	% of baseline mortality of FFC SPA mean of 2012, 15 & 17 census data***
Based on CRM figures from Table 3 of REP6-019 (WCS 100% turbines in Vanguard East)	49 (1-133)	2.52 (0.05-6.83)	2.08 (0.04-5.64)	2.26 (0.05-6.15)
Based on CRM figures from Table 3 of AS-043 WCS 50% turbines in Vanguard West & 50% in Vanguard East)***	33 (1-94)	1.70 (0.05-4.83)	1.40 (0.04-3.99)	1.52 (0.05-4.34)

* 11,061 pairs (22,122 adults), 1% baseline mortality = 19 birds
** 13,391 pairs (26,782 adults), 1% baseline mortality = 24 birds
*** 24,594 adults, 1% baseline mortality = 22 birds

2.2.3. From Table 2 above, the predicted collision impacts presented in the Applicant's Deadline 6 (REP6-019) CRM submission for the gannet feature of FFC SPA are **49 (1-133)** adults[1] per annum for Norfolk Vanguard alone. The revised layout scenarios worst case predicted collision impacts in the Applicant's Deadline 6.5 (AS-043) reduce the predicted figures to **33 (1-94)** adults[1] per annum for Norfolk Vanguard alone. Even with the reduction from the revised layout worst case scenario, the predicted 33 adults per annum equates to more than 1% of baseline mortality of the colony (see Table 2). Therefore, the potential impacts on the SPA require further consideration.

2.2.4. Accordingly Natural England has considered the predicted collision figures for Vanguard alone with the outputs from the updated FFC SPA gannet PVA undertaken during the Hornsea 3 examination (Hornsea Project Three Offshore Wind Farm 2019b) (see

2.2.5. Table ***3*** below). As the predictions based on the revised layout worst case scenario at Deadline 6.5 (AS-043) supersede the Deadline 6 (REP6-019) collision predictions, we have focused our assessment below on the Deadline 6.5 (AS-043) predictions.

[1] As no information has been provided on the age structure of the gannets recorded in the baseline aerial surveys undertaken at the Vanguard sites, a precautionary approach has been taken of assuming all collision are on adult birds.

Table 3 Predicted population impacts on the gannet population of FFC SPA for the range of mortality impacts predicted for Norfolk Vanguard alone. PVA impact metrics are as provided in Hornsea Project Three Offshore Wind Farm (2019b). The range of predicted project alone figures are indicated in pink. The darker shaded cells represent the level of impact closest to the central value of the predictions in Table 2 above.

GANNET – FFC SPA VANGUARD ALONE					
Additional mortality	% Baseline Mortality using designation population size (22,122 adults), as used by Applicant	% Baseline Mortality using 2017 count size (26,782 adults), as used by Applicant	% Baseline Mortality using mean of 2012, 15 & 17 census data (24,594 adults)	Counterfactual of Final Population Size (CPS)**	Counterfactual of Growth rate (CGR)***
5	0.26	0.21	0.23		No value available
10	0.51	0.42	0.46		No value available
20	1.03	0.85	0.92		No value available
25*	1.28	1.06	1.16	0.968 (0.967-0.968)	0.999
30	1.54	1.27	1.39		No value available
40	2.05	1.70	1.85		No value available
50*	2.57	2.12	2.31	0.936 (0.936-0.937)	0.998
75	3.85	3.18	3.47	0.906 (0.905-0.907)	0.997
100	5.14	4.24	4.62	0.877 (0.876-0.878)	0.995
125	6.42	5.30	5.78	0.848 (0.847-0.850)	0.994
150	7.71	6.36	6.93	0.821 (0.819-0.823)	0.993
200	10.27	8.49	9.24	0.768 (0.766-0.771)	0.991

* Note, 20 and 50 are shaded as counterfactual metrics aren't available in between these values in the PVA

** Gannet, demographic rate set 2, counterfactuals of population size after 30 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_3.1 in Hornsea Three Offshore Wind Farm 2019b

*** Gannet, demographic rate set 2, counterfactuals of population growth rate after 35 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_3.3 in Hornsea Three Offshore Wind Farm 2019b. Counterfactuals only available for after 35 years.

2.2.6. If the additional mortality from Vanguard alone is 25 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to Vanguard Deadline 6.5 AS-043 predicted 33 adult mortalities) then the population of FFC SPA after 30 years will be 3.2% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.1% (

2.2.7. Table ***3***). We do note however that the Applicant has not given any consideration in its assessment to the uncertainty/variability around the CRM input parameters – the range of collision predictions should also be considered in the assessment. We note that if the upper range of 94 birds (as calculated by Natural England for the revised layout worst case scenario) is considered, then if the additional mortality from Vanguard alone is 100 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019 to Vanguard upper range predicted 94 adult mortalities) then the population of FFC SPA after 30 years will be 12.3% lower than it would have been in the absence of the additional mortality and the population growth rate would be reduced by 0.5% (

2.2.8. Table ***3***).

2.2.9. Please note that these figures are for predicted collision mortalities only. Adding predicted displacement mortality would add 2.5-3.3 adults per annum to FFC SPA for Norfolk Vanguard alone (as presented by the Applicant in Table 7 of REP6-021 (which Natural England are in agreement with) to the alone total. This gives a combined total alone impact of up to 36 adult gannet mortalities from FFC using the Deadline 6.5 (AS-043) collision figure. For the combined collision and displacement impacts, additional mortality from the windfarm of 25-50 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to predicted combined adult mortalities for Vanguard alone using either the Deadline 6 or Deadline 6.5 collision figures) then the population of

FFC SPA after 30 years will be 3.2-6.4% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.1-0.2%.

2.2.10. The gannet population of FFC SPA increased at 11.1% per annum (between 2003/4 and 2015, JNCC Seabird Monitoring Programme data). Using FFC SPA census data 2002-2017 the growth rate was 9.4% per annum.

2.2.11. The Applicant has not considered the displacement mortality predictions based on considering the upper and lower 95% CIs of abundance/density to account for uncertainty/variability. Therefore, this should be considered and then combined with the predicted ranges of collision predictions. Once this has been completed by the Applicant, we can then reach a conclusion as to the level of impact from Vanguard alone on gannets from the FFC SPA.

2.3. KITTIWAKE – Flamborough and Filey Coast (FFC) SPA, Vanguard alone (Section 2.2.1.1 of REP6-021)

2.3.1. We note that in REP6-021 the HRA for kittiwake at the FFC SPA has been based on collision predictions for Vanguard alone at the Vanguard West site rather than the Vanguard East site. This is because the Applicant considers the Vanguard West site is closer to the FFC SPA and there is more compelling evidence for connectivity on this site.

2.3.2. We have significant concerns regarding this approach, as this will not be the realistic worst case scenario for the Vanguard Rochdale envelope, given that Vanguard East has a higher level of predicted kittiwake collisions. However, we note that the predictions based on the revised layout worst case scenario of 1/2 the turbines in Vanguard West and 1/2 in Vanguard East (Deadline 6.5, AS-043) supersedes the Deadline 6 (REP6-019 and REP-021) collision predictions, and so this specific issue with the kittiwake assessment may now be less relevant. We note that the assessment in Section 2.2.1.1 of REP6-021 is based on the collision figures calculated in the Deadline 6 (REP6-019) for the 10MW turbines with scenarios of all turbines in Vanguard West or all turbines in Vanguard East. Since this no longer represents the worst case scenario, we advise that the apportionment and assessment to the FFC SPA is undertaken on the collision predictions for the new worst case scenario (i.e. the collision predictions for 1/2 the turbines in Vanguard West and 1/2 in Vanguard East from AS-043).

2.3.3. In the HRA assessment of CRM from Vanguard alone in REP6-021 the Applicant has apportioned 26.1% of collisions in the breeding season, 5.4% in the autumn and 7.2% in spring to the FFC SPA. We agree with the apportionment rates used for autumn and spring.

2.3.4. We welcome that the Applicant has given consideration to the more recent (2017) RSPB kittiwake tracking data from the FFC SPA, and as acknowledged by the Applicant, this does indicate connectivity of adult kittiwakes from the FFC SPA with Norfolk Vanguard. Following consideration as this additional tracking data, the Applicant has calculated a breeding season apportionment rate of 26.1%, which has been calculated by taking the proportion that the FFC SPA adult kittiwake colony population (89,040 adults at designation) equates to out of a total BDMPS calculated by summing the FFC adult population with the UK North Sea spring migration BDMPS total immature kittiwake population given in Furness (2015) (i.e. a total BDMPS of 89,040 + 252,001 = 341,041; so: (89,040/341,041)x100=26.1%) . This approach was discussed by Natural England with the Applicant on a call dated 02 April 2019, where Natural England advised that the Applicant 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 the Vanguard site will predominantly be immatures. This information has not been provided, and we again recommend that it is.

2.3.5. As noted by the Applicant in paragraph 50 of REP6-021, Natural England advised that the Applicant gives consideration to a wider range of possible breeding season connectivity percentages, potentially including up to 100%. A wide range of breeding season apportioning values have been used for North Sea wind farms where breeding season

connectivity has been identified, and the values used have varied between 19.3% and 100%, with varying levels of agreement to these values from Natural England.

2.3.6. Since the call on 02 April, we welcome that the Applicant has also in REP6-021 given consideration to the other kittiwake colonies in addition to the FFC SPA that are located between Humberside and Suffolk, and have used the SNH apportionment tool to calculate the estimated proportions of adult kittiwakes from each colony present on the Norfolk Vanguard site. This has resulted in a calculation that up to 86% are potentially from FFC SPA, a value broadly similar to that used for e.g. the Hornsea projects, including Hornsea 3.

2.3.7. We note that the SNH tool uses the term $1/distance^2$ as a weighting factor. This approach means that for a colony of a given size, the further it is away from the development site, the lower its overall weighting factor will be and so too will its estimated contribution to the birds present at the development site, which makes sense. However, the underlying assumption here is that the likelihood of an individual travelling 1km from its colony or out to 205km (in the case of the minimum distance given by the Applicant for the FFC colony from Vanguard West) is identical, such that the density of birds declines with increasing distance from the colony solely because within each concentric 1km ring around a colony the area within it will increase as a linear function of its distance from the colony. This fails to take account of the fact that seabirds are central place foragers that must forage away from their nest but return to it to feed their chicks. This places strong advantages in terms of reducing both time spent away from the nest and energy expended in foraging if birds can forage as close to their colony as possible. As such, the likelihood of each individual foraging closer to their colony than further away will not be equal and so the density of birds is likely to decline more rapidly with increasing distance from a colony than the simple geometric relationship based on the square of distance would suggest. This might suggest that 86% is a rather precautionary worst case apportioning scenario.

2.3.8. Based on the updated information provided by the Applicant, Natural England's position remains as discussed with the Applicant on the call on 02 April 2019. This is that the tracking data has shown evidence of potential connectivity of the kittiwakes from the FFC SPA and the Norfolk Vanguard site (particularly Vanguard West). We also assume that adult kittiwakes have been recorded in the Vanguard baseline surveys and we would again suggest that information is provided on the proportion of adults recorded in the survey data. Natural England considers that it is difficult to have much confidence in pinning down an actual figure for use in the apportionment in the breeding season and therefore, we again suggest that a range of apportionment rates for the breeding season are considered in the assessment via a matrix approach (such as the approach undertaken for displacement assessments), which could potentially be up to 100% in multiples of 10%. In the absence of alternative means to identify an appropriate apportioning rate, and our concerns that 26.1% lacks suitable precaution given the absence of other colonies than those identified with likely connectivity during the breeding season, Natural England considers that the 86% apportioning value from the SNH tool should be one of the apportioning rates that the Applicant considers further in the context of a matrix-type approach.

