Deadline 2 submission
for
The Royal Society for the Protection of Birds

21 November 2018

Planning Act 2008 (as amended)

In the matter of:

Application by Ørsted Hornsea Project Three (UK) Ltd for an Order Granting Development Consent for the

Hornsea Project Three Offshore Wind Farm

Planning Inspectorate Ref: EN010080
Registration Identification Ref: 20010702

Contents

Correction to the RSPB's answer to Q1.2.75

Following a query from Ørsted, the RSPB has become aware of a typographical error in our response to Q1.2.75. The maximum foraging range for kittiwake should have been reported as **324km** (not the 342km stated). This error does not affect the substance of our response.

Ørsted were informed of the error on Tuesday 13 November.

The RSPB apologises for any inconvenience this has caused the examination.

RSPB's Outstanding Concerns

Having reviewed all the documents the RSPB offers the following summary of our concerns with the assessment. They include:

- Baseline characterisation and inadequate survey effort
- Collision risk modelling, in particular the use of model options and avoidance rates
- Phenology and the definitions of breeding season
- Apportioning of impacts to pSPA
- The interpretation of population model outputs
- The assessment of cumulative impacts and "corrections" applied

We have detailed these concerns in our Relevant Representation and Answers to the Examiners questions and expand on these in relation to other parties' documents submitted for Deadline 1.

Responses to Answers to the Examining Authority's First Written Questions

Q1.2.38 The RSPB note, and agree with, Natural England's answer to this question (the duration of the ornithological survey required). The RSPB also note the MMO's response. We support their point that "some important periods are only surveyed once and therefore the results may not be representative of the overall use of the site."

Q1.2.40 The RSPB and NE have been consistently clear that 20 months of survey effect is inadequate and that 24 months is an absolute minimum. However, the RSPB have been trying to explore approaches that can come up with a solution to the problem of incomplete survey. We supported the meta-analysis, the primary aim of which was to assess whether 20 months survey would be adequate to account for variability in bird density through examination of the historical data set. The analysis was unable to provide this assurance.

Variability in density will have both a special and temporal component. As a means of addressing the spatial variability the RSPB agree with NE that including the data from the additional 2 cameras will help to properly characterise the degree of variability by increasing survey coverage from 10% to 20% of the project area. The applicant in their answer also agree that this will improve the precision of the estimated density.

Q1.2.42 The RSPB are supportive of NE's position with regards to this; we do not accept that the historical boat-based survey data can be used as part of the impact assessment. The meta-analysis carried out was in part to explore this possibility and from that analysis it could not be concluded that the use of such data was appropriate.

Q1.2.50 The RSPB note the Applicant's response but prefer the use of colony specific data on phenology where available.

Q1.2.51 Please see our answer to Q 1.2.50 above. The RSPB agree with Natural England's response to this question.

Q1.2.52 The RSPB disagreed with herring gull being screened out of the EIA. Herring gull is currently red listed in Birds of Conservation Concern 4. Numbers in the breeding season are relatively high (221 in June 2017) and therefore asked for further consideration to be made in the assessment. The RSPB acknowledges a Clarification Note on herring gull provided by the Applicant which conducts this assessment.

Q1.2.53 Following discussion with the Applicant, the RSPB can now acknowledge that we consider the approach taken to be acceptable.

Q1.2.54 The RSPB welcome the inclusion of some elements of uncertainty in the collision risk assessment arising from variability in density, flight height and avoidance rate. However this is not a complete consideration of uncertainty in the modelling process. Uncertainty in CRM arise from variability in all the input variables and as through observer and model error. All these aspects have not been fully considered, neither has the interaction between these sources of variability. A more robust manner of doing this would be via the recent stochastic Collision Risk model, produced by MacGregor *et al.* (2018).

We agree with the answer of NE to this question with regard to displacement effects.

Q1.2.56 Please see our response to Q1.2.54 above. The RSPB agree with Natural England's response to this question.

