



THE PLANNING ACT 2008  
THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE)  
RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

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**Natural England's comments on other documents submitted at  
Deadline 8**

06 June 2019

## 1. Introduction

- 1.1. In this document Natural England provides comment, where necessary, on any other documents submitted by the Applicant at Deadline 8 and that are relevant to Natural England's remit. This document is divided by theme.

## 2. DCO / DML

### 2.1. Deadline 8 submission 3.1 Applicant's revised draft DCO (Revision 6) (Clean & Tracked Changes Versions [REP8-003 & REP8004]

- 2.1.1. There are 14 references to Natural England throughout this document. For consistency these should be amended to state '*the relevant statutory nature conservation body*'.
- 2.1.2. The only exception to this is within the DML where the addresses of the Natural England's offices are provided.

### **Schedule 9 & 10 part 4 condition 15 (3) (5) Schedule 11 and 12 part 4 condition 10 (3) (5):**

- 2.1.3. The changes proposed to this condition remove the ability to reset the four month clock should further information be required. The wording also states that the Applicant's agreement is needed for any extension. Natural England considers that the decision to grant an extension should be at the discretion of the regulatory body and not the applicant.
- 2.1.4. As highlighted in earlier responses on condition 15 the pre-construction documentation should be provided 6 months prior to construction to allow time for required additional information and further consultation. Natural England notes that 15 (3) has been amended to state 4 months prior to construction and not 6 months and would reiterate our previous concerns [RR-106, REP1-088].
- 2.1.5. In addition, Natural England notes the addition of an appeals process. Natural England supports the comments made by the Marine Management Organisation with regards to appeals and arbitration. If the appeals process is included, under the current 4 month prior to construction and 4 months to reach a determination, then there is no time for any appeals process to be run without significant delay to the construction start date. However, if the documentation was submitted 6 months before construction then this gives a minimum of 2 months for appeals and for discussions and agreements on potential alternatives that could gain approval.

### 2.2. Deadline 8 Submission - Applicant's Comments on ExA's draft DCO Schedule of Changes [REP8-065]

- 2.2.1. Natural England notes the amendment by Examining Authority to Requirement 17 (1) to include '*the relevant statutory nature conservation body*' as one of the consultees for the Code of Construction Practice.
- 2.2.2. However, within REP8-065 the Applicant suggests Natural England should only be consulted on the Invasive Species Management Plan.
- 2.2.3. Natural England are supportive of the amendment made by the Examining Authority and would request that this remains

### 2.3. Other Matters

- 2.3.1. As advised in our earlier submissions [RR-106, REP1-088, REP3-051, REP4-062, REP5-017, and REP7-075] Natural England suggests that the SIP should contain criteria that the disposal locations should meet to ensure that the dredge material will be >95% similar in particle size to disposal locations.

- 2.3.2. Therefore, Natural England suggests the condition below could be included Within Schedule 11 Part 4 condition 9 (1) (m) to ensure the particle size of disposal material matches the disposal site within the Haisborough Hammond and Winterton SAC:
- 2.3.3. *(i) Disposal activities within the Haisborough, Hammond and Winterton Special Area of Conservation Site must not take place until the undertaker has confirmed that the particle size composition of the disposal material is within 95% similarity to the particle size composition of the seabed at the location which it will be disposed of.*
- 2.3.4. If the Examining Authority is not minded to include this as a condition within the DML, Natural England would request that the Outline Site Integrity Plan for the HHW SAC be amended to include a requirement to ensure the disposal site and the material being disposed of are within a 95% similarity of particle size. This is to ensure that there is no change to the sediment distribution within the HHW SAC and to ensure that there is no permanent loss of features through a change of the sediment composition.
- 2.3.5. Natural England have discussed this amendment with Marine Management Organisation (MMO) who are supportive of its inclusion. Natural England understand MMO will be making representations to this regard at Deadline 9.

### **3. Benthic Ecology – Fisheries Byelaw**

- 3.1. Deadline 8 submission – Eastern Inshore Fisheries & Conservation Authority [REP8-099]
- 3.1.1. Please note Natural England is in agreement with EIFCA where they state: ‘...*the claim that the areas “are not extensively reef but have been identified as areas which have potential to become reef if the recurring impact from bottom towed fishing gear is ceased in these areas” is not an accurate representation of Eastern IFCA’s proposed Restricted Area 36, which coincides with the cable corridor.*’
- 3.1.2. Natural England would therefore support the request by EIFCA that the Outline Norfolk Vanguard Haisborough Hammond and Winterton Special Area of Conservation Site Integrity Plan is edited to reflect these comments.

### **4. Onshore Ecology**

- 4.1. Deadline 8 submission 8.8 Outline Traffic Management Plan (Clean and Tracked Changes Version) [REP8-013 & REP8-014]
- 4.1.1. Natural England requests that they are added as a consultee within the Outline Construction Management Plan and the Outline Traffic Management Plan (OTMP).
- 4.1.2. We advise that the OTMP maps the final routes in relation to designated sites, to allow for an assessment of air quality impacts in combination with other developments. Natural England request that they are consulted on the final plan including the associated Air Quality Management plan.
- 4.2. Deadline 8 Submission - Consideration of potential impacts related to continuous periods of operation - Referred to in DCO Requirement 26(a) and 26(d) [REP8-070]
- 4.2.1. Natural England looks forward to being consulted on the final Code of Construction Practice and construction noise management plan.
- 4.2.2. We advise that suitable mitigation including noise protective barriers are employed in proximity to designated sites with noise sensitive features of interest.



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**Natural England's comments on the Applicant's Deadline 8 Submission:  
Applicant's Comments on Deadline 7 Written Submissions [REP8-062]**

06 June 2019

**Norfolk Vanguard Offshore Wind Farm – Natural England comments on the Applicant’s Deadline 8 Submission: Applicant’s Comments on Deadline 7 Written Submissions [REP8-062].**

Following submission of Natural England’s responses at Deadline 7 regarding the construction and operation of Norfolk Vanguard Offshore Wind Farm, Natural England has reviewed the Applicant’s responses on Natural England’s submissions and commented on any major outstanding issues. Please note, the colour coding of specific points indicates the significance of the advice (red – major concerns; amber – moderate concerns; green – minor concerns).

Table 1: Natural England comments on the Applicant’s Deadline 8 Submission: Applicant’s Comments on Deadline 7 Written Submissions [REP8-062].

Document responded to	Applicant’s comments	Natural England response
<p>Natural England Interim Position Statement at Deadline 7 for Offshore Ornithology Final</p>	<p><u>EIA cumulative</u></p> <p>The Applicant welcomes Natural England’s conclusion that there will not be a significant cumulative impact on herring gull. With respect to the cumulative impacts on other species due to collisions (gannet, kittiwake, lesser black-backed gull and great black-backed gull), these assessments have been updated following the advice received from Natural England at Deadline 7 (REP7-075) and to reflect the project revisions (i.e. 5m increase in draught height) and these were submitted after Deadline 7 (ExA; As; 10.D7.5.2, late submission accepted at the discretion of the Examining Authority).</p> <p>The revised assessment concludes no significant impacts for cumulative collisions and considers that these updates address the remaining concerns raised by Natural England.</p> <p>Updated auk cumulative displacement tables and in-combination assessment were submitted at Deadline 8 (ExA;AS;10.D8.10) which followed the advice provided by Natural England at Deadline 7 (REP7-075). The conclusions of the cumulative assessment submitted at</p>	<p>Natural England advises that a significant (moderate adverse) impact on the following species cannot be ruled out due to cumulative collision totals:</p> <ul style="list-style-type: none"> <li>• Gannet</li> <li>• Kittiwake</li> <li>• Great Black-backed gull.</li> </ul> <p>We note that the abundance values used for the Hornsea 3 contribution to cumulative displacement effects differs from that advised by Natural England. Natural England advises that a significant (moderate adverse) impact on the following species cannot be due to cumulative displacement effects:</p> <ul style="list-style-type: none"> <li>• Red-throated diver (moderate adverse)</li> <li>• Guillemot (moderate adverse)</li> <li>• Razorbill (moderate adverse)</li> </ul>

Document responded to	Applicant's comments	Natural England response
	Deadline 6 (ExA;AS;10.D6.17), of no significant cumulative impacts due to displacement, remain unchanged following this update.	
Natural England Interim Position Statement at Deadline 7 for Offshore Ornithology Final	<p><u>HRA – Greater Wash SPA</u></p> <p>The Applicant and Natural England have reached agreement on measures to avoid an adverse effect on the integrity of this SPA due to operations and maintenance vessels. The DCO (3.1 version 5) and Outline PEMP (8.14 version 2) submitted at Deadline 7 include the agreed mitigation measures.</p> <p>The Applicant welcomes the conclusion from Natural England that there will not be an adverse effect on little gull from the project alone and notes that a revised in-combination assessment (which concludes no adverse effect) which was submitted after Deadline 7 (ExA; As; 10.D7.5.2, late submission accepted at the discretion of the Examining Authority).</p> <p>With respect to potential disturbance to red-throated diver due to installation of the export cable, the Applicant has reviewed the construction programme and in order to address Natural England's concerns has committed that, should it be necessary to install the offshore export cable through the Greater Wash SPA between January and March inclusive, this will involve only one main cable laying vessel at any one time. This commitment has been included in Condition 18, Part 4 of Schedules 11 and 12 (Transmission DMLs) of the updated dDCO submitted at Deadline 8.</p>	<p>Natural England advises that the Applicant's commitment to reduce the number of cable laying vessels to one in the months January to March inclusive has reduced the predicted impacts to a level where we can conclude no AEIO on Greater Wash SPA red-throated diver for the project alone.</p> <p>Regarding cable installation/reburial works from other windfarms that could affect the Greater Wash SPA, Natural England has reviewed the predicted cable installation timetables for consented projects due to undertake cable installation or remedial works (Hornsea 1, Hornsea 2, Triton Knoll and Race Bank), and considers that these are highly unlikely to overlap temporally with cable installation from Norfolk Vanguard.</p> <p>Regarding impacts from operational arrays, Natural England acknowledges the difficulty in carrying out an in-combination assessment with projects of significantly different temporal and spatial scale, though notes that the pressure on the receptor (displacement) is the same, and also that the aggregates industry carried out an in-combination assessment for the Outer Thames Estuary SPA which considered both aggregates extraction vessels and offshore windfarms. Nevertheless, given the reduction of impact now proposed by the Applicant in the most sensitive period for red-throated divers, Natural England has concluded that the limited</p>

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		<p>temporal and spatial contribution of the project to such in-combination affects does not, on balance, warrant such an assessment.</p> <p>However, we do have residual concerns with the levels of windfarm-associated activity consented proposed within the Greater Wash SPA, and anticipate that this issue will need more detailed exploration for future projects that will add to the current in-combination displacement levels, such as Norfolk Boreas.</p>
<p>Natural England Interim Position Statement at Deadline 7 for Offshore Ornithology Final</p>	<p><u>HRA - Alde-Ore Estuary SPA</u></p> <p>The Applicant notes Natural England's position with respect to the potential for adverse effects due to collision risk for lesser black-backed gull and the request for further assessment and mitigation. Both these requests have been addressed in the updated collision risk modelling submitted after Deadline 7 (ExA; As; 10.D7.5.2, late submission accepted at the discretion of the Examining Authority). This included method revisions requested by Natural England and reflected the project design update for the revised layout and the 5m increase in draught height. The assessment concludes that there would be no adverse effect on integrity of this SPA due to the project alone or in-combination with other plans and projects.</p>	<p>Natural England advises that adverse effect on integrity (AEOI) can be ruled out for the Alde-Ore Estuary SPA LBBG from the project alone. However, Natural England advises that an AEOI cannot be ruled out when the project is considered in-combination with other offshore wind farms (OWFs). Please see our Deadline 8 response for the rationale behind these judgements [REP8-104].</p>
<p>Natural England Interim Position Statement at Deadline 7 for Offshore</p>	<p><u>HRA – Flamborough and Filey Coast SPA</u></p> <p>The Applicant welcomes Natural England's position that the in-combination gannet assessment now addresses their previous concerns. The additional requested updates to the assessment have been included in the update submitted after Deadline 7 (ExA; As; 10.D7.5.2, late submission accepted at the discretion of the Examining</p>	<p>Natural England advises that AEOI can be ruled out for the FFC SPA gannet from the project alone, or in-combination with other OWFs when Hornsea 3 is excluded. However, Natural England advises that an AEOI cannot be ruled out when the project is</p>