2.3.9. As the Applicant has not undertaken this approach, Natural England has, in order to progress our conclusion on the project alone, considered the apportionment to the FFC SPA from Vanguard alone using what is likely to be a precautionary 86% apportioning rate in the breeding season together with the agreed 5.4% in autumn and 7.2% in spring. This assessment has been made by applying these apportionment rates to the CRM predictions for the revised worst case layout of 2/3 of turbines in Vanguard West and 1/3 in East (as set out in AS-043). Using these rates results in annual total of 68 kittiwake collisions (range of 4-195 based on 95% CIs of density data) to the FFC SPA. These figures equate to 0.53% (range 0.03-1.50%) of baseline mortality of the FFC SPA kittiwake colony using the designated colony adult population or to 0.46% (range 0.02-1.30%) of baseline mortality using the mean of 2016-17 population and an adult mortality rate of 14.6% (Horswill & Robinson 2015). It is worth noting that there is limited evidence and therefore some uncertainty around baseline mortality rates. Natural England nevertheless observes that

the predicted level of mortality only exceeds 1% of the baseline mortality rate towards the upper end of the 95% CIs.

2.3.10. However, as the collision predictions based on the upper 95% CI of the density data does equate to more than 1% of baseline mortality of the FFC SPA colony, Natural England has considered the predicted collision figures for Vanguard alone with the outputs from the updated FFC SPA kittiwake PVA undertaken during the Hornsea 3 examination (Hornsea Project Three Offshore Wind Farm 2019b) (see Table 4 below).

Table 4 Predicted population impacts on the kittiwake population of FFC SPA for the range of mortality impacts predicted for Norfolk Vanguard alone using precautionary 86% apportionment in the breeding season and agreed rates of 5.4% in autumn and 7.2% in spring. PVA impact metrics are as provided in Hornsea Project Three Offshore Wind Farm (2019b). The range of predicted project alone figures are indicated in pink. The darker shaded cells represent the level of impact closest to the central value of the prediction above

KITTIWAKE – FFC SPA VANGUARD ALONE				
Additional mortality	% Baseline Mortality using designation population size (89,040 adults)	% Baseline Mortality using mean 2016-17 census data (102,536 adults)	Counterfactual of Final Population Size (CPS)*	Counterfactual of Growth rate (CGR)**
50	0.38	0.33	0.984 (CIs same as median)	0.999
100	0.77	0.67	0.968 (CIs same as median)	0.999
150	1.15	1.00	0.952 (0.952-0.953)	0.998
200	1.54	1.34	0.937 (0.936-0.937)	0.998

* Kittiwake, demographic rate set 2, counterfactuals of population size after 30 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_7.1 in Hornsea Project Three Offshore Wind Farm (2019)

** Kittiwake, demographic rate set 2, counterfactuals of population growth rate after 35 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_7.3 in Hornsea Project Three Offshore Wind Farm (2019). Whilst Vanguard's lifespan is 30 years, data on counterfactuals of growth rate are only available in Hornsea Project Three Offshore Wind Farm (2019) for after 35 years. No CLs given as they are the same as the median values.

2.3.11. If the additional mortality from Vanguard alone is 50 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to Natural England precautionary apportionment approach of 68 predicted adult mortalities, based on the mean density CRM predictions) then the population of FFC SPA after 30 years will be 1.6% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.1% (Table 4). At 100 adults per annum (next closest output to 68 mortalities), the population of FFC SPA after 30 years will be 3.2% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.1% (Table 4).

2.3.12. Taking account of uncertainty/variability in the CRM input parameters (using the upper 95% CI of the bird density data, as this accounts for the greatest variability in the predictions), if the additional mortality is 200 adults per annum (closest PVA output available in Hornsea Project Three Offshore Wind Farm 2019b to Natural England precautionary apportionment approach of 195 predicted adult mortalities, based on the upper 95% CI of density CRM predictions) then the population of the FFC SPA after 30 years will be 6.3% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.2%. These values would be of significant concern.

2.3.13. However, bearing in mind that the upper confidence limits in this particular instance are likely to represent an overly precautionary prediction (given the breeding season apportionment rate of 86% and the assumption that all birds are adults), Natural England considers that the PVA values bounding the central value of the range (i.e. 50 and 100

birds) are more likely to reflect an appropriately precautionary worst case scenario on which to base our integrity judgements. On the basis of these PVA outputs, Natural England advises that a conclusion of no AEOI of the kittiwake feature of the FFC SPA from collision risk from Norfolk Vanguard alone can be reached. It should be noted though that the contribution of Vanguard alone to the in-combination total for FFC SPA appears likely to be a substantial one.

2.4. LESSER BLACK-BACKED GULL (LBBG) – Alde-Ore Estuary SPA, Vanguard alone (Section 2.4.1.2 of REP6-021)

2.4.1. In the HRA assessment of CRM from Vanguard alone in REP6-021 the Applicant has apportioned 3-17% of collisions in the breeding season, 3.3% in both the autumn and spring, and 5% in winter to the Alde-Ore Estuary SPA.

2.4.2. As noted in our Relevant Representations (RR-106), our standard advice regarding apportionment of impacts in the non-breeding seasons to relevant colonies is that the data presented in the tables in Appendix A of Furness (2015) for the relevant species BDMPS for each season (e.g. migration, winter etc.) are used. Whether the colony figure in the BDMPS tables used is the adult figure or that for all ages depends on any Population Viability Analysis (PVA) model and outputs to be used. As noted in our Written Representations (REP1-088), the approach taken by the Applicant for arriving at the 3.3% apportioning rate for spring and autumn and 5% for winter for LBBG for the Alde-Ore Estuary SPA colony departs from this standard practice. However, in this instance the Applicant's approach does not appear to make a significant difference to the apportionment figures in the non-breeding season that result from taking the Natural England recommended approach and therefore, we are content with the rates used by the Applicant for the non-breeding seasons.

2.4.3. The breeding season apportionment rate of 17% has been calculated using the SNH apportionment tool and the figure of 3% is based on tracking data. We welcome that the Applicant has considered this approach and note that the SNH tool uses the term $1/distance^2$ as a weighting factor. This approach means that for a colony of a given size, the further it is away from the development site, the lower its overall weighting factor will be and so too will its estimated contribution to the birds present at the development site, which makes sense. However, the underlying assumption here is that the likelihood of an individual travelling 1km from its colony or 181km (in the case of maximum foraging range of LBBG) is identical, such that the density of birds declines with increasing distance from the colony solely because within each concentric 1km ring around a colony the area within it will increase as a linear function of its distance from the colony. This fails to take account of the fact that seabirds are central place foragers that must forage away from their nest but return to it to feed their chicks. This places strong advantages in terms of reducing both time spent away from the nest and energy expended in foraging if birds can forage as close to their colony as possible. As such, the likelihood of each individual foraging closer to their colony than further away will not be equal and so the density of birds is likely to decline more rapidly with increasing distance from a colony than the simple geometric relationship based on the square of distance would suggest.

2.4.4. We note welcome the information provided by the Applicant regarding the other LBBG colonies located within foraging range of Vanguard and note that there are other LBBG colonies located closer to the Vanguard site (e.g. town colonies). We also welcome the information provided by the Applicant on the control of urban gull populations and on the foraging habits of urban and rural LBBGs. All of this information indicates just how variable the ecology of this species can be, both between individuals within a colony and between seasons and years.

2.4.5. This information and the breeding season apportionment rates were discussed by Natural England with the Applicant on a call dated 02 April 2019. Natural England advised the Applicant that the tracking data has shown evidence of potential connectivity between the LBBGs from the Alde-Ore Estuary SPA and Norfolk Vanguard. In addition the data

presented in Annex 8 of Appendix 13.1 of the original submission documents (APP-217) shows that adult LBBGs have been recorded in the Vanguard baseline survey data during the breeding season. All of the information provided by the Applicant indicates just how variable the ecology of this species can be, both between individuals within a colony and between seasons and years. As a result it is difficult to have much confidence in pinning down an actual figure for use in apportionment. Therefore, we suggest that a full range of apportionment rates for the breeding season are considered in the assessment via a matrix approach (such as the approach undertaken for displacement assessments), which could potentially be up to 100% in multiples of 10%. However, in the case of LBBGs from the Alde-Ore Estuary SPA and Norfolk Vanguard, we note that 100% would be highly over-precautionary given the size of the wider East Anglian population. We therefore continue to advise the use of a matrix approach, but would invite the Vanguard Applicant to focus their assessment on rates between 10% and 30% to provide a realistic worst case scenario of the proportion of birds from the SPA.

2.4.6. If this is conducted by the Applicant using the CRM data for the revised layout worst case scenario, we will then be in a position to make conclusions regarding the effect on integrity of the LBBG population of the Alde-Ore Estuary SPA. However, we do note that based on using the Applicant's preferred breeding season apportionment rate of 17% and the Applicant's apportionment rates of 3.3% in autumn and spring and 5% in the winter, the predicted apportioned collision mortality from Vanguard alone (using the CRM for the revised worst case layout scenario of 2/3 of the turbines in Vanguard West and 1/3 in East) of 4 LBBGs from the Alde-Ore (range 0-11 birds) equates to 0.96% (0.04-2.41%) of baseline mortality of the colony calculated assuming all collisions are to adults and using an adult colony size and adult mortality rate. This gives further weight to the need to consider impacts on the Alde-Ore SPA through a PVA – Natural England has provided comments on the PVA proposed by the Applicant at Deadline 7 (see Natural England Comments on Lesser black-backed gull (LBBG) Alde-Ore Estuary Population Viability Analysis (PVA) document).

2.5. HRA collision risk modelling (CRM) in-combination impacts – gannet, kittiwake, lesser black-backed gull (Sections 2.1.1.2, 2.2.1.2 & 2.4.1.3 of REP6-021)

2.5.1. We understand that the Applicant will be submitting updated in-combination CRM assessments at Deadline 7. Therefore, as these figures will be updated, we have only made interim conclusions regarding levels of cumulative CRM impact (or in the case of gannet, for cumulative CRM and cumulative displacement combined). We reserve the right to revisit these interim conclusions in our Deadline 8 response.

2.5.2. **General Points:**

a. We note that the CRM figures included in the in-combination assessments for gannet, kittiwake and LBBG for East Anglia One are the figures for the 150 turbine option (which is the legally secured design).
b. The Applicant has assumed that the figures presented in the collision risk in-combination tables and assessments and totals are all for birds of all ages. It is unclear whether this approach is justified i.e. whether the figures for each project are for adults only or birds of all ages, as our understanding is that the figures for some projects (e.g. the Hornsea projects) have been already been adjusted to adult only figures. Therefore, unless evidence can be produced to show otherwise, the in-combination totals should be considered to be for adult birds. In that context it is not appropriate to then adjust these totals to an adult only total figure. We recognise that this approach may be precautionary as the figures included for some projects will be for all ages. This is consistent with the approach Natural England has taken in its Deadline 7 response during the Hornsea 3 examination (Natural England 2019).
c. We suggest the Hornsea Three alone figures included in the in-combination assessments are updated to those presented in the Natural England Deadline 7 response (Natural England 2019).

2.5.3. **Gannet, FFC SPA:**

a. We welcome that for gannet for the FFC SPA all of the other offshore wind farm collision and displacement predictions for autumn and spring in the in-combination tables (Table 4 and Table 6 of REP6-021) have been apportioned using the Natural England recommended rates of 4.8% in autumn and 6.2% in spring.
b. We welcome that the in-combination assessments for gannet now include figures for the Hywind, Kincardine and Moray West offshore wind farms (OWFs).
c. We welcome that the in-combination assessment in REP6-021 for gannet at the FFC SPA now makes reference to the updated PVA undertaken for Hornsea Three.
d. We note that based on the figures currently presented for gannet from the FFC SPA in Table 4 (collision risk) and Table 6 (displacement) of REP6-021, the in-combination totals for collision and displacement combined of up to 307 (excluding Hornsea Three) or 326 (including Hornsea Three) gannet mortalities per annum from FFC SPA equates to greater than 1% of baseline mortality of the FFC SPA colony. Based on the outputs of the PVA for gannet at FFC SPA undertaken at Hornsea Three (Hornsea Project Three Offshore Wind Farm 2019b), with the additional mortality of 300-325 adults per annum then the population of FFC SPA after 30 years will be 32.7-34.9% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 1.4-1.5%. Natural England advises that it may not be possible to rule out AEOI in-combination beyond reasonable scientific doubt from this level of impact and again recommends that impact mitigation through raising rotor blade heights is considered to reduce the contribution of the Vanguard project to in-combination impacts to this and other SPA features (and cumulative impacts at an EIA scale). However, we will provide a final conclusion on this once the updated in-combination (collision and displacement combined) assessments are provided by the Applicant.