Q1.2.57 We disagree with the applicant's answer that "There is no statistically robust way in which these confidence intervals could be combined". Such a method has been described by Masden's (2015) 'proof of concept' stochastic formulation of the Band model. Subsequently, a statistically robust method of carrying out the modelling process incorporating variability in all model parameters had been developed, overseen by a scientific steering group, and published. This is the Marine Scotland Science funded Stochastic Collision Risk model, MacGregor *et al*. (2018).

Q1.2.59 Please see our response to Q1.2.60 below.

Q1.2.60 The RSPB do not agree with the changes in Nocturnal Activity Factor for kittiwake and gannet. The supporting analysis does not include all available data and does not account for the distinction between the definition of daylight as used in the Band Model and the official concept of 'twilight' and 'night', including civil, astronomical and nautical twilight. Nor does it account for the potential interaction between survey timing and diurnal behavioural patterns. Seabird foraging activity often peaks at first and last light. There is a danger that these peaks are not accounted for in the assessment either because they have been removed from the analysis by and overly simplified definition of day and night or because the survey was carried out at a time of much lower activity.

The evidence presented by the applicant for changes in NAFs is inconsistent. For example, three different gannet NAFs are suggested in the three documents cited (MacArthur Green, 2015, Macarthur Green 2018, and Furness *et al.,* 2018, (only the latter of which is peer reviewed)) despite them being by the same authors. This is indicative of the high level of uncertainty in the calculation of NAFs.

The RSPB acknowledge that they accepted a NAF of 2 for kittiwake in the Forth and Tay scoping Advice produced by Marine Scotland, however this was prior to our understanding of the distinctions in the definition of daylight and the degree of uncertainty inherent in the process. For this reason we prefer that alongside a NAF of 2, the results for kittiwake are also presented with a NAF of 3, until such a time as a more realistic range of values can be incorporated into a stochastic CRM.

The RSPB do not accept the Applicant's answer that uncertainty in how well peaks in activity are be captured in the modelling process should form part of the correction factor known as "Avoidance Rate". This simply diverts focus away from the issue rather than providing empirical evidence. The first stage of providing empirical evidence would be for the applicant to publish the timings of the aerial surveys carried out to characterise the site and contrast these with the diel activity patterns described by tracking data. We would highlight figure 3 of Furness *et al*. (2018) which demonstrates peaks in foraging activity of gannets and highlights the risk that brief snapshots surveys may miss considerable amount of activity and therefore seriously underestimate modelled mortalities. As this figure is for diving birds only (i.e. foraging birds) we would also note that these are the birds most at risk of collision (Cleasby *et al.,* 2015).

Q1.2.62 The RSPB refer back to our Deadline 1 response to this question, notably in regard to Skov *et al.,* as included by the applicant as Appendix 41.

Q1.2.72 The RSPB agree with NE's position on mean seasonal peaks, in that the seasons have not been correctly defined and that there is incomplete survey coverage.

Q1.2.75 Please note the correction to the RSPB's answer to this response at the top of this document: the maximum foraging distance for kittiwake should have been reported as 324km. This was for a successful breeding bird in 2017. In further evidence of this foraging range the RSPB would like to add a citation, Wischnewski *et al.* (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines (copy attached to this response).

Q1.2.80 While acknowledging the uncertainty in assessment, the RSPB consider that the probability of a non-breeding bird being associated with a particular colony will be higher the closer to the colony the bird is and that this probability is also higher in proportion to the size of the colony. As such, a relatively simple apportioning calculation, broadly similar to that used in the SNH Apportioning Tool, with a distance-density function could be used to calculate the proportion of non-breeders associated with each SPA and pSPA, such as those identified for razorbill in Annex 3 of HRA report, set against the appropriate biologically defined population.

Q1.2.81 See response to *Appendix 7: Alternative approach to sourcing cumulative and in-combination collision risk estimates - Clarification Note* below.

Q1.2.115 See response to *Appendix 3: Age Class Data Clarification Note* below.

Q1.2.117 See response to *Appendix 9: Population Viability Analysis* below.