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Ornithology Final	<p>Authority). This reflected the project design update for the revised layout and the 5m increase in draught height. The assessment concludes that there would be no adverse effect on integrity of this SPA due to the project alone or in-combination with other plans and projects.</p> <p>The Applicant welcomes Natural England's position that the project alone will not have an adverse effect on kittiwake and notes that this conclusion was reached prior to the additional reduction in collisions resulting from the 5m draught height increase. The Applicant also notes that Natural England's methodological concerns for the in-combination assessment have now been addressed. In view of Natural England's advice that they cannot rule out an in-combination effect on kittiwake and the request to further reduce the Project's contribution (made prior to the 5m draught height increase), the Applicant would like to draw attention to the fact that since Natural England reached this conclusion the Project collision risks for this species have been further reduced by 38%, as detailed in the update submitted after Deadline 7 (ExA; AS; 10.D7.5.2, late submission accepted at the discretion of the Examining Authority) with the consequence that the contribution from Norfolk Vanguard to the total is very small. The assessment concludes that there would be no adverse effect on the integrity of this SPA due to the project alone or in-combination with other plans and projects.</p> <p>The Applicant welcomes the comments from Natural England that there will not be any adverse effects on guillemot and puffin from this SPA due to displacement from the project alone (and following correction of minor errors identified by Natural England the Applicant is confident that the same conclusion will be agreed for razorbill; ExA; AS; 10.D8.10). The methodological concerns raised by Natural England with respect to the in-combination assessment have been addressed in a revised assessment submitted at Deadline 8 (ExA; AS; 10.D8.10). Following this update the Applicant has concluded there will be no adverse effect on the integrity of this SPA on these auk species due to the project in-combination with other plans and projects.</p>	<p>considered in-combination with other OWFs including Hornsea 3.</p> <p>Natural England advises that AEOI can be ruled out for the FFC SPA kittiwake from the project alone. However, Natural England advises an AEOI cannot be ruled out when the project is considered in-combination with other OWFs, irrespective of whether Hornsea 3 is included or excluded.</p> <p>Natural England advises that AEOI can be ruled out for the FFC SPA razorbill from the project alone, or in-combination with other OWFs when Hornsea 3 is excluded. However, Natural England advises that an AEOI cannot be ruled out when the project is considered in-combination with other OWFs including Hornsea 3.</p> <p>Natural England advises that AEOI can be ruled out for the FFC SPA guillemot from the project alone, or in-combination with other OWFs when Hornsea 3 is excluded. However, Natural England advises that an AEOI cannot be ruled out when the project is considered in-combination with other OWFs including Hornsea 3.</p> <p>Natural England advises that AEOI can be ruled out for the seabird assemblage feature of the FFC SPA for the puffin component of the assemblage from the project alone. We also advise that no AEOI can be ruled out for the seabird assemblage feature of the FFC SPA as a whole from the project alone. For in-combination with other OWFs, we advise that AEOI can be ruled out for the seabird assemblage feature</p>



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		<p>of the FFC SPA for the puffin component of the assemblage.</p> <p>However, given that we consider there is an adverse effect on the kittiwake feature of the FFC SPA in its own right from in-combination impacts and also on the gannet, guillemot and razorbill features from in-combination when Hornsea 3 is included, it therefore follows that an AEOI cannot be ruled out for the assemblage feature of the FFC SPA in-combination with other OWFs, irrespective of whether Hornsea 3 is included or excluded.</p> <p>Please see our Deadline 8 [REP8-104] and our submission at Deadline 9 for the rationale behind these judgements.</p>
Natural England's comments on LBBG Alde-Ore Final	Natural England kindly provided this note to the Applicant in advance of Deadline 7 and therefore it was possible for the Applicant to address the comments received and provide updates, and these were submitted at Deadline 7 (ExA; AS; 10.D7.21A).	Please see Natural England's comments on the updated Population Viability Analysis (PVA) in paragraph 3.3.5 of Natural England's Comments on Norfolk Vanguard Ltd. Deadline 7 and Deadline 7.5 submissions in relation to Offshore Ornithology Related Matters [REP8-104].
RSPB Deadline 7 response – Counterfactual of Growth Rate Outputs	<p>The RSPB considers that comparison of the counterfactual of population growth rate (CPGR) with the recent observed trends in the growth rate is inappropriate as the future growth trend is unknown. For these reasons the RSPB consider that the counterfactual of population size (CPS) is a more appropriate measure of impact.</p> <p>However, both counterfactual measures are based on an underlying assumption that current conditions will prevail for the duration of the simulated time span. Thus, comparison of predictions with the recent</p>	<p>Natural England notes that our advice in our Deadline 8 response [REP8-104] and our Deadline 9 response clearly considers both the counterfactual of population size AND the counterfactual of growth rate.</p> <p>Natural England also notes that we have interpreted the counterfactual of final population size in the context of what we know about the reference</p>

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	<p>trends in population growth rate is appropriate, since these trends very likely correspond to the period over which the demographic data were collected. Furthermore, the RSPB's preferred metric, the CPS, when derived from their preferred density independent model generates highly precautionary results which can considerably over-estimate the magnitude of impacts. This is because the population size obtained from a density independent model is unlimited, and the baseline runs can achieve highly unrealistic total sizes. For example, the density independent kittiwake population simulation submitted for the Hornsea Project Three wind farm (EN0180080-001142-DI_HOW03_Appx9) to which reference has been made in the Norfolk Vanguard assessment predicts the baseline (unimpacted) kittiwake population will increase from the starting size of 44,520 pairs to over 150,000 pairs after 35 years while the maximum impact scenario (additional mortality of 1,600) predicts the increase will be to 83,000 pairs. Thus, while the CPS for this example is 0.54, this masks the fact that both outputs have grown considerably and that this level of growth is highly improbable (in terms of available space and resources). For these reasons the Applicant considers that comparisons of the CPGR with recent trends is more appropriate in conjunction with density independent simulations as it provides a much more realistic comparison.</p>	<p>population trends and conservation objectives for a feature/SPA. Accordingly a 10% reduction in the counterfactual of final population size might be of concern in for some species at some colonies, but might be acceptable for other features – it is by no means a threshold. Gannet at the Flamborough and Filey Coast SPA is a good example of where there is a substantial reduction in the final population size (well beyond 10%), but because of the robustness of the population we have concluded no adverse effect on integrity (AEOI) in-combination excluding Hornsea 3.</p>
<p>RSPB Deadline 7 response – kittiwake assessment</p>	<p><u>Conservation status of kittiwake at Flamborough and Filey Coast SPA</u></p> <p>The Applicant acknowledges that updated conservation objectives have recently been published for this SPA. However, the basis for the target of increasing the population to 83,700 pairs is considered to be highly questionable. This reflects population counts made during the 1980s which have been the subject of considerable discussion during past wind farm examinations and scrutiny. These counts are also mentioned in the monograph for this species (The Kittiwake, Coulson 2011, Poyser) in which the author, arguably the leading authority on this species, considers the counts in question to refer to individuals but to</p>	<p>Natural England confirms that the target for the population abundance attribute in our draft conservation advice is to restore the kittiwake population to 83,700 pairs, which was the 1987 count value used to classify the Flamborough Head and Bempton Cliffs SPA, now subsumed into the FFC SPA.</p>

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	<p>have been recorded as pairs. Certainly, the fact that the population apparently doubled in size within the space of 10 years (to the higher estimate) and then halved again 10 years later is a rather surprising observation.</p>	
<p>RSPB Deadline 7 response – kittiwake assessment</p>	<p><u>Kittiwake demographic rates</u></p> <p>The population model referred to by the Applicant in the kittiwake assessment was produced following Natural England advice, and this did not include updating demographic rates from the previous versions. Furthermore, one of the stated benefits of using the CPS and CPGR, for estimating impacts, is that these outputs are relatively insensitive to variations in parameters and therefore it is considered that the model outputs would be unlikely to be affected by this change.</p>	<p>The reference by the Applicant that the population model referred to was produced '<i>Following NE advice</i>' is misleading.</p> <p>Natural England did not agree on the updated models produced for Hornsea 3 at any point in the planning process/examination for the Hornsea 3 project. We advised that the existing models produced for the Hornsea 2 project required updating and made recommendations on certain issues (e.g. matched pairs/runs). However, Natural England were never involved in any discussions with the Hornsea 3 application and agreed the details of the population models that Hornsea 3 undertook. The Hornsea 3 Applicant submitted two versions of the updated PVAs during the examination phase and Natural England provided comments on these during the examination, but only after they had been submitted.</p>
<p>Comments on changes to draft DCO made at deadline 6.5</p>	<p>18. The location for sediment disposal will be determined post-consent through the HHW SAC SIP, in accordance with the Outline HHW SAC SIP (document 8.20) as required by Condition 9(1)(m) of the Transmission DMLs. Section 5.4 of the Outline HHW SAC SIP shows that the location(s) and methodology for disposal must be agreed with the MMO in consultation with Natural England before works can commence.</p>	<p>Natural England notes that the Applicant states that the location for sediment disposal will be determined post-consent. Natural England would advise that this is contradictory to the Site Integrity Plan which states that these will be along the cable route.</p>

Document responded to	Applicant's comments	Natural England response
	<p>In accordance with advice from Natural England a minimum buffer of 50m will be maintained between sediment disposal and <i>S. spinulosa</i> reef recorded during the pre-construction surveys. It is therefore necessary to determine the locations for sediment disposal post-consent, following the pre-construction surveys.</p> <p>Disposal in the SAC is included in the draft DCO under Part 3, 1(d)(iv) of the Transmission DMLs (Schedules 11 to 12).</p>	
Comments on changes to draft DCO made at deadline 6.5	N/A	<p>Natural England notes that the Applicant is yet to commit to ensuring that the disposal locations should meet certain criteria to ensure that the dredge material will be &gt;95% similar in particle size to disposal locations. Please see our other submission at Deadline 9 (Natural England's comments on other documents submitted at Deadline 8) for further information in this regard.</p>



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**Natural England's comments on the Applicant's Deadline 8 Submission:  
Applicant's Comments on the Report on the Implications for European  
Sites (RIES) [REP8-064]**

06 June 2019

## 1. Introduction

- 1.1. In this document Natural England provides comments on the Applicant's Deadline 8 Submission - Applicant's Comments on the Report on the Implications for European Sites (RIES) [REP8-064].
- 1.2. Please note, the colour coding of specific points indicates the significance of the advice (red – major concerns; amber – moderate concerns; green – minor concerns).

