# Deadline 4 Submission
# for
# The Royal Society for the Protection of Birds

**20 October 2015**

**Planning Act 2008 (as amended)**

**In the matter of:**

**Application by SMartWind for an Order granting Development Consent for the**

**Hornsea Offshore Wind Farm – Project Two**

**Planning Inspectorate Ref: EN010053**
**Registration Identification Ref: 10031166**

rspb giving nature a home

## Intertidal issues

1. This section responds to the Applicant's *Summary of Oral Case – Issue Specific Hearing 15 September 2015* (Appendix I to the Response submitted for Deadline III) and Natural England's *Written Submission for Deadline III* that are not addressed in the RSPB's answers to the Examiners Second Round of Questions.

Construction window

2. The RSPB notes the Applicant's statement that the six month intertidal construction window must allow for delays (Appendix I to Deadline III response, para 4.2) but, as we set out in Appendix 1 of our Deadline II response, we consider that this appears to be twice the length it needs to be, based upon the details and timings of the construction works supplied by the Applicant in their ES (*Project Description*, ES, Vol. 1, Ch. 3, para. 3.3.5; *Intertidal Ornithology*, ES, Vol. 3, Ch.4, Table 4.11 and para. 4.11.36) and set out in paras 10 to 12 of Appendix I to the RSPB's Deadline II response where we indicated that the work could be completed in the equivalent of a three month period every year for five years (a total of 15 months versus the 12 months originally proposed for Project 1): as we observed in our Written Representation (at para 10.3) we are unclear why this Project requires up to eight ducts and cables compared with Project 1's four, with attendant impacts upon the duration of the intertidal works. We also note that Phase 1 includes year 3 as a contingency period for the ducting work (Appendix I to Deadline III response, para 4.1). We question whether substantial contingency periods are required for ducting work in years 1 and 2 as well as a contingency construction year. We are keen to explore any opportunities to keep the periods of disruption from work to the least sensitive parts of the construction window, namely the months of June, July and August, which are the months least likely to include birds using the SPA on passage to other areas. We remain of the view that the Applicant still has not detailed the justification for these delays within the 6-month construction period, and await further clarification as part of our ongoing discussion with the Applicant over intertidal construction impacts.

Tide height restriction

3. The RSPB notes the Applicant's response in relation to our proposed tide height restriction (*Summary of Oral Case – Issue Specific Hearing 15 September 2015,* Appendix I to Deadline III response, paras 4.3 to 4.5). We consider that due to the significant extension to the intertidal works from the 2 years envisaged when Project One was being examined to the 5 years now proposed (*Project Description*, ES, Vol. 1, Ch.3, para 3.5.5, x) that a tide height restriction for Project Two alone is justified, notwithstanding the Applicant's submission that it was originally proposed as a cumulative requirement (Appendix I to Deadline III response, para 4.5). The Applicant now envisages that Hornsea Project 2 requires an operation period of up to 5 years in the intertidal zone, compared with a total of 4 years for Projects 1 and 2 together that was envisaged during the Project 1 Examination. The RSPB considers that due to the significantly extended construction window that a tide height restriction is now essential for the Hornsea Project 2 alone in order to keep the disturbance effects to a level that avoids harming the integrity of the SPA. We understand the Applicant's concerns (set out in para 4.4) that such a restriction might impact on their construction programme, and are currently discussing this

further with the Applicant. The Applicant has provided the RSPB further information, but there has not been sufficient time to respond to this new information in detail for Deadline 4, however we will be able to provide an update at the next ISH.

4. The RSPB set out the likely implications of our suggested restriction in its Deadline 3 submission (paragraph 3.4.5), which indicates that such a restriction would amount to only 18% of the available hours within the construction window: we are continuing to discuss with the Applicant how this would impact on the construction programme, and will update the ExA of those discussions at the next ISH.

5. The RSPB welcomes the confirmation by Natural England

> "that a work restriction on tides higher than 6.5 m above Chart Datum (CD) is consistent with other projects in this area." (Natural England, Written Submission for Deadline 3, para 1.3)

We understand this to apply to individual projects, rather than as a cumulative requirement. Consequently, for the reasons stated in the previous paragraph, we are keen to see such a restriction used for all of the intertidal works for Hornsea Project Two.

6. We await the Applicant's response to Natural England's advice as follows

> "Natural England therefore advised the Applicant to ascertain how regular the disturbance to Humber Estuary Special Protection Area (SPA) birds would be and whether there are alternative roost areas available for birds during the Hornsea P2 works. The Applicant may be able to demonstrate that the restriction may not be necessary." (NE, Deadline 3 response, para 1.3)

7. The RSPB also notes the information provided about discussions between Natural England and the Applicant

> "whether there are alternative roost areas available for birds during the Hornsea P2 works" (Natural England, Written Submission for Deadline 3, para 1.3).

8. The RSPB are unaware of any alternative roosts on the Humber Estuary that would actually be used by birds displaced by the construction activities. On the basis of the information that has currently been provided by the Applicants we do not consider that the Applicant is capable of demonstrating that tidal restrictions are not necessary in order to protect the Humber Estuary SPA and its species, due to the risk of disturbance of the intertidal roost by construction activity in the intertidal zone over an extended period of time.

9. At present in the absence of information clearly establishing that such tide height restrictions are not required, the RSPB maintains that the restrictions are essential. Given the RSPB's concerns about the likely impacts of Project 2 alone, the RSPB considers that it is not possible to conclude that additional disturbance from other plans or projects in the area would not also harm the integrity of the SPA.

