

From: [Brown, Emma](#)
To: [Hornsea Project Three](#)
Subject: EN010080 Hornsea Project 3: Deadline 7 Submission from Natural England
Date: 15 March 2019 00:02:45
Attachments: [EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX C - Cable Protection Advice Note.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX D - Note on Small Scale Impact.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX E - Ornithology Response.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on Cromer Shoal MCZ.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on Markham's Triangle pMCZ.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on North Norfolk Sandbanks and Saturen Reef SAC.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 Natural England's comments on the RIES .pdf](#)
[JNCC Report 598 Revised-2018 WEB - Monitoring guidance for marine benthic habitats.pdf](#)
[Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf](#)
[NECR164 Non-breeding season populations of seabirds in UK waters.pdf](#)
[SNCB response to MSS avoidance rate report FINAL_251114.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX A - Further Advice on PTA REP5 - 010.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX B - Sabellaria Spinulosa Advice Note.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - Rule 17 Response.pdf](#)
[Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf](#)

Good Evening,

Please find attached Natural England's Deadline 7 Response.

This includes:

- Comments on the RIES
- Rule 17 Response
- ANNEX A: Further Advice on PTA REP 5 – 010
- ANNEX B: Sabellaria Spinulosa Advice Note
- ANNEX C: Cable Protection Advice Note
- ANNEX D: Note on Small Scale Impact
- ANNEX E: Ornithology Response
- Summary of Natural England's Advice on Cromer Shoal MCZ
- Summary of Natural England's Advice on Markham's Triangle pMCZ
- Summary of Natural England's Advice on The Wash and North Norfolk Coast SAC
- Summary of Natural England's Advice on North Norfolk Sandbanks SAC
- Natural England & JNCC joint Technical Guidance Note – Marine Buffers and Margins
- SNCB response to MSS Avoidance Rate Report
- NERC164
- JNCC Report 598

Please note that Natural England has reviewed the MMO's draft Response to the ExA dDCO/DML and are in agreement with their comments. Therefore we will not be providing a separate response on this occasion.

Kind regards,

Emma

This email and any attachments is intended for the named recipient only. If you have received it in error you have no authority to use, disclose, store or copy any of its contents and you should destroy it and inform the sender. Whilst this email and associated attachments will have been checked for known viruses whilst within the Natural England systems, we can accept no responsibility once it has left our systems. Communications on Natural England systems may be monitored and/or recorded to secure the effective operation of the system and for other lawful purposes.

This email has been scanned by the Symantec Email Security.cloud service.
For more information please visit <http://www.symanteccloud.com>



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

HORNSEA PROJECT THREE OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010080

NATURAL ENGLAND

Written Submission for Deadline 7

Natural England's Response to Rule 17 Questions

14 March 2019

Statements of Common Ground		
F2.1	Written questions Q2.2.1 and Q2.2.37 requested the submission of agreed Statements of Common Ground for benthic ecology and offshore ornithology by D6. Please submit these statements using the required headings noting any areas where there will be no agreement.	<p>Natural England provided updated comments to the applicant on both Benthic and Ornithology Statements of comment Ground prior to Deadline 6. We have also held discussions with the Applicant and provided subsequent comments since this time</p> <p>In Natural England’s view there have been versions of these documents that could have been submitted at each deadline as an indication of our progress, however, as these documents are owned by the Applicant, it is for them to submit to Examining authority.</p> <p>The Applicant is seeking to provide SoCGs that are clear and well-structured in line with the ExA’s requests.</p>
General Benthic Issues		
F2.2	You submitted geographical data at D4 [REP4-131, REP4-132] and an associated report by Vanstaen & Whomersley (2015) [REP4-140]. Please submit a text document that contains the justification for assigning a 500m buffer to the reef layer.	Please see “Marine Buffers” doc submitted as part of our D7 submission.
Cable Specification Installation Plan		
F2.3	In your D6 submission [REP6-049] you state that the rock protection within MPAs would be 10% plus 25%. The ExA understands that 25% is the replenishment rate of the maximum design scenario where up to 10% of the cable route within MPAs would require protection during the lifetime of the project. If this is correct, how do you arrive at a figure of 35%? In paragraph 12 of your submission you seek clarification on the maximum design scenarios, can you explain your concerns more fully?	<p>[For clarification the 35% figure was a query, and we received subsequent information from the applicant to clarify this point.]</p> <p>We have considered the issue of 10% vs 25% further in ANNEX C Natural England’s Deadline 7 Submission.</p> <p>Please note that both Natural England and the MMO believe that the 10% of cable protection should be restricted to the construction phase only.</p> <p>There are also some outstanding concerns/considerations in relation to the quantities relating to the 25%. Therefore, we request that should the SoS of state be minded to permit the application as is (i.e. considers there to be no AEol) the parameters of the both the 10%</p>