## 2. Detailed Comments – Offshore Ornithology

Ref.	REIS Section / Para	Applicant's Comments	Comment
2.1	2.37 – 2.39	<p>The Applicant would like to draw attention to the fact that the SPA features for which assessment has been provided has been updated and now includes:</p> <ul style="list-style-type: none"> <li>• Flamborough and Filey Coast SPA gannet collision risk alone and in-combination (ExA; AS; 10.D7.21 version 2), gannet displacement risk alone and in-combination (ExA; AS; 10.D7.21 version 2), gannet combined displacement and collision risk alone and in-combination (ExA; AS; 10.D7.21 version 2), kittiwake collision risk alone and in-combination (ExA; AS; 10.D7.21 version 2), razorbill displacement risk alone and in-combination (ExA; AS; 10.D6.17 and ExA; AS; 10.D8.10), guillemot displacement risk alone and in-combination (ExA; AS; 10.D6.17 and ExA; AS; 10.D8.10), puffin displacement risk alone and in-combination (ExA; AS; 10.D6.17 and ExA; AS; 10.D8.10).</li> <li>• Alde Ore Estuary SPA lesser black-backed gull alone and in-combination collision risk (ExA; AS; 10.D7.21 version 2);</li> <li>• Greater Wash SPA red-throated diver alone and in-combination displacement risks during construction and operation (ExA; AS; 10.D6.17), little gull alone and in-combination collision risk (ExA; AS; 10.D7.21 version 2). This has updated the list of projects considered in the in-combination assessment following advice from Natural England; and,</li> </ul>	<p>Natural England highlights the following:</p> <ul style="list-style-type: none"> <li>• For Greater Wash SPA red-throated diver, the in-combination assessment for construction now includes the cable installation in-combination with cable installation from Hornsea 3, but does not include consideration of displacement effects in combination with operational OWFs. Please see the Statement of Common Ground with the Applicant also provided at Deadline 9 for further information.</li> <li>• For Greater Wash SPA little gull, Natural England has previously commented that Dudgeon, East Anglia 1 and East Anglia 3 should also be included in the in-combination assessment. However, Natural England understands that CRM for this species was not carried out for the above projects during their Examination, and therefore this is not possible. Please see the Statement of Common Ground with the Applicant also provided at Deadline 9 for further information.</li> </ul>

Ref.	REIS Section / Para	Applicant's Comments	Comment
		<ul style="list-style-type: none"> <li>• Outer Thames Estuary SPA red-throated diver alone and in-combination displacement risk during operation (ExA; AS; 10.D6.17).</li> </ul>	
2.2	2.5.23	<p>The Applicant considers that the counterfactual of population growth rate is a much more robust and informative Population Viability analysis (PVA) measure on which to base consideration of the consequences of additional mortality than the counterfactual of population size, particularly when using precautionary density independent models. The density independent models predict unlimited growth, which is widely acknowledged to be unrealistic. In the current assessment an observation that the counterfactual of population size indicates that an impacted population will be 10% smaller than the non-impacted one is interpreted by the RSPB and Natural England as a concern. However, for the population models referenced in this assessment at the levels of mortality under consideration, both the impacted and non-impacted populations show growth, albeit at different rates. After 30 years the difference in population size can therefore appear to be large, but this is due to the fact that population growth is compound and density independent populations can grow indefinitely.</p> <p>For this reason the Applicant considers that the counterfactual of population size from density dependent population projections provides much more realistic guidance. However, if density independent models are preferred then the counterfactual of population growth rate is more robust since it provides an estimate of the year on year effect which can be compared with historical observations for this metric.</p> <p>The Applicant would also like to note that the use of changes in the background mortality of up to 1% as a first step in the assessment of impacts has been used in</p>	<p>Natural England notes that our advice in our Deadline 8 response (REP8-104) and our other Deadline 9 response clearly considers both the counterfactual of population size AND the counterfactual of growth rate.</p> <p>Natural England also notes that we have interpreted the counterfactual of final population size in the context of what we know about the reference population trends and conservation objectives for a feature/SPA. Accordingly a 10% reduction in the counterfactual of final population size might be of concern in for some species at some colonies, but might be acceptable for other features – it is by no means a threshold. Gannet at the Flamborough and Filey Coast SPA is a good example of where there is a substantial reduction in the final population size (well beyond 10%), but because of the robustness of the population we have concluded no adverse effect on integrity (AEOI) in-combination excluding Hornsea 3.</p>

Ref.	REIS Section / Para	Applicant's Comments	Comment
		<p>the assessment on the advice of Natural England.</p> <p>It should be noted that the Applicant has submitted a note on uncertainty and precaution in the impact assessment at Deadline 8 (ExA; AS; 10.D8.10) which provides further illustration of how these aspects have led to over-estimation of predicted impact magnitudes.</p>	
2.3	2.5.24 – 2.5.28	<p>The Applicant followed the advice from Natural England to include impact estimates for the Hornsea Project Three and Thanet Extension wind farms, and this has been reflected in all the cumulative and in-combination assessments submitted from Deadline 6 onwards and will also be included in any future submissions.</p>	<p>Natural England notes that the Applicant has used the impact assessments for Hornsea 3 as presented in the ES. However, these have been updated during the examination. Natural England's advice is based on values from Natural England's Deadline 7 response for Hornsea 3, where we presented an analysis of Hornsea 3's baseline data using our preferred parameters for e.g. CRM, whilst continuing to advise the Examining Authority that the Hornsea 3 baseline data was inadequate for the purposes of impact assessment.</p>
2.4	Table 3.2	<p><b>Greater Wash SPA – Common scoter</b></p> <p>The potential for a LSE for common scoter due to construction disturbance in the Greater Wash SPA is identified as not agreed by the Applicant. The Applicant's justification for this is summarised below.</p> <p>The Applicant does not agree that there is risk of a LSE for common scoter in the Greater Wash SPA due to disturbance during offshore export cable installation. It should be noted that while the offshore export cable route does cross the SPA, the SPA boundary has been drawn to enclose areas of importance for several different species, each with different areas of importance. Following a request from Natural England, the distribution of common scoter in the SPA (as used in the SPA designation) was presented on a map with the export cable route (ExA; WQRApp23.1;10.D2.3). This clearly</p>	<p>Natural England continues to advise that the test of likely significant effect is a coarse filter and as the offshore cable route passes through the Greater Wash SPA, this would indicate a potential impact pathway for a species sensitive to disturbance/displacement from the presence of vessels. Accordingly Natural England concluded a likely significant effect, and advised that the analysis of whether the cable corridor overlaps spatially with the distribution of the species should then be considered within the Appropriate Assessment.</p> <p>It is worth noting that, whilst the export cable route does avoid the principal aggregations of common scoter within the SPA, Figure 9 in Lawson et al. (2015) (which provides the raw data from the aerial surveys) does identify locations with 1 -250 common scoter in east Norfolk waters. These form part of the</p>



Ref.	REIS Section / Para	Applicant's Comments	Comment
		identified that the export cable route overlaps with areas of very low common scoter density (i.e. outside areas identified as important for this species) hence the risk of an LSE was excluded.	qualifying population of common scoter within the site.
2.5	Screening matrix 1 – Applicant's point n	<p><b>Seabird assemblage</b></p> <p>The Applicant can confirm that project alone and in-combination displacement for puffin has been screened in to the assessment and this has been assessed in the Applicant's submission at Deadline 6 (ExA; AS; 10.D.6.17) and updated at Deadline 8 (ExA; AS; 10.D8.10).</p>	Natural England suggests that the Secretary of State assess impacts on the seabird assemblage with respect to the relevant attributes in the draft conservation advice for the assemblage feature of the Flamborough & Filey Coast SPA.
2.6	Screening matrix 2 – Applicant's point d	<p><b>RTDs - Operational disturbance/displacement</b></p> <p>The Applicant would like to draw attention to the fact that the comments attributed to Natural England with respect to the use of the correct abundance estimates for Norfolk Vanguard West (i.e. to base this on all birds present, not just those on the water; RR-106), were not made in relation to assessment for the Greater Wash SPA but rather the Environmental Impact Assessment. In agreement with Natural England, displacement of red-throated diver from the wind farm sites themselves was screened out of the assessment for this SPA. Only the potential for disturbance due to operation and maintenance vessel movements across the SPA has been screened in.</p>	Natural England agrees with the Applicant on this point.
2.7	Integrity matrix 3 – Applicant's point a (?)	The Applicant agrees with the notes provided however would also like to draw attention to the fact that the Applicant has reviewed the construction programme and in order to address Natural England's concerns has committed that, should it be necessary to install the offshore export cable through the Greater Wash SPA between January and March inclusive, this will involve only one main cable laying vessel at any one time; this would halve the magnitude of any potential displacement. This would	Natural England advises that the Applicant's commitment to reduce the number of cable laying vessels to one in the months January to March inclusive has reduced the predicted impacts to a level where we can conclude no AEOI on this feature for the project alone.

Ref.	REIS Section / Para	Applicant's Comments	Comment
		<p>reduce the worst case impact estimated using Natural England's advised rates to an increase in background mortality of 0.65% to 1.3% and using the evidence based rates to 0.05% to 0.12%, and in all cases this would be a one-off impact in a single winter. The Applicant considers that this further supports a conclusion of no Adverse Effect on Integrity as a result of export cable installation through the SPA.</p> <p>This commitment has been included in Condition 18, Part 4 of Schedule 11-12 (Transmission DMLs) of the dDCO submitted at Deadline 8.</p>	
2.8	Integrity matrix 3 – Applicant's point d (?)	<p>The Applicant notes the comments made by Natural England (RR-106) that operational wind farms in the SPA should be included in the Norfolk Vanguard in-combination assessment of cable installation. However, the Applicant considers that combining impacts from Norfolk Vanguard (a maximum six-week construction period of minimal disturbance due to effectively stationary vessels, which furthermore will likely not occur during winter due to weather conditions) with those for operational wind farms which will last for the duration of those projects as proposed by Natural England is highly inappropriate. The potential effects from these two sources of disturbance (cable installation and operational wind farm displacement) are on very different temporal (6 weeks vs. up to 25 years) and spatial scales (wind farms plus buffers within the SPA cover an area in excess of 10 times that of the zone around a cable laying vessel). Therefore, for these reasons the Applicant considers this requested assessment to be unnecessary and inappropriate. The Applicant also notes that to the best of their knowledge this has not been required of any previous offshore wind farm application. The Applicant would also like to note that, following further consideration of the construction programme, although export</p>	<p>Regarding cable installation/reburial works from other windfarms that could affect the Greater Wash SPA, Natural England has reviewed the predicted cable installation timetables for consented projects due to undertake cable installation or remedial works (Hornsea 1, Hornsea 2, Triton Knoll and Race Bank), and considers that these are highly unlikely to overlap temporally with cable installation from Norfolk Vanguard.</p> <p>Regarding impacts from operational arrays, Natural England acknowledges the difficulty in carrying out an in-combination assessment with projects of significantly different temporal and spatial scale, though notes that the pressure on the receptor (displacement) is the same, and also that the aggregates industry carried out an in-combination assessment for the Outer Thames Estuary SPA which considered both aggregates extraction vessels and offshore windfarms. Nevertheless, given the reduction of impact now proposed by the Applicant in the most sensitive period for red-throated divers, Natural England has concluded that the limited temporal and spatial contribution of the project to such in-combination affects does not, on balance, warrant such an assessment.</p>

Ref.	REIS Section / Para	Applicant's Comments	Comment
		<p>cable installation is not planned to occur during the winter, should installation of the export cable through the SPA be unavoidable during the most sensitive period for red-throated diver (January to March inclusive), such work will involve only one main cable laying vessel (the previous worst case assumed there could be up to two vessels). This commitment has been included in Condition 18, Part 4 of Schedule 11-12 (Transmission DMLs) of the dDCO submitted at Deadline 8.</p>	<p>However, we do have residual concerns with the levels of windfarm-associated activity consented proposed within the Greater Wash SPA, and anticipate that this issue will need more detailed exploration for future projects that will add to the current in-combination displacement levels, such as Norfolk Boreas.</p>
2.9	<p>Integrity matrix 3 – Applicant's point g (?)</p>	<p><b>Little gull in-combination collision mortality</b></p> <p>The Applicant agrees with the notes provided, however would also like to highlight that collision risk has been further reduced for the project following a commitment to raise the draught height by 5m (from 22m to 27m above Mean High Water Springs). The updated collision predictions and assessment of impact on the Greater Wash SPA have been provided in ExA;AS;10.D7.21.Version2.</p>	<p>For Greater Wash SPA little gull, Natural England has previously commented that Dudgeon, East Anglia 1 and East Anglia 3 should also be included in the in-combination assessment. However, Natural England understands that CRM for this species was not carried out for the above projects during their Examination, and therefore this is not possible. Please see the Statement of Common Ground with the Applicant also provided at Deadline 9 for further information.</p>
2.10	<p>Integrity matrix 3 – Applicant's point h (?)</p>	<p><b>Common scoter disturbance/displacement</b></p> <p>The Applicant agrees with the notes provided. The Applicant maintains the position that as the offshore cable route does not overlap with any concentrations of common scoter there would be no LSE and therefore no further assessment has been undertaken.</p>	<p>Natural England continues to advise that the test of likely significant effect is a coarse filter and as the offshore cable route passes through the Greater Wash SPA, this would indicate a potential impact pathway for a species sensitive to disturbance/displacement from the presence of vessels. Accordingly Natural England concluded a likely significant effect, and advised that the analysis of whether the cable corridor overlaps spatially with the distribution of the species should then be considered within the Appropriate Assessment.</p> <p>It is worth noting that, whilst the export cable route does avoid the principal aggregations of common scoter within the SPA, Figure 9 in Lawson et al. (2015) providing the raw data from the aerial surveys does identify locations with 1 - 250 common scoter in east Norfolk</p>

Ref.	REIS Section / Para	Applicant's Comments	Comment
			waters. These form part of the qualifying population of common scoter within the site.