10. The Applicant supplied the RSPB with further information on 13 October on the intertidal construction issues. This includes consideration of the RSPB's suggestions for tide height and working month restrictions. The RSPB and the Applicant are having ongoing discussions on these issues and the RSPB hopes to be able to update the ExA at the next ISH and make further written submissions on them for Deadline 5.

Phases and timing of Project 2 ducting

11. The RSPB notes the Applicant's response on this issue (set out in paragraphs 4.16 to 4.18 of its *Summary of Oral Case – Issue Specific Hearing 15 September 2015* (Appendix I to the Response submitted for Deadline III)), and Natural England's response (para 1.5 and Appendix 1, *Written Submission for Deadline 3*). The RSPB is grateful for the consideration given to this issue by the Applicant and Natural England, but given the reasons advanced by the Applicant and Natural England's position, does not consider it appropriate to pursue this matter further during the Examination.

## Greater Wash proposed Special Protection Area

12. The RSPB has considered this proposed Special Protection Area (SPA). It is important to note that this is a particularly large proposed SPA and at this early stage there is no information available to the RSPB on the distribution of the species for which the proposed SPA is being considered. However, it is known that both the cable route and boat traffic to and from Project 2 will pass through the Greater Wash proposed SPA.

13. The species for which the SPA is being considered are:
    - little gull;
    - tern species which currently breed within existing SPAs;
    - common scoter; and
    - red-throated diver.

14. The RSPB sets out below some preliminary observations about these species, based upon our understanding of the needs and sensitivities of them as we have suggested in our response to the ExA second questions to see these concerns considered in the Applicant's assessment of any *likely significant effects* from Hornsea Project Two on this proposed SPA and its species.

15. ***Little gull:*** These are known to occur in the general area of the cable route. The RSPB considers it important that the Applicant assesses the potential impacts of cable-laying and other boat traffic upon the proposed SPA populations of foraging terns.

16. ***Foraging Little, Common and Sandwich Terns:*** The RSPB also considers it important that the Applicant assesses the potential impacts of cable-laying and other boat traffic upon the proposed SPA populations of foraging terns.

17. ***Common scoter:*** Kaiser et al. 2006[1] highlighted that common scoter can be flushed (disturbed and caused to fly away) at distances of 1-2km from a disturbance source, so the cable-laying

[1] Kaiser, M.J., M. Galanidi, D. A. Showler, A. J. Elliott, R. W. G. Caldow, E. I. S. Rees, R. A. Stillman and W. J. Sutherland. 2006. Distribution and behaviour of common scoter *Melanitta nigra* relative to prey resources and environmental parameters. Ibis 148: 110-128.

operation and the subsequent use of boats to access the wind farm construction area, and to conduct maintenance once the farm has been constructed, may have an effect upon them.

18. The RSPB notes that Natural England have not expressed concerns about common scoter at this stage but, in light of the limited evidence currently available, we consider that the Applicant should consider possible impacts on this species in light of its sensitivity to disturbance.

19. ***Red-throated diver****:* Peterson et al (2006)[2] in their study of the Horns Rev offshore wind farm in Denmark found that red-throated diver abundance declined to zero within the wind farm area post construction and that the relative abundance of divers was 92% lower within 2km of the wind farm, and 66% lower within 4km. This demonstrates that red-throated divers are susceptible to disturbance and displacement out to 4km.

20. The RSPB notes that Natural England have also stated that it is concerned about impacts upon rafting red-throated diver (NE response to Deadline 3, para 1.58).

21. Therefore the RSPB considers that the Applicants should, at a minimum, consider a 8km corridor surrounding the cable route (i.e. 4km either side of the cable) for red throated divers due to disturbance and displacement effects being known to occur up to 4km away from the project or activity. Kaiser et al 2006 have demonstrated disturbance and displacement of common scoters to 2km so the impacts on scoters could be assessed within the suggested 8km corridor The RSPB also considers it important that the Applicant assesses the potential impacts of cable-laying and other boat traffic upon the proposed SPA populations of little gulls and foraging little, common and sandwich terns. The RSPB is unclear of the basis on which Natural England has apparently concluded that common scoter, foraging terns and little gulls are not of concern.

22. A proposed SPA should receive the same protection as a designated SPA. If a likely significant effect is predicted due to cable laying and maintenance activities, then measures should be taken to mitigate impacts. These could include scheduling activity to times when the affected qualifying species are not present. A proper assessment of the impacts needs to be undertaken now so that the DCO and DMLs can provide appropriate safeguards if required. If the proper assessment is not done now the work will have to be done before the construction work for Project 2 can commence – potentially causing delay and creating uncertainty when detailed work plans are being drawn up.

## Offshore issues

**Introduction**

23. The following provides details of the manner in which the RSPB has reached its conclusions as to the potential impacts of the Hornsea Project 2 development on the Flamborough and Filey Coast SPA and pSPA and additional responses to information submitted by the Applicant not covered by the ExA second round of questions.

24. The figures used below are from the Applicant's own calculations (Appendices N-R of the Response submitted for Deadline 2A) the figures presented by Natural England (Appendices 2-6

[2] Petersen, I.K., Christensen, T.K., Kahlert, J., Desholm, M. & Fox, A.D. (2006) Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. Natural Environment Research Institute

of Written Submission for Deadline 3) and PVAs calculated by the RSPB, but tuned to match those presented by the Applicant, in other words so they produce almost identical results (Appendix M to the Response submitted for Deadline 2A).