		and the 25% in both Volume, Area and length are secured in the DCO/DML so that the necessary restrictions are in place.
Cable Trenching Assessment		
F2.4	Please explain why you think that the trenching assessment [REP6-026] should consider more than the direct areas of overlap between the MPAs and the cable corridor as stated in paragraph 9 of your D6 submission [REP6-048].	Natural England has reviewed our previous comment and can confirm that there was an error on our part and we are content with the sections considered by PTA.
F2.5	In paragraph 7 of your D6 submission [REP6-048] you raised questions about how the insights from the trenching assessment would be implemented and incorporated into the Cable Specification and Installation Plan (CSIP). However, the Applicant appears to have set out how this would occur through liaison with an Ecological Clerk of Works and ongoing dialogue. Please explain why you do not think that this would be adequate. What specific measures do you suggest?	Natural England recognises that the Applicant is making upfront assumptions in relation to contractor installation capabilities, before they have a contractor on board. It is recognised that not all contractors will be able to deliver all requirements. Therefore we are seeking assurances on how the applicant will ensure the contractor can deliver on the ground what they are committing to now i.e. is the applicant committing themselves to have a contract tender/s for the work that specifies any particular requirements/tools to achieve desired outcomes.
F2.6	You note in paragraph 10 of your D6 submission [REP6-048] that the Applicant hasn't considered mixed sediments. The ExA notes that they are not listed in table 4.2. Do you have any further clarification from your geologist to be able to elaborate on this point? Do you have any further comments on the adequacy of the ground model?	<p>Please refer to ANNEX A of our D7 submission where we have provided further advice on REP5 - 10.</p> <p>Our Stratigrapher has raised some concerns in relation to the adequacy the ground model particularly in relation to coverage, lithologies, and Ground models (section 3), but is unfortunately without more evidence from the Applicant we are unable to provide further advice in relation to mixed sediment.</p> <p>As a sub feature of Annex I sandbanks it is highly probable that this features will be regularly found along the cable route. Mixed sediment have proven to be challenging for cable installation for other projects and therefore It would be helpful for the Applicant to consider this further.</p>
F2.7	Please explain how seeing the detail of the geotechnical surveys undertaken in 2018 within the Wash and North Norfolk Coast Special Area of Conservation, as set out in paragraph 13 of your D6 submission [REP6-048], would inform your views and help the examination at this stage?	As with other thematic areas such as Ornithology having sight of the survey data can often help us formulate our own views on what the data shows and enable us to have a better understanding on what the applicant has based their assessment on. It would hopefully provide a greater degree of confidence in the findings of the PTA.

F2.8	Please elaborate on the point you made about Edmond Ground in paragraph 15 of your D6 submission [REP6-048]. How does this relate to potential impacts on site integrity.	Please see sections 1 and 3 of ANNEX A of Natural Deadline 7 submission.
F2.9	You have suggested in paragraph 16 of your D6 submission [REP6-048] that the Applicant might not be able to trench through Boulder's Bank because of the stiff clay. This contradicts the applicant's tool assessment which highlights two viable trenching options. What technical evidence or direct engineering experience have you drawn upon to suggest that either mechanical trenchers or cable ploughs would be unsuitable under these circumstances? What are JNCCs views and how are they informed by direct engineering knowledge of the equipment that would be used? If cable trenching has been unsuccessful elsewhere was the trenching equipment the same in all respects as the equipment that would be used in this project?	<p>Please see Further comments on REP5-010 submitted at Deadline 7. (Annex A)</p> <p>Please note that the Applicant themselves have identified that outcropping stiff clay is particularly challenging to install cable through, citing one advantage of the alternative route through The Wash and Norfolk Coast SAC away from Cromer Shoal Chalk Beds MCZ is avoiding known outcropping clay within the MCZ.</p> <p>Whilst Natural England's Stratigrapher has also highlighted the challenges of this sediment, we do not have sufficient engineering knowledge of the specific equipment and or evidence presented in the PTA to comment on the unsuitability of the equipment.</p> <p>Whilst both Natural England and JNCC are aware that stiff clay was a challenge this awareness is derived from industry who have cited challenges with stiff clay as justification to progress alternative installation options which avoid those areas. We are also aware that both Sheringham Shoal and Humber Gateway OWFs have cut through stiff clay in the near shore area some of which is part of the boulder bank formation there is no evidence to demonstrate how analogous that is to stiff clay formations in the offshore environment.</p> <p>And whilst we know that cutting tools were required for those two projects, we do not have sufficient information on the schematics of the tools to make a direct comparison of the equipment presented in the PTA and/or evidence of the impacts of using said tools on designated site features as either outside of a site or monitoring not undertaken. In addition as set out in question F.2.5 The PTA sets out known tools on the market that could undertake the work to the desired outcome. But as with all equipment some manufactures and models are better than others at achieving the desired outcome.</p>