Q1.4.20 The RSPB notes the Applicant's response and its proposed means of addressing the potential impacts upon pink-footed geese. We continue to discuss the matter with the Applicant.

Q1.15.6 The RSPB notes the Applicant's response in relation to the Outline Code of Construction Practice (OCOCP). We note that at the point of determination of the DCO that the OCOCP will be fixed and no longer "living". Provided that the mitigation measures secured during the Examination Process are present in the "fixed" version of the OCOCP the RSPB considers that this should address our concerns about the security of the mitigation measures within the document.

Q1.15.7 The RSPB notes the Applicant's response in relation to the Outline Ecological Management Plan (OEMP). We note that at the point of determination of the DCO that the OEMP will be fixed and no longer "living". Provided that the mitigation measures secured during the Examination Process are present in the "fixed" version of the OEMP the RSPB considers that this should address our concerns about the security of the mitigation measures within the document.

Comments on documents submitted by Ørsted at Deadline 1

Due to the number of documents produced by Ørsted that the RSPB wish to comment on we have grouped them into 3 sections:

- Application documents – covering the Development Consent Order, Outline Code of Construction Practice, outline ecological management plan, In-Principle Monitoring Plan and the Habitats Regulations Assessment and Screening and Integrity Matrices;
- Examination documents – covering Ørsted's Responses to Relevant Representations; and
- Ornithological documents – drawing together the assorted supporting documents that were shared with the RSPB prior to and/or submitted at Deadline 1.

Application documents

Revised Development Consent Order

The RSPB has reviewed this document. We note that none of the changes to the document affect our representations upon the previous version.

We welcome the decision of the Applicant to make the document available in a tracked change format.

The RSPB note that the approach to defining the rotor swept area has removed the reference to rotor diameter and replaced it with reference to "a total rotor swept area of 9 km^2" (Schedule 1 – Authorised Project, Part 3 – Requirements, 2(1) and Schedule 11 – Deemed Marine Licence – Generation Assets, Part 2- Conditions, condition 1(1)). This does not alter the way in which the collision risk modelling is undertaken, so our previous comments remain unaffected.

The RSPB welcomes the new provision in Schedule 1, part 3, 10(2) in relation to the Ecological Management Plan which stipulates that it must accord with outline ecological management plan. We consider that this gives greater security to mitigation measures agreed during the course of the Examination Process in relation to the transition of the document from a "live" to a "fixed" version.

The RSPB notes the introduction of reference to an ornithological monitoring plan into Schedule 11, Part 2, 13(1)(l) and 17(2)(c), but is not aware that such a document has yet been produced. We consider it is important that a version of this is submitted to the Examination.

Revised Outline Code of Construction Practice (APP-179) (Appendix 44)

The RSPB has reviewed this document. We note that none of the changes to the document affect our representations upon the previous version.

We welcome the decision of the Applicant to make the document available in a tracked change format.

Revised Outline Ecological Management Plan (APP-180) (Appendix 46)

The RSPB has reviewed this document. We note that none of the changes to the document affect our representations upon the previous version.

We welcome the decision of the Applicant to make the document available in a tracked change format.

In-Principle Monitoring Plan v2.0 (APP-182) (Appendix 2)

The RSPB has reviewed this document. We note that none of the changes to the document affect our representations upon the previous version.

We are disappointed that the Applicant has not made the document available in a tracked change format and request that future versions are.

Examination Documents

Applicant's Comments on Relevant Representations

Annex 7 – Full response to Natural England [RR-097]
The RSPB note the Applicant's response in relation to a Pink-footed Goose Mitigation Plan.

Annex 9 – Full response to Royal Society for the Protection of Birds [RR-113]
The RSPB note the Applicant's response in relation to a Pink-footed Goose Management Plan. We continue to discuss ways to address our concerns. (We also note that in its response to Natural England the Applicant referred to it as a "Mitigation" Plan.)