25. The RSPB are broadly in alignment with the calculations for displacement and collision, and the apportioning values, presented by Natural England. The points of difference between the RSPB and Natural England are

    - the avoidance rate for the breeding season for gannet (98 as opposed to 98.9%).
    - The displacement mortality shown is considered by NE to be the upper limit of the considered range, the RSPB consider this to be a reasonable figure, not necessarily at the upper limit. Based on the current empirical evidence there is no certainty as to what this upper limit may be, however given the multiple uncertainties involved, the RSPB consider the use of this reasonable value the most helpful means of making an assessment of impact.

26. The RSPB also differs with Natural England in the preferred output metric of the Population Viability Analysis (PVA), although both Natural England and the RSPB preferred metrics are population counterfactuals. The Counterfactual of Population Size (CPS) is the percentage difference between median population sizes with and without the development, after 25 years (the lifetime of the project). The percentage figure adopted represents a comparative decrease in population.

27. The Counterfactual of Population Growth Rate (CPGR) is the change in median population growth rate. This metric is presented following the recommendation of Natural England and is its preferred metric, although the reasons for this have not been given. It is presented in comparison with current population growth rate. If the current rate exceeds that modelled rate, then there would not be an adverse effect on site integrity.

28. It has not been explained fully in the documents provided how this metric has been calculated, in particular whether it represents a single year or the lifetime of the project. For the density independent model, where growth rate will be fairly constant through out the lifetime of the project, this is not a serious problem, and it is a useful contextual metric. For the density dependent model, the growth rate will change throughout the lifetime of the project and therefore a full explanation of how it is calculated, including justification for the parameters used to describe the strength and shape of density dependence, is required. Furthermore, in using the metric to make comparison with current population growth rate it neglects to make the more meaningful comparison with growth rate after the lifetime of the project as the current growth rate will almost certainly change in the future. Indeed the Applicant acknowledges that accurate predictions of future growth are "*almost certainly an impossible aim*". The RSPB place greater reliance on the Counterfactual of Population Size, as this later metric incorporates data over the lifetime of the project. As such, it is our preferred metric for assessing the impacts of developments on bird populations.

29. The RSPB strongly believes that the density independent PVA models provide the most robust output metrics for assessment and this is explained in more detail below. In alignment with Natural England, it believes that there is insufficient evidence of the size and shape of density dependence to rely on the outputs of a population model that includes density dependence.

Detail as to why the RSPB do not accept the arguments put across by the Applicant in Appendix M to the Response submitted for Deadline 2A are set out below.

**Flamborough SPA &pSPA**

30. As Natural England has set out in their Written Representations and the RSPB set out in its Written Representations and Annex III (both submitted for Deadline III) the Flamborough Head and Bempton Cliffs SPA is designated for the following reasons:

> The Flamborough Head and Bempton Cliffs SPA was designated under Article 4(2) of the Birds Directive as an SPA in 1993 due to the presence of 83,370 pairs of black-legged kittiwake (*Rissa tridactyla*), representing 4% of the Eastern Atlantic breeding population.

31. And the Flamborough and Filey Coast pSPA is proposed to be designated under Article 4.2 of the Birds Directive by regularly supporting populations of the following species, in the breeding season:

> 1. Black-legged kittiwake, *Rissa tridactyla*
> 2. Northern gannet, *Morus bassanus*
> 3. Common guillemot, *Uria aalge*
> 4. Razorbill, *Alca torda*

32. And the Flamborough pSPA is proposed to be classified under Article 4.2 of the Birds Directive by regularly supporting important assemblage of birds including the following species, in the breeding season:

> 1. 215,750 seabirds (5 year peak mean 2008 to 2012). Including the following named components*:* black-legged kittiwake, northern gannet, common guillemot, razorbill, northern fulmar. Great cormorant *Phalacrocorax carbo*, European shag *Phalacrocorax aristotelis*, herring gull *Larus argentatus* and Atlantic puffin *Fratercula*

33. It is important to note that the seabird assemblage population for the Flamborough pSPA represents a considerable decline on the population of 305,784 when the seabird assemblage feature was first identified as a potential qualifying feature in the 2001 UK SPA Review.

**Conservation Objectives**

34. As set out in paras 3.25 to 3.31 of the RSPB's Written Representations (submitted for Deadline II) and more specifically in paras 3.29 and 3.30 as follows:

> 3.29 European Commission guidance "Managing Natura 2000" advises[3] that "as regards the connotation or meaning of 'integrity', this can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation. The 'integrity of the site' has been usefully defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'.[4] A site can be described as having a high degree of integrity where the inherent potential for

[3] Paragraph 4.6.3.

[4] See ODPM Circular 6/2005 para. 20.

meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required. When looking at the 'integrity of the site', it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term".[5]

3.30 Commission guidance on "Assessment of plans and projects significantly affecting Natura 2000 sites" includes an "integrity of site checklist"[6] which asks whether the project has the potential to cause delays towards achieving the conservation objectives of the site; interrupt progress towards achieving the conservation objectives of the site; disrupt the factors that help to maintain the conservation objectives of the site; and interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site.

