



THE PLANNING ACT 2008

THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE)
RULES
2010

East Anglia TWO Offshore Wind Farm

Appendix A12 to the Natural England's Deadline 4 Submission

**NE advice on Red-Throated Divers in the Outer Thames Estuary Special
Protected Area related to Deadline 3 submissions**

For:

The construction and operation of East Anglia Two Offshore Windfarm, a 900MW windfarm which could consist of up to 75 turbines, generators and associated infrastructure, located 37km from Lowestoft and 32km from Southwold.

Planning Inspectorate Reference: EN010078

13th January 2020



Natural England advice on Red-Throated Divers (RTD) in the Outer Thames Estuary Special Protected Area (OTE SPA) related to Deadline 3 submissions

This document is applicable to both the East Anglia ONE North and East Anglia TWO applications, and therefore is endorsed with the yellow and blue icon used to identify materially identical documentation in accordance with the Examining Authority's (ExA) procedural decisions on document management of 23rd December 2019. Whilst for completeness of the record this document has been submitted to both Examinations, if it is read for one project submission there is no need to read it again for the other project.

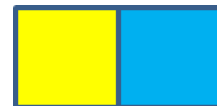
1) Introduction

This document provides Natural England's statutory advice based on points raised in the following documents submitted by the Applicant at Deadline 3:

- REP3-40/41 Offshore In-principle Monitoring Plan
- REP3-49 Displacement of Red Throated Divers (RTD) in the Outer Thames SPA
- REP3-052 Project Update Note
- REP3-070 Applicants' Comments on Natural England's Deadline 2 Submissions
- REP3-073 Offshore commitments
- REP3-074 Best Practice Protocol for minimising disturbance to RTD
- REP3-084 Written Summary of Oral Case (ISH1)

Summary

- i) Natural England welcomes the undertaking of the additional analysis of red-throated diver displacement from the Outer Thames Estuary SPA. But as set out in Natural England's REP3-117 it is unfortunate given Natural England's fundamental concerns, that this assessment wasn't included as part of the original application and/or prior to examination commencing. It is Natural England's view that these issues are better dealt without outside of the constraints of examination.
- ii) Natural England raises fundamental issues regarding the Applicant's modelling approach. These relate to inclusion of aerial surveys without corrections for



observer bias, application of shipping lane data and pseudo-replication for spatial and temporal parameters which is likely to **result in displacement up to 7km being an underestimate.**

- iii) As the Applicant is basing their conclusions on their modelling approach, which we consider requires further consideration and validation, we believe the conclusions in Tables 5, 7 and 10 of REP3-049 to be unreliable. **Until the modelling approach has been validated, and the issues around treatment of the visual aerial surveys have been addressed, Natural England cannot agree with any of the conclusions.**
- iv) The modelled predictions of displacement are completely inconsistent with all empirical studies of red-throated diver displacement recorded at windfarms within or near the Outer Thames Estuary SPA. **Therefore, until such time that these predictions are validated, we consider it wholly inappropriate to assume that the reduction of relative density within the windfarm is 33%.** As stated in MacArthur Green (2019) evidence suggests that displacement of red-throated divers tends to be around 80-100% from within offshore wind farms. **Therefore, until there has been validation of model predictions, the 'effective area of displacement' within windfarms themselves should be considered as the upper end of the range for within windfarm displacement for assessment purposes i.e. 80-100%.**
- v) Whilst East Anglia Two will have less of an impact on red-throated diver in the Outer Thames Estuary SPA than East Anglia One North; we disagree that there will be no displacement from East Anglia Two. **We advise that the questions raised around the modelling approach are addressed before effects from East Anglia Two can be ruled out.**
- vi) There is clear evidence that the distributions of the red throated diver within the site have already changed as a result of windfarms that are already constructed within the Outer Thames Estuary SPA, and it is likely that if East Anglia One North is built just 2km away from the SPA boundary, there will be additional effects on the distribution of red-throated diver. The key issue here is the effect of the presence of additional windfarms inside or close to the boundary of the SPA has on the distribution of divers and how this may impact on the ability of the SPA to support the same number and distribution of birds as it otherwise would. **Given the expected displacement of red-throated divers in the Outer Thames Estuary SPA due to existing (and planned) offshore wind development, further displacement should be avoided.**



- vii) If the proposed windfarm was to be moved 10km away from the Outer Thames Estuary SPA boundary this is likely to negate any significant effects of displacement.
- viii) The approach taken by the Applicant to quantifying “effective habitat loss” ignores the issue that over the whole of the area of overlap defined by whatever buffer is considered appropriate (>10km in our opinion), the density of divers and so the ability of those sea areas to support the qualifying feature **will be reduced** to some degree. Therefore, notwithstanding the disagreement on the modelling outputs Natural England advises that displacement 6-7% of the SPA population is a significant effect.
- ix) **Natural England has set out its legal submission in Deadline 4 Appendix A15 our views on fundamental flaws in the legal position set out by the Applicant in Section 4 and 5 of the Displacement of RTD in the OTE SPA document [REP-049] which should be read along-side the technical advice provided in this response.**