F2.10	<p>You queried the consistency of the chalk in paragraphs 19 and 21 of your D6 submission [REP6-048]. What, if anything, do you infer from the fact that all of the sample cores readily penetrated the chalk up to a depth of 6m? If there was no impedance why would a mechanical trencher not work under these circumstances?</p>	<p>Please see “NE’s Further Advice on PTA” section 2 submitted at deadline 7 in relation to the chalk. Natural England acknowledges that a trencher could work in these habitats as Sheringham Shoal used similar. However, the scale of the impact remains unknown. But we remain cautious because similar CPT tests were undertaken prior to construction for other projects only for the installation tool to fail in burying to the optimum depth. Is this because the wrong tool was chosen/used for the job? Or is it a compromise between repeatedly switching between tools and potential requirement for cable protection therefore choosing a suboptimal tool for one particular habitat in favour for one that is more of a generalist that can install in most habitats</p>
Cable Protection Decommissioning		
F2.11	<p>The Rock Protection Decommissioning Report submitted at D6 [REP6-018] states that rock protection measures could be removed either with a Trailing Suction Hopper or a Backhoe Dredger. If up to 30cm of seabed was removed, would you still conclude that the removal of the rock protection would lead to the permanent loss of interest features? Would this conclusion apply equally to all features or would some have a greater potential for recovery? If so, which ones? Do you have any other comments to make regarding this report?</p>	<p>Please see section 7 ANNEX C of our D7 submission which provides our advice on the limitations of REP6 – 018.</p> <p>Natural England remains of the view that removal of 30cm of Annex I feature below the rock armouring would be a permanent habitat loss.</p> <p>The Annex I habitat that has the greatest potential for recovery is Annex I Sandbanks, but not where there are mixed and coarse sediment sub features. Natural England is of a view that for all other features an AEoI can’t be ruled out.</p>
F2.12	<p>The Applicant has highlighted the fact that some studies suggest a greater frequency of rocky habitats previously occurred in the North Sea and that significant infaunal and epifaunal communities, including sabbelariid reefs, can develop on rock berms [REP1-138]. What are your views? Could the rock protection lead to ‘no net loss’ of biodiversity in its broader sense? What would be the consequences of removing rock protection under those circumstances?</p>	<p>Please ANNEX B of our D7 submission in which Natural England presents our advice on colonisation of Sabellaria spinulosa on rock armouring.</p> <p>Please note that whilst we don’t disagree that the North Sea may have looked very different in the past. The habitats Regulations requirements is to protect the interest features of the sites at the time of designation.</p> <p>Therefore, our advice remains unchanged.</p>
F2.13	<p>In your D6 response [REP6-055] you state that you would welcome the inclusion of a commitment to remove rock protection in the dDCO but you then go on to state that it no longer</p>	<p>Natural England welcomes any commitment to minimise the impacts the impacts of a project.</p> <p>Natural England has previously considered the removal of cable protection as mitigation as the</p>

	provides mitigation and that you have significant concerns over its effectiveness. Why would a condition be justified if it would not provide the necessary mitigation?	impacts would be 'long lasting, but temporary' (Dogger Bank Creyke Beck 2014 and Dogger Bank Teesside 2015). However as set out in our Deadline 1 response we no longer have the confidence that decommissioning can occur and if it can that there wouldn't be wider impacts to the features as a result i.e. permanent removal of the interest feature.
North Norfolk Sandbanks and Saturn Reef Special Area of Conservation		
F2.14	You referred to a 'standard set of analyses' in your D6 response [REP6-47] to a D4 submission [REP4-097]. Please indicate where this standard has been established, whether it has been subject to peer review in an academic journal and the extent to which benthic researchers apply the analysis you favour in the peer reviewed literature. If there is more than one accepted way to analyse benthic data why is the approach used by the Applicant unacceptable?	The SNCBs advice to all developers and marine industries on best practice/standard set of analyses are based on our <i>ongoing</i> consideration of casework and assessment that have been undertaken and all relevant peer reviewed guidance that is out there (best available evidence). And yes these are subject to change as knowledge and understanding evolves. Therefore we are not necessarily saying the applicant is incorrect in their approach, but we are trying to ensure that the competent authorities can undertake an equitable in-combination assessment i.e. comparing apples with apples and the only way to do this is to undertake standard analysis to provide a common currency. The applicant figures could then be used by the competent authority (if considered appropriate) to inform the level of confidence or risk around standard analysis figures.
F2.15	In your D6 response [REP6-47] you stated that the methodology used by the Applicant, which includes the techniques highlighted in Jenkins et al. (2015), was not 'scientifically rigorous'. Could you explain why you consider this to be the case and whether this was related to the sampling strategy, sample processing, measurements or the processing of the resulting data? In your view, what should have been done differently and why?	Natural England has provided the Examiner at D7 with a copy of a JNCC report on undertaking surveys within MPAs. This is provided to help demonstrate the expected survey design and effort required when trying to determine the scale of the impacts and possible mitigation measures required for sustainable development in SACs. Short of doing further surveys, it is our opinion there is nothing that the Applicant can do at this time to address the survey shortfall and therefore their remains scientific doubt. And whilst any pre-construction survey could provide that rigour it doesn't address our current uncertainties
The Wash and North Norfolk Coast		
F2.16	You raised a number of concerns in your D6 submission [REP6-051] in relation to the revised in combination assessment for this site [REP3-024]. You noted that the assessment did not include Race Bank or explicitly consider permanent loss from cable protection. Please explain these comments in more detail bearing in mind, among other things, the content of section 3 and	The details behind the figures included in table 3.1 have not explicitly been included, therefore we are unable to collaborate any figures presented here. Please also note that discussions in relation to Race Bank cable protection are ongoing and currently we are unable to advise that an adverse effect on integrity could be ruled out alone.

	<p>table 3-1 of [REP3-024]. You have also noted a failure to consider the ‘Large Shallow Inlet and Bay’ feature. What did your own data from the MAGIC website show? If there was no overlap with the cable export corridor why should it be considered in the assessment?</p>	<p>Whilst MAGIC provide a boundary for the Large Shallow Inlet and Bay Feature the conservation advise packages and objectives for The Wash and North Norfolk Coast doesn’t make the same distinction. Therefore we don’t believe that it was appropriate to screen this feature out at the tLSE stage, but recognise that an argument could be put forward to demonstrate why there is unlikely to be an AEol.</p>
--	--	---

Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ)