35. Conservation objectives play a key part in the assessment of adverse effects on SPAs and their qualifying species. As the RSPB has noted in its written representations the following Conservation Objectives apply to the Flamborough SPA[7]:

> *With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified ("the Qualifying Features" listed below), and subject to natural change;*
> ***Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:***
>
> - *The extent and distribution of the habitats of the qualifying features*
> - *The structure and function of the habitats of the qualifying features*
> - *The supporting processes on which the habitats of the qualifying features rely*
> - *The populations of the qualifying features, and,*
> - *The distribution of the qualifying features within the site.*
>
> *This document should be read in conjunction with the accompanying Supplementary Advice document, which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.*
>
> ***Qualifying Features:***
> *A188* Rissa *tridactyla; Black-legged kittiwake (Breeding)* (see para 2.2, RSPB WR)

**Breeding Seabird Assemblage**

36. In addition to the consideration of the Flamborough SPA species on their own regard must be had to the additional reason for the pSPA namely the seabird assemblage, to which all of the individual species under consideration contribute. It is important to recognise therefore that any assessment of effects on individual species must then be followed by consideration of all the population declines together, such that the resulting impact on the seabird assemblage also

[5] See too the European Commission Guidance; Wind Energy Developments and Natura 2000, 2011, page 82-83, paragraph 5.5.3.
[6] P. 28 paragraph 3.2.4.
[7] Available here: http://publications.naturalengland.org.uk/publication/5400434877399040 (accessed 12 July 2015).

needs to be assessed. This should occur even before other plans and projects that may contribute to the effects on the SPA and its species are considered.

37. Once drafted the Conservation Objectives will equally apply to the Flamborough pSPA breeding seabird assemblage (as the current Conservation Objectives for the SPA set out above state) as they do to the individual SPA species and therefore a population decline to that assemblage, in our view, is inconsistent with the conservation objective of "***ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring...****The populations of the qualifying features*..."

**SPA/pSPA Considerations**

38. In consideration of whether it is possible to ascertain that there will not be an adverse effect to the integrity of a designated site and its species individually and as part the breeding seabird assemblage the RSPB views the counterfactual in the context of all supporting evidence, contextual information and the Conservation Objectives for Flamborough SPA and what will be the conservation objectives for the Flamborough pSPA as set out above.

**Gannet**

39. The RSPB's concern over the possible impacts to gannets is in part due to the SPA being the only gannetry (breeding colony) in England. In 2015 it supported 12,494 occupied nests (HRA Report Part 2 (ref 12.6), paragraph H.22), concentrated in an approximately 5 km stretch of cliff. Within this area is the RSPB's Bempton Cliffs Reserve. This SPA population accounts for approximately 3.3% of the North Atlantic biogeographic population.

40. This Bempton Cliffs colony has been increasing since the 1980s, more steeply since 2004, with a growth rate of 10.5% per annum between 1986 and 2012, and 12.8% between 2004 and 2012. Other UK colonies, with the exception of St. Kilda which has remained constant, have also grown but at a slower rate.

41. A recent paper (Cleasby *et al.,* 2015) where flight height was measured, rather than estimated, demonstrated that collision mortality could be considerably higher than previous predictions. These predictions were for the Forth and Tay wind farm developments, but the results are analogous with Hornsea 2, and so predicted collision mortality for this development could also be considerably higher. Furthermore, the in combination assessment does not include additional mortality from Forth and Tay wind farms as predicted by Cleasby *et al* (2015), and indeed other wind farms where predictions could also be an underestimate, and therefore the in combination figures are also likely to be low.

42. The PVA carried out by MacArthur Green for the Applicant (Deadline IIa) has indicated that for the recent increases in the Bempton Cliffs population, there would have needed to be high net immigration into colony, most likely from the Bass Rock gannetry. This gannetry would be the main focus for the increased mortality from Forth and Tay wind farms, as predicted by Cleasby *et al.,* (2015), and therefore it is likely that this net migration would be reduced, if not stopped altogether. This would markedly reduce the population growth rate further, alongside the direct

impacts on the population from increased collisions both through the Project alone and in combination.

43. Finally, the high population growth associated with the UK population is likely to be man made, driven by the discards from fishing vessels. Legislation is making such discards illegal, and this is likely to slow, or even curtail the population growth.

44. The mortality figures given by the Applicant include confidence intervals as a measure of uncertainty arising through variability in flight height and bird density. While welcome, this is only a partial indication of the multiple uncertainties implicit in the assessment, and so the values should not be looked at as unlikely, or even as maximum values. They provide a reasonable representation of the range of potential impact.

45. Table 1 shows the gannet mortality predicted as a consequence of Hornsea 2, attributed to the Flamborough pSPA, using the different means of calculation preferred by the Applicant, Natural England and the RSPB. For the project alone these include upper and lower confidence intervals as an indication of variability. In alignment with Natural England, RSPB considers this range to be realistic, rather than precautionary. Table 2 shows these predicted mortalities as the counterfactuals of population size (CPS) after the lifetime of the project, and the counterfactuals of population growth rate, (see above). The RSPB's preferred metric is the counterfactual of population size.