Ornithological documents

Appendix 3: Age Class Data Clarification Note

The RSPB welcome this clarification note which was produced in response to questions from Natural England, and welcome the inclusion of breeding seasons as defined by Furness (2015), (and note that these are virtually identical to those based on site specific data). However, the presentation of data is incomplete in three ways:

1. The data are for gannet, kittiwake and puffin only. No data are presented for guillemot or razorbill. These data would be informative for considering the appropriate apportionment of non-breeders and particularly juveniles of these species in the assessment.
2. The date are from the historical boat based surveys only and do not include data from the far more recent aerial surveys.
3. The data are for the whole of the former Hornsea zone only. It would be informative to have the data for the Hornsea Three subset of data extracted and presented as well, in particular the more recent aerial survey data.

For these reasons, we do not think that the document provides sufficient detail to fully resolve the issues highlighted by Natural England.

Appendix 4: Analysis of precaution in cumulative and in-combination assessments – as-built scenarios – Clarification Note

Appendix 4 presents revised collision mortalities based on either the correction factors presented in Trinder (2017) (see below for further comments on this report) or the applicant's own calculations. Both are unacceptable. These simplified corrections do not take into account changes in turbine specification, as they are based simply on turbine numbers. Hub and lower tip height are key drivers

of the scale of predicted collision impacts and these are omitted from the calculation and turbine rotor speed, which tends to be greater in more modern turbines is also an important determinant of risk. If an approach to recalculating cumulative collision risk is to be untaken the collision risk modelling for each wind farm should be redone, not an overly simplistic and arbitrary correction factor.

The RSPB also note that the Applicant states that the reduced turbine numbers for several developments have been legally secured by Section 36 consent variations. We would be grateful for details of these agreements as we have been unable to find any other further information.

Appendix 7: Alternative approach to sourcing cumulative and in-combination collision risk estimates – Clarification Note

Appendix 7 presents the predicted cumulative mortalities amended using the corrections described in Appendix 4. It then applies further correction derived from the arguments presented in Appendix 10. The RSPB disagrees with this approach for reasons detailed under the headings for each of these appendices and therefore does not accept the conclusion of Appendix 7.

Appendix 8: Baseline Characterisation Sensitivity Testing Clarification Note

From the outset of Hornsea Project Three the RSPB and NE have been consistently clear that 20 months of survey effect is inadequate and that 24 months is an absolute minimum. However, with the Applicant and Natural England, the RSPB have been trying to explore approaches that can come up with a solution to the problems presented by an incomplete survey. We supported the meta-analysis work, the primary aim of which was to assess whether 20 months survey would be adequate to account for variability in bird density through examination of the historical data set. Regrettably, the analysis was unable to provide this assurance.

In defence of this incomplete survey effort, the Applicant includes a list of other projects that had incomplete data (Table 1.3). None of these, with the exception of Moray West has as many missing *consecutive* months. Moray West is not consented, and during the application both SNH and RSPB objected on the grounds of insufficient survey effort.

In table 1.4 the Applicant seeks to describe the importance of the missing four months in terms of breeding seasons. However they are using an incorrect definition of breeding season, not those defined by site specific data or from Furness (2015).

We do not accept the results of the sensitivity testing to determine whether inter-annual variability would be significant. The analysis is carried out by setting the results against the Applicant's own test for significance, which the RSPB disagree with.

Variability in density will have both a spatial and temporal component. As a means of addressing the spatial variability the RSPB agree with NE that including the data from the additional 2 cameras will help to properly characterise the degree of variability by increasing survey coverage from 10% to 20% of the project area. The applicant in their answer to Q1.2.40 also agree that this will improve the precision of the estimated density.

The RSPB are supportive of NE's position with regards to this; we do not accept that the historical boat-based survey data can be used as part of the impact assessment. The meta-analysis carried out

was in part to explore this possibility and from that analysis it could not be concluded that the use of such data was appropriate.

While the presentation of the results of an alternative hierarchical method are of some contextual interest, the note, like the previous meta-analysis, does not provide sufficient evidence to overcome the argument that 20 months is an adequate survey period.