2.5.4. **Kittiwake, FFC SPA:**

a. We welcome that for kittiwake for the FFC SPA all of the other offshore wind farm collision predictions for autumn and spring in the in-combination table (Table 13 of REP6-021) have been apportioned using the rates of 5.4% in autumn and 7.2% in spring.
b. We also welcome that for kittiwake from the FFC SPA the breeding season apportionment rates labelled as the 'NE method' from the East Anglia Three assessment have been used in Table 13 of REP-021, with the higher rate of 83% also used for Hornsea Two.
c. We welcome that the in-combination assessments for kittiwake now include figures for the Hywind, Kincardine and Moray West offshore wind farms (OWFs).
d. We welcome that the in-combination assessment in REP6-021 for kittiwake at the FFC SPA now makes reference to the updated PVA undertaken for Hornsea Three.
e. We note that based on the figures currently presented for kittiwake from the FFC SPA in Table 13 of REP6-021, the in-combination totals for collision of 337 (excluding Hornsea Three) or 495 (including Hornsea Three) gannet mortalities per annum from FFC SPA equates to greater than 1% of baseline mortality of the FFC SPA colony. Based on the outputs of the PVA for kittiwake at FFC SPA undertaken at Hornsea Three (Hornsea Project Three Offshore Wind Farm 2019b):
    - If the additional mortality from the windfarm is 350 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to current predicted 337 adult mortalities for in-combination total excluding Hornsea Three in REP6-021) then the population of FFC SPA after 30 years will be 10.8% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.4%. If it is assumed that the population is stable then this would mean that the population would be 10.8% lower than the current population size.
    - If the additional mortality from the windfarm is 500 adults per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to current predicted 495 adult mortalities for in-combination total including Hornsea Three in REP6-021) then the population of FFC SPA after 30 years will be 15.1% lower than it would have been in the

absence of the additional mortality. The population growth rate would be reduced by 0.6%. If it is assumed that the population is stable then this would mean that the population would be 15.1% lower than the current population size.

- In both scenarios there is a clear risk of a significant population decline from its current, apparently broadly stable level, and would in any event be counter to the restore conservation objective required for FFC SPA kittiwake. In this context, Natural England currently concludes that there would be an AEOI in-combination with other constructed, consented and proposed projects. This is in line with our previous conclusions at Hornsea Two and East Anglia Three.
- We will provide a final conclusion on this once the updated in-combination collision assessment is provided by the Applicant. Nevertheless, Natural England again recommends that impact mitigation through raising turbine rotor blade heights is considered to reduce the contribution of the Vanguard project to in-combination impacts to this and other SPA features (and cumulative impacts at an EIA scale).
- In that context, Natural England highlights the significant reduction in kittiwake collision mortality predictions delivered by this mitigation measure for the Hornsea Two windfarm, where the applicant proposed an increase in the minimum blade tip height from 26m relative to lowest astronomical tide (LAT) to 34.97m.

2.5.5. **LBBG, Alde-Ore Estuary SPA:**

a. We note that the cumulative CRM table (and hence the in-combination assessment) for LBBG (Table 19 of REP6-021) still does not include figures for the Hywind and Kincardine OWFs.
b. We welcome that the in-combination assessment in REP6-021 for LBBG at the Alde-Ore Estuary SPA makes reference to the outputs from the updated PVA undertaken by the Applicant in REP6-020.
c. We consider the approach taken by the Applicant for LBBG from the Alde-Ore Estuary SPA in paragraph 117 of REP6-021 for reaching an apportionment rate for in-combination in the non-breeding season of 4% is acceptable. We also welcome that the Applicant has considered all offshore wind farms within 141km from the Alde-Ore in the breeding season assessment. However, the Applicant has then applied a generic rate of 30% apportionment to the total breeding season collision predictions from all the wind farms within 141km of the Alde-Ore to apportion total in-combination collisions in the breeding season. As we have advised previously noted in REP2-038, we consider this to be an overly simplistic approach, as this does not consider the distance of each of these wind farms from the Alde-Ore SPA, the other colonies within foraging range of each of these offshore wind farms, the size of each of the other offshore wind farms etc. We again suggest that the Applicant re-considers this issue. Potentially the most straightforward approach would be to use the apportionment rates used by the other wind farms in their assessments, as Natural England has advised for FFC SPA kittiwake, though other options might be appropriate and we would be happy to try to identify these with the Applicant.
d. We note that based on the figures currently presented in REP6-021 for in-combination CRM for LBBGs from the Alde-Ore Estuary SPA, the in-combination total of 39 LBBGs to the SPA (assuming figures for other sites are for adults), based on 141km foraging range (see paragraph 123 of REP6-021), an additional 39 LBBG mortalities per annum from the Alde-Ore Estuary SPA equates to greater than 1% of baseline mortality of the Alde-Ore Estuary SPA colony. Based on the outputs of the updated PVA for LBBG at the Alde-Ore SPA undertaken by the Applicant in REP6-020:
    - If the additional mortality from the windfarm is 40 adults per annum (closest PVA outputs available in REP6-020 to current predicted 39 adult mortalities for in-combination total in REP6-021) then the population of the Alde-Ore Estuary SPA after 30 years will be 8.5% lower than it would have been in the absence of the additional mortality using the density dependent model and 25.3% lower using the density independent model. The population growth rate would be reduced by 0.2% using the density dependent model and 1.0% using the density independent model. This would be counter to the restore conservation objective required at this site and Natural England therefore advises that it may not be

possible to rule out AEOI in-combination beyond reasonable scientific doubt from this level of impact. Natural England again recommends that impact mitigation through raising turbine rotor blade heights is considered to reduce the contribution of the project to in-combination impacts to this and other SPA features (and cumulative impacts at an EIA scale). However, we will provide a final conclusion on this once the updated in-combination collision assessment is provided by the Applicant.

2.6. HRA auk operational displacement impacts from Vanguard alone (Sections 2.6.1.3, 2.7.1.3 & 2.8.1.3 of REP6-021) – General Points

2.6.1. We welcome that assessments for auks (puffin, razorbill and guillemot) at the FFC SPA from operational displacement from Vanguard alone have been undertaken by the Applicant in REP6-021 (Sections: 2.8.1.3 for guillemot).

2.6.2. We agree with the Applicant's apportionment rate of 0% to the FFC SPA in the breeding season for all three species. As has been advised previously, we recommend that for apportionment of impacts in the non-breeding season to relevant colonies is that the data presented in the tables in Appendix A of Furness (2015) for the relevant species BDMPS for each season (e.g. migration, winter etc.) are used. Whether the colony figure in the BDMPS tables used is the adult figure or that for all ages depends on any Population Viability Analysis (PVA) model and outputs to be used. It does not appear that this approach has been taken by the Applicant in the assessments in REP6-021. Therefore, we advise that the assessment are updated using the following non-breeding season apportionment rates:

- Puffin: 0.41% for non-breeding season (1.5% used by the Applicant)
- Razorbill: 3.4% for autumn/post-breeding season
  - 2.7% for winter/non-breeding season
  - 3.4% for spring/pre-breeding season
- Guillemot: 4.4% for non-breeding season (5.14% used by Applicant)

2.6.3. These rates are consistent with those used previously by Natural England (e.g. at Hornsea 2 – see our written submission for Deadline 3, Appendices 4, 5 and 6 – Natural England 2015a, b & c).

2.6.4. As with the HRA CRM assessments for Vanguard alone:

a. Baseline mortality rates for HRA assessments for have been based on using an all age colony count and all age survival/mortality rate to calculate baseline mortality. We again advise again that assessments should be done using baseline mortality calculations using the adult colony figures and adult mortality rates.
b. Displacement predictions in the HRA assessments have been adjusted to adult only currency by using the proportion of adults based on the age structure model in BDMPS report (Furness 2015) that was created in order to assess the numbers of immature birds that are associated with breeding populations. We are uncertain as to the appropriateness of assuming that the proportion of adults from this model will be representative of the proportion of adults recorded in the Vanguard areas. We recommend that this would be better undertaken based on the proportion of adults recorded in the baseline survey data for each season from Vanguard.
c. The HRA assessments of CRM impacts from Vanguard alone only consider the predictions for the central input parameters (i.e. using mean densities, recommended avoidance rates, maximum likelihood flight height distribution data and the currently recommended nocturnal activity factors). No consideration has been given to the uncertainty/variability in the input parameters. Consideration should also be given in the assessment to the range of CRM predictions from using the upper and lower 95% CIs of bird density (as these account for the greatest variation).

2.6.5. **Puffin, FFC SPA**

a. The Applicant's non-breeding season apportionment rate of 1.5% for puffin can be considered to be precautionary (higher than Natural England advised rate of 0.41%) and we

agree with 0% apportionment in the breeding season for Vanguard. Therefore, the Applicant's calculated additional FFC SPA puffin mortalities at the worst case of 70% displacement and 10% mortality of 0.12 birds (see Section 2.6.1.3 of REP6-021) equates to 0.06% of baseline mortality of the colony, based on using an adult colony size of 1,960 adults (at designation) and an adult mortality rate of 9.4% (from Horswill & Robinson 2015). Based on this figure, no AEOI for the puffin feature of the seabird assemblage feature FFC SPA from Vanguard alone could be concluded. However, the Applicant still needs to consider the predicted figures based on the upper and lower 95% CIs of the bird abundance/density data in order to consider the uncertainty/variability. Therefore, Natural England reserves the right to revise the integrity judgement provided here based on the best available evidence presented.

2.6.6. **Razorbill, FFC SPA**

a. Before any conclusions can be reached regarding the potential impact of operational displacement from Vanguard alone to the FFC SPA razorbill qualifying feature, we advise that the Applicant considers the issues Natural England has noted in 1.4 above regarding the mix up of the seasonal figures presented for Vanguard alone, as we assume that the seasonal apportionment rates used by the Applicant have been potentially applied to the incorrect seasonal abundances.

2.6.7. **Guillemot, FFC SPA**

a. From Table 27 of REP6-021, it would appear that the Applicant has used an apportionment rate of 5.14% for guillemot in the non-breeding season and that this has been applied to the abundances of guillemot in the non-breeding season at all of the OWFs included in the in-combination assessment. The Applicant's non-breeding season apportionment rate of 5.14% for guillemot can be considered to be precautionary (higher than Natural England advised rate of 4.4%) and we agree with 0% apportionment in the breeding season for Vanguard. Therefore, the Applicant's calculated additional FFC SPA guillemot mortalities at the worst case of 70% displacement and 10% mortality of 17 birds (see Section 2.8.1.3 of REP6-021) equates to 0.34% of baseline mortality of the colony, based on using an adult colony size of 83,214 adults (at designation) and an adult mortality rate of 6.1% (from Horswill & Robinson 2015). Based on this figure no AEOI for the guillemot feature of the FFC SPA from Vanguard alone could be concluded. However, the Applicant still needs to consider the predicted figures based on the upper and lower 95% CIs of the bird abundance/density data in order to consider the uncertainty/variability. Therefore, Natural England reserves the right to revise the integrity judgement provided here based on the best available evidence presented.