**Table 1. The predicted gannet mortalities as a result of Hornsea Project 2**

| | Alone | | | In combination |
|---|---|---|---|---|
| | Confidence intervals | | | |
| | Lower | Median | Upper | |
| SMartWind | 7 | **15** | 30 | **215** |
| Natural England | 6 | **37** | 90 | **190** |
| RSPB | 10 | **47** | 100 | **270** |

**Table 2. The population counterfactuals predicted by density independent and density dependent PVA as a result of gannet mortalities predicted as a result of Hornsea Project 2. CPS is the Counterfactual of Population Size, CPGR is the Counterfactual of Population Growth Rate. CPS is the RSPB's preferred metric**

| | Alone | | | | In combination | | | |
|---|---|---|---|---|---|---|---|---|
| | Density independent | | Density dependent | | Density independent | | Density dependent | |
| | CPS | CPGR | CPS | CPGR | CPS | CPGR | CPS | CPGR |
| SMartWind | 1.6 | 0.07 | 1.2 | 0.02 | 20.9 | 1.00 | 15.9 | 0.68 |
| Natural England | 4.0 | 0.17 | 2.9 | 0.12 | 18.7 | 0.87 | 14.1 | 0.60 |
| RSPB | 5.0 | 0.22 | 3.7 | 0.16 | **25.5** | 1.24 | 19.5 | 0.86 |

46. PVA modelling predicts a decrease in population size of 5.0% with the Project alone, and of 25.5% in combination. However these values could potentially be larger. As such, in the context of the information above, the international importance of the UK gannet population, the unique nature of the Bempton Cliffs gannetry in England and in light of the Conservation Objectives for designated sites the RSPB is unable to rule out the possibility of an adverse effect on site integrity and therefore

**Maintains its objection on the grounds of potential impact on the gannet pSPA population through the project alone**

**Maintains its objection on the grounds of potential impact on the gannet pSPA population through the project in combination with other projects**

**Kittiwake**

47. The SPA is the only English SPA supporting black-legged kittiwake in numbers of international importance. Between 2008 and 2011 the SPA, including the proposed extension, supported an average of 44,520 pairs of black-legged kittiwakes, which represents 2% of the North Atlantic biogeographic population, but is also a substantial decline on historical population levels. At the time of designation of the SPA, the population estimate was 83,370 pairs. This recent colony trend is represents a population decline of 4.1% per annum, 1987-2008. As such, the SPA is in unfavourable condition.

48. These colony declines are also reflected nationally, as there has been an English population decline of 51% and Scottish of 63%, between 1987 and 2008.

49. Table 3 shows the kittiwake mortality predicted as a consequence of Hornsea 2, attributed to the pSPA, using the different means of calculation preferred by the Applicant and Natural England. The RSPB agrees with the figures preferred by Natural England. For the project alone these include upper and lower confidence intervals as an indication of variability. In alignment with Natural England, RSPB considers this range to be realistic, rather than precautionary. Table 4 shows these predicted mortalities as the counterfactuals of population size (CPS) after the lifetime of the project, and the counterfactuals of population growth rate (CPGR), (see above for explanation). The RSPB's preferred metric is the counterfactual of population size.

**Table 3. The predicted kittiwake mortalities as a result of Hornsea Project 2**

| | Alone | | | In combination |
|---|---|---|---|---|
| | Confidence intervals | | | |
| | Lower | Median | Upper | |
| SMartWind | 3 | **6** | 11 | 146 |
| Natural England | 73 | **134** | 231 | 503 |

**Table 4. The population counterfactuals as a result of kittiwake mortalities predicted as a result of Hornsea Project 2. CPS is the Counterfactual of Population Size, CPGR is the Counterfactual of Population Growth Rate. CPS is the RSPBs preferred metric**

| | Alone | | | | In combination | | | |
|---|---|---|---|---|---|---|---|---|
| | Density independent | | Density dependent | | Density independent | | Density dependent | |
| | CPS | CPGR | CPS | CPGR | CPS | CPGR | CPS | CPGR |
| SMartWind | 0.2 | 0.01 | 0.1 | 0.002 | 3.8 | 0.16 | 1.4 | 0.05 |
| Natural England | 3.5 | 0.15 | 1.3 | 0.04 | 12.5 | 0.57 | 4.8 | 0.16 |

50. PVA modelling predicts a decrease in population size of 3.5% with the Project alone, and of 12.5% in combination. As such, in the context of the information above, the national decline of the UK kittiwake population and in light of the Conservation Objectives for designated sites the RSPB is unable to rule out the possibility of an adverse effect on site integrity and therefore

**Maintains its objection on the grounds of potential impact on the kittiwake pSPA population through the project alone**

**Maintains its objection on the grounds of potential impact on the kittiwake pSPA population through the project in combination with other projects**

**Guillemot**

51. The pSPA colony population has increased by 2.8% per annum between 1987-2008, and its current population is 83,214 breeding adults. The rest of the UK population between 1990 and 2001 also increased, although since 2001, there has been a lack of a clear trend. The UK population is 33.3% of the biogeographical population and 12.9% of the global population.

52. Table 5 shows the guillemot mortality predicted as a consequence of Hornsea 2, attributed to the pSPA, using the different means of calculation preferred by the Applicant and Natural England. The RSPB agrees with the figures preferred by Natural England, although Natural England present these values to be at the edge of their assessed range,(though not the potential maximum), the RSPB considers them reasonable values. Table 6 shows these predicted mortalities as the counterfactuals of population size (CPS) after the lifetime of the project, and the counterfactuals of population growth rate (CPGR), (see above for explanation). The RSPB's preferred metric is the counterfactual of population size.