<p>F2.17</p>	<p>In your D6 submission [REP6-050] you recommend further discussions with relevant parties over Measures of Equivalent Environmental Benefit (MEEB). Section 126(5) of the Marine & Coastal Access Act (2009) states that authorisation should not be granted where harm might be caused unless three tests are met which includes arrangements for MEEB. Section 126(9) requires an authority to attach conditions to an authorisation in order to secure MEEB. As a consequence, and given your unresolved concerns, is it the case that consent cannot be granted for the proposal unless MEEB are secured through the dDCO? If this is the case then what would be your advice to the SoS?</p>	<p>If the SoS were to conclude that the impacts on the MCZ were significant and that MEEB are required, we would recommend that further Advice is sought from Defra on the status of the designation (noting that we do not yet have a timetable for the decision on tranche 3 sites) and for further guidance in relation to MEEB.</p> <p>As highlighted in our D6 [REP6-050], there is currently no formal guidance on MEEB, consequently we would recommend that discussions relating to MEEB (should the need arise) include input from the SNCBs, Regulatory Agencies (i.e. MMO and BEIS) and Defra.</p> <p>[It should be noted that the applicant has concluded that the impacts are not significant].</p> <p>The Applicant has not provided information in their application or additional submissions that allows Natural England to understand and advise the potential significance of impacts to the designated features at this stage.</p> <p>Natural England hopes to explore this matter with the applicant over the coming week, with a view to informing our SoCG with the Applicant.”</p>
--------------	---	--

Markham’s Triangle pMCZ

<p>F2.18</p>	<p>Do you consider that the proposed reduction in the maximum design envelope within Markham’s Triangle and removal of cable/scour protection would reduce the risk of hindering the conservation objectives to an acceptable level at this site? If this is not the case, do you also advise that MEEB should be secured for this site?</p>	<p>Natural England’s understanding is that the commitment to reduce the Maximum Design scenario from 24% overlap with the pMCZ to 10.5% is secured within the dDCO/DML.</p> <p>Obviously, the reduction of infrastructure in the site would intuitively reduce the overall footprint of impact within the site. However, as explained further in NE’s Deadline 7 Submission “Summary of Advice on Markham’s Triangle pMCZ” NE/JNCC</p>
--------------	--	--

		<p>would require further information before we could comment on the likely significance of the impact on each feature of the site.</p> <p>It should also be noted that NE would consider cable/scour protection would constitute a permanent impact on the site</p>
F2.20	<p>If Markham's Triangle is designated as an MCZ before the SoS determines the application, is it the case that consent cannot be granted for the proposal unless MEEB are secured through the dDCO? If this is the case then what would be your advice to the SoS?</p>	<p>As Markham's Triangle is a pMCZ it is a material consideration and therefore should be treated in the same way as a designated MCZ.</p>
F2.21	<p>In your D4 response [REP1-131] you raised concerns over inconsistencies in biotope classification compared to Sotheran et al. (2017). Given that the majority of samples were in the eastern part of Markham's Triangle, away from the array area, how can this survey be considered representative and why do the inconsistencies matter? Whilst some samples indicated a different biotope in the western area, the Applicant considers that there would be no significant difference in recoverability given the similarity to what was identified in their own analysis [REP5-008]. How do you respond? Sotheran et al. (2017) states that 'biotope allocation can be subjective and dependent on the opinion of the analyst'. If there is no objective method of assigning biotopes could the differences not simply be the result of subjective similarity thresholds that were used in the cluster analysis?</p>	<p>Whilst NE and JNCC would be happy to answer this question in detail, we would first direct the ExA to consider NE's Deadline 7 Submission: Summary of Advice on Markham's Triangle pMCZ.</p> <p>Should the ExA have any further Questions we would be happy to provide further comment.</p>
F2.22	<p>In your D4 response [REP1-131] you stated that the applicant has not undertaken MCZ assessments in a way that allows the best scientific understanding of the potential impacts. Can you be more specific about what, in your view, needs to be done to enable</p>	<p>Please note, Natural England has provided a summary of our position on Markham's Triangle pMCZ, and Cromer Shoal Chalk Beds MCZ with our Deadline 7 submission.</p>

	the impacts to be more clearly understood for both Markham's Triangle and Cromer Shoal Chalk Beds?	Natural England hopes to explore this matter with the applicant over the coming week, with a view to informing our SoCG with the Applicant.
Cumulative Benthic Effects		
F2.23	In your D4 response [REP4-130] you stated that repetitive impacts on the same benthic footprints had not been adequately considered between different stages of installation and under a phased scenario. The Applicant disputes your position and has stated that no recovery was assumed between different phases of installation [REP1-178] and that the approach to assessing cumulative impacts was no different to other projects [ERP4-012]. In the light of these comments what are your outstanding concerns and are they sufficient to conclude that the cumulative impact assessments are flawed? If so, please suggest how this should be remedied..	<p>Natural England notes that in [REP - 178] the applicant has not anticipated that recovery will happen between both the different construction stages and the phased builds. Therefore any Appropriate Assessment would need to take into account both the spatial and temporal impact to the interest feature/s of the site. As there could 13 years of impact before the site would start to recover and up to 18 before full recovery could occur unless cable protection was used when we believe there would be a permanent habitat change.</p> <p>Therefore we can confirm that we do not believe the cumulative impact is flawed, it is more a recognition of the temporal scale of the impacts</p>
Marine Mammal Site Integrity Plan		
F2.24	You stated at ISH5 [REP6-055] that you were awaiting general guidance on Site Integrity Plans (SIP) from BEIS and the MMO as part of the Review of Consents. Do you have any further information?	BEIS/MMO conducted a second consultation on what the SIP will include. Natural England have responded, but still have concerns that there is no mechanism for the review and oversight of multiple SIPs.
F2.25	You stated at ISH5 [REP6-055] that you required a mechanism to enable regulators to consider the impact of multiple SIPs occurring over varying timescales and that procedural elements need to be in place to ensure noise generating activities do not happen at once. Do you have any suggestions about how this could be achieved bearing in mind the legal scope of the dDCO?	<p>Natural England consider that the current requirement within the dDCO for a SIP to be produced and signed off by the MMO (in consultation with the SNCBs) prior to construction commencing, would be sufficient to address the AEol issue.</p> <p>The point Natural England seeking to raise is that in order for the SIP to be signed off, it would need to be demonstrated that there would not be an adverse effect on site integrity in combination. This would require consideration of multiple SIPs over different timescales, and as yet there is no mechanism in place for this which would presents a potential risk to the project (rather than the harbour porpoise) down the line.</p>
Ornithological Collision Risk Model		