2.7. HRA auk operational displacement in-combination impacts (Sections 2.6.1.4, 2.7.1.4 & 2.8.1.4 of REP6-021) – General Points

2.7.1. We note that for each of puffin (see paragraph 134 of REP6-021), razorbill and guillemot, the Applicant has apportioned 100% of birds to the FFC SPA during the breeding season for projects located within mean-maximum foraging range of each species. We advise that the Applicant follows the approach taken by Natural England in the Hornsea 2 written submission for Deadline 3, Appendices 4, 5 and 6 (Natural England 2015a, b & c), namely:

a. For puffin: 100% apportioning for projects within mean maximum foraging range (Humber Gateway, Teesside, Westermost Rough, Triton Knoll), except for Hornsea Two where 38% apportioning applied based on proportion of adults in baseline surveys during the breeding season. 38% also applied to Hornsea One. For Dogger Bank Creyke Beck and Dogger Bank Teesside 30% birds apportioned to FFC SPA (as per examination for these projects). In our Deadline 7 response at Hornsea Three (Natural England 2019) Natural England apportioned 50% of puffin in the breeding season for Hornsea Three, so we advise the same approach is taken by Vanguard.
b. For razorbill: 100% apportioning for projects within mean maximum foraging range (Westermost Rough), 48.2% for Hornsea One and Two; 30% for Dogger Bank Creyke

Beck and Dogger Bank Teesside (as per examination for these projects) (Natural England 2015b).

c. For guillemot: 100% apportioning 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 (Natural England 2015a).
d. We note that in our Deadline 7 response at Hornsea Three (Natural England 2019) there are no mortalities from Hornsea Three for guillemot and razorbill apportioned to the FFC SPA in the breeding season. This is because the figures relate to breeding adult mortalities. While Natural England considered that it was unlikely there would be connectivity between breeding adult birds from FFC SPA and Hornsea Three, we do consider there is potential for immature birds that may recruit to FFC SPA to be present at Hornsea Three. However, given that the predicted displacement impacts are presented as adult mortalities and further, the outputs from the PVA models available for FFC SPA are assessed on an adult currency mortality level it was not possible to account for windfarm impacts across immature age classes. Therefore the 0% apportioned in the breeding season to Hornsea Three for razorbill and guillemot in Vanguard's in-combination assessment will be satisfactory.

2.7.2. For apportionment in the non-breeding seasons, we advise that the approach recommended by Natural England is taken and that these rates are applied to all projects considered in the in-combination assessments, namely:

- Puffin: 0.41% for non-breeding season
- Razorbill: 3.4% for autumn/post-breeding season
  - 2.7% for winter/non-breeding season
  - 3.4% for spring/pre-breeding season
- Guillemot: 4.4% for non-breeding season

2.7.3. In light of the issues noted with the Vanguard seasonal abundance figures in the EIA and HRA assessments for razorbill in 1.4 above, we suggest that the seasonal total razorbill abundances presented for each of the other offshore wind farms are checked to ensure that the correct totals are presented for each season and hence that the seasonal apportionment rates are applied to the correct figures.

2.7.4. As per the auk displacement cumulative assessments, we welcome that the Applicant has included figures for Hornsea Three in the assessment. However, we note that these are from the project's Environmental Statement (ES). We note that the during the examination phase for the Hornsea Three project discussions were held over the appropriateness of the baseline dataset for the project and hence the abundance estimates generated, there were also discussions regarding the seasonal definitions used. Therefore, we advise that the abundance estimates used in the auk cumulative and hence in-combination displacement assessments for the Hornsea 3 project are those presented for the 'alternative analysis' in Annex C of Appendix 28 of the Deadline 4 submission by the Hornsea 3 Applicant (Hornsea Project Three Offshore Wind Farm 2019a) in Table 1.11 for guillemot, Table 1.15 for razorbill and Table 1.19 for puffin. We note that these are the figures used by Natural England in its Hornsea Three Deadline 7 response for displacement. We again note that it should still be noted that Natural England have highlighted throughout our written and oral submissions for Hornsea Three that the lack of complete baseline information for the Hornsea Three Zone (i.e. the array area) means that there is a level of uncertainty (and thereby level of risk) associated with these figures and these should not be seen as Natural England's agreed position on the levels of impact from Hornsea Three.

2.7.5. Assessments should again be undertaken against baseline mortality for the colony calculated using adult colony sizes and adult mortality rates, and the it should be assumed that the in-combination totals are for adult birds (which we acknowledge will be precautionary).

2.7.6. Until such assessments are undertaken by the Applicant has not undertaken this approach, we are unable to make any conclusions regarding the level of impact from operational in-combination displacement on the auk populations of the FFC SPA.

2.8. HRA RTD Greater Wash SPA displacement impacts from Vanguard alone - Project alone, export cable installation (Section 2.9.1.2 of REP6-021)

2.8.1. We welcome that the Applicant has undertaken the assessment using the Natural England preferred worst case scenario of 100% displacement and 10% mortality, and we agree with the Applicant's calculations that the predicted impacts equate to 1.3-2.6% of baseline mortality of the SPA RTD population. We again note that this is not insignificant.

2.8.2. The Applicant considers the Natural England worst case scenario of 10% mortality to be precautionary. We note that the mortality factor is a way of crudely capturing a range of non-lethal effects (e.g. reduced body condition in spring) as well as actual mortality. Therefore, whilst the worst case scenario advised by Natural England of 100% displacement and 10% mortality in this instance is in all probability precautionary with respect to mortality, wider considerations are necessary given the cable installation could take place in the non-breeding season in an SPA classified for non-breeding red-throated diver. Furthermore, the Export Cable Route traverses an area of high diver density compared to elsewhere in the Greater Wash SPA. In this context, the displacement of RTD due to the presence of cable laying vessels in the Greater Wash SPA effectively means the loss of habitat in an important area of the SPA concerned for approximately 40 days during a winter/non-breeding season. Therefore, we do not agree with the conclusion by the Applicant of no AEOI.

2.8.3. Natural England again recommends that the Applicant considers mitigation options for RTD disturbance from offshore cable route laying, such as avoiding undertaking cable laying activities during the most sensitive months. For example, cable installation within or affecting the Greater Wash could be scheduled outside January-March inclusive (as per the best practice note for operations and maintenance vessels already supplied by Natural England to the Applicant), as this is the period in which it might be expected that disturbance would be more costly and also when food supplies might start to become depleted. If this mitigation measure was committed to by the Applicant then Natural England would be in a position to conclude no AEOI.

2.9. HRA RTD Greater Wash SPA in-combination displacement impacts

2.9.1. In-combination, export cable installation (Section 2.9.1.3 of REP6-021)

a. We welcome that the Applicant has undertaken an in-combination assessment of export cable installation for Vanguard in-combination with Hornsea 3 export cable laying. We note that using the Natural England preferred worst case scenario of 100% displacement and 10% mortality that the assessment predicts that the predicted in-combination impact equates to 2-3.3% of baseline mortality of the SPA. As with export cable installation for Vanguard alone, we again note that this is not insignificant and do not agree with the conclusion of no AEOI. Whilst the Applicant notes that the non-breeding season is the least favoured period for such work due to less suitable weather conditions, the DCO/DML for Norfolk Vanguard in no way secures cable installation outside this period, so limited weight should be placed on this in the assessment. Therefore we again recommend that the Applicant considers mitigation options for RTD disturbance from offshore cable route laying, such as avoiding undertaking cable laying activities outside of the sensitive period for RTD.
b. As noted in our Relevant Representations (RR-106), consideration should also be given to the in-combination disturbance/displacement effect on RTD of cable laying with the currently constructed or consented wind farms within the Greater Wash SPA. This has still not been undertaken by the Applicant. Nevertheless, should the Applicant commit to no cable installation within or affecting the Greater Wash SPA between January and March inclusive, Natural England foresees that the potential for Norfolk Vanguard to contribute to in-combination affects is likely to be minimal, and therefore no AEOI in-combination could be concluded.

2.10. In-combination, operations and maintenance (Section 2.9.1.4 of REP6-021)

2.10.1. We welcome that the Applicant states in paragraph 203 that it has agreed to the mitigation measures suggested by Natural England regarding red-throated diver and that these will be secured via the Development Consent Order (DCO) as a requirement within the Project Environmental Management Plan (PEMP). Natural England considers the proposed amendment to the DCO/DML broadly acceptable, though recommends the replacement of 'adopted' with 'followed'.

2.10.2. Regarding the PEMP, Natural England recommends that an updated version of the PEMP which sets out the nature of the measures to mitigate the impacts on red-throated divers is submitted into the Examination. Once this is available for review, Natural England will be able to advise whether the measures will rule out an AEOI to the RTD features of the Greater Wash SPA and Outer Thames SPA in relation to disturbance and displacement from operation and maintenance vessel movements.

2.11. HRA little gull Greater Wash SPA CRM impacts from Vanguard alone and in-combination

2.11.1. We note that the CRM for the little gull at EIA from Vanguard alone has been updated for the worst case scenario revised layout, which is now that for ½ the turbines in Vanguard West and ½ in Vanguard East. We therefore advise that the Applicant also updates the assessment of little gull CRM apportioned to the Greater Wash SPA from Vanguard alone and also considers our comments in REP2-038 regarding little gull in-combination CRM for the Greater Wash SPA, namely that whilst the predicted Vanguard CRM impact to little gulls from the Greater Wash SPA is likely to equate to less than 1% baseline mortality and could be considered non-significant and therefore would not be an AEOI. However, while 1% baseline mortality can be considered to be insignificant in the context of the population, this does not mean that this level of additional mortality should not be added to an assessment of in-combination impacts. Therefore, we advise that the in-combination CRM figures for other relevant North Sea offshore wind farms (OWFs) for little gull from the Greater Wash SPA are presented (where figures are available) and that the overall in-combination CRM figure is presented.

3. References

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THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Comments on Vanguard Deterministic Collision Risk Modelling (REP6-019)

02 May 2019

1. Comments on deterministic CRM

1.1. Natural England welcomes the work undertaken by the Applicant on the deterministic collision risk modelling (CRM) undertaken for the 10MW turbine worst case scenario.

1.2. This work presents CRM predictions for the deterministic/Band model Option 2 for:

a. All of the various input parameters that Natural England have advised, i.e. mean densities of birds in flight, together with the SNCB recommended avoidance rates for the 'Basic' (i.e. Options 1 or 2) of the Band (2012) model, the maximum likelihood flight height data from Johnston et al. (2014) and the currently recommended nocturnal activity rates (see Tables 1-4 of REP6-019).

b. In addition, outputs are also presented in Tables 10-17 of REP6-019 for the deterministic/Band model where each parameter (density, avoidance rate, flight height and nocturnal activity) in turn is varied to account for the uncertainty in these input parameters as has been requested by Natural England. These utilise the upper and lower 95% CIs of the bird densities, the ±2SDs of avoidance rates as recommended by the SNCBs (JNCC et al, 2014), the upper and lower 95% CIs of the Johnston et al. (2014) flight height distribution data, and the upper and lower nocturnal activity factor ranges recommended by Natural England. In scenarios where bird density has not been the parameter that is varied, the mean densities are used in the CRM scenarios.

c. Consideration has been given to both monthly collision predictions using the migration free breeding period and the full breeding period (with overlapping non-breeding seasons adjusted accordingly) in Tables 1-4 of REP6-019.

1.3. In addition, outputs are also presented for the deterministic/Band model Option 1 in Tables 18-19 of REP6-019. However, given the concerns regarding reliability with the site-specific flight height data collected from the digital aerial survey data noted in the original Environmental Statement submission (see section 4.7 of Appendix 13.01), Natural England agrees with the use of the Option 2 outputs for the Norfolk Vanguard assessment.