**Table 5. The predicted guillemot mortalities as a result of Hornsea Project 2**

| | Alone | In combination |
|---|---|---|
| SMartWind | 28 | 290 |
| Natural England | 291 | 1416 |

**Table 6. The population counterfactuals as a result of guillemot mortalities predicted as a result of Hornsea Project 2. CPS is the Counterfactual of Population Size, CPGR is the Counterfactual of Population Growth Rate. CPS is the RSPB's preferred metric**

| | Alone | | | | In combination | | | |
|---|---|---|---|---|---|---|---|---|
| | Density independent | | Density dependent | | Density independent | | Density dependent | |
| | CPS | CPGR | CPS | CPGR | CPS | CPGR | CPS | CPGR |
| SMartWind | 0.8 | 0.04 | 0.5 | 0.02 | 8.1 | 0.36 | 5.0 | 0.19 |
| Natural England | 8.1 | 0.37 | 5.0 | 0.19 | 33.8 | 1.78 | 22.1 | 0.94 |

53. PVA modelling predicts a decrease in population size of 8.1% with the Project alone, and of 33.8% in combination. As such, in the context of the information above, in particular the international importance of the UK guillemot population and in light of the Conservation Objectives for designated sites the RSPB is unable to rule out the possibility of an adverse effect on site integrity and therefore

**Maintains its objection on the grounds of potential impact on the guillemot pSPA population through the project alone**

**Maintains its objection on the grounds of potential impact on the guillemot pSPA population through the project in combination with other projects**

**Razorbill**

54. The pSPA colony population increased by 2.8% per annum between 1987-2008 and the current population size is 21,140 breeding adults. The National population has also increased over this time, though not as markedly. The UK population is an estimated 23.6% of the biogeographic population and 20.2% of the global population.

55. Table 7 shows the razorbill mortality predicted as a consequence of Hornsea 2, attributed to the pSPA, using the different means of calculation preferred by the Applicant and Natural England. The RSPB agrees with the figures preferred by Natural England, although Natural England present these values to be at the edge of their assessed range,(though not the potential maximum), the RSPB considers them reasonable values. Table 8 shows these predicted mortalities as the counterfactuals of population size (CPS) after the lifetime of the project, and the counterfactuals of population growth rate (CPGR), (see above for explanation). The RSPB's preferred metric is the counterfactual of population size.

**Table 7. The predicted razorbill mortalities as a result of Hornsea Project 2**

| | Alone | In combination |
|---|---|---|
| SMartWind | 37 | 44 |
| Natural England | 100 | 364 |

**Table 8. The population counterfactuals as a result of razorbill mortalities predicted as a result of Hornsea Project 2. CPS is the Counterfactual of Population Size, CPGR is the Counterfactual of Population Growth Rate. CPS is the RSPB's preferred metric**

| | Alone | | | | In combination | | | |
|---|---|---|---|---|---|---|---|---|
| | Density independent | | Density dependent | | Density independent | | Density dependent | |
| | CPS | CPGR | CPS | CPGR | CPS | CPGR | CPS | CPGR |
| SMartWind | 4.2 | 0.19 | 1.7 | 0.06 | 4.9 | 0.22 | 2.0 | 0.07 |
| Natural England | 10.9 | 0.50 | 4.5 | 0.15 | 34.2 | 1.83 | 15.4 | 0.55 |

56. PVA modelling predicts a decrease in population size of 10.9% with the Project alone, and of 34.2% in combination. As such, in the context of the information above, in particular the international importance of the UK guillemot population and in light of the Conservation Objectives for designated sites the RSPB is unable to rule out the possibility of an adverse effect on site integrity and therefore

    **Maintains its objection on the grounds of potential impact on the guillemot pSPA population through the project alone.**

    **Maintains its objection on the grounds of potential impact on the guillemot pSPA population through the project in combination with other projects**

**Puffin**

57. Puffin is listed as part of the breeding seabird assemblage of the Flambrough pSPA. The most recent count was in 2008 and estimated 479 pairs. The count in 2000, using comparable methods, estimated 1,315 pairs, a decline of 64%. However Puffin are one of the most difficult seabird species to census as they tuck themselves away in cracks, crevices and burrows. At Bempton these are on 100 meter cliffs that are only viewable from a boat. This means that there can be difference in count records between years that are an artefact of variability in count

conditions and the behaviour of the puffins on the survey days. However with the seasonal and methodological comparability between the counts in 2000 and 2008, the scale of the estimated decline is such that it is clear that decline has occurred to some extent.

58. Due to the difficulties in surveying puffin colonies there are few annual colony counts elsewhere. However it is generally accepted that the UK population increased up to around 2000-2003, with large declines recorded at those colonies with regular counts, such as Farne Islands in Northumberland and the Isle of May in the Firth of Forth since then.

59. Table 9 shows the puffin mortality predicted as a consequence of Hornsea 2, attributed to the pSPA, using the different means of calculation preferred by the Applicant and Natural England. The RSPB agrees with the figures preferred by Natural England, although Natural England present these values to be at the edge of their assessed range,(though not the potential maximum), the RSPB considers them reasonable values. Table 10 shows these predicted mortalities as the counterfactuals of population size (CPS) after the lifetime of the project, and the counterfactuals of population growth rate (CPGR), (see above for explanation). The RSPB's preferred metric is the counterfactual of population size.