<p>F2.26</p>	<p>The Applicant submitted a revised Collision Risk Model (CRM) analysis at D6 that includes your recommended parameters [REP6-043]. Leaving aside the baseline data issue, please can you indicate precisely which aspects of this analysis accord with your original recommendation and how any relevant results would alter the baseline mortality estimates for gannet and kittiwake, as set out in tables 7.13 and 7.17 of [APP-051] and tables 5.26 and 5.27 of [APP-065]. Please address whether the apportioning outside the core breeding season is realistic and give a reasoned justification for your conclusion. In your D1 submission [REP1-211] you recommend the use of Option 2 but do not specify which generic height data should be used. Please indicate your preferred choice. Please also submit a table showing what CRM parameters you feel should be applied to each species and the publications that justify each of your choices, these should include: proportion flying at risk height, windfarm latitude, nocturnal activity factor, flight speed (m/sec), wing span (m), bird length (m), flight style, proportion of upwind flights, avoidance rate for the basic model and avoidance rate for the extended model.</p>	<p><i>Applicant's revised collision risk modelling</i></p> <p>Natural England has provided precise information on the aspects of REP6-043 that accord with our advice in the Table 1 below and in ANNEX E of our D7 submission, including how these affect the annual mortality relative to the baseline mortality for gannet and kittiwake for comparison with information presented by the Applicant as set out in tables 7.13 and 7.17 of [APP-051] and tables 5.26 and 5.27 of [APP-065] and associated text.</p> <p><i>Apportioning outside the core breeding season.</i></p> <p>Birds are apportioned to individual SPAs throughout the year – outside the breeding season the standard approach is to refer to Furness (2015 - REP4-036) and derive proportions from this. The approach set out in Furness (2015) defines seasonal 'biologically defined minimum population sizes – (BDMPS), and calculates what proportion a particular SPA population constitutes of this BDMPS. (e.g. 4.8% of the total gannet population estimated to be in the North Sea in the post breeding season are estimated to be adults that breed at FFC SPA)</p> <p>During the breeding season the approach in the past (if only one breeding colony is within foraging range) has been to assume either that 100% of birds are apportioned or that 100% of adults are connected (and hence apportioned) to the colony in question.</p> <p>As NE have explained in our response to the first Ex A (REP1-212 Q1.2.51) and in our written representation (REP1-211, Section 7.9-7.15), the outcome of defining a 'core' breeding season (i.e. excluding 'non-core' early/late breeding season months) is that a very low number of birds are apportioned to the colony in the 'non-core' breeding season months. As an example, in the case of Gannet the applicant has defined the 'core' breeding season as April – August. In August somewhere between 40-60+% of birds are apportioned to FFC SPA (depending on the data set used to inform the % of adults observed – in the case of Gannets adults can be aged, so there is no reason to think that immatures are included in this figure). In September, FFC SPA reserve managers/researchers observe substantial numbers of birds to still be present at the breeding colony, (RSPB, pers com, Langston et al 2012) however only 4.8% of birds observed at the project site would be apportioned to FFC. We do not consider this approach to apportioning in the 'non-</p>
--------------	--	--

		<p>core’ breeding months to be a realistic, and more specifically we consider this approach to lead to an underestimation of impact at the SPA in question (FFC) which is contrary to the precautionary principle.</p> <p>The most data driven approach is to assume that all adults observed during the full breeding season (‘core and non ‘core) are apportioned to FFC SPA based on the proportion of adults at the project site (admittedly, for kittiwake and puffin this is ‘adult-type’ birds which will contain an unknown proportion of pre-adult birds). We do not have specific data that will inform the proportion of birds that are non-FFC birds, or the proportion of immatures (in the case of puffin and kittiwake). If this approach is employed it is the case that an unknown proportion of birds will be incorrectly apportioned to FFC SPA, i.e. the impact may be over-estimated.</p> <p>The two approaches then, ‘core’ vs ‘full’ breeding season apportioning lead to inaccuracies – either under or over estimating the impact (respectively). However, of the two approaches, NE consider the latter is more appropriate and justifiable, it makes no assumptions in regards when the ‘core’ months might be (an aspect open to considerable debate) and establishes a precautionary baseline that can be examined via presentation of a range of lower apportioning rates. NE suggested presenting a range of apportioning values (in much the same way that a range of displacement and mortality effects are presented for displacement) acknowledging that there is likely to be a proportion of non-breeding adult FFC birds present, and the applicant has followed this advice and presented such a range in REP4-049 (e.g. Table 1.28 Annex C).</p> <p><i>Generic height data for use with Option 2 of the Band Model.</i></p> <p>See below table for information on the generic flight height data that Natural England advises should be used with Option 2 of the Band (2012) collision model and other CRM parameter information requested.</p>
F2.27	In your D1 response [REP1-211] you use Johnston and Cook (2016) as one of the reasons for rejecting the use of boat-based observations of flight height from earlier Hornsea projects when used in conjunction with digital aerial survey	The issue that Natural England raised in our [REP1-211] response related specifically to the use of flight height distributions generated from boat-based observations with density data derived from digital aerial data when the Extended Band Model is used. The Extended Band model does not use a