1.4. All of the input parameters required for to run the deterministic/Band (2012) model are provided in Tables 5-8 of REP6-019 and Natural England has therefore been able to check the CRM outputs presented by the Applicant. Following this, it can be seen that the greatest uncertainty in the CRM predictions occurs due to the variability/uncertainty in the bird density. We agree with the Applicant that all the central CRM predictions (i.e. using mean density, mean avoidance rate, maximum likelihood flight height data and the standard nocturnal activity rates) equate to less than 1% baseline mortality of largest the BDMPS and biogeographic populations for all of the five key species (gannet, kittiwake, lesser black-backed gull, herring gull and great black-backed gull). This is also the case for the upper 95% confidence intervals of the bird density for all species except great black-backed gull (GBBG), where the predicted CRM figure of 340 (Tables 1 and 3 of REP6-019) equates to 2.01% of baseline mortality of the largest BDMPS for all turbines in Vanguard East and 0.78% of baseline mortality of the biogeographic population.

1.5. **Therefore, based on these figures we agree with the Applicant's conclusion in REP6-019 that the collision risk from Vanguard alone would have no significant impact at the EIA scale for all species, although this conclusion can only be made with low confidence regarding impacts on GBBG at Vanguard East.**

2. References

Band, W. (2012). Using a collision risk model to assess bird collision risks for offshore wind farms. The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02.

Johnston, A., Cook, A. S. C. P., Wright, L. J., Humphreys, E. M. and Burton, N.H.K. (2014). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. *Journal of Applied Ecology,* 51, 31–41 doi: 10.1111/1365-2664.12191.

Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH). (2014). Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review. 25th November 2014. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010053/EN010053-001024-Appendix%20Y_Joint%20response%20from%20SNCBs%20to%20MSS%20Avoidance%20Rate%20Paper%2025%20November%202014.pdf. This document was provided at Deadline 1.

THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Comments on Lesser Black-Backed Gull (LBBG) Alde-Ore Estuary Population Viability Analysis (PVA) (REP6-020)

02 May 2019

1. Summary Comments

1.1. Natural England welcomes the work undertaken by the Applicant on the LBBG Alde-Ore Estuary SPA PVA in REP6-020. This PVA has been run as a density independent and density dependent formulations, which have been run using a 'matched runs/pairs' approach, have been run over 30 years and the output metrics presented as the counterfactuals of population size and of population growth rate, as per Natural England's advice provided during the Vanguard examination process. With regards to density independent and density dependent models, as noted during Issue Specific Hearing 4 on 27 March 2019 and summarised in our Deadline 6 response (REP6-032), Natural England's position regarding density independent versus density dependent models is that we agree that density dependent processes are likely to operate on seabird populations, but where there is no clear evidence to support application of any particular form or magnitude of density dependence operating we recommend that density independent model outputs should also be considered.

1.2. We note that previous PVAs (e.g. MacArthur Green 2015) have used 5,000 simulations for the stochastic models, whereas the LBBG Alde-Ore PVA in REP6-020 undertaken by the Applicant has used 1,000 simulations. As was advised by Natural England at Hornsea 3 regarding the updated PVAs undertaken for the Flamborough and Filey Coast (FFC) SPA, a larger number of simulations would potentially be needed to generate reliable results (Natural England 2019).

1.3. With regard to the metrics, it is not clear how the median and confidence intervals around the counterfactuals of population size and growth rate metrics have been calculated for the 'matched runs/pairs' approach. Therefore, Natural England suggests that the Applicant sets out how they have calculated the metrics - a worked example would be useful. Natural England advises that with a 'matched runs/pairs' method the metric should be calculated for each of the individual matched pairs and then (as there are 1,000 simulations in the Applicant's models) there will be 1,000 metric calculations from which a median value of the metric and the 95% confidence intervals can be derived.

1.4. We note that the final paragraph of Section 4 of REP6-020 states that: *'…the demographic rates indicate that under baseline conditions the population growth rate would be in excess of 10%.'* Natural England is concerned by this statement as there is no evidence to suggest this is an appropriate assumption. We note that the original LBBG Alde-Ore Estuary SPA PVA undertaken for the Galloper offshore wind farm (OWF) (GWFL 2012), when run in density independent mode and with the "historic" scenario, resulted in projected population *decline*. This PVA used the following parameters: juvenile survival rate = 0.82, adult survival rate = 0.90, productivity = 0.45 chicks per pair and proportion of adults breeding = 0.66. These demographic rates are quite similar to the parameters used in this PVA undertaken for Vanguard (juvenile survival = 0.82, adult survival = 0.885, productivity = 0.53 and proportion of adults breeding = 0.663. Natural England does not believe there is evidence to show the Alde-Ore Estuary SPA colony is growing at all at the moment, and therefore considers that its demographic rates must be different to those used here. Further justification for this assumption is needed should it continue to form part of the PVA.

1.5. Additionally, we note that it is not possible to evaluate the statement regarding baseline conditions and population growth rate being in excess of 10% from the figures and tables presented in the Appendix of REP6-020, as all that has been

presented are the counterfactuals and not the actual annual growth rate under the unimpacted scenario for both density independent and density dependent options. Likewise, it appears that the statement that *'smaller reductions in the growth rate, such as up to 3% for example, are unlikely to trigger a population decline'* cannot be validated from the outputs provided. Also, with regards to the statement that *'…using the more precautionary density independent model, the results suggest that an adult mortality of up to 120, which corresponds to a 3% reduction in growth rate, is unlikely to trigger a population decline'*, clarification is required as to from what to what the 3% reduction in growth rate is referring to.

1.6. Until these clarifications are provided, Natural England will not able to provide full advice on the likely implications of the PVA outputs for the Alde-Ore Estuary SPA lesser black-backed gull colony.

2. Detailed Comments

Ref.	Section	Comment
2.1	Table 1 – survival rates	We assume there are no Alde-Ore LBBG colony specific survival rates available for use in the model. We note that the survival rate of 0.82 for the 0-1 age class is that from Horswill & Robinson (2015) for juvenile LBBG survival (0-1yr). However, the standard deviation is given for the older age class only in Horswill & Robinson, so here we are assuming the same for 0-1yr. This is probably acceptable as the mean values are quite similar. We note that the survival rate of 0.8865 for the 1-2 through to adult age classes is that from Horswill & Robinson (2015) for adult LBBG survival (2yrs or greater), as is the standard deviation, which is acceptable.
2.2	Table 1- reproduction rates	We note that the value of 0.351 fledged young per pair is a rather low value. This figure has been arrived at by multiplying the Horswill & Robinson (2015) value of 0.530 for national mean productivity by 0.663 to take account of the proportion of birds that miss breeding each year (in an average LBBG population). Natural England is not certain about the appropriateness of this and note that in the old LBBG Alde-Ore PVA undertaken for Galloper OWF (GWFL 2012) three productivity rates were simulated: 0.45, 0.80 and 1.0, with the assessment focussing on the result when 0.8 was used. That was on the basis of a good year for productivity in 2011. However, the 3-year mean productivity at Orford up to 2011 was 0.256 and in 2012 it was 0.19. We note that there is breeding success data in the Seabird Monitoring Programme (SMP) database for Havergate Island from 2009-11 and 2014-15, but no data for Orfordness.
2.3	Section 2, Methods – para 4	The last sentence of this paragraph states: *'Population projections produced by such models will either increase to infinity or decrease to extinction.'*

		We note that if survival and productivity are perfectly matched then in theory the population may remain stable, but as the Applicant notes even if slightly mis-matched then over time the colony will drift up or down - though if quite closely matched the two stochastic elements may stop the inexorable rise or fall, or slow it considerably.
2.4	Section 2, Methods – para 5	We are not aware of any evidence of density dependence acting on the LBBG colony at the Alde-Ore Estuary SPA. The colony declined significantly in 2001, and although the reasons for the decline are not understood it may be due to external factors. It is now such a small colony that it is hard to imagine density dependence operating much now (unless maybe through depensatory effects). This paragraph states: *'…the demographic rate most likely to reflect density dependent effects will be reproduction, with breeding success declining as population approaches the ceiling set by food resources…'* We note that this will almost certainly NOT be operating at present in the Alde-Ore LBBG SPA with such a depleted colony, and is likely to exert a pretty weak effect until the colony gets much bigger. However, we consider it appropriate that the Applicant has considered modelling density dependent regulation through reproduction rather than survival across multiple rates.
2.5	Section 2, Methods – para 11	The last sentence of this paragraph states: *'Furthermore, the additional mortality was applied to all age classes in proportion to their presence (i.e. wind farm mortality was not considered to target specific age classes).'* Clarification is required as to whether this was applied to the modelled population as a whole or their presence in the OWF survey dataset of age classes recorded at sea. Natural England assumes it is the former, but clarification is required.
2.6	Section 4, Discussion, para 2	The first sentence of this paragraph states: *'Although the trend in the Alde-Ore Estuary population is not well known...'* Natural England notes that the Alde-Ore LBBG population trend is well known from 2001 to 2010 at least, as shown in one of the figures in the Alde-Ore LBBG stochastic PVA report undertaken for Galloper OWF (GWFL 2012).

3. References

GWFL (2012) Galloper Wind Farm Project: Alde-Ore Estuary lesser black-backed gull Stochastic PVA.

MacArthur Green (2015) Flamborough and Filey Coast pSPA Seabird PVA Report.

Natural England (2019) Hornsea Project Three Offshore Windfarm Natural England Written Submission for Deadline 6: Written Submission of Natural England's Representation at Issue Specific Hearing 5 – Offshore Ecology. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-

content/ipc/uploads/projects/EN010080/EN010080-001688-Natural%20England%20-%20Written%20Submission%20of%20Natural%20England%E2%80%99s%20Representations%20at%20Issue%20Specific%20Hearing%205%20-%20Offshore%20Ecology.pdf

THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Comments on Norfolk Vanguard Migrant Non-seabird Collision Risk Modelling (REP6-022)

02 May 2019

Natural England welcomes the work undertaken by the Applicant on migrant non-seabird collision risk modelling (CRM) in REP6-022, to address comments made by Natural England on the previous version of this modelling and to update the CRM to reflect the revised design changes for the 10MW.

1. Relevant total and SPA population sizes (Table 4)

1.1. Natural England welcome the further information provided by the Applicant in Table 4 of REP6-022 on the migration routes and migrant population sizes. We note that the figure of 465,000 for the lapwing migrant population presented in Table 4 of REP6-022 does not equal the GB and Ireland total non-breeding populations presented in Wright et al. (2012) (this equals 827,700). However, the Applicant notes that APEM (2014) (the work undertaken for East Anglia Three offshore wind farm) present a calculation of the size of migrant lapwing population which is derived from Wright et al. (2012). We note that the APEM (2014) figure matches that presented by the Vanguard Applicant and has been calculated as follows:

1.2. *'Wright et al. (2012) suggests few breeding birds migrate out of UK, but mostly go south if they do migrate. An assumption of all adults (approx. 300,000 in GB alone) remain in GB and 150,000 juveniles (based on approx. one juvenile per pair in GB) migrate out for winter then GB breeders wintering in UK must be joined by 320,000 migrants from Europe to total the 620,000 GB non-breeding population. That makes the migrant population ~75% of non-breeding numbers in GB, so 465,000 birds.'*

1.3. Natural England are therefore content with the total migrant population sizes used by the Applicant as presented in Table 4 of REP6-022.

1.4. We welcome that the assessments to the relevant SPAs have now been conducted using both the most recent 5-year mean peak counts and the citation figures. We note the issues with differences in the SPA boundaries and the Wetland Bird Survey (WeBS) sites; whilst the data for the actual SPA sites could be requested through a data request to the BTO, given the Vanguard examination timescales, we agree that the Applicant's approach is the most appropriate at this stage and is sufficiently precautionary for Breydon Water SPA and the North Norfolk Coast SPA.