Detailed Comments on Displacement of Red-Throated Divers in the Outer Thames Estuary Special Protected Area [REP3-049]

1) Buffer - Major Concern

1. Natural England project advice: The Applicant states their view of Natural England’s current position, that a robust HRA which assumes that displacement extends up to 10km, is more conservative than our position pre-application. However, this is not the case. We raised the issue that the recent evidence suggests that red-throated diver displacement extends to beyond 10km before application submission as part of the Expert Topic Group meetings in June 2019.
2. In addition, whilst we acknowledge that there is research from the German Bight that indicates red-throated diver displacement is at least to 10km; this was not the only research which informed our position. The London Array final year post construction monitoring report (APEM, 2020), which reported displacement out to 11.5km within the Outer Thames Estuary SPA is of direct relevance and informed our position more than the similar evidence emerging from the German Bight.



3. It is incorrect to state that Natural England's original recommendation was to employ a buffer of 4km. For EIA purposes we recommend that an assumption that there is 100% displacement out to 4km is used. However, since pre-application we have consistently advised that the HRA for the Outer Thames Estuary SPA needs to take account of the evidence that displacement of red-throated divers is in excess of 10km.
4. Adoption of 2km buffer: Natural England welcomes the Applicant's commitment to the provision of a 2km buffer between East Anglia One North and the SPA boundary. However, we note and agree with the Applicant's position that the 2km buffer reduces the impact, but the proposed buffer does not fully mitigate the impact of displacement to an acceptable level.
5. Locating OWFs away from RTD SPAs: We also acknowledge that there will not be complete avoidance within the buffer, instead there is a gradual decline in displacement with increased distance from the windfarm. However, whether the displacement is 7km, as proposed by the Applicant's modelling, or 11.5km as predicted by the London Array monitoring, **the area affected is significant.** The advice in: "*Review of ornithology constraints for Offshore Wind Leasing in Areas 3 (Yorkshire Coast) and 4 (The Wash)*" Report to The Crown Estate (March 2019) by MacArthur Green states:

"Since offshore wind farms can displace red-throated divers up to distances that in some extreme cases appear to exceed 10 km from the turbines, it may be prudent to trim the inshore boundary of Regions 3 and 4 so that these are a minimum of 10 km from the outer edge of Greater Wash SPA."

6. Natural England agrees with this advice, and although this is in the context of the Greater Wash SPA, we advise that the same approach needs taken here to avoid an Adverse Effect on Integrity (AEol) of the Outer Thames Estuary SPA.

2) Visual Aerial Surveys - major concern

7. A key issue is that the 2002-2008 visual aerial data set appears to be treated the same as 2013 and 2018 survey data that was collected using digital photographic aerial methods. The visual aerial survey represents an accurate distribution of red-throated diver at the time when all (apart from one) offshore wind farms had not



been constructed. However, it cannot be considered to be an accurate reflection of the absolute numbers of red-throated diver in the SPA at the time, due to visual aerial methods under-estimating true numbers. APEM (2010) carried out comparisons between visual and digital survey methods and reported that digital stills reveal up to 6.5 times as many birds as the visual spotter method.

8. Therefore, the Applicant has not accounted for the likelihood that, in comparison with post construction surveys (conducted by digital aerial photography), the abundance figures in and around the windfarm footprints during the pre-construction period are artificially low due to the use of visual aerial survey methods at that time, there is a risk that the predicted level of displacement will be significantly underestimated.
9. Whilst we recognise that the APEM (2020) monitoring is of course a smaller area, and uses a number of environmental co-variates, the key issue is the baseline surveys in 2009 were undertaken using digital aerial surveys, and therefore comparable to post construction surveys which used the same survey platform. In contrast, the Applicant's approach combines data from different survey platforms, but without considering any correction factors to correct for the perception bias in the earlier visual surveys.
10. Recognising the change in survey platform as an issue Natural England recommended that an approach that considered change in relative densities inside the windfarm footprint and outside needed to be considered.