### 3. Detailed Comments – Benthic Ecology

Ref.	REIS Section / Para	Applicant's Comments	Comment
3.1	Table 14 – Applicant's point d (?)	<p>The worst case total area of cable protection installed within the SAC could be up to 0.084km<sup>2</sup> for Norfolk Vanguard and Norfolk Boreas based on the following:</p> <ul style="list-style-type: none"> <li>• 0.00002km<sup>2</sup> of clump weights based on cutting two existing dis-used cables and placing clump weights of up to 5m<sup>2</sup> on either end of the dis-used cables (would be cut once to allow for both projects);</li> <li>• Six crossings for each of the four cable pairs (two per project) within the SAC with a total footprint of 24,000m<sup>2</sup> (0.024km<sup>2</sup>) (100m length and 10m width of protection); and</li> <li>• A contingency of up to 2km of cable protection per cable pair for Norfolk Vanguard and 4km per cable pair for Norfolk Boreas, resulting in a footprint of 60,000m<sup>2</sup> (5m width of cable protection).</li> </ul> <p>Based on this worst case scenario, the total permanent footprint on sandbanks equates to less than 0.006% of the total area of the SAC (1,468km<sup>2</sup>) and 0.013% of the area of sandbanks within the SAC (669km<sup>2</sup>).</p> <p>Due to the patterns of erosion, accretion and movement of sand waves naturally occurring within the offshore cable corridor (discussed in Appendix 7.1 of the Information to Support HRA report) it is expected that the cable protection may undergo some periodic burial and uncovering and therefore there would be</p>	<p>Natural England would refer the Examining Authority to our previous advice with regards to scour protection in terms of small scale impacts provided at Deadline 4 [REP4-062], as well as our comments on the Haisborough, Hammond and Winterton SAC Site Integrity Plan provided at Deadline 8 [REP8-104].</p>

Ref.	REIS Section / Para	Applicant's Comments	Comment
		<p>no adverse effect on the form and function of the Sandbanks.</p> <p>The deployment of cable protection must be agreed with the MMO in consultation with Natural England through the HHW SAC SIP, in accordance with the Outline HHW SAC SIP (document 8.20). The wording of Condition 9(1)(m) of the Transmission DMLs allows a conclusion of no AEol to be made at the consenting stage, as it ensures that works cannot commence in the HHW SAC until the MMO is satisfied that there would be no AEol.</p>	
3.2	Table 14 – Applicant's point e (?)	The Applicant agrees with the notes provided and has no further comments.	Please see Natural England's advice provided at Deadline 4 [REP4-062] regarding the development of <i>Sabellaria spinulosa</i> on artificial substrate not being considered as Annex I habitat.
3.3	Table 14 – Applicant's point h (?)	<p>A conference call was held between the Applicant, Natural England and the MMO on the 21st May 2019 to discuss feedback on the updated version of the Outline HHW SAC SIP that was submitted at Deadline 7. The Applicant understands that the use of a SIP approach is now accepted and the Outline HHW SAC SIP submitted at Deadline 7 has been welcomed by Natural England and the MMO, subject to minor comments that are expected to be submitted by both parties at Deadline 8.</p> <p>In correction to note 'h' of the RIES, Hornsea Project Two did not use a Site Integrity Plan. The Consideration of the Purpose of the HHW SAC SIP (document reference ExA; AS; 10.D7.19) submitted at Deadline 7 provides a review of the Hornsea Project Two approach along with the SIP approach adopted for the consented East Anglia THREE project in relation to the Southern North Sea SAC and the SIP approach proposed for Norfolk Vanguard in relation to the HHW SAC.</p>	Please note that because a WCS can be assessed for the project the SIP is only considered appropriate for this project within the HHW SAC when considered alone. Whilst it may be possible for a SIP to be considered acceptable for the Vattenfall sister project, Boreas, because it is the same developer and commitments could potentially be made to reduce the combined impacts to an acceptable level; any other SIP received for activities within this particular SAC is unlikely to be able to address any potential in-combination AEol issues.

#### 4. Detailed Comments – Onshore Ecology

Ref.	REIS Section / Para	Applicant's Comments	Comment
4.1	Table 3.2 & Table 20 - Broadland SPA and Ramsar site	<p>The potential for a LSE for Broadland SPA and Ramsar site due to impacts to ex-situ habitats is identified as not agreed by the Applicant. The Applicant's justification for this is summarised below.</p> <p>The Applicant has been undertaking ongoing discussions with Natural England in relation to the potential for LSE at Broadland SPA and Ramsar site. Whilst the Applicant's position is that the wintering bird survey baseline collected in 2016/2017 is sufficient to conclude that the qualifying features of the Broadland SPA and Ramsar site are not present within functionally-linked land located within an identified study area (comprising land located both within 5km of the Broadland SPA and Ramsar site and 300m of the onshore project area), following discussions with Natural England the Applicant has agreed to manage land in such a way that should qualifying features of the Broadland SPA and Ramsar site be displaced during the works there will be suitable alternative habitat available. The Applicant and Natural England are still in discussion on the exact form of this mitigation; a summary of ongoing discussion with Natural England is provided in the Position Statement submitted at Deadline 8 (document reference ExA; AS; 10.D8.17) and summarised in sections 7.5 and 8.11 of this document.</p>	<p>Natural England had a meeting with the Applicant on 03 June 2019 and are satisfied that our advice regarding SPA/Ramsar species and ex situ habitats has been incorporated into the updated OLEMS as provided by the applicant on 04 June 2019. Natural England agrees that with these measures there will be no adverse effect on integrity on the ex situ habitats of Broadland SPA/Ramsar.</p>
4.2	Tables 16 – 20	N/A	<p>As stated in our Deadline 8 response [REP8-104], Natural England advise the Applicant that their approach to in combination assessment should be in line with the Waddenzee judgement.</p>



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RULES 2010

NORFOLK VANGUARD OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010079

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**Natural England's comments on Deadline 8 Submission - Offshore  
Ornithology Precaution in ornithological assessment for offshore wind  
farms [REP8-067]**

06 June 2019

## 1. Summary Comments

- 1.1. The document misrepresents Natural England's position on a number of offshore ornithology assessment issues, which is disappointing given the generally constructive and solutions-focussed dialogue we have had with the Applicant. Given the late stage of the Examination we have not had the capacity to provide a detailed rebuttal of all misrepresentations and areas of disagreement, and have only been able to highlight some areas of particular disagreement in the comments below.
- 1.2. **We would therefore like to take the opportunity to advise the Examining Authority that any statements within REP8-067 should not be taken to reflect Natural England's position, or as being agreed by Natural England.**

## 2. Natural England's Comments on ExA; AS; 10.D8.8: Offshore Ornithology Precaution in ornithological assessment for offshore wind farms [REP8-067]

### 2.1. Misrepresentation of Natural England's range-based approach

- 2.1.1. The Applicant asserts that Natural England 'make precautionary assumptions, at each stage of the assessment by focussing attention on the upper limits of each component'. This is inaccurate. As set out in our Deadline 8 response to the Rule 17 letter (REP8-104), where a given dataset or parameter has a significant degree of uncertainty, Natural England takes a range-based approach when considering impacts, evaluating outputs across that range. Upper confidence limits are indeed considered in our advice, including as the most robust method to rule out significant impacts e.g. where 1% of baseline mortality is not even exceeded at the upper limits of predicted impacts, but this is quite different from an exclusive focus on upper confidence limits. In the face of a single or small number of values being presented by Applicant's for an issue with a high degree of uncertainty, Natural England has sought consideration of a range of values e.g. apportioning rates for lesser black-backed gull from the Alde-Ore Estuary SPA. However, we have been clear in a number of instances that we consider the upper limits of a suggested or presented range of impacts to be excessively precautionary.

### 2.2. Cumulative and in-combination assessments methodology

- 2.2.1. The Applicant asserts that cumulative and in-combination collision risk assessments use upper 95% confidence limits for all projects, thereby resulting in greatly overestimated cumulative impacts. Natural England is not aware of any cumulative or in-combination assessment to date that has actually taken this approach. A review of the collision and displacement values from individual projects which feature in such assessments is much-needed, given that predictions submitted at the application stage are often subject to multiple revisions following scrutiny from stakeholders; however, Natural England's understanding is that, whilst approaches may differ from project to project, it is standard practice for the 'central values' from individual project assessments for both collision and displacement to be carried forward into cumulative and in-combination assessments, rather than upper 95% confidence limits. In any event, for all Round 1 and Round 2 projects the use of upper 95% confidence limits is simply not possible, because earlier windfarm Environmental Statements did not present such information.
- 2.2.2. **Natural England therefore wholly disputes the statement that *'this form of joint worst case prediction is exactly the overly precautionary approach currently being adopted by Natural England'*.**



### 2.3. Density and abundance data

2.3.1. As stated in our Deadline 8 response (REP8-104), the distribution of birds in the marine environment appears to be highly variable between days, seasons and years. It is likely that e.g. 24 days of surveys over 2 years - approximately 3.3% of the total number of 720 days - do not fully capture the full extent of variation density/abundance of seabirds that can be present within the survey areas during the 2 year period, including low as well as high counts, let alone over the 30-year period of the lifespan of the project. In that context, if uncertainty in an offshore ornithology survey dataset is to be properly addressed, it is entirely appropriate for the Applicant to present values from both lower and upper 95% confidence limits for consideration, bearing in mind that Natural England takes – and has consistently advocated - a range-based approach.

### 2.4. The Applicant's stochastic version of the Band Model

2.4.1. For clarity, Natural England did not support the use of the applicant's stochastic CRM because important aspects of the model were not submitted into the Examination, and more generally the model had not been subject to peer review. It would be inappropriate for Natural England – or indeed decision-makers - to base impact conclusions on a model that could not be subject to appropriate testing or scrutiny by stakeholders.

### 2.5. 'Headroom'

2.5.1. Please note that Natural England does not support the method cited by the applicant (MacArthur Green, 2017) for recalculating collision mortalities from 'as built' windfarms, and advises against its use. This is for methodological reasons relating to the simplicity of the method as well as the legal ones referred to, which are set out in detail in Annex G of our response to the Hornsea 3 examination at Deadline 6<sup>1</sup>. Our position remains as set out in our Deadline 2 response, REP2-038, to the Applicant's Section 51 advice response AS-006 – that unless the 'as-built' project parameters are legally secured and a full updated collision risk assessment is carried out based on the full details of the final project, it would be unsafe for consenting decisions to be made on the basis of 'headroom' being potentially available.

### 2.6. Displacement

2.6.1. The Applicant asserts that there is 'very little evidence that displacement actually extends over these distances [2 and 4km around the site boundary] for any species'. This statement ignores a number of studies that have, for example, demonstrated reductions in densities for red-throated diver up to 12km from offshore windfarms (evidence for which is set out in the offshore ornithology annex of our Relevant Representations (RR-106).