	<p>data. Why does this matter when: a) the same study shows that there was only a significant overall difference in height estimation between the two methods for gannet and Sandwich tern; and b) a supplementary aerial survey [REP2-017] indicates that the flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area when recorded by more accurate means.</p>	<p>simple percentage of birds at collision height (PCH) measure, but uses detailed information on flight height distributions in one metre height intervals. Johnston and Cook (2016) found that for most species, the fitted distributions generated from digital aerial survey data differed from distributions previously estimated with boat survey data. The reasons for these differences were not clear and may have included different observation processes and data collection processes resulting in for example, differences in the accuracy of the different survey methods, analytical differences, site-specific differences, survey times in different seasons or times of day, behavioural patterns affected by the presence of boats or planes (Johnston and Cook 2016).</p> <p>So although Johnston and Cook (2016) found that the estimated proportion at potential collision height for the distributions derived from boat survey data and digital aerial data was similar for 5 out of 7 species, the fitted distributions that are needed for the Extended Band Model were not. In other words it is possible to have a similar value for PCH but for the fine scale distribution of flight heights to be different between datasets.</p> <p>As a result Johnston and Cook (2016) concluded that <i>“if the extended Band model is used, the flight height distributions may not be transferable across platforms, i.e. distributions derived from digital aerial survey data should not be used with densities derived from boat-based surveys and vice versa.”</i></p> <p>Natural England do not agree that the supplementary aerial survey [REP2-017] provides evidence to prove that the flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area.</p> <p>The Applicant did not test whether the flight heights from the LiDAR data were statistically comparable with the historical boat based data used in the Applicant’s collision risk modelling. The LiDAR data collected by the Applicant was limited to July and August 2017. Flight heights of species are known to vary by season, so any comparison with historical flight height data would need to account for this. The study did not use a LiDAR scanner synchronised with digital still cameras to measure the flight height of identified seabirds (eg. as in Cook et al 2018), instead the Applicant used the LiDAR data to indicate where in a separate image database to find an image subset, and from there make a manual visual interpretation of</p>
--	--	--

	<p>species. No review of the robustness of this method has been undertaken. Using this method the Applicant was not able to identify all birds to species level in their study – for example the Applicant states that <i>“Thirty-four birds were identified as probable Kittiwake across HOW03. However, it was also considered likely that the majority of birds identified as grey backed gull species from the images (91 birds) were also Kittiwake”</i>. Given that there are differences in the flight height behaviour of the different gull species, being able to accurately identify birds to a species level is important.</p> <p>The Applicant also states that <i>“The findings of this study found a markedly lower proportion of birds at potential collision height than the baseline characterisation surveys at HOW03 (HiDef pers comm.)”</i>, however it is not clear whether this statement refers to the digital aerial baseline data or the historical boat based data. The Applicant states that <i>“In combination with those birds identified as probable Kittiwake (34 birds), only 2.4% (3) of grey backed gulls flying were at potential collision risk. This is markedly lower than the proportion of Kittiwakes baseline characterisation surveys at HOW03 have identified as being at collision risk...”</i>. This statement is confusing as the Applicant has used a PCH value of 0.78% for kittiwake in collision risk modelling at Hornsea Project Three (Table 1.6 [REP-109]) which the Applicant apparently derived from the boat based survey data for Hornsea Project Three. Further, this statement does not seem to indicate that the LiDAR data demonstrate that <i>“flight heights recorded during boat-based surveys are representative of flight behaviour of birds in the array area when recorded by more accurate means”</i> as stated in part b of question F2.27. Using LIDAR is a novel approach to assess height information. The Applicant has stated that the work presented in [REP2-017] was a pilot trial to test a system. Most birds were not identified to species level, therefore it is difficult to draw conclusions on flight heights at a species level. Neither the method, nor the data derived by the Applicant has been reviewed in detail in terms of robustness.</p> <p>Natural England does not believe that the LIDAR methodology has been validated so it would be a leap for the applicant to state that this validates the boat based data in any way. There have only</p>
--	--