2. CRM input parameters (Table 5)

2.1. Natural England previously requested clarification as to the source of the proportion at potential collision height (%PCH) values used for each species. We have advised the Applicant uses the recommended central %PCH values for each species group or species and the ranges recommended in Table 3 of Wright et al. (2012). In Table 2 of REP6-022, the Applicant confirms that the %PCH figures used are those in Wright et al. (2012) and notes that whilst the correct figures have been used in the CRM, there were some errors in the values presented in the original non-seabird migrant CRM document (REP3-038), but that these are corrected in Table 5 of the updated assessment in REP6-022. However, we note that the previous errors noted by Natural England still remain in Table 5 of REP6-022, namely:

- Common scoter: Table 3 of Wright et al. (2012) advises 1% PCH (range <0.1-17%), but we note that in Table 5 of REP6-022, the Applicant lists this as 30%;

- Curlew: Table 3 of Wright et al. (2012) advises 25% PCH for waders (range 5-75%), but we note that in Table 5 of REP6-022, the Applicant lists this as 1%.

2.2. However, we note that we have run the CRM using the correct %PCHs for these two species and confirm that we get the same predictions as the Applicant, so it appears that the Applicant has used the correct figures in the CRM and that the errors identified in Table 5 of REP6-022 are just typing errors in Table 5.

2.3. We welcome that the Band (2012) model input and output data sheets for Bewick's swan are included in Appendix 2 of REP6-022 as an example.

3. Avoidance rates

3.1. We welcome that the Applicant has undertaken and presented CRM results for a range of avoidance rates from 98% to 99.8% for each species in Table 6 of REP6-022. However, as noted in our response to REP3-038, we again note that Natural England does not agree that 99.5% avoidance for Bewick's swan and 99.8% for dark-bellied brent goose (DBBG) are appropriately precautionary rates for these species to base assessment conclusions on. This is because:

a. We note that the SNH recommended avoidance rate of 99.5% for swans in SNH (2017) is based on use for onshore wind farms and not offshore wind farms such as Norfolk Vanguard, where bird behaviour may well be different. We also note that the recommendation of 99.5% is based on evidence presented in Whitfield & Urquhart (2015). Whitfield & Urquhart (2015) presents empirical evidence from one study at a Dutch polder (by Fijn et al. 2012). Whilst the study does present some other evidence from studies that appear to suggest that swan avoidance rates are likely to be high, there are some issues associated with these: not able to calculate avoidance rates from them; and most are from sites where swan densities are low anyway, meaning there would be a low likelihood of detecting collisions. Given this and that the recommended figure is based on one onshore study from the Netherlands, and that we do not know whether the species behaves in the same way at an offshore wind farm in the southern North Sea, Natural England currently does not consider that 99.5% is an appropriately precautionary avoidance rate to use in CRM for offshore wind farms for Bewick's swan. We again advise that a 98% avoidance rate is considered the appropriate precautionary rate for Bewick's swan for CRM assessments at OWFs.

b. We note that WWT Consulting, under contract to NE, have reviewed much the same material regarding goose avoidance rates of wind farms as SNH have done in their 2010 and 2013 (SNH 2010; 2013) reviews (WWT Consulting 2014). From this WWT Consulting concluded that although the average avoidance rate for geese is likely to be high, they considered that there seems to be little new evidence since the Fernley et al. (2006) and Pendlebury (2006) reviews (on which the SNH 99% AR recommendation was based) on which to base an informed revision.

Therefore, due to these uncertainties Natural England recommends that an avoidance rate of 99% is used for CRM assessments for geese, including DBBG, but that a broader range of avoidance rates (e.g. 95-99.8%) is also presented.

4. CRM estimates, Vanguard East and Vanguard West

4.1. We note that if a 98% avoidance rate is used in the assessment for Bewick's swan, 1.4 annual collisions are predicted, rather than 1 or fewer as stated by the Applicant in paragraph 14 of REP6-022.

4.2. We note that if a 99% avoidance rate is used in the assessment for DBBG, 4.4 annual collisions are predicted, rather than 1 or fewer as stated by the Applicant in paragraph 14 of REP6-022.

4.3. However, we note that these increases would not alter the Applicant's conclusions for the assessment of impact from Vanguard alone.

4.4. Based on the CRM predictions presented by the Applicant in REP6-022, we note that none of the predicted impacts (using the avoidance rates we consider to be appropriate) for any species equate to 1% or more of baseline mortality for the relevant reference populations for EIA and therefore, we conclude no significant impact from collision risk from Vanguard alone for any of the non-seabird migrant species considered at EIA scale.

4.5. We also note that for the three SPAs considered (Breydon Water, Broadland and North Norfolk Coast) none of the predicted impacts (using the avoidance rates we consider to be appropriate) for any of the relevant qualifying features of these sites equate to 1% or more of baseline mortality for either the most recent 5 year mean site figures from WeBS or the citation figures. Therefore, no AEOI can be concluded from collision risk from Vanguard alone for all of the relevant non-seabird migrant qualifying features of these three sites.

5. Cumulative assessments

5.1. We welcome that the Applicant has undertaken a cumulative and in-combination assessment for Vanguard plus the East Anglia Three offshore wind farm. Based on the cumulative CRM predictions presented by the Applicant REP6-022, we note that none of the predicted cumulative impacts (using the avoidance rates we consider to be appropriate) for any species equate to 1% or more of baseline mortality for the relevant reference populations for EIA and therefore, we conclude no significant impact from collision risk from Vanguard in-combination with East Anglia Three for any of the non-seabird migrant species considered at EIA scale.

5.2. We also note that for the three SPAs considered (Breydon Water, Broadland and North Norfolk Coast) none of the predicted in-combination impacts (using the avoidance rates we consider to be appropriate) for any of the relevant qualifying features of these sites equate to 1% or more of baseline mortality for either the most recent 5 year mean site figures from WeBS or the citation figures. Therefore, no AEOI can be concluded from collision risk from Vanguard in-

combination with East Anglia Three for all of the relevant non-seabird migrant qualifying features of these three sites.

6. References

APEM (2014) East Anglia THREE Windfarm Migropath and Collision Risk Modelling Report for Non-seabirds. APEM Scientific Report 512608-Mig-3.A. APEM Ltd., Stockport.

Band, W. (2012). Using a collision risk model to assess bird collision risks for offshore wind farms. The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02.

Fernley, J. Lowther, S. & Whitfield, P. (2006) A review of goose collisions at operating wind farms and estimation of the goose avoidance rate. Natural Research Ltd, West Coast Energy and Hyder Consulting report. West Coast Energy, Mold, UK.

Fijn, R.C., Krijgsveld, K., Tijsen, W., Prinsen, H.A.M., & Dirksen, S. (2012) Habitat use, disturbance and collision risks for Bewick's Swans *Cygnus columbianus bewickii* wintering near a wind farm in the Netherlands. Wildfowl, 62: 97–116.

Pendlebury, C. (2006) Review of 'Review of goose collisions at operating wind farms and estimation of the goose avoidance rate'. BTO report to SNH.

SNH (2010) Use of avoidance rates in the SNH wind farm collision risk model. SNH Guidance Note.

SNH (2013) Avoidance rates for wintering species of geese in Scotland at onshore wind farms.

SNH (2017) Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model.

Whitfield, D.P & Urquhart, B. (2015) Deriving an avoidance rate for swans suitable for onshore wind farm collision risk modelling. Natural Research Information Note 6. Natural Research Ltd, Banchory, UK.

Wright, L.J., Ross-Smith, V.H., Massimino, D., Dadam, D., Cook, A.S.C.P. & Burton, N.H.K. (2012). Assessing the risk of offshore windfarm development to migratory birds designated as features of UK Special Protection Areas (and other Annex I species). Strategic Ornithological Support Services. Project SOSS-05. BTO Research Report No. 592.

WWT Consulting (2014) Pink-footed Goose anthropogenic mortality review: Avoidance rate review. Natural England Commissioned Report, NECR196.

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NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Natural England's Comments on changes made to draft Development Consent Order as submitted by the Applicant [AS-040]

02 May 2019

Norfolk Vanguard Offshore Wind Farm – Comments on changes made to draft Development Consent Order as submitted by the Applicant at Deadline 6.5 [AS-040]

Following submission of revised draft Development Consent Order by the Applicant at Deadline 6.5 regarding the construction and operation of Norfolk Vanguard Offshore Wind Farm, Natural England has reviewed this document, and provided comment within the remit of Natural England. These comments are colour coded as:

Green Comments – Comments support/agree with Natural England position or does not impact on Natural England concerns

Amber Comments – Natural England comments may be in contradiction further advice needed, or potential new issue not included in Natural England comments

Red Comments – Comments in direct contradiction/argument with Natural England position or represents a significant issue not mentioned by Natural England

Table 1: Natural England Comments on changes made to draft Development Consent Order as submitted by the Applicant at Deadline 6.5 [AS-040]. This table only includes responses to comments made by Natural England, has particular interest for Natural England or Natural England has concerns with the change made.

Ref	DCO Ref.	Consultee	Comments from stakeholder (rationale for the change)	Change made by the Applicant	Natural England Comments
2.	Article 37	NCC	Additional certified plans to reflect the new requirements at Part 3 of Schedule 1	(x) the outline Norfolk Vanguard Haisborough, Hammond, and Winterton Special Area of Conservation site integrity plan (8.20) (y) the outline operational drainage plan (8.21) (z) the outline skills and employment plan (8.22).	No comments.
3.	Article 39	N/A	To reflect the new requirements at Part 3 of Schedule 1	(2) Schedule 15 (procedure for discharge of requirements) has effect in relation to all agreements or approvals granted, refused or withheld in relation to requirements 13, 14, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, and 29, 32 and 33 in Part 3 of Schedule 1 (requirements).	No comments.
5.	Schedule 1, Part 1	N/A	Updates to the disposal figures to account for removal of 9MW turbine option.	(c) the removal of material from the seabed required for the construction of Work Nos. 1 to 4B and the disposal of up to ~~51,207,566~~ 49,329,712 cubic metres of inert material of natural origin within the Order limits produced during construction	No comments.

Ref	DCO Ref.	Consultee	Comments from stakeholder (rationale for the change)	Change made by the Applicant	Natural England Comments
				drilling, seabed preparation for foundation works, cable installation preparation such as sandwave clearance, boulder clearance and pre-trenching and excavation of horizontal directional drilling exit pits;	
8.	Schedule 1, Part 3, requirement 2(d)	N/A	Updating of turbine spacing in accordance with removal of 9MW turbine option and removal of floating foundation.	(d) be less than ~~720~~ 760 metres from the nearest wind turbine generator in either direction perpendicular to the approximate prevailing wind direction (crosswind) or be less than ~~720~~ 760 metres from the nearest wind turbine generator in either direction which is in line with the approximate prevailing wind direction (downwind);	No comments.
9.	Schedule 1, Part 3, requirement 5	N/A	Updates to cable protection volume and area to reflect commitment to remove the 9MW turbine option and reduction of cable protection in HHW SAC.	Cable protection (m2 and m3) 400,000m2 204,000 m3 76,000m2 38,000 m3 102,086m2 59,836 m3	Natural England welcomes the reduced volume and area figures for cable protection. However, Natural England still strongly advises against the use of cable protection within designated sites, regardless of the amount, as the addition of hard substrata is often incompatible with the conservation objectives for Annex I sandbanks and reef features.
10.	Schedule 1, Part 3, requirement 6(2)	N/A	Update to the parameter following the removal of floating foundations.	(2) In relation to a wind turbine generator, each foundation must not have a seabed footprint area (excluding scour protection) of greater than ~~4,900~~ 1,963 m2.	No comments.
11.	Schedule 1, Part 3, requirement 11	N/A	Update to the parameter following the removal of floating foundations and removal of 9MW turbine option.	The total amount of scour protection for the wind turbine generators, accommodation platform, meteorological masts, offshore electrical platforms and LIDAR measurement buoys forming part of the authorised project must not exceed ~~10,639,080~~ 5,483,752 m2 and ~~53,195,398~~ 27,418,759 m3.	Natural England welcomes the reduction in total volume and area of scour protection. However, Natural England's position has not changed in this regard; the DCO and DML should further split maximum scour protection areas out for individual structures. A mass total is not appropriate to ensure scour protection is installed within the