### 2.7. Mortality rates

2.7.1. Please see our comments above regarding Natural England's range-based approach – it is not the case that Natural England focusses its assessments on a 10% mortality rate alone. Critically though, empirical evidence regarding the energetic consequences of displacement for seabirds and wintering waterbirds using the marine environment are very limited, and the role of overwinter survival on seabird population dynamics is poorly understood. Furthermore, we again note that the mortality rates are a crude method of capturing a range of potentially deleterious effects that could arise from displacement, including reduced fitness for migration and reduced productivity during the breeding season. These are particularly relevant when considering displacement effects within sites designated for the species affected.

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<sup>1</sup> <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-001695-Natural%20England%20-%20ISH5%20Annex%20G-%20Natural%20England's%20Comments%20on%20the%20Applicant's%20response%20to%20ExA%20Q2.2.38.pdf>

## 2.8. Seabird foraging ranges

- 2.8.1. It is generally accepted that the foraging ranges set out in Thaxter et al. (2012) no longer reflect the best available evidence, in particular the large amounts of data produced by the FAME/STAR projects. In any event, Natural England's advice to Applicants is to use site-specific data when it is available, and the tracking data from Flamborough & Filey Coast SPA clearly demonstrates that kittiwake have reached the Vanguard West area, and can travel as far as Vanguard East.
- 2.8.2. We are not aware of any particular evidence that could provide any means of quantifying the Applicant's assertion that 'If birds made multiple long trips, they would simply run out of time to provide their chicks with the number of feeds they require...', and we note RSPB's observation that some of the tracked kittiwakes from Flamborough - which the Applicant asserts are likely to be inexperienced, colony-edge breeders, hence their lengthy foraging trips - successfully raised chicks.

## 2.9. Seasonal definitions

- 2.9.1. The detailed nature of behaviour of seabirds from any given colony in the early and latter stages of the breeding season are poorly understood, but it is clear from data collected at Flamborough and other colonies that birds can be present at the colonies in meaningful numbers at these times, and interacting with the offshore environment when not present at the colony. Excluding these months from an assessment of impacts is likely to result in birds with connectivity to the SPA being excluded, which is why Natural England advises they are included.

## 2.10. Density dependence and independence

- 2.10.1. It is not the case that Natural England advises that density dependent regulation should be excluded from PVA models. For clarity, Natural England's position can be summarised as follows: where there is no clear evidence to support the application of any particular form or magnitude of density dependence in a given model, Natural England has based its advice on the outputs of the density independent PVA model, as these make no assumptions about the form or strength of any density dependent effects.

## 2.11. Conclusions

- 2.11.1. Natural England would be pleased to enter further discussions regarding refining the treatment of uncertainty in offshore windfarms – having already been involved in initiatives to improve impact assessments. However, we consider the description of our advice on impact assessment to have resulted in '*a process which uniformly inflates predicted impact magnitudes*' as a caricature, and not supported by the evidence presented in this submission.

## 3. **Other Comments**

- 3.1. The note '*Offshore Ornithology: Kittiwake Age Structure in the Southern North Sea*' is a separate document to the '*Offshore ornithology: Precaution in ornithological assessment for offshore windfarms*' and should be submitted as such, so it forms part of the document library and is clearly available for stakeholders to comment.

#### **4. References**

MacArthur Green (2017) Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality. Report to The Crown Estate.

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S.C.P., Roos, S., Bolton, M., Langston, R.H.W. and Burton, N.H.K. (2012). Seabird foraging ranges as a preliminary tool for identifying Marine Protected Areas. *Biological Conservation*, 156: 53-61.



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**Natural England's comments on Deadline 8 Submission - Offshore  
Ornithology Auk Displacement Assessment Update for Deadline 8  
[REP8-069]**

06 June 2019

## 1. Introduction

- 1.1. This document is a technical document submitted into the Norfolk Vanguard Examination to provide scientific justification for Natural England's advice provided on the significance of the potential impacts on designated sites features, as summarised within each section. Our advice is based on best available evidence at the time of writing and is subject to change in the future (likely to be outside of this examination process) should further evidence be presented.

## 2. HABITATS REGULATIONS ASSESSMENT (HRA)

- 2.1. Natural England welcome that the Applicant has undertaken revised assessments for auks (puffin, razorbill and guillemot) at the FFC SPA regarding operational displacement from Vanguard alone and in-combination in REP8-069.

### 2.2. Impacts from Vanguard alone

#### a. Razorbill alone: Flamborough & Filey Coast SPA

- 2.2.1. We agree with the Applicant's apportionment rate of 0% to the FFC SPA in the breeding season and we welcome that the Applicant has used apportionment rates of 3.4% for autumn and spring and 2.7% for winter (as recommended by Natural England in REP7-075).
- 2.2.2. Using these rates, we agree with the predicted impact figures calculated by the Applicant in Table 5 of REP8-069 for the annual impact from Vanguard East and West combined. Using the worst case scenario of 70% displacement and 10% mortality from the Natural England advised range of displacement and mortality rates, an additional 5.8 (range based on 95% confidence intervals of abundance: 2.4-10.8) razorbill mortalities from the FFC SPA are predicted from Vanguard alone. This equates to 0.26% (range: 0.11-0.49%) of baseline mortality of the razorbill population of the FFC SPA, based on the designated colony size of 10,570 pairs (21,140 adults) and an adult mortality rate of 10.5% (calculated from the adult survival rate of 0.895 in Horswill & Robinson 2015).
- 2.2.3. The Conservation Objective for the razorbill feature of the FFC SPA is to maintain the size of the breeding population at a level which is above 10,570 breeding pairs whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. Given that the predicted impacts (even using the upper 95% confidence intervals of the abundance data) equates to less than 1% of baseline mortality of the colony, therefore we consider that this level of additional mortality could be considered non-significant and therefore would not be an AEOI. The conservation objectives regarding the razorbill feature would be met and **therefore Natural England advises an adverse effect on integrity (AEOI) of the razorbill feature of the FFC SPA can be ruled out for displacement impacts from Vanguard alone.**

#### b. Guillemot alone: Flamborough & Filey Coast SPA

- 2.2.4. We agree with the Applicant's apportionment rate of 0% to the FFC SPA in the breeding season and we welcome that the Applicant has used an apportionment rate of 4.4% for the non-breeding season (as recommended by Natural England in REP7-075).
- 2.2.5. Using these rates, we agree with the predicted impact figures calculated by the Applicant in Table 8 of REP8-069 for the annual impact from Vanguard East and West combined. Using the worst case scenario 70% displacement and 10% mortality from the Natural England advised range of displacement and mortality rates, an additional 14.7 (range based on 95% confidence intervals of abundance: 8-29.2) guillemot mortalities from the FFC SPA are predicted from Vanguard alone. This equates to 0.29% (range: 0.16-0.58%)

of baseline mortality of the guillemot population of the FFC SPA, based on the designated colony size of 41,607 pairs (83,214 adults) and an adult mortality rate of 6.1% (calculated from the adult survival rate of 0.939 in Horswill & Robinson 2015).

- 2.2.6. The Conservation Objective for the guillemot feature of the FFC SPA is to maintain the size of the breeding population at a level which is above 41,607 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent. Given that the predicted impacts (even using the upper 95% confidence intervals of the abundance data) equates to less than 1% of baseline mortality of the colony, therefore we consider that this level of additional mortality could be considered non-significant and therefore would not be an AEOI. The conservation objectives regarding the guillemot feature would be met and **therefore Natural England advises an AEOI of the guillemot feature of the FFC SPA can be ruled out for displacement impacts from Vanguard alone.**

c. Puffin assemblage component alone: Flamborough & Filey Coast SPA

- 2.2.7. We agree with the Applicant's apportionment rate of 0% to the FFC SPA in the breeding season and we welcome that the Applicant has used an apportionment rate of 0.41% for the non-breeding season (as recommended by Natural England in REP7-075).
- 2.2.8. Using these rates, we calculate slightly different predicted impact figures from the Applicant. We calculate that using the worst case scenario of the Natural England advised range of displacement and mortality rates of 70% displacement and 10% mortality that an additional 0.03 (range based on 95% confidence intervals of abundance: 0-0.14) puffin mortalities from the FFC SPA are predicted from Vanguard alone. This equates to 0.02% (range: 0.00-0.08%) of baseline mortality of the puffin population of the FFC SPA, based on the designated colony size of 890 pairs (1,960 adults) based on the data used to classify the SPA and an adult mortality rate of 9.4% (calculated from the adult survival rate of 0.906 in Horswill & Robinson 2015). We note that the predicted mortality is significantly closer to zero than a single bird, even at the upper 95% confidence limits.
- 2.2.9. **Therefore Natural England advises that an adverse effect on integrity (AEOI) of the assemblage feature of the FFC SPA can be ruled out for predicted displacement impacts from Vanguard alone on the puffin component of the assemblage.**

2.3. **Impacts in-combination with other plans and projects**

a. General comments

- 2.3.1. We note that figures included for Hornsea 3 for each species are again the abundance figures from the project's Environmental Statement (ES). As noted in our Deadline 7 response (REP7-075) during the examination phase for the Hornsea 3 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 advised in our Deadline 7 response (REP7-075) that the abundance estimates used by the Vanguard Applicant in the auk cumulative/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 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<sup>1</sup>.

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<sup>1</sup> 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

We note that the Vanguard Applicant has not taken this advice in the revised assessments presented in the updated assessments in REP8-069. Natural England has used the abundance estimates for Hornsea 3 from the 'alternative analysis' in our in-combination assessments, hence our in-combination totals discussed below are different to those calculated by the Applicant in REP8-069.

2.3.2. We welcome that the Applicant has considered the predicted in-combination impacts excluding Hornsea 3 and with the inclusion of Hornsea 3.

b. Razorbill in-combination: Flamborough & Filey Coast SPA

2.3.3. We welcome that the Applicant has used the apportionment rates advised by Natural England in REP7-075 for the breeding season for Westernmost Rough (100%), Hornsea 1 (48.2%), Hornsea 2 (48.2%), Dogger Bank Creyke Beck A (30%), Dogger Bank Creyke Beck B (30%), Dogger Bank Teesside A (30%) and Dogger Bank Teesside B (30%).

2.3.4. We also welcome that the Applicant has apportioned 3.4% in spring and autumn and 2.7% in winter of razorbill abundances at all of the offshore wind farms to the FFC SPA, as recommended by Natural England in REP7-075.

2.3.5. Note Natural England have used the abundance figures from the 'alternative analysis' Table 1.15 of Hornsea Project Three Offshore Wind Farm (2019a). Therefore, we have included figures of 630 razorbill in the breeding season (same as the Vanguard Applicant), 2,020 razorbill in the autumn/post breeding season (same as the Vanguard Applicant), 5,024 razorbill in the winter/non-breeding season (rather than the 3,649 used by the Vanguard Applicant) and 1,754 razorbill in the spring/pre-breeding season (rather than the 1,236 used by the Vanguard Applicant) for Hornsea 3 to apply the apportionment rates to. This results in 0 razorbills in the breeding season, 68.7 in the autumn/post-breeding season, 135.6 in the winter/non-breeding season and 59.6 in the spring/pre-breeding season apportioned to the FFC SPA for Hornsea 3.

2.3.6. Therefore, we calculate the total in-combination number of razorbills from the FFC SPA to be at risk of displacement (including from Hornsea 3) to be 3,268 in the breeding season, 1,178 in the autumn/post breeding season, 618 in the winter/non-breeding season and 959 in the spring/pre-breeding season, an annual in-combination total including Hornsea 3 of 6,023 razorbills at risk of displacement.

2.3.7. We agree with the annual in-combination total excluding Hornsea 3 of 5,759 razorbills from the FFC SPA at risk of displacement calculated by the Applicant in Table 4 of REP8-069.

2.3.8. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional in-combination mortalities **excluding** Hornsea 3 is between 17 (30% displacement and 1% mortality) and 403 (70% displacement and 10% mortality) razorbills from the FFC SPA. This equates to 0.78-18.16% of baseline mortality for the colony. Even at the Applicant's preferred rates of 50% displacement and 1% mortality, the predicted additional mortalities equate to more than 1% of baseline mortality (Table 1). This is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.