Appendix 9: Population Viability Analysis

The RSPB welcome the inclusion of this report and in particular the inclusion in the outputs of the RSPB preferred metric, the Counterfactual of Population Size (Green *et al.* (2016) and subsequently endorsed by Cook & Robinson (2017) and Jithal *et al.* (2017)). We also welcome the use of the matched runs approach as recommended by Cook & Robinson (2017) and Jithal *et al.* (2017). However we note that the models used are based on those carried out in 2012 as part of the Hornsea Project One Examination and this approach assumes that there have been no changes in population sizes or productivity in the intervening years. This is of particular concern for kittiwake whose productivity has been in decline at the pSPA since 2009 (Aitken *et al.* 2018). As such we can only have a limited amount of confidence in the conclusions for this species. We recommend that the models are re-run using the most up-to-date population data available.

Furthermore we disagree with how the conclusions of adverse effect on the site integrity of FFC pSPA have been drawn in 3.5, 3.9 and 3.15. These presume there is no adverse effect if population does not decline over the 35 years of wind farm operation. This is to misunderstand the nature of PVA and the counterfactual outputs. The counter-factual of population size approach advocated by the RSPB and the SNCBs identifies the relative impact that the scheme would have upon the population. It is not possible to give an absolute prediction of the population size or trajectory, such as is suggested by the applicant in their conclusion of no adverse effect, because of the long timespan of the potential operation and the large number of confounding variables (e.g. climate change and changes in fishing discard policy) that would need to be included in the modelling approach.

We also note that under 3.9 and 3.15, which refer to kittiwake and guillemot respectively the applicant says there is no “likelihood of the *gannet* population at FFC pSPA declining over a period of 35 years”. We presume this is an error and should read kittiwake and guillemot respectively. Nonetheless, we disagree with the conclusion.

As such we would ask that the PVA are rerun using up to date demographic rates and with proper interpretation of the output metrics.

Appendix 10: Collision Risk Modelling - Updates to Species-Specific Parameters – Clarification Note

This clarification note seeks to update the input parameters of the Band model used in collision risk modelling. The suggested use of empirically derived parameters of greater precision is to be welcomed, but the RSPB is concerned that the focus has been entirely on those parameters that can reduce collision estimates and that there is an over reliance on non-peer-reviewed studies. The key papers are the final report of the ORJIP Bird Collision Avoidance project (Skov *et al.,* 2018) and

Furness *et al.* (2018) paper on gannet nocturnal activity rates, although other developer commissioned reports on nocturnal activity are included.

The ORJIP Bird Collision Avoidance study used a number of largely novel technologies to record bird behaviour at and around a small number of turbines at the edge of Thanet wind farm, located 12km off the coast of Margate, Kent, in the UK. Data were collected between July 2014 to April 2016 and the final project report was published on Thursday 19th April 2018. Whilst, as the report acknowledges, there were considerable limitations to the collected data, it did use a novel approach to shed new light on seabird avoidance behaviours in and around offshore wind turbines. A key limitation of the study was that it was located distant from SPA breeding colonies, approximately 300 km from the nearest UK SPA colonies for gannet and kittiwake at Flamborough and Filey Coast pSPA, and therefore the results have limited applicability to breeding birds whose behaviour will be markedly different to those of non-breeding birds because of the constraints described by central place foraging (where by an animals movements are constrained by the need to return to a fixed location, in this case the nest). Another important limitation of the study is the lack of pre-construction data in the analysis, particular as it relates to the calculation of macro-avoidance.

Flight speed

The RSPB welcome the incorporation of more accurate flight speed figures. The lack of precision in flight speed estimates is an issue that has been highlighted repeatedly by the RSPB, notably during the Hornsea Project Two Examination. However it is important to note that the flight speeds presented are from a single site during the non-breeding season. Such data may not be directly transferable to other sites or to the breeding season due to potential differences in bird behaviour. Until the issue around the transferability of these data are resolved, or until site-specific flight speeds can be produced, it is not acceptable that these data are directly used in the CRM for a different site, during the breeding season.