**Table 9. The predicted puffin mortalities as a result of Hornsea Project 2**

| | Alone | In combination |
|---|---|---|
| SMartWind | 1 | 8.9 |
| Natural England | 13 | 54.0 |

**Table 10. The population counterfactuals as a result of puffin mortalities predicted as a result of Hornsea Project 2. CPS is the Counterfactual of Population Size, CPGR is the Counterfactual of Population Growth Rate. CPS is the RSPB's preferred metric**

| | Alone | | | | In combination | | | |
|---|---|---|---|---|---|---|---|---|
| | Density independent | | Density dependent | | Density independent | | Density dependent | |
| | CPS | CPGR | CPS | CPGR | CPS | CPGR | CPS | CPGR |
| SMartWind | 1.2 | 0.05 | 1.0 | 0.04 | 10.3 | 0.44 | 8.5 | 0.36 |
| Natural England | 14.7 | 0.65 | 12.1 | 0.52 | 48.2 | 2.69 | 41.6 | 2.15 |

60. PVA modelling predicts a decrease in population size of 14.7% with the Project alone, and of 48.2% in combination. As such, in the context of the information above, the national decline of the UK puffin population and in light of the Conservation Objectives for designated sites the RSPB is unable to rule out the possibility of an adverse effect on site integrity and therefore

**Maintains its objection on the grounds of potential impact on the puffin component of the pSPA breeding seabird assemblage population through the project alone**

**Maintains its objection on the grounds of potential impact on the puffin component of the pSPA breeding seabird assemblage through the project in combination with other projects**

**The Breeding Seabird Assemblage**

61. In addition to the species specific consideration set out above it is the RSPB's view that when combined these effects will result in an adverse effect on the breeding seabird assemblage, as all the species listed are part of that assemblage.

**Density Dependence and Density Independence**

62. The purpose of this section is to explain the difference between density dependent and density independent PVA modelling; why the difference is important and why use of a density dependent PVA model is inappropriate when compared with a density independent model.

63. As previously discussed, density dependence occurs when the population growth rate or demographic rates vary causally with population size or density. When population density is high, increased competition for resources – food, nest sites, mates etc, tends to slow or halt population growth, whilst at lower population density competition tends to be reduced, leading to increases in population growth rates. At very low population density, individuals may be less able to find mates and inverse density dependence can occur.

64. As previously set out in our and NE's submissions our preferred method is density independence due to a lack of robust data and methodology being available to complete precautionary Density Dependent (DD) considerations. This is consistent with the precautionary principle to be applied when undertaking habitats assessment.

65. In the RSPB's oral summary of the ISH (submitted for Deadline III) we explain as following:

*(c) Population modelling*

8.4.17 The RSPB welcomes the fact that the Applicant has conducted PVA modelling of 5 species, presented as Appendix M to the Deadline IIA response, and that these include the RSPB preferred metric, the counterfactual of population size after 25 years.

8.4.18 The population modelling presented relies to some extent on density dependence. Density dependence occurs when the population growth rate or demographic rates vary causally with population size. When population density is high, increased competition for resources – food, nest sites, mates etc, tends to slow or halt population growth whilst at lower population density, competition tends to be reduced, leading to increases in population growth rates. At very low population density, individuals may be less able to find mates; this is inverse density dependence. Density independence is in where there is no link between demographic rates and population size.

8.4.19 Whilst the RSPB welcomes the Applicant's PVA, it contends the only the version of this measure from the density independent model is robust because results from versions that include density dependence are sensitive to the assumptions made about its strength. The true strength of density dependence is unknown and has had to be estimated. This flaw in the use of density dependent models has previously been acknowledged in a report to CEFAS carried out by the authors of the PVA modelling for Hornsea Projects One and Two. This stated *"the most robust approach for modelling is to avoid the temptation to include density dependence, since this is often based on the premise that 'it must be operating therefore it should be included' even if the mechanism is unknown".* The Applicant's modelling of two sets of demographic rates demonstrates that the density dependant model is more sensitive to variation in these rates than the density independent model."

66. And NE confirmed in para 1.30 of its Oral Summary (submitted for Deadline III):

"...there isn't the evidence to select the level or form of density dependence that should be applied to a PVA model. Further the density dependent models presented by the Applicant have

been tuned in an attempt to get the model to have a stable trajectory by modifying the scale of the density dependence operating on the reproductive rate rather than by changing the demographic variables. Natural England has reservations about this approach. Broadly speaking density independent outputs will be the most precautionary, except in the case of depensatory density dependence operating. The effect of assuming compensatory density dependence will be to ameliorate the population effect of the predicted impact - but we have no idea as to the extent of this effect. On this basis Natural England considers that the outputs of a density independent model should form the basis of the assessment, with the acknowledgement that if density dependence is operating on the colony then the impacts may be less than that predicted from the density independent model..."

67. To explain in more detail, while this phenomenon of density dependence is well established, there remains scant data to underpin the modelling of such processes, notably for seabirds, as this modelling requires detailed knowledge of demographic rates or population growth rate across a wide range of densities under otherwise comparable conditions for the species and population of interest. In the absence of such knowledge it is preferable to use a density independent model. As set out above this position is confirmed by Natural England in their Written Submissions for Deadline 3, and by the Applicant's consultants who authored the PVA Report for Deadline 2A – MacArthur Green. As mentioned previously (para 8.4.19, Oral Summary, set out above) these authors stated in an earlier report (MacArthur Green 2013) that "*"the most robust approach for modelling is to avoid the temptation to include density dependence, since this is often based on the premise that 'it must be operating therefore it should be included' even if the mechanism is unknown".* We would add to this that the form and strength of density dependence, as well as the demographic rates upon which it operates, affect the degree to which additional anthropogenic mortality or reduction of reproductive success is compensated for by density-dependent processes.