2.3.9. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional in-combination mortalities **including** Hornsea 3 is between 18 (30% displacement and 1% mortality) and 422 (70% displacement and 10% mortality) razorbills from the FFC SPA. This equates to 0.81-18.99% of baseline mortality for the colony. Even at the Applicant's preferred rates of 50% displacement and 1% mortality, the predicted additional mortalities equate to more than 1% of baseline mortality (Table 1). As with the in-combination figure excluding Hornsea 3, this is not insignificant at

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figures and these should in no way be seen as Natural England's agreed position on the levels of impact from Hornsea 3.

the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.

**Table 1** Predicted annual displacement mortalities for in-combination impact levels calculated by Natural England for excluding and including Hornsea 3 for razorbill for FFC SPA. Pink shaded cells indicate predicted mortalities that exceed 1% of baseline mortality – baseline mortality calculated using adult only colony size (designated size of 21,140 adults) and adult mortality rate (10.5% from Horswill & Robinson 2015) – 1% baseline mortality = 22 birds.

<b>Razorbill in-combination mortality figures, EXCLUDING Hornsea 3</b>		% mortality				
FFC adults mean of population		1	2	5	10	
% displacement	30	17	35	86	173	
	40	23	46	115	230	
	50	29	58	144	288	
	60	35	69	173	346	
	70	40	81	202	403	
<b>Razorbill in-combination mortality figures, INCLUDING Hornsea 3</b>		% mortality				
FFC adults mean of population		1	2	5	10	
% displacement	30	18	36	90	181	
	40	24	48	120	241	
	50	30	60	151	301	
	60	36	72	181	361	
	70	42	84	211	422	

2.3.10. We welcome that the Applicant has considered in REP8-069 the predicted in-combination displacement figures with the outputs from the updated FFC SPA razorbill Population Viability Analysis (PVA) undertaken during the Hornsea 3 examination (Hornsea Project Three Offshore Wind Farm 2019b). Natural England notes that, as with the puffin PVA, we had outstanding concerns with the Hornsea 3 PVAs which were not resolved by the close of the Examination, relating to the number of simulations and the demographic data not being updated (see our Deadline 6 response to the Hornsea 3 Examination – written summary of representations of ISH5<sup>2</sup>). This nevertheless represents the best available population model on which to base an assessment, though this should not be taken as an endorsement or ‘acceptance’ of the model.

2.3.11. There is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling, therefore Natural England has based its advice on the outputs of the density independent PVA model (as these make no assumptions about the form or strength of any density dependent effects). Therefore, Natural England has focused our conclusions on the PVA outputs from the density independent model for demographic rate set 2 (the rates Natural England considers to be the most appropriate) using a matched runs approach (as per Natural England advice).

<sup>2</sup> Natural England (2019) Hornsea Project Three Offshore Wind Farm: Natural England Written Submission for Deadline 6 – Written Submission of Natural England’s Representations at Issue Specific Hearing 5, Offshore Ecology. Available from: <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010080/EN010080-001688-Natural%20England%20-%20Written%20Submission%20of%20Natural%20England’s%20Representations%20at%20Issue%20Specific%20Hearing%205%20-%20Offshore%20Ecology.pdf>



- 2.3.12. The FFC SPA razorbill colony increased by 3% per annum 1987-2008 and the designated population size is 21,140 breeding adults. The 2017 colony count indicated approximately 40,506 breeding adults across the site, indicating continued increases (Aitken et al. 2017). It is not clear whether the colony will continue to grow at the current rate for the next 30 years and this should be considered when judging the significance of predicted impacts against the conservation objectives for the feature. However, colony productivity is higher than the national average. The Conservation Objective for the razorbill population of the FFC SPA is to maintain the size of the breeding population at a level which is above 10,570 breeding pairs whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
- 2.3.13. If the additional mortality from the windfarm is 400-450 birds per annum (closest PVA outputs available in Hornsea Project Three Offshore Wind Farm 2019b to predicted 403 mortalities for the in-combination total excluding Hornsea 3 at 70% displacement and 10% mortality and to the 422 in-combination total calculated by Natural England for including Hornsea 3 at 70% displacement and 10% mortality) then the population of FFC SPA after 30 years will be 42.6-46.5% lower (see Table A2\_15.1 of Hornsea Project Three Offshore Wind Farm 2019b) than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 1.9-2.1% (see Table A2\_15.3 of Hornsea Project Three Offshore Wind Farm 2019b). This level of impact would be considered significant in the context of the current colony population trend.
- 2.3.14. However, while there is some empirical evidence to support the displacement levels for auks we do not know what the likely mortality impacts of displacement are. We therefore consider it appropriate to consider a range of mortalities from 1-10%. However, on the basis that the projects that have been scoped into the assessment lie in areas of the North Sea that represent low to medium levels of razorbill density during both the breeding (where relevant) and non-breeding seasons<sup>3</sup>, it is assumed that areas of low/medium density will be less important/desirable feeding areas and therefore mortality impacts of displacement from lower quality areas would be lower than displacement from optimal/important areas. Therefore, we do not anticipate razorbill mortality rates to be at the top of the range considered. We do not expect the mortality to exceed a level where the population growth rate would decline by more than approximately 0.5% per annum, as shown in Table 2. This would approximate to the population being approximately 13% lower after 30 years when compared to the un-impacted population (based on 100 birds annual adult mortality) (based on the counterfactual of final population size in Table A2\_15.1 of Hornsea Project Three Offshore Wind Farm 2019b).

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<sup>3</sup> NE/MMO Seabird Sensitivity Mapping Tool. [http://www.gis.naturalengland.org.uk/pubs/gis/GIS\\_register.asp](http://www.gis.naturalengland.org.uk/pubs/gis/GIS_register.asp)

**Table 2** Predicted % reductions in population growth rates<sup>4</sup> from Project in-combination with other plans and projects for excluding and including Hornsea 3. Shaded cells are those where the reduction in growth rate exceeds 0.5%, 1% or 2%).

<b>Razorbill growth rate figures*, EXCLUDING Hornsea 3</b>		% mortality			
FFC adults in-combination		1	2	5	10
% displacement	30	0.2	0.2	0.5	0.9
	40	0.2	0.2	0.7	1.2
	50	0.2	0.5	0.7	1.4
	60	0.2	0.5	0.9	1.7
	70	0.2	0.5	1.2	1.9
<b>Razorbill growth rate figures*, INCLUDING Hornsea 3</b>		% mortality			
FFC adults in-combination		1	2	5	10
% displacement	30	0.2	0.2	0.5	0.9
	40	0.2	0.2	0.7	1.2
	50	0.2	0.5	0.9	1.7
	60	0.2	0.5	0.9	1.9
	70	0.2	0.5	1.2	2.1

\* Razorbill, 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\_15.3 in Hornsea Project Three Offshore Wind Farm (2019b). Whilst Vanguard's lifespan is 30 years, data on counterfactuals of growth rate are only available in Hornsea Project Three Offshore Wind Farm (2019b) for after 35 years.

- 2.3.15. Based on the current population trend and productivity levels for the colony, and on the basis of predicted displacement mortality for the project in-combination with other plans and projects resulting in a decline in growth rate of less than 0.5% per annum, **Natural England advises that an AEOI on the razorbill feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects if Hornsea 3 is excluded from the in-combination total.**
- 2.3.16. **However, due to Natural England's significant concerns regarding the incomplete baseline surveys for the Hornsea 3 project, and the associated level of uncertainty as regards the potential impacts of that project, Natural England is not in a position to advise that an AEOI on the razorbill feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects when Hornsea 3 is included in the in-combination total.**

c. Guillemot in-combination: Flamborough & Filey Coast SPA

- 2.3.17. We welcome that the Applicant has used the apportionment rates advised by Natural England in REP7-075 for the breeding season for Teesside (100%), Westernmost Rough (100%), Humber Gateway (100%), Triton Knoll (100%), Hornsea 1 (46.3%), Hornsea 2 (46.3%), Dogger Bank Creyke Beck A (35%), Dogger Bank Creyke Beck B (35%), Dogger Bank Teesside A (35%) and Dogger Bank Teesside B (35%).

<sup>4</sup> Reductions in population growth rate relate to the nearest mortality level output from the PVA model that lies above the predicted in-combination displacement mortality in Table 1 above. So for example if the predicted displacement is 110 birds and PVA outputs are given in 50 bird increments, the reduction in growth rate in the matrix is that for the 150 birds mortality level.

- 2.3.18. We also welcome that the Applicant has apportioned 4.4% in the non-breeding season of guillemot abundances at all of the offshore wind farms to the FFC SPA, as recommended by Natural England in REP7-075.
- 2.3.19. Note Natural England have used the abundance figures from the ‘alternative analysis’ Table 1.11 of Hornsea Project Three Offshore Wind Farm (2019a). Therefore, we have included figures of 13,374 guillemot in the breeding season (same as the Vanguard Applicant) and 19,174 guillemot in the non-breeding season (rather than the 17,772 used by the Vanguard Applicant) for Hornsea 3 to apply the apportionment rates to. This results in 0 guillemots in the breeding season and 843.7 in the non-breeding season apportioned to the FFC SPA for Hornsea 3.
- 2.3.20. We agree with the annual in-combination total excluding Hornsea 3 of 22,779 guillemots from the FFC SPA at risk of displacement calculated by the Applicant in Table 7 of REP8-069.
- 2.3.21. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional in-combination mortalities **excluding** Hornsea 3 is between 68 (30% displacement and 1% mortality) and 1,595 (70% displacement and 10% mortality) guillemots from the FFC SPA. This equates to 1.35-31.41% of baseline mortality for the colony. Even at the Applicant’s preferred rates of 50% displacement and 1% mortality, the predicted additional mortalities equate to more than 1% of baseline mortality (Table 3). This is not insignificant and requires further consideration.
- 2.3.22. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional in-combination mortalities **including** Hornsea 3 is between 71 (30% displacement and 1% mortality) and 1,654 (70% displacement and 10% mortality) guillemots from the FFC SPA. This equates to 1.40-32.58% of baseline mortality for the colony. Even at the Applicant’s preferred rates of 50% displacement and 1% mortality, the predicted additional mortalities equate to more than 1% of baseline mortality (Table 3). As with the in-combination figure excluding Hornsea 3, this is not insignificant and requires further consideration.

**Table 3** Percentage annual displacement mortalities for in-combination impact levels calculated by Natural England for excluding and including Hornsea 3 for guillemot for FFC SPA. Pink shaded cells indicate predicted mortalities that exceed 1% of baseline mortality – baseline mortality calculated using adult only colony size (designated size of 83,214 adults) and adult mortality rate (6.1% from Horswill & Robinson 2015) – 1% baseline mortality = 51 birds.