		<p>been a few studies with LIDAR data. Until recently there was a widely accepted methodology for using digital aerial survey data to derive flight height which has now been shown to be invalid, so this demonstrates the need to fully evaluate methodologies prior to accepting them.</p>
F2.28	<p>In your D3 response [REP3-075] you state that the flight height data in Skov et al. (2018) are not more widely applicable because the results relate to a single site outside the breeding season. Figure 3.4 of Skov et al. (2018) seems to suggest otherwise. Please explain the basis for your view that flight height measurements in this study did not occur during the breeding season. Given that Pennycuik 1987 relates to a single site why is it more acceptable to use this as the basis for gannet flight speed estimation in a CRM rather than Skov et al. (2018) which has a larger sample size? What evidence do you have to suggest that flight speed varies in a statistically significant manner between spatially distinct seabird populations?</p>	<p>Our comments regarding the ORJIP study were in relation to the flight speed data not flight height data, as the Applicant has proposed use of the Skov et al (2018) data presented on flight speeds but not the data collected for flight heights. Figure 3.4 of Skov et al (2018) shows the fieldwork effort from 1 July 2014 - 14 April 2016 for the ORJIP study. This does include survey effort in months that represent the breeding season for seabird species, but does not indicate if birds were recorded in those months. In the case of kittiwake the majority of rangefinder track samples (which were the platform used to derive flight speed data) came from the non-breeding season months (~84% of rangefinder tracks were from the months September to February), and of those ~16% of tracks that were recorded between March and August, 86% were in March. Further, there are no colonies within foraging range of Thanet for kittiwake (or gannet) so Natural England's view is that any flight speed records from breeding season months for these species will not relate to birds that are engaged in breeding activity in that season. This is the basis for our view that flight behaviour measurements relate to a single site (Thanet OWF) and the data are derived from birds that were not breeding birds with foraging connectivity to a colony, and further were birds that were recorded predominantly in non-breeding season months.</p> <p>Bird flight speeds are highly variable depending on environmental factors, notably wind speed and direction as well as behavioural state e.g. migrating, foraging, and also at different stages of breeding season (e.g. incubation versus chick rearing) e.g. Elliott and Gaston 2005, Pennycuik 1987, Spear and Ainley 2008), all of which have a spatial as well as temporal component.</p> <p>For example, GPS logger data from studies of great black-backed gulls at two sites – one in Swedish Baltic Sea and the other in Danish Kattegat showed a similar distribution of flight speeds, but the mean flight speed for the Swedish data was 45.1 km/hr</p>

	<p>compared to 38.8 km/hr for the Danish offshore data (Gyimesi et al. 2017).</p> <p>Seabird flight speed data for use in CRM with the Band Model have typically been taken from Pennycuik 1987,1997 for gannet and Pennycuik 1987,1997 and Alerstam et al 2007 for kittiwake. The Pennycuik data are based on observations at Foula, Shetland. Foula is an SPA for breeding seabirds including kittiwake.</p> <p>Natural England accepts that there are now additional sources of data available which include information on flight speeds (e.g. from seabird tracking studies) and that a review is needed of appropriate flight speeds and variability around these to use for Collision Risk Modelling. However this needs to be based on all of the available information, and not just a single study or set of outputs. There is no evidence that any single published set of figures is more appropriate than the current set, irrespective of sample sizes and what those “samples” represent (e.g. number of birds, number of tracks, number of segments within tracks, length of tracks etc). There are a number of factors that need to be considered including weather conditions at the time of the studies, methods used to measure flights speeds (e.g. rangefinders, data from tagged birds etc) and methods used to analyse the data and derive flight speed statistics (e.g. how data have been processed for analysis and how flight speed data have been calculated from the recorded information), as well as time of year and location of studies.</p> <p>A further consideration is that the appropriate avoidance rates (ARs) to use in CRM are dependent on other model parameters and flight speed is one of these. The avoidance rates that Natural England advise are used for CRM with Band (2012) were calculated using the flight speed data from Pennycuik/Alerstam et al. and are based on the work in Cook et al (2014) which derived ARs using flight speeds from Pennycuik/Alterstam et al. These ARs are not transferable for use in CRM with the flight speed data from Skov et al. (2018).</p> <p>Natural England note that projects that have generated collision risk figures that use Pennycuik (1987) and Alerstam et al (2007) flight speed data include East Anglia 1, Burbo Bank Extension, Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck, Dogger Bank Teesside, East Anglia 3, Beatrice, Moray East, Nearte na Gaoithe,</p>
--	--

		<p>Norfolk Vanguard, Thanet Extension (noting that the Skov et al (2018) study was based at Thanet OWF) and Hornsea Project Three in their original ES and RIAA, amongst others.</p> <p>Given that the majority of projects that have recently been consented or are in the planning system have used Pennycuik/Alterstam et al. figures and that the ARs that are recommended by the SNCBs for the key species were derived using the Pennycuik/Alterstam et al. flight speed data, Natural England advise that these figures should be used until a full review of all evidence sources has been undertaken.</p>
F2.29	<p>In your D6 submission [REP6-055] you stated that you were in the process of reviewing Bowgen and Cook (2018) and the implications it has for SNCB advice on collision risk modelling parameterisation. Please provide a summary of your conclusions in relation to this study. If the recommendations in JNCC (2014) have changed then please include any revised Apportioning Rate (AR) and flight height values and provide a view on the implications this has for the CRM analysis that informed the ES and RIAA.</p>	<p>The recommendations in JNCC et al (2014) have not changed. As stated in F2.29, the SNCB's are currently reviewing the evidence on avoidance rates presented in the recently published Bowgen and Cook (2018), and its implications for SNCB advice on CRM parameterisation, including avoidance rates (AR). This work is ongoing and will not be completed before the end of the Hornsea Project Three examination.</p> <p>Therefore Natural England's position remains that the appropriate avoidance rates to use with Band (2012) model are those set out in the SNCB guidance note JNCC et al (2014) as provided in advice to Hornsea Three through the Evidence Working Group process, Scoping and PEiR stages of the Application as well as to other projects currently in the planning system.</p>
F2.30	<p>The following publication does not appear to be present in the examination library: JNCC et al. (2014) Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review, 25th November 2014. Please submit a copy.</p>	<p>A copy of this report is provided with our Deadline 7 Submission.</p>

Table 1. CRM Parameter information requested by ExA.