Nocturnal Activity

The current Nocturnal Activity Factors recommended in Band (2012) are derived from the expert opinion collected by Garthe and Huppop (2004). A review of seabird vulnerability to offshore wind farms (Furness *et al.,* 2013) recommended that no changes be made to the nocturnal activity scores for these species, and an update, including the same authors (Wade *et al*., 2016) maintained this recommendation. Furness *et al*. (2018) recommends changes to the gannet nocturnal activity factor, although the suggested change is different from that the same authors proposed elsewhere (MacArthur Green, 2015, MacArthur Green 2018). While we welcome the Furness *et al*. (2018) review, we are concerned that the mortalities predicted using revised nocturnal activity rates for gannet (and this is applicable to other species) are potentially underestimated because they do not account for the potential interaction between survey timing and diurnal behavioural patterns, whereby peaks in foraging activity at first and last light (see Fig. 3 in Furness *et al.* 2018) will not be accounted for in the assessment if these did not coincide with surveys (the timings of which are currently unknown, but likely to be midday if aerial), and the survey may have been carried out at a time of much lower activity. Thereby the application of the revised nocturnal activity factor recommended by Furness *et al*. (2018) could result in inaccurate underestimates of collision risk.

The applicant also presents a non-peer-reviewed report (MacArthur Green 2018) that includes kittiwake NAFs. Given that the gannet NAFs included in this report were amended during peer review for Furness *et al*. (2018), it is likely that the same will happen for kittiwake, and so this report cannot be relied on as a source for kittiwake NAFs until it is peer reviewed.

The applicant also cites the final report of the ORJIP Bird Collision Avoidance project (Skov *et al.,* 2018), which includes an incomplete analysis of nocturnal activity that does not include species specific data. Furthermore, that report does not fully account for the distinction between the definition of daylight as used in the Band model and with the official concept of 'twilight' and 'night'. This is an issue as the Band (2012) model considers the nocturnal period as between sunset to sunrise and so treats flight activity that occurs at twilight as being within the nocturnal flight period. Evidence from tagging shows that a number of seabirds actively forage at twilight. This will result in an underestimate of bird collision mortality.

Avoidance rate

Avoidance Rate accounts for the discrepancy between predicted collision mortality and actual collision mortality. Such discrepancy arises because of natural variability and uncertainty in the input parameters, such as flight height and bird density, errors in the modelling process, errors in the model itself as well as any avoidance behaviour of the birds in response to the turbines. As such, "Avoidance Rate" is a misnomer; it is not exclusively related to avoidance behaviour *per se.* A number of studies have shown that Avoidance Rate has a disproportionate influence on the number of mortalities predicted by Collision Risk Modelling and there has been considerable debate around what its actual value should be (it is largely estimated) and how it could be better measured and refined. Improving understanding of the true value of the correction factor termed "Avoidance Rate" would allow us to predict collision mortality with greater confidence in the accuracy of models.

However the empirically derived avoidance rates presented in Skov *et al.* (2018) are functionally different from the Avoidance Rates used in the Band (2012) model, as the later incorporate error and variability in relation to both the data used and the model itself (Cook *et al*., 2014), which means that Band model Avoidances Rates will be lower than empirically derived avoidance rates. Indeed the Applicant argues elsewhere that uncertainties around the manner in which peaks in activity are be captured in the modelling process should form part of Avoidance Rate. Debate is ongoing as to how to apply the EARs into the Band model and so it is not clear how, if at all, predicted mortalities would be different if the Skov *et al.* rates were considered.

It is also important to highlight that there are difficulties in the manner in which Skov *et al.* (2018) calculated the Empirical Avoidance Rates, particularly for macro-avoidance. As there were no pre-construction data available for this calculation, the study estimated macro-avoidance by comparing the density of bird tracks within the wind farm to the density of bird tracks in a 3 km buffer around the wind farm. However this calculation assumed that there is no attraction by birds to the wind farm area. Other research has suggested that birds may be attracted to wind farm sites e.g. Vanermen et al (2015). Birds may also be attracted to birds funnelling or otherwise aggregating outside the wind farm. Furthermore it appears that fishing vessels were frequently recorded in the wind farm buffer which would increase the attraction to birds. Previous studies (Krijgsveld et al. 2011) noted gulls being attracted to fishing vessels on the edge of a wind farm and observers noted a similar effect as part of the ORJIP BCA study. In such circumstances, birds will be responding to the

fishing vessels rather than the turbines and this will strongly bias the results. As such little confidence can be placed in this calculation.