<b>Guillemot in-combination mortality figures, EXCLUDING Hornsea 3</b>		% mortality			
FFC adults mean of population		1	2	5	10
% displacement	30	68	137	342	683
	40	91	182	456	911
	50	114	228	569	1,139
	60	137	273	683	1,367
	70	159	319	797	1,595
<b>Guillemot in-combination mortality figures, INCLUDING Hornsea 3</b>		% mortality			
FFC adults mean of population		1	2	5	10
% displacement	30	71	142	354	709
	40	94	189	472	945
	50	118	236	591	1,181
	60	142	283	709	1,417
	70	165	331	827	1,654

- 2.3.23. We welcome that the Applicant has considered in REP8-069 the predicted in-combination displacement figures with the outputs from the updated FFC SPA guillemot Population Viability Analysis (PVA) undertaken during the Hornsea 3 examination (Hornsea Project Three Offshore Wind Farm 2019b). Natural England notes that, as with the puffin and razorbill PVAs, we had outstanding concerns with the Hornsea 3 PVAs which were not resolved by the close of the Examination, relating to the number of simulations and the demographic data not being updated (see our Deadline 6 response to the Hornsea 3 Examination – written summary of representations of ISH5). This nevertheless represents the best available evidence on which to base an assessment, though this should not be taken as an endorsement or ‘acceptance’ of the model.
- 2.3.24. There is no clear evidence to support the application of any particular form or magnitude of density dependence in the modelling, therefore Natural England has based its advice on the outputs of the density independent PVA model (as these make no assumptions about the form or strength of any density dependent effects). Therefore, Natural England has focused our conclusions on the PVA outputs from the density independent model for demographic rate set 2 (the rates Natural England considers to be the most appropriate) using a matched runs approach (as per Natural England advice).
- 2.3.25. The FFC SPA guillemot colony increased by 2.8% per annum between 1987-2008 and the designated population size is 83,214 breeding adults. The 2017 colony count indicated approximately 121,754 breeding adults across the site (Aitken et al. 2017). It is not clear whether the colony will continue to grow at the current rate for the next 30 years and this should be considered when judging the significance of predicted impacts against the conservation objectives for the feature. The Conservation Objective for the guillemot population of the FFC SPA is to maintain the size of the breeding population at a level which is above 41,607 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
- 2.3.26. If the additional mortality from the windfarm is 1,600 birds per annum (closest PVA outputs available and maximum impact size provided in Hornsea Project Three Offshore Wind Farm 2019b to predicted 1,595 mortalities for the in-combination total excluding Hornsea 3 at 70% displacement and 10% mortality and to the 1,654 in-combination total calculated by Natural England for including Hornsea 3 at 70% displacement and 10% mortality) then the population of FFC SPA after 30 years will be 43.1% lower (see Table A2\_11.1 of Hornsea Project Three Offshore Wind Farm 2019b) than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 1.9% (see Table A2\_11.3 of Hornsea Project Three Offshore Wind Farm 2019b). This level of impact would be considered significant in the context of the current colony population trend.
- 2.3.27. However, while there is some empirical evidence to support the displacement levels for auks we do not know what the likely mortality impacts of displacement are. We therefore consider it appropriate to consider a range of mortalities from 1-10%. However, on the basis that the projects that have been scoped into the assessment lie in areas of the North Sea that represent low to medium levels of guillemot density during both the breeding (where relevant) and non-breeding seasons (Seabird Sensitivity Mapping Tool), it is assumed that areas of low/medium density will be less important/desirable feeding areas and therefore mortality impacts of displacement from lower quality areas would be lower than displacement from optimal/important areas. Therefore, we do not anticipate that mortality rates to be at the top of the range considered. We do not expect the mortality to exceed a level where the population growth rate would decline by more than approximately 0.4% per annum (Table 4).

**Table 4** Predicted % reductions in population growth rates<sup>5</sup> from Project in-combination with other plans and projects for excluding and including Hornsea 3. Shaded cells are those where the reduction in growth rate exceeds 0.5%, 1% or 2%).

<b>Guillemot growth rate figures*, EXCLUDING Hornsea 3</b>		% mortality			
FFC adults in-combination		1	2	5	10
% displacement	30	0.1	0.2	0.4	0.8
	40	0.1	0.2	0.6	1.1
	50	0.2	0.3	0.7	1.4
	60	0.2	0.4	0.8	1.7
	70	0.2	0.4	1.0	1.9
<b>Guillemot growth rate figures*, INCLUDING Hornsea 3</b>		% mortality			
FFC adults in-combination		1	2	5	10
% displacement	30	0.1	0.2	0.5	0.9
	40	0.1	0.2	0.6	1.1
	50	0.2	0.3	0.7	1.4
	60	0.2	0.4	0.9	1.7
	70	0.2	0.4	1.0	1.9

\* Guillemot, 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\_11.3 in Hornsea Project Three Offshore Wind Farm (2019b). Whilst Vanguard’s lifespan is 30 years, data on counterfactuals of growth rate are only available in Hornsea Project Three Offshore Wind Farm (2019b) for after 35 years.

2.3.28. Based on the current population trend for the colony and the restore conservation objective, and on the basis of predicted displacement mortality for the project in-combination with other plans and projects resulting in a decline in growth rate of no more than 0.4%, **Natural England advises that an AEOI on the guillemot feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects if Hornsea 3 is excluded from the in-combination total.**

2.3.29. **However, due to Natural England’s significant concerns regarding the incomplete baseline surveys for the Hornsea 3 project, and the associated level of uncertainty as regards the potential impacts of that project, Natural England is not in a position to advise that an AEOI on the guillemot feature of the FFC SPA can be ruled out from displacement in-combination with other plans and projects when Hornsea 3 is included in the in-combination total.**

d. Puffin assemblage component in-combination: Flamborough & Filey Coast SPA

2.3.30. On the basis that the Vanguard contribution to the in-combination total is much closer to 0 than 1 puffin per annum at the most precautionary rate of 70% displacement and 10% mortality, Natural England considers that Vanguard is unlikely to make any contribution to the in-combination total. **Therefore, we consider that an AEOI of the assemblage feature of the FFC SPA can be ruled out for predicted displacement impacts from**

<sup>5</sup> Reductions in population growth rate relate to the nearest mortality level output from the PVA model that lies above the predicted in-combination displacement mortality in Table 3 above. So for example if the predicted displacement is 110 birds and PVA outputs are given in 50 bird increments, the reduction in growth rate in the matrix is that for the 150 birds mortality level.

**Vanguard in-combination with other plans and projects on the puffin component of the assemblage.**

- 2.3.31. **Regarding the seabird assemblage more generally, Natural England observes that we consider there is an adverse effect on the kittiwake feature in its own right from in-combination collision mortality and also on the gannet feature from in-combination mortality when Hornsea 3 is included in the in-combination total. Therefore it follows that an AEOI cannot be rule out for the assemblage feature of the FFC SPA in-combination.**

### **3. Environmental Impact Assessment (EIA)**

- 3.1. We note that the 'auk displacement assessment update for deadline 8' document (REP8-069) submitted by the Applicant does not contain any updated EIA assessments. The figures for EIA for Vanguard alone and cumulatively with other plans and projects are presented, but no updated EIA assessments are included. Natural England has therefore undertaken this assessment using the alone and cumulative figures we consider most appropriate.

#### **3.2. Impacts from Vanguard Alone**

- 3.2.1. Based on the predictions for the WCS of 100% of turbines in Vanguard West plus 100% of turbines in Vanguard East (which is ultimately an unrealistic scenario) presented in Tables 3, 5 and 8 of REP8-069 for using the mean abundance figures in the displacement assessments, the predicted impacts for puffin, razorbill and guillemot even at the Natural England worst case range of 70% displacement and 10% mortality do not exceed 1% of baseline mortality of the largest BDMPS for any of the three auk species (Table 5).
- 3.2.2. The Applicant did not present the range of figures based on use of the lower and upper 95% confidence intervals (CIs) of the abundance/density data in their updated assessment in REP6-021, and has not included this again in REP8-069.
- 3.2.3. In Table 5 Natural England has calculated these figures using the upper and lower 95% confidence intervals of the abundance data presented in the tables in Annex 1 of Appendix 13.1 (APP-217) of the submission documents

**Table 5** Percentage of baseline mortality for auk displacement for Vanguard alone at EIA scale, using average across all age class mortality rates, as used by the Applicant

	Bird abundance	Displacement prediction, Vanguard alone (from Tables in REP8-069)*	Largest BDMPS individuals, Furness (2015)**	% baseline mortality largest BDMPS
Puffin	Lower 95% CI	0-0	868,689	0.00-0.00
	Mean	1-13		0.0004-0.01
	Upper 95% CI	2-43		0.001-0.003
Razorbill	Lower 95% CI	3-96	591,874	0.003-0.09
	Mean	11-246		0.01-0.24
	Upper 95% CI	20-458		0.02-0.44
Guillemot	Lower 95% CI	11-251	2,045,078	0.004-0.09
	Mean	27-637		0.01-0.22
	Upper 95% CI	53-1233		0.02-0.43

\*Displacement predictions based on Natural England advised range of 30-70% displacement and 1-10% mortality. Lower figure relates to 30% displacement and 1% mortality, upper figure relates to 70% displacement and 10% mortality

\*\* Largest North Sea population scale

3.2.4. From Table 5 above, using the upper 95% confidence intervals of abundance/density data, the predicted impacts for puffin, razorbill and guillemot even at the Natural England worst case range of 70% displacement and 10% mortality do not exceed 1% of baseline mortality of the largest BDMPS for any of the three auk species.

3.2.5. **Therefore, based on this we conclude that the operational displacement risk from Norfolk Vanguard alone would have no significant impact (negligible to minor adverse) at the EIA scale for all three auk species.**

### 3.3. Cumulative impacts with other plans and projects

#### a. General Comments

3.3.1. In our Deadline 7 response [REP7-075] we advised 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.

- 3.3.2. As a result we recommended that the Applicant updated the cumulative assessment in their Deadline 6 assessment (REP6-021) 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. We note that in REP8-069 the Applicant has not updated the figures for Hornsea 3 or updated the cumulative assessments to account for this. However, we welcome that cumulative abundance totals are presented in the tables in REP8-069 for including and excluding Hornsea 3.
- 3.3.3. We have therefore used the same figures for Hornsea 3 in this response as we have used in the Hornsea 3 Deadline 7 (i.e. those from the 'alternative analysis' response to ensure consistency across the projects (Natural England 2019)). Our advice remains that there is still considerable uncertainty around the Hornsea 3 cumulative contribution due to the lack of a full baseline dataset, hence our suggestion that Vanguard present figures with and without Hornsea 3.
- b. Puffin cumulative operational displacement
- 3.3.4. Note Natural England have used the abundance figures from the 'alternative analysis' Table 1.19 of Hornsea Project Three Offshore Wind Farm (2019a). Therefore, we have included figures of 253 puffin in the breeding season (same as the Vanguard Applicant) and 77 puffin in the non-breeding season (rather than the 127 used by the Vanguard Applicant) for Hornsea 3 in the cumulative assessment.
- 3.3.5. Therefore, we make the total cumulative number of puffins to be at risk of displacement (including Hornsea 3) to be 21,261 in the breeding season (same as the Applicant in Table 2 of REP8-069) and 23,171 in the non-breeding season (rather than the 23,221 calculated by the Applicant in Table 2 of REP8-069). Which equals an annual cumulative total including Hornsea 3 of 44,432 puffins at risk of displacement.
- 3.3.6. We agree with the annual cumulative total excluding Hornsea 3 of 44,102 puffins at risk of displacement calculated by the Applicant in Table 2 of REP8-069.
- 3.3.7. In REP6-021 the Applicant considered in their assessment the predicted impacts using both their preferred rates of 50% displacement and 1% mortality and up to the Natural England advised worst case scenario of up to 70% displacement and 10% mortality and these are again presented in Table 3 of REP8-069. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **excluding** Hornsea 3 is between 132 (30% displacement and 1% mortality) and 3,087 (70% displacement and 10% mortality) puffins. This equates to 0.09-2.13% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.15% of baseline mortality of the largest BDMPS (Table 6). This is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.8. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **including** Hornsea 3 is between 133 (30% displacement and 1% mortality) and 3,110 (70% displacement and 10% mortality) puffins. This equates to 0.09-2.14% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.15% of baseline mortality of the largest BDMPS (Table 6). Again, this is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.9. Table 6 below indicates that when considering the cumulative totals, either excluding or including Hornsea 3 as calculated by Natural England, for the Natural England recommended range of 30-70% displacement and 1-10% mortality and the predicted impacts against baseline mortality for the largest BDMPS:



- 1% of baseline mortality of the largest BDMPS is not exceeded for any displacement scenario (30-70%) at 1-4% mortality;
- At 5% mortality, 1% of baseline mortality is not exceeded until displacement is 70% or above; and,
- At 10% mortality, 1% of baseline mortality is exceeded when displacement is more than 30%, with 40-60% displacement not exceeding 2% of baseline mortality.