Parameter	Ref	Gannet	Kittiwake	Lesser BBG	Great BBG	Herring Gull
Proportion flying at risk	PCH is not a relevant parameter as NE advise use of Band Model Option 2. This uses the flight height distributions available as a spreadsheet from the authors of					

height (PCH)	Johnston et al (2014a,b) to calculate PCH values within the Band Model. Summaries of these data are available in the corrigendum of Johnston et al (2014a,b).					
Windfarm Latitude	This is not something that Natural England can provide. The developer has specified a latitude for the windfarm in Table 1.4 of Annex 5.3 of their ES [APP-109]					
Nocturnal Activity Factor (NAF)	Natural England Annex C [REP1-211]	1-2	2-3	2-3	2-3	2-3
Flight Speed	Speed data taken from Pennyquick (1987,1997) and Alerstam et al. (2007) and used in Cook et al. (2014). Copied here for reference for ExA. In m/sec	14.9	13.1	13.1	13.7	12.8
Wingspan	Approach is to follow guidance in Band (2012) <i>“these should be drawn from standard reference works, eg Cramp & Simmons (1983) or from BTO Bird Facts”</i> . The Applicant has used “Robinson 2017” which is the BTO Bird Facts data. See Table 1.3 of Annex 5.3 of the ES. These are the same data used in Cook et al 2014. NE accepts the use of these parameters for CRM.					
Bird length	Follow guidance in Band (2012) <i>“these should be drawn from standard reference works, eg Cramp & Simmons (1983) or from BTO Bird Facts”</i> . The Applicant has used Robinson 2017 which is the BTO Bird Facts data. See Table 1.3 of Annex 5.3 of the ES [APP-109]. These are the same data used in Cook et al 2014. NE accepts the use of these parameters for CRM.					
Flight style	Applicant has used F (Flapping) for all species. Cook et al (2014) used G (Gliding) for GX, and F (Flapping) for all other species that are relevant to Hornsea Project Three. The Applicant states that use of Flapping rather than Gliding is more precautionary. Natural England have not tested this.					
Proportion upwind flights	Band (2012) advises <i>“This should be set to 50% unless survey indicates a predominant direction relative to wind, eg for large-scale migration flights.”</i> Applicant has used 50%. Natural England accepted these assumptions for the HOW3 CRM					
Avoidance rate (AR) Basic Band Model	JNCC (2014)	98.9 (98.7-99.1)	98.9 (98.7-99.1)	99.5 (99.4-99.6)	99.5 (99.4-99.6)	99.5 (99.4-99.6)
Avoidance Rates (AR) Extended Band Model	JNCC (2014) and Natural England Annex C [REP1-211]	none	none	none	none	none

References

- Alerstam, T., Rosén, M., Bäckman, J., Ericson, P.G.P., Hellgren, O. (2007) Flight speeds among bird species: allometric and phylogenetic effects. *PLoS Biology* 5(8): 1656-1662.
- Band, W. (2012). Using a collision risk model to assess bird collision risks for offshore wind farms. Report to The Crown Estate Strategic Ornithological Support Services (SOSS), SOSS-02. <http://www.bto.org/science/wetland-and-marine/soos/projects>.
- Bowgen, K. & Cook, A. (2018). Bird Collision Avoidance: Empirical evidence and impact assessments. JNCC Report No. 614, JNCC, Peterborough, ISSN 0963-8091.
- Cook, A.S.C.P., Humphries, E.M., Masden, E.A., and Burton, N.H.K. 2014. The avoidance rates of collision between birds and offshore turbines. BTO research Report No 656 to Marine Scotland Science.
- Elliott, K.H. and Gaston, A.J. (2005) Flight speeds of two seabirds: a test of Norberg's hypothesis. *Ibis* 147, pp 783–789.
- Furness, R.W. (2015). Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Reports, Number 164.
- Gyimesi, A., T.J. Evans, J.F. Linnebjerg, J.W. de Jong, M.P. Collier, R.C. Fijn (2017). Review and analysis of tracking data to delineate flight characteristics and migration routes of birds over the Southern North Sea. Bureau Waardenburg bv / Rijkswaterstaat report commissioned by: Rijkswaterstaat WVL.
- Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH). (2014). Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review. 25th November 2014.
- Johnston, A., Cook, A. S. C. P., Wright, L. J., Humphreys, E. M. and Burton, N.H.K. (2014a). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. *Journal of Applied Ecology* 51, 31–41 doi: 10.1111/1365-2664.12191
- Johnston, A., Cook, A. S. C. P., Wright, L. J., Humphreys, E. M. and Burton, N.H.K. (2014b). Corrigendum. *Journal of Applied Ecology* 2014, 51, 1126–1130 doi: 10.1111/1365-2664.12260
- Johnston, A. and Cook, A.S.C.P. (2016). How high do birds fly? Development of methods and analysis of digital aerial data of seabird flight heights. BTO Research Report Number 676.
- Pennycuik, C.J. (1987). Flight Of Auks (Alcidae) And Other Northern Seabirds Compared With Southern Procellariiformes: Ornithodolite Observations. *J. exp. Biol.* 128, 335-347.
- Pennycuik, C.J. (1997) Actual and 'optimum' flight speeds: field data reassessed. *The Journal of Experimental Biology* 200: 2355-2361.
- Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. & Ellis, I. (2018). ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. United Kingdom. 247 pp.
- Spear, L.B. and Ainley, B.G. (2008) Flight speed of seabirds in relation to wind speed and direction. *Ibis* 139: 234-251.