Flight height

Given the emphasis put on the results of Skov *et al*. (2018) elsewhere by the applicant, it is perhaps surprising that the flight height data used for the assessment is not derived from this report or referenced anywhere in the documentation. Flight heights in Skov *et al*., were measured using laser rangefinders to a high level of accuracy. Conversely the flight heights used for the collision risk model in the assessment were from surveys where boat based surveyors estimated the heights of birds and allocated them into height bands. For Options 2 and 3 the generic data from Johnston *et al*. (2014) was used. These aggregated data are based almost entirely on boat based estimates, and while the manner in which they were analysed by Johnston *et al*., was statistically robust and the paper that presented them was an important step forward, there was still a reliance on observers ability to estimate the height of a flying bird; a wholly questionable proposition. The ORJIP BCA study has generated the most extensive dataset of observations of seabird behaviour in and around an operational offshore wind farm that is currently available. This includes species-specific data on flight height as measured using laser rangefinders. The use of these data in collision risk modelling would result in greater predicted mortalities, as higher numbers of birds were measured at collision risk height than either the historical boat based surveys estimates from the Hornsea zone or the modelled data from Johnston *et al*. (2014).

The lack of validation for collision risk models has been a key problem for some time (Masden & Cook 2016) and there is some evidence that modelled predictions may be a poor match for observed collision rates (Ferrer et al. 2012; de Lucas et al. 2008).

A key calculation underpinning the Band CRM is that of *pColl*, the probability of collision. This estimates the number of birds at risk of collision by predicting the number of birds passing through the turbine rotor-swept area that will be struck by a rotating blade (Band 2012). The figures presented by Skov *et al.* (2018) allow for the first time a validation of this calculation to be made and suggests that the Band CRM may grossly underestimate the probability of a bird passing through a turbine colliding with the blades. If the site-specific data are used for this calculation, *pColl* will be estimated at between 0.07 – 0.12, depending on the species and approach used. However, the data collected as part of the ORJIP BCA showed six of the 15 birds that crossed the rotor swept area collided, implying a greater *pColl* of 0.4. While this must be caveated with the fact it is a small sample size, it indicates that the Band model may *underestimate* the collision mortalities by a factor of around four. Therefore until further data are available validating the calculation of *pColl* any mortalities calculated by the model must be interpreted with a high degree of caution and the minor adjustments of input parameters to lower predictions is likely to be a distraction from this larger issue.

Appendix 12: Collision risk modelling – herring gull – Clarification Note

The RSPB welcome this clarification note.

Appendix 39: Ornithological Survey Data Coverage Figures

The RSPB has no comments on this document.

Appendix 40: Paper by Furness R.W et. Al. (Environmental Impact Assessment Review 73, 2018, 1-6) (Nocturnal flight activity of northern gannet *Morus bassanus* and Implications for Modelling Collision Risk at Offshore Wind Farms)

Please see our comments under Appendix 10 above.

Appendix 41: Paper by Skov H. et al. (ORJIP Bird Collision and Avoidance Study Final report – April 2018)

Please see our comments under Appendix 10 above.

Appendix 42: Paper by Cleasby I.R. et al. (RSPB Research Report no. 63.) (Combining Habitat Modelling and Hotspot Analysis to Reveal the Location of High Density Seabird Areas Across the UK)

The RSPB has no comment on this document.