**Table 6** Percent of baseline mortality (using 16.7% average across all age class mortality rates, as used by the Applicant) that predicted puffin cumulative operational displacement impacts equate to of largest BDMPS for Natural England preferred range of 30-70% displacement and 1-10% mortality (note covers Applicants preferred rates of 50% displacement and 1% mortality) for Natural England calculated cumulative totals excluding and including Hornsea 3. Shaded cells are those where 1% of baseline mortality is exceeded

EXCLUDING HORNSEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.09	0.18	0.36	0.46	0.55	0.73	0.91
40	0.12	0.24	0.49	0.61	0.73	0.97	1.22
50	0.15	0.30	0.61	0.76	0.91	1.22	1.52
60	0.18	0.36	0.73	0.91	1.09	1.46	1.82
70	0.21	0.43	0.85	1.06	1.28	1.70	2.13
INCLUDING HORNSEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.09	0.18	0.37	0.46	0.55	0.74	0.92
40	0.12	0.25	0.49	0.61	0.74	0.98	1.23
50	0.15	0.31	0.61	0.77	0.92	1.23	1.53
60	0.18	0.37	0.74	0.92	1.10	1.47	1.84
70	0.21	0.43	0.86	1.07	1.29	1.72	2.14

\* 868,689 individuals for largest North Sea Population scale (from Furness 2015)

- 3.3.10. Puffin are listed as 'Vulnerable' on the IUCN Red List (Birdlife International 2018) and is also listed as Red on BoCC4 (Eaton et al. 2015).
- 3.3.11. There is some evidence that puffin have a lower sensitivity to disturbance compared to razorbill and guillemot (Furness et al. 2013; Bradbury et al. 2014). Therefore Natural England considers that displacement levels will be at the lower end of the 10-70% range. There is considerable uncertainty around what level of mortality would be associated with displacement, therefore we consider it appropriate to consider a range of mortalities from 1-10%. However, on the basis that the projects that have been scoped into the assessment lie in areas of the North Sea that represent low to medium levels of guillemot density during both the breeding (where relevant) and non-breeding seasons (Seabird Sensitivity Mapping Tool), it is assumed that areas of low/medium density will be less important/desirable feeding areas and therefore mortality impacts of displacement from lower quality areas would be lower than displacement from optimal/important areas. Therefore, we do not

expect mortality rates to be at the top of the range considered. Given that 1% of baseline mortality of the largest BDMPS is exceeded only when the mortality rate exceeds 5% and then at the higher end of the displacement range, **we advise a minor adverse impact to puffin from cumulative operational displacement at an EIA scale.**

c. Razorbill cumulative operational displacement

- 3.3.12. We welcome that the apparent mix up of seasons and razorbill abundances highlighted in our Deadline 7 response (REP7-075) have been corrected by the Applicant in REP8-069.
- 3.3.13. Note Natural England have used the abundance figures from the 'alternative analysis' Table 1.15 of Hornsea Project Three Offshore Wind Farm (2019a). Therefore, we have included figures of 630 razorbill in the breeding season (same as the Vanguard Applicant), 2,020 razorbill in the autumn/post breeding season (same as the Vanguard Applicant), 5,024 razorbill in the winter/non-breeding season (rather than the 3,649 used by the Vanguard Applicant) and 1,754 razorbill in the spring/pre-breeding season (rather than the 1,236 used by the Vanguard Applicant) for Hornsea 3 in the cumulative assessment.
- 3.3.14. Therefore, we calculate the total cumulative number of razorbills to be at risk of displacement (including from Hornsea 3) to be 30,176 in the breeding season (same as the Applicant in Table 4 of REP8-069), 34,649 in the autumn/post breeding season (same as Applicant), 22,895 in the winter/non-breeding season (rather than 21,520 as calculated by the Applicant) and 28,194 in the spring/pre-breeding season (rather than 27,676 as calculated by the Applicant). Which equals an annual cumulative total including Hornsea 3 of 115,914 razorbills at risk of displacement.
- 3.3.15. We agree with the annual cumulative total excluding Hornsea 3 of 106,486 razorbills at risk of displacement calculated by the Applicant in Table 4 of REP8-069.
- 3.3.16. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **excluding** Hornsea 3 is between 319 (30% displacement and 1% mortality) and 7,454 (70% displacement and 10% mortality) razorbills. This equates to 0.31-7.24% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.52% of baseline mortality of the largest BDMPS (Table 7). This is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.17. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **including** Hornsea 3 is between 348 (30% displacement and 1% mortality) and 8,114 (70% displacement and 10% mortality) razorbills. This equates to 0.34-7.88% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.56% of baseline mortality of the largest BDMPS (Table 7). Again, this is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.18. Table 7 below indicates that when considering the cumulative totals, either excluding or including Hornsea 3 as calculated by Natural England, for the Natural England recommended range of 30-70% displacement and 1-10% mortality and the predicted impacts against baseline mortality for the largest BDMPS:
- 1% of baseline mortality of the largest BDMPS is not exceed for any displacement scenario (30-70%) at 1% mortality;
  - At 5%-10% mortality, 1% of baseline mortality is exceeded at all displacement rates from 30-70%.

**Table 7** Percent of baseline mortality (using 17.4% average across all age class mortality rates, as used by the Applicant) that predicted razorbill cumulative operational displacement impacts equate to of largest BDMPS for Natural England preferred range of 30-70% displacement and 1-10% mortality (note covers Applicants preferred rates of 50% displacement and 1% mortality) for Natural England calculated cumulative totals excluding and including Hornsea 3. Shaded cells are those where 1% of baseline mortality is exceeded

EXCLUDING HORNSEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.31	0.62	1.25	1.55	1.86	2.48	3.10
40	0.41	0.83	1.65	2.07	2.48	3.31	4.14
50	0.52	1.03	2.07	2.58	3.10	4.14	5.17
60	0.62	1.24	2.48	3.10	3.72	4.96	6.20
70	0.72	1.45	2.90	3.62	4.34	5.79	7.24
INCLUDING HORNSEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.34	0.68	1.35	1.69	2.03	2.70	3.38
40	0.45	0.90	1.80	2.25	2.70	3.60	4.50
50	0.56	1.13	2.25	2.81	3.38	4.50	5.63
60	0.68	1.35	2.70	3.38	4.05	5.40	6.75
70	0.79	1.58	3.15	3.94	4.73	6.30	7.88

\* 591,874 individuals for largest North Sea Population scale (from Furness 2015)

- 3.3.19. Razorbill are listed as 'near threatened' on the IUCN Red List (Birdlife International 2018) and is also listed as amber on BoCC4 (Eaton et al. 2015).
- 3.3.20. While there is some empirical evidence to support the displacement levels for auks we do not know what the likely mortality impacts of displacement are. We therefore consider it appropriate to consider a range of mortalities from 1-10%. However, on the basis that the projects that have been scoped into the assessment lie in areas of the North Sea that represent low to medium levels of razorbill density during both the breeding (where relevant) and non-breeding seasons (Seabird Sensitivity Mapping Tool), it is assumed that areas of low/medium density will be less important/desirable feeding areas and therefore mortality impacts of displacement from lower quality areas would be lower than displacement from optimal/important areas. Therefore, we do not expect mortality rates to be at the top of the range considered.
- 3.3.21. Predicted cumulative mortality predictions exceed 1% of baseline mortality of the largest BDMPS at a 2% mortality rate and between 40 and 50% displacement. **Therefore, we advise a moderate adverse impact to razorbill from cumulative operational displacement at an EIA scale.**

d. Guillemot cumulative operational displacement

- 3.3.22. Note Natural England have used the abundance figures from the 'alternative analysis' Table 1.11 of Hornsea Project Three Offshore Wind Farm (2019a). Therefore, we have included figures of 13,374 guillemot in the breeding season (same as the Vanguard Applicant) and 19,174 guillemot in the non-breeding season (rather than the 17,772 used by the Vanguard Applicant) for Hornsea 3 in the cumulative assessment.
- 3.3.23. Therefore, we make the total cumulative number of guillemots to be at risk of displacement (including Hornsea 3) to be 145,694 in the breeding season (same as the Applicant in Table 7 of REP8-069) and 140,135 in the non-breeding season (rather than the 138,733 calculated by the Applicant in Table 7 of REP8-069). Which equals an annual cumulative total including Hornsea 3 of 285,829 guillemots at risk of displacement.
- 3.3.24. We agree with the annual cumulative total excluding Hornsea 3 of 253,281 guillemots at risk of displacement calculated by the Applicant in Table 7 of REP8-069.
- 3.3.25. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **excluding** Hornsea 3 is between 760 (30% displacement and 1% mortality) and 17,730 (70% displacement and 10% mortality) guillemots. This equates to 0.27-6.19% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.44% of baseline mortality of the largest BDMPS (Table 8). This is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.26. For the Natural England recommended rates of 30-70% displacement and 1-10% mortality, the number of predicted additional cumulative mortalities **including** Hornsea 3 is between 857 (30% displacement and 1% mortality) and 20,008 (70% displacement and 10% mortality) razorbills. This equates to 0.30-6.99% of baseline mortality for the largest BDMPS. At the Applicant's preferred rates of 50% displacement and 1% mortality this equates to 0.50% of baseline mortality of the largest BDMPS (Table 8). Again, this is not insignificant at the upper level of the displacement/mortality range that the SNCBs advise for auks (70% displacement and 10% mortality) and therefore requires further consideration.
- 3.3.27. Table 8 below indicates that when considering the cumulative totals, either excluding or including Hornsea 3 as calculated by Natural England, for the Natural England recommended range of 30-70% displacement and 1-10% mortality and the predicted impacts against baseline mortality for the largest BDMPS:
- 1% of baseline mortality of the largest BDMPS is not exceeded for any displacement scenario (30-70%) at 1% mortality and not until displacement exceeds 50% for 2% mortality;
  - At 4% mortality and above, 1% of baseline mortality is exceeded at all displacement rates from 30-70%.

**Table 8** Percent of baseline mortality (using 14% average across all age class mortality rates, as used by the Applicant) that predicted guillemot cumulative operational displacement impacts equate to of largest BDMPS for Natural England preferred range of 30-70% displacement and 1-10% mortality (note covers Applicants preferred rates of 50% displacement and 1% mortality) for Natural England calculated cumulative totals excluding and including Hornsea 3. Shaded cells are those where 1% of baseline mortality is exceeded

EXCLUDING HORSNEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.27	0.53	1.06	1.33	1.59	2.12	2.65
40	0.35	0.71	1.42	1.77	2.12	2.83	3.54
50	0.44	0.88	1.77	2.21	2.65	3.54	4.42
60	0.53	1.06	2.12	2.65	3.18	4.25	5.31
70	0.62	1.24	2.48	3.10	3.72	4.95	6.19
INCLUDING HORSNEA 3							
Displacement (%)	% Baseline mortality of largest BDMPS*						
	Mortality rate (%)						
	1	2	4	5	6	8	10
30	0.30	0.60	1.20	1.50	1.80	2.40	2.99
40	0.40	0.80	1.60	2.00	2.40	3.19	3.99
50	0.50	1.00	2.00	2.50	2.99	3.99	4.99
60	0.60	1.20	2.40	2.99	3.59	4.79	5.99
70	0.70	1.40	2.80	3.49	4.19	5.59	6.99

\* 2,045,078 individuals for largest North Sea Population scale (from Furness 2015)

- 3.3.28. Guillemot are listed as ‘least concern’ on the IUCN Red List (Birdlife International 2018) and is also listed as amber on BoCC4 (Eaton et al. 2015).
- 3.3.29. While there is some empirical evidence to support the displacement levels for auks we do not know what the likely mortality impacts of displacement are. We therefore consider it appropriate to consider a range of mortalities from 1-10%. However, on the basis that the projects that have been scoped into the assessment lie in areas of the North Sea that represent low to medium levels of razorbill density during both the breeding (where relevant) and non-breeding seasons (Seabird Sensitivity Mapping Tool), it is assumed that areas of low/medium density will be less important/desirable feeding areas and therefore mortality impacts of displacement from less good areas would be lower than displacement from optimal/important areas. Therefore, we do not expect mortality rates to be at the top of the range considered.
- 3.3.30. Predicted cumulative mortality predictions exceed 1% of baseline mortality of the largest BDMPS at a 2% mortality rate and between 40 and 50% displacement. **Therefore, we advise a moderate adverse impact to razorbill from cumulative operational displacement at an EIA scale.**

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