Ref	DCO Ref.	Consultee	Comments from stakeholder (rationale for the change)	Change made by the Applicant	Natural England Comments
					predicted maximums for each element of the project. This is also in agreement with the position laid out by MMO in their Deadline 6 response [REP6-030].
13.	Schedule 1, Part 3, requirement 17	NNDC	Agreed with NNDC to secure ongoing monitoring of cables and ducts at landfall.	(1) No part of Works No. 4A, 4B or 4C may commence until a method statement for the construction of Works No. 4A, 4B and 4C has been submitted to and approved in writing by ~~the relevant planning authority~~ North Norfolk District Council. (2) The method statement referred to in subparagraph (1) must include measures for long horizontal directional drilling below the coastal shore platform and cliff base at the landfall as well as measures for ongoing inspection of Work No. 4C and reporting of results to North Norfolk District Council during the operation of the authorised project. (3) In the event that inspections indicate that as a result of the rate and extent of landfall erosion Work No. 4C could become exposed during the operation of the authorised project the undertaker must, as soon as practicable, submit proposals in writing for remedial measures to protect Work No. 4C, together with a timetable for their implementation, to North Norfolk District Council for their approval. (4) The method statement and any proposals for remedial measures must be implemented as approved.	Natural England welcomes the proposal by the Applicant to monitor the rate of coastal erosion at the landfall. We note the text proposed by NNDC to be added to Requirement 17 (landfall method statement) to cover a monitoring requirement. Due to the location of the landfall within the Greater Wash SPA and its proximity to Happisburgh cliffs SSSI Natural England would expect to see a commitment that 'the undertaker must, as soon as practicable, submit proposals in writing for remedial measures together with a timetable for their implementation, to SNCB including Natural England.
14.	Schedule 1, Part 3, requirement 20	N/A	To make clear that the CoCP elements of surface water and drainage only apply to construction, as the relevant operational elements will be addressed through the	(i) construction surface water and drainage;	No comments.

Ref	DCO Ref.	Consultee	Comments from stakeholder (rationale for the change)	Change made by the Applicant	Natural England Comments
			Operational Drainage Plan pursuant to requirement 32.		
15.	Schedule 1, Part 3, requirement 24	NNDC	As requested by NNDC to capture post consent ecological surveys of previously unsurveyed areas	(1) No stage of the onshore transmission works may commence until for that stage a written ecological management plan (which accords with the outline landscape and ecological management strategy as appropriate for the relevant stage) has been submitted to and approved by the relevant planning authority in consultation with Natural England. The ecological management plan must be informed by post consent ecological surveying of previously un-surveyed areas for the relevant stage. … (3) Pre-commencement site clearance works must only take place in accordance with a specific ecological management plan for site clearance works which is in accordance with the relevant details for site clearance works set out in the outline landscape and ecological management strategy, and which has been submitted to and approved by the relevant local authority. The plan for site clearance works must be informed by post consent ecological surveying of previously un-surveyed areas for the relevant stage referred to in the plan.	No comments.
18.	Schedule 9 - 10, Part 3, paragraph 1(d)	N/A	Parameters updated to reflect removal of floating foundation and 9MW turbine, and also to capture the disposal site references.	the disposal of up to ~~39,732,566~~ 37,854,712 m3 of inert material of natural origin within the offshore Order limits produced during construction drilling or seabed preparation for foundation works and cable (including fibre optic cable) sandwave preparation works at disposal site references ~~[XX]~~ HU215 and HU216 within the extent of the Order limits seaward of MHWS, comprising— (i) 36,000,000 m3 for cable and fibre optic cable installation;	As stated previously in both our Deadline 3 [REP3-051] and Deadline 5 [REP5-017] responses Natural England advise that greater clarity is still required as to where this sediment is to be disposed of. This is particularly important when looking at locations within the boundary of the SAC. Natural England suggest that this detail could be provided in the SIP, however, are unable to comment on

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				(ii) ~~3,645,000~~ 1,767,146 m3 for the wind turbine generators; (iii) 75,000 m3 for the accommodation platform; and (iv) 12,566 m3 for the meteorological masts; and (e) the removal of static fishing equipment	the suitability of this until it has been produced. With this in mind Natural England suggest that the SIP should contain criteria that the disposal locations within the SAC should meet to ensure that any sediment will remain within the system, that the dredge material will be >95% similar in particle size to disposal locations whilst ensure that there is no interaction with Annex 1 reef. Natural England would suggest that the disposal volumes should be split according to type of material, for example drill arisings, boulders, sand and mud. This is important because different materials have different impacts and those impacts have been assessed based on maximum volumes as provided in the ES. Also the maximum volumes taken within the Haisborough, Hammond and Winterton SAC should be detailed separately to ensure the impacts to the designated site remain within the impacts assessed. The wording should also limit the area of impact from removal of substances for disposal to the area assessed.
19.	Schedule 9 - 10, Part 3, paragraph 2(2)(c)	N/A	Parameter updated to reflect removal of floating foundation and 9MW turbine	the removal of material from the seabed required for the construction of Work No. 1 and the disposal of up to ~~39,732,566~~ 37,854,712 cubic metres of inert material of natural origin within the Order limits produced during construction drilling, seabed preparation for foundation works, cable installation	No comments.

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				preparation such as sandwave clearance, boulder clearance and pre–trenching and excavation of horizontal directional drilling exit pits; and	
20.	Schedule 9 - 10, Part 4, condition 1(d)	N/A	Parameter updated to reflect removal of floating foundation and 9MW turbine	be less than ~~720~~ 760 metres from the nearest wind turbine generator in either direction perpendicular to the approximate prevailing wind direction (crosswind) or be less than ~~720~~ 760 metres from the nearest wind turbine generator in either direction which is in line with the approximate prevailing wind direction (downwind);	No comments.
21.	Schedule 9 - 10, Part 4, condition 3	N/A	Parameter updated to reflect removal of 9MW turbine option.	Cable protection (m2 and m3) ~~410,000~~ 400,000 m2 ~~209,000~~ 204,000 m3	Natural England welcomes the reduced volume and area figures for cable protection. However, Natural England still strongly advises against the use of cable protection within designated sites, regardless of the amount, as the addition of hard substrata is often incompatible with the conservation objectives for Annex I sandbanks and reef features.
22.	Schedule 9 - 10, Part 4, condition 4(2)	N/A	Parameter updated to reflect removal of floating foundation.	(2) In relation to a wind turbine generator, each foundation must not have a seabed footprint area (excluding scour protection) of greater than ~~4,900~~ 1,963 m2.	No comments.
23.	Schedule 9 - 10, Part 4, condition 8(1)	N/A	Parameter updated to reflect removal of floating foundations and removal of 9MW turbine option.	(g) the total amount of scour protection for the wind turbine generators, accommodation platform, meteorological masts and measurement buoys forming part of the authorised scheme must not exceed ~~10,619,080~~ 5,463,752 m2 and ~~53,095,398~~ 27,318,759 m3; and (h) the total amount of inert material of natural origin disposed within the offshore Order limits as part of the authorised scheme must not exceed ~~39,732,566.37~~ 37,854,712 m3	Natural England welcomes the reduction in total volume and area of scour protection. However, Natural England's position has not changed in this regard; the DCO and DML should further split maximum scour protection areas out for individual structures. A mass total is not appropriate to ensure scour protection is installed within the

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					predicted maximums for each element of the project. This is also in agreement with the position laid out by MMO in their Deadline 6 response [REP6-030].
24.	Schedule 9 - 10, Part 4, condition 9(12) Schedule 11 - 12, Part 4, condition 4(12)	MMO and Trinity House	New sub-paragraph for this part of the condition as requested by MMO and Trinity House	(12) In case of exposure of cables on or above the seabed, the undertaker must within five days following the receipt by the undertaker of the final survey report from the periodic burial survey, notify mariners by issuing a notice to mariners and by informing Kingfisher Information Service of the location and extent of exposure.	No comments.
25.	Schedule 9 - 10, Part 4, condition 10(5)	N/A	Updated to reflect new condition 9(12).	(5) In the event that the provisions of condition 9(11) and condition 9(12) are invoked, the undertaker must lay down such marker buoys, exhibit such lights and take such other steps for preventing danger to navigation as directed by Trinity House	No comments.
26.	Schedule 9 - 10, Part 4, condition 12(5)	MMO	Updating of disposal references	(5) The undertaker must ensure that only inert material of natural origin, produced during the drilling installation of or seabed preparation for foundations, and drilling mud is disposed of within site disposal references ~~[XX]~~ HU215 and HU216 within the extent of the Order limits seaward of MHWS. Any other materials must be screened out before disposal of the inert material at this site.	As stated previously in both our Deadline 3 [REP3-051] and Deadline 5 [REP5-017] responses Natural England advise that greater clarity is still required as to where this sediment is to be disposed of. This is particularly important when looking at locations within the boundary of the SAC. Natural England suggest that this detail could be provided in the SIP, however, are unable to comment on the suitability of this until it has been produced. With this in mind Natural England suggest that the SIP should contain

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					criteria that the disposal locations within the SAC should meet to ensure that any sediment will remain within the system, that the dredge material will be >95% similar in particle size to disposal locations whilst ensure that there is no interaction with Annex 1 reef. Natural England would suggest that the disposal volumes should be split according to type of material, for example drill arisings, boulders, sand and mud. This is important because different materials have different impacts and those impacts have been assessed based on maximum volumes as provided in the ES. Also the maximum volumes taken within the Haisborough, Hammond and Winterton SAC should be detailed separately to ensure the impacts to the designated site remain within the impacts assessed. The wording should also limit the area of impact from removal of substances for disposal to the area assessed.
27.	Schedule 9 - 10, Part 4, condition 14(1)(d)(vi)	Natural England	RTD mitigation requested by NE	(vi) procedures to be adopted within vessels transit corridors to minimise disturbance to red-throated diver during operation and maintenance activities.	Natural England welcomes that the Applicant has agreed to the mitigation measures suggested by Natural England regarding red-throated diver and that these will be secured via the Development Consent Order (DCO) as a requirement within the Project Environmental Management Plan (PEMP). Natural England has reviewed the proposed amendment

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					to the DCO/DML and finds it broadly acceptable, though recommends the replacement of 'adopted' with 'followed'. Regarding the PEMP, Natural England recommends that an updated version of the PEMP which sets out the nature of the measures to mitigate the impacts on red-throated divers is submitted into the Examination. Once this is available for review, Natural England will be in a position to advise whether the measures will rule out an AEOI to the RTD features of the Greater Wash SPA and Outer Thames SPA in relation to disturbance and displacement from operation and maintenance vessel movements.
28.	Schedule 9 - 10, Part 4, condition 14(1)(e) Schedule 11-12, Part 4, condition 9(1)(e)	MMO	Updated in response to comments from the MMO at ISH5.	A scour protection and cable protection plan (in accordance with the outline scour protection and cable protection plan) providing details of the need, type, sources, quantity, distribution and installation methods for scour protection and cable (including fibre optic cable) protection, which must be updated and resubmitted for approval if changes to it are proposed following cable laying operations.	Natural England's position has not changed in this regard; the DCO and DML should further split maximum scour protection areas out for individual structures. A mass total is not appropriate to ensure scour protection is installed within the predicted maximums for each element of the project. This is also in agreement with the position laid out by MMO in their Deadline 6 response [REP6-030].
29.	Schedule 9 - 10, Part 4, condition 14(1)(f) Schedule 11-	N/A	Updated to cover all types of piled foundations.	In the event that ~~driven or part driven~~ piled foundations are proposed to be used, a marine mammal mitigation protocol, in accordance with the draft marine mammal mitigation protocol, the intention of which is to prevent injury to marine	Natural England welcomes this amendment.