Appendix 43: Paper by Trinder M. (The Crown Estate 2017) (Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality)

This paper was produced initially as an internal discussion note by the Crown Estate, but subsequently received wider circulation. Whilst the RSPB appreciate the value of an accurate understanding of "as-built" turbine / wind farm parameters, we also highlight that the approach taken in the report has fundamental limitations as follows:

1. The approach taken in the report is counter, in our view, to the relevant conservation objectives for the affected sites and their species as well as the broader legal conservation requirements and the principles of sustainable development. The industry should be aiming to achieve maximum capacity for least environmental effect, not simply looking to fully exploit the "available" environmental capacity. The report implies the calculated "headroom" for each species is simply expendable. A more appropriate approach would be to simply present the re-established cumulative/in-combination totals, without referring to the available headroom. It is for the decision-maker to make the decision as to whether predicted impacts of any future proposals are acceptable.

2. The report is limited as it does not take account of potential impacts from displacement and emerging concerns regarding barrier effects on migratory birds that are largely unexplored but which are becoming increasingly important due to the scale of development that has and is planned to be deployed.

3. The report assumes that predicted impacts of consented development were acceptable and still are acceptable and uses the consented impacts as thresholds. They should not be used for this purpose. Assessment methodologies and improvements in understanding of seabird ecology are developing all the time whilst new marine protected areas are in development. This new knowledge and understanding is not accommodated within the report. For instance there is no clarity on the accuracy of the underlying baseline data sets, uncertainties within the modelling and expression of confidence intervals for the outputs, as well as the other potential impacts identified above.

4. Perhaps most importantly a number of assumptions are stated throughout the report in a discursive manner, the majority or all stating that existing methodologies of assessment are precautionary and that impacts are likely to be smaller. Taking these two points together there exists the risk of raising expectations amongst the intended audience, in the absence of any evidence, and which could be unfounded. This report simply emphasises the point that adequate monitoring is required to provide an evidence base to inform future assessment and consideration of cumulative/in-combination impacts.

5. Finally, as recognised in the Report (page 2) theoretically a developer could build out to consented capacity sometime after initial construction if they had not reached that capacity, especially where there has been no change in conditions associated with their consent restricting the use of particular turbines. However clearly in situations where fewer turbines have been used but the consented capacity has been reached, or other consent restrictions mean that a new consent would need to be applied for if further turbines are to be built, this is not an issue. Therefore, if the spreadsheet does not already include this, it might be sensible to add columns for the consented capacity, as-built capacity, and the potential further build (consented minus as-built – this would be 0 in cases where the consented capacity has been reached, or could be noted as irrelevant where other consent conditions mean that no further turbines can be built without a new application).

Given these limitations of the MacArthur Green report the RSPB strongly advise that projects do not seek to rely upon it when undertaking cumulative/ in-combination assessments. The report itself notes (on page 3) that for the most recently consented wind farms (those with the highest predicted mortalities) their calculations are indicative only. However, the RSPB would welcome an approach that allows for standardisation in the assessment procedure.

Comments submitted by other parties at Deadline 1

Marine Management Organisation

Written Representation

The RSPB supports the Marine Management Organisation's (MMO) recommendation in paragraph 2.6 that pre- and post-construction monitoring for features of ecological importance should be included in the Deemed Marine Licences.

The RSPB notes the MMO's recommendations in relation to the DCO. We support their recommended amendments to the monitoring and surveys provisions of the Deemed Marine Licence for Generation Asset (Schedule 11, Part 2, 15(1) and (2)) set out in paragraphs 4.12 and 4.13 of their response.

Natural England

Written Representations of Natural England

The RSPB note that Natural England have asked for *at least* 12 months consultation on the pink-footed geese mitigation plan ahead of construction works (paragraph 6.9.2) and support this request.

Annex B – Detailed comments on the Development Consent Order and Deemed Marine Licences

The RSPB note Natural England's request in relation to the in-principle monitoring plan (paragraph 1.5). We repeat it here for ease of reference:

> "1.5. A requirement needs to be added within the In-Principle Monitoring plan to re-run the Collision Risk Modelling as the first step in the post construction monitoring of ornithological impacts. The monitoring conditions within Schedules 11 and 12 may need to be updated to reflect they cover monitoring and modelling of impacts."

The RSPB support this request.

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