68. In order to incorporate density dependence into a PVA, a mathematical function is usually added, which links the population size with a demographic rate or rates. Alternatively, density may be assumed to influence population growth rate through an unspecified demographic mechanism. This function will include a number of fixed parameters, which mathematically describe the relationship between population size and demographic rate or population growth rate. These parameters would ideally be estimated with high precision from demographic data from the population of interest.

69. For the Hornsea Project 2 PVA the Applicant has used a Weibull mathematical function to describe the relationship between reproductive rate and population size (Appendix M to the Response submitted to Deadline II). This function describes the strength and shape of density dependence acting on the modelled populations. This function has 3 parameters, *α, β,* and *maxF.* It is important to note that none of these values have supporting empirical evidence, as partly acknowledged by the Applicant ("*the shape and scale parameters were not known for the seabird species assessed"*, para 4, page 170, Appendix 4 to Appendix X to the Response submitted for Deadline 4, Hornsea Project 1).

70. The Applicant argues that there are constraints on the acceptable parameter values of their Weibull function, based upon material drawn from a study of the relationship between seabird breeding success and food supply by Cury *et al.,* (2011). However, the Cury *et al.,* (2011) paper

does not address the density-dependence of breeding success directly at all. The Applicant indicates that the Cury *et al.,* (2011) paper suggests that $\beta$ has a value greater than 1, but do not give a detailed formal argument for this. The Applicant asserts that a realistic value for $\beta$ is 1.2 on the grounds that this generates population trends similar to those observed for a range of seabird species and populations considered by Cury et al., (2011). We note that Cury et al., (2011) do not make any such assessment of the value of $\beta$ in their paper and neither do the Applicant derive any formal estimates of the scale and shape parameters of the Weibull function from the data used by Cury et al., (2011). If, as the Applicant claims, it can derive Weibull parameter estimates from the Cury et al., (2011) data and observed seabird population trends, it must do so formally and provide full details of its analysis and confidence limits for its resulting parameter estimates. The claims made by the Applicant about the form and strength of density dependence are therefore unsubstantiated and should not be used.

71. In addition, there has been no justification from the Applicant for the values used for *maxF* other than that these were based on "expert opinion" as to the estimated biological maximum reproductive rate. Again, it must be noted that an estimate is being used. Defining *maxF* in this way is mistaken since it is not the "biological maximum" that should be used, but rather it should be expected productivity, specific to species and colony, that is likely to occur at very low population density. This will only rarely be the maximum reproductive rate of which individual pairs of the species are capable. It is not clear how *maxF* was derived. In addition, despite this parameter being asserted rather than estimated from field data from the population concerned, the Applicant has provided no information as to how sensitive the outputs of the models are to variation in it.

72. Therefore, the means of describing density dependence used in the Applicant's PVA models relies on parameters that have not been correctly defined or tested. Under such circumstances, the only models that can be relied upon are those versions that use density independent formulations.

Appendix

**JNCC guidance to boat survey training**

The following is from the JNCC website describing the main points of their training for boat surveyors, often known as ESAS (European Seabirds At Sea) training. This is the industry standard training. It is included to demonstrate that it includes no component dealing with the estimation or measurement of flight height.

JNCC is concerned to ensure that marine surveys of seabirds carried out in UK waters follow common standards and are compatible with data collected as part of the JNCC Seabirds at Sea (SAS) and the European Seabirds at Sea (ESAS) databases. To this end, JNCC has periodically organised courses in boat-based ESAS survey methods, and hopes to hold further training courses in the future, but is unable to offer any courses at present.

At the end of the course, the trainer will make his or her assessment, and will pass these details back to JNCC. For a trainee to become accredited, feedback on the course and the trainer must be returned to [XXX]. Once this is received, the trainee will be issued with their certificate and observer number. JNCC recognises that there is sometimes need for a fast turnaround with certification, and as such will endeavour to return certificates and observer numbers as promptly as possible.

If there are having problems setting up a course, or are a trainer looking to fill spaces on a course, the UK ESAS hub yahoo group might be of use. As well as being a means of putting trainers in touch with trainees and vice versa, the hub can be used to ask any pertinent questions, and JNCC will use it to disseminate ESAS and survey related news.

There is now a Yahoo group (UK ESAS hub) that will allow trainers and trainees a more useful means of contacting one another, as well as being a hub for any other ESAS based questions. To use the site, simply email the above address. All emails will need to be passed by the moderator of the site before being made public. This may lead to occasional delays when the moderator is out of the office, but we will do our best to ensure that these times will be made clear to all users of the site.

Training takes the form of at least three days of theoretical and practical instruction by a JNCC-approved ESAS trainer. The trainers will assess their students in five areas of competency: identification skills, understanding of recording methods, basic navigation, eyesight and recording stamina. While all surveyors receive a course completion certificate or letter, the trainers might not be able to pass students in all five competencies. If you are considering taking training, it is essential that you are realistic about your abilities in identification (seabirds and cetaceans), eyesight (visual acuity) and recording stamina (seasickness, fatigue), as these competencies cannot be taught during a training course. In particular, a number of trainees present on courses lack seabird identification skills; when this happens, the trainer finds it virtually impossible to assess the students because they struggle in all practical aspects to the training. If you are in doubt then please discuss this with the trainer.