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	12, Part 4, condition 9(1)(f)			mammals and following current best practice as advised by the relevant statutory nature conservation bodies.	
30.	Schedule 9 - 10, Part 4, condition 14(1)(j) Schedule 11 - 12, Part 4, condition 9(1)(j)	N/A	Previously deleted in error.	An offshore operations and maintenance plan, in accordance with the outline offshore operations and maintenance plan, to be submitted to the MMO at least four months prior to commencement of operation of the licensed activities and to provide for review and resubmission every three years during the operational phase.	No comments.
31.	Schedule 9 - 10, Part 4, condition 14(1)(m) Schedule 11 - 12, Part 4, condition 9(1)(l)	MMO / Natural England	Updated to cover all types of piled foundations.	In the event that ~~driven or part-driven~~ piled foundations are proposed to be used, the licensed activities, or any phase of those activities must not commence until a site integrity plan which accords with the principles set out in the in principle Norfolk Vanguard Southern North Sea candidate Special Area of Conservation Site Integrity Plan has been submitted to the MMO and the MMO is satisfied that the plan, provides such mitigation as is necessary to avoid adversely affecting the integrity (within the meaning of the 2017 Regulations) of a relevant site, to the extent that harbour porpoise are a protected feature of that site.	Natural England welcomes this amendment.
32.	Schedule 9 - 10 Part 4, condition 15(4) Schedule 11 - 12 Part 4, condition 10(4)	MMO	Reasonable endeavours inserted as a result of oral submissions from the MMO who indicated a willingness to accept. The period for requesting further information has been extended to two months at the request of the MMO.	Unless otherwise agreed in writing with the undertaker, the MMO must use reasonable endeavours to determine an application for approval made under condition 14 as soon as practicable and in any event within a period of four months commencing on the date the application is received by the MMO or if the MMO reasonably requests further information to determine the application for approval, within a period of two months commencing on the date that the further information is received by the MMO. For the purposes of this paragraph (4), the MMO may only request further information from the undertaker	Whilst Natural England welcomes the Applicant's attempt to address this concern, Natural England would advise that the additional wording does not provide enough clarity as this isn't enforceable as reasonable endeavours is not defined. Natural England would therefore recommend that the wording is amended, although would defer to MMO in this regard.

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				within a period of two months from receipt of the application for approval.	
34.	Schedule 9 - 10, Part 4, condition 19(5)	N/A	Updated to cover all types of piled foundations associated with the generation assets.	In the event that ~~driven or part-driven~~ piled foundations are proposed to be used, a marine mammal mitigation protocol will be followed in accordance with the draft marine mammal mitigation protocol and the in principle monitoring plan.	Natural England welcomes this amendment.
36.	Schedule 11 -12, Part 3, paragraph 1(d)	MMO	Updated to reflect disposal site references	the disposal of up to 11,475,000 m3 of inert material of natural origin within the offshore Order limits produced during construction drilling or seabed preparation for foundation works and cable (including fibre optic cable) sandwave preparation works at disposal site references HU213, HU214, HU215 and HU216 ~~[XX]~~ within the extent of the Order limits seaward of MHWS, comprising-	As stated previously in both our Deadline 3 [REP3-051] and Deadline 5 [REP5-017] responses Natural England advise that greater clarity is still required as to where this sediment is to be disposed of. This is particularly important when looking at locations within the boundary of the SAC. Natural England suggest that this detail could be provided in the SIP, however, are unable to comment on the suitability of this until it has been produced. With this in mind Natural England suggest that the SIP should contain criteria that the disposal locations within the SAC should meet to ensure that any sediment will remain within the system, that the dredge material will be >95% similar in particle size to disposal locations whilst ensure that there is no interaction with Annex 1 reef. Natural England would suggest that the disposal volumes should be split according to type of material, for example drill arisings, boulders, sand

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					and mud. This is important because different materials have different impacts and those impacts have been assessed based on maximum volumes as provided in the ES. Also the maximum volumes taken within the Haisborough, Hammond and Winterton SAC should be detailed separately to ensure the impacts to the designated site remain within the impacts assessed. The wording should also limit the area of impact from removal of substances for disposal to the area assessed.
37.	Schedule 11 - 12, Part 4, condition 2	N/A	Updated to reflect reduction in cable protection to 5% in HHW SAC.	Cable protection (m2 and m3) 76,000m2 38,000 m3 ~~122,086~~ 102,086m2 ~~69,836~~ 59,836m3	Natural England welcomes the reduced volume and area figures for cable protection. However, Natural England still strongly advises against the use of cable protection within designated sites, regardless of the amount, as the addition of hard substrata is often incompatible with the conservation objectives for Annex I sandbanks and reef features.
38.	Schedule 11 - 12, Part 4, Condition 5(5)	N/A	Updated to reflect new condition 4(12)	(5) In the event that the provisions of condition 4(11) and condition 4(12) are invoked, the undertaker must lay down such marker buoys, exhibit such lights and take such other steps for preventing danger to navigation as directed by Trinity House.	No comments.
39.	Schedule 11 - 12, Part 4, condition 7(5)	MMO	Updated to reflect disposal site references	(5) The undertaker must ensure that only inert material of natural origin, produced during the drilling installation of or seabed preparation for foundations, and drilling mud is disposed of within site disposal references ~~[XX]~~ HU213, HU214,	As stated previously in both our Deadline 3 [REP3-051] and Deadline 5 [REP5-017] responses Natural England advise that greater clarity is still required as to where this

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				HU215 and HU216 within the extent of the Order limits seaward of MHWS. Any other materials must be screened out before disposal of the inert material at this site.	sediment is to be disposed of. This is particularly important when looking at locations within the boundary of the SAC. Natural England suggest that this detail could be provided in the SIP, however, are unable to comment on the suitability of this until it has been produced. With this in mind Natural England suggest that the SIP should contain criteria that the disposal locations within the SAC should meet to ensure that any sediment will remain within the system, that the dredge material will be >95% similar in particle size to disposal locations whilst ensure that there is no interaction with Annex 1 reef. Natural England would suggest that the disposal volumes should be split according to type of material, for example drill arisings, boulders, sand and mud. This is important because different materials have different impacts and those impacts have been assessed based on maximum volumes as provided in the ES. Also the maximum volumes taken within the Haisborough, Hammond and Winterton SAC should be detailed separately to ensure the impacts to the designated site remain within the impacts assessed. The wording should also limit the area of

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					impact from removal of substances for disposal to the area assessed.
40.	Schedule 11 - 12, Part 4, condition 9(1)(c)(vi)	N/A	Previously deleted in error	vessels, vessels maintenance and vessels transit corridors	No comments.
41.	Schedule 11 - 12, Part 4, condition 9(1)(g)(ii)	N/A	Removed as this is now covered in the new SIP for the HHW SAC (condition 9(1)(m))	a detailed cable (including fibre optic cable) laying plan for the Order limits, incorporating a burial risk assessment to ascertain suitable burial depths and cable laying techniques, including cable landfall and cable protection measures ~~and, in particular, proposals for the Haisborough, Hammond and Winterton Special Area of Conservation.~~	Please see our Deadline 6 response for full comment in this regard [REP6-032].

THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE) RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

Copy of Natural England's Discretionary Advice Service (DAS) Response Letter to the Applicant on Outstanding Issues Raised by Natural England Following 18 March DAS Responses Clarification Note provided by the Applicant to Natural England on 15 April 2019

02 May 2019

Date: 30 April 2019
Our ref: 280816
Your ref: Outstanding Issues Clarification Note

Royal Haskoning DHV on behalf of Norfolk Vanguard Ltd.

BY EMAIL ONLY

Customer Services
Hornbeam House
Crewe Business Park
Electra Way
Crewe
Cheshire
CW1 6GJ

T 0300 060 3900

Dear Jon,

Planning consultation: Norfolk Vanguard Offshore Windfarm Outstanding issues raised by Natural England following 18 March DAS Responses Clarification Note
Location: Norfolk

Thank you for your consultation on the above dated 15 April 2019 which was received by Natural England on the same date. The following advice is provided under Natural England's Discretionary Advice Service (DAS).

1. Unresolved issue: One year of survey data in relation to Broadland SPA / Ramsar site wintering birds

Natural England welcomes the additional measures presented. The European Site Conservation Objectives: Supplementary advice on conserving and restoring site features Broadland SPA was updated in February 2019, and this should inform your assessment.

Functionally Linked Land (FLL) describes areas of land or sea occurring outside of a designated site which nonetheless are considered to be critical to or necessary for the ecological or behavioural functioning in a relevant season of a qualifying feature for which that site has been designated.

Norfolk Vanguard Ltd. should clearly demonstrate functional linkage and the absence of risks of adverse effects on FLL. For further information please see Natural England's report on Functional Linkage and authoritative decisions (2016).

a. Measure 1

We welcome the commitment to undertaking a second year of wintering bird surveys post consent. This should be incorporated into the baseline and be used to inform future monitoring and mitigation. We note that the survey area has been identified as the area comprising farmland within the Order limits (and up to 300m buffer) that sits within 5km of Broadland SPA / Ramsar. We would advise that the area of survey is informed by the area of Functionally Linked Land (FLL) for Broadland SPA designated features. Pink footed goose (*Anser brachyrhynchus*) have a maximum foraging distance of 20km, whilst white-fronted goose (*Anser albifrons*), greylag goose (*Anser anser anser*), Bewick's swan (*Cygnus columbianus bewickii*), whooper swan (*Cygnus Cygnus*) and bean goose (*Anser fabalis*) have a maximum foraging distance of 10 km. We question therefore why a 5km buffer has been proposed? We advise that the survey area is extended to 20km to include the maximum extent of potential FLL from Broadland SPA/Ramsar.

We welcome the commitment to record all swan and goose species. We note that Bewick's swan and greylag goose are not currently identified as key species and advise that the appropriate Ramsar

species are also included (http://jncc.defra.gov.uk/pdf/RIS/UK11010.pdf).

We would expect the second year of wintering bird surveys to record land use across the survey area. Reporting will ideally look at the characteristics of land e.g. distance from designated site, location within landscape, habitat types present, land use (this should include a review of land under relevant agri-environment options (available via MagicMap), aerial photography, and presence of positive/negative factors (e.g. size, public access, shape, presence/proximity of edge features etc.) to determine the likelihood of a site being important for SPA/Ramsar species. Norfolk Vanguard Ltd. should assign a classification of suitability as FLL such as negligible, low, moderate or high. The results of the survey should be used to determine Likely Significant Effect or Adverse Effect on Integrity in relation to designated features and the Conservation Objectives of the site, available from http://publications.naturalengland.org.uk/publication/5310905998901248.

b. Measure 2

We welcome the commitment to only undertake intrusive/disruptive work in one section of the onshore project area which intersects with the SPA/Ramsar FLL during winter. We recommend that this measure is revisited given our advice that the survey area should be extended from 5km to 20km from the Broadland SPA/Ramsar.

Bewick's swan and whooper swan are present in significant numbers in the SPA from October to March (European Site Conservation objectives: Supplementary advice on conserving and restoring site features, February 2019). Natural England therefore seeks further clarification on the methodology proposed for Measure 2 and why restrictions are proposed from November to January, and not over the full duration when designated species are present.

2. Sediment management measures in relation to the River Wensum

a. Restoration plan outside of functional floodplain

Natural England look forward to receiving the detailed scheme and programme of watercourse crossings which will be produced by Norfolk Vanguard Ltd. post-consent and is secured through DCO requirement 25. We will provide detailed comment on the proposed scheme once provided.

b. Reinstatement of work areas

Natural England welcome the provision of further clarification regarding reinstatement of work areas methodology and commitment to include in the updated Code of Construction Practice.

c. Number of HDDs

Natural England look forward to receiving information on the exact number of HDDs under the River Wensum SAC, we understand that this will be post-consent and secured through DCO Requirement 25.

☒ The advice provided in this letter has been through Natural England's Quality Assurance process.

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or

completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Yours sincerely,

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