3) Pseudo-replication – major concern

11. It is unclear how the strengths of effects are being defined. This is particularly in lieu of the fact that there was uncertainty around the partial plot of distance to windfarm in regards to the confidence limits around the presented relationship. As it stands, the confidence limits around the partial relationship between abundance and distance to wind farm includes a straight line through 0 on the y-axis, which suggests that the actual relationship as presented may not exist, or may not be strong.
12. We note that the relative diver distributions in Appendix 1 figure 6a and 8a are very similar. The remarkably similar distributions between factuals and counterfactuals



(Appendix 1 figures 7 and 8) are likely due to the fact that the covariates used are mostly static, and if distance to windfarm is not strongly influencing predictions, removing it or changing it as a parameter should not greatly impact predictive output. Counterfactuals were created here to act as a baseline for which to compare model predictions. This was done by simply changing the distance to windfarm parameter to represent the environment between 2002 and 2006. However, a year covariate and a spatial smoothing covariate were also included in the model. The concern is that there is a signal in the spatial and year parameters that confounds the distance to windfarm parameter because distance to windfarm is a covariate that is made up by the year and spatial elements, thus potentially incorporating an element of pseudo-replication in the model. Therefore, the impact of the windfarms, which is captured by inclusion of the year and spatial parameters, is being passed to the counterfactual. It is therefore unlikely that they actually represent a true baseline to compare against. It is recommended that this potential source of pseudo-replication be investigated and removed if possible.

4) Displacement effect – major concern

13. The predicted abundance of RTD displayed in Tables 1 and 2 of REP3-049 is surprising. The comparison of the empirical data in the Applicant’s review (in Table 1.1 Appendix 2) stated the level of displacement within the actual windfarm footprint ranged typically between 78% and 95% displacement (Table A below includes all the studies from within or near the Outer Thames Estuary SPA).

Table A: Results of studies near or within the Outer Thames Estuary SPA that had reported effects on red-throated diver within the windfarm footprint

Study	Location	Reported effects on red-throated diver within the offshore wind farm
Percival (2013): Thanet Offshore Wind Farm Ornithological Report 2012-13	Near Outer Thames Estuary SPA	Compared to the preconstruction phase, within the offshore wind farm an 82% decline in red-throated diver abundance was recorded during construction, and 73% during operation.
Gill et al. (2018): Greater Gabbard offshore wind farm	Near Outer Thames Estuary SPA	Compared to the 0-4km buffer around the offshore wind farm, red-throated



<p>Elston et al.(2016): Greater Gabbard Offshore Wind</p>		<p>diver densities within the offshore wind farm declined 83% between preconstruction and construction.</p>
<p>Percival & Ford (2017): Kentish Flats Offshore Wind Farm Extension: Ornithological survey annual report, October 2016 – March 2017.</p>	<p>Within Outer Thames Estuary SPA</p>	<p>The mean encounter rate within the offshore wind farm dropped from 0.55 birds/km prior to construction, to 0.03 in the first operational year and 0.13 in the second operational year. This was equivalent to reductions of 95% and 76% on the preconstruction baseline.</p>
<p>NIRAS Consulting (2016): Gunfleet Sands 1&2 Offshore Wind Farms</p>	<p>Within Outer Thames Estuary SPA</p>	<p>Survey results indicated a 90% reduction in recorded abundance of divers within the offshore wind farm between preconstruction and construction/operation. Statistical analysis indicated the difference between years was significant.</p>
<p>Percival (2014): Kentish Flats Offshore Wind Farm: Diver Surveys 2011-12 and 2012-13</p>	<p>Within Outer Thames Estuary SPA</p>	<p>Displacement of red-throated divers from within the offshore wind farm was apparent in all seven years of operational monitoring. The magnitude of this effect was calculated to be between 89% and 94% depending on the comparisons undertaken.</p>
<p>McGovern et al. (2020) Final Ornithological Monitoring Report for London Array Offshore Wind Farm</p>	<p>Within Outer Thames Estuary SPA</p>	<p>The proportion of divers displaced from the London Array footprint was estimated to be approximately 78% and 55% for during and post-construction respectively.</p>



14. **Therefore, we advise that Tables 1 and 2 of REP3-049 which indicate that the within windfarm reduction is only ~33% is not consistent with the empirical studies carried out in or near the Outer Thames Estuary SPA (Table A above).**
15. The Applicant's modelling has not found a similar diver response (reported elsewhere) when considering within the windfarm area. Other studies in the Outer Thames Estuary, the Greater Wash and the German Bight have all reported much greater levels of displacement within the windfarms themselves. Whilst we agree that results in one region are not automatically transferable to another region; this is not the situation here. **Empirical data from windfarms impacting upon the same SPA namely the Outer Thames Estuary SPA are demonstrating significant differences in diver responses when compared to this (theoretical) modelling.**
16. Contrary to the Applicant's opinion, the observations do not appear to be similar to the London Array post construction monitoring (APEM, 2020). Firstly, the London Array data; although lower than many of the studies in Table A, a 55% reduction within the windfarm is still considerably higher than the 33% found by the Applicant's modelling approach. This disparity, together with the fact that no cross-validation efforts were made to determine the predictive performance of the model, leads Natural England to question whether **the model is underestimating the displacement effects**

5) Validation of Model predictions – major concern

17. The issue of the un-validated model prediction, that the percentage reduction within the windfarm is approximately 33%, does not relate to East Anglia One North because the proposed array is located outside of the SPA. However, it does mean the total displacement that the SPA is already subjected to is massively underestimated.
18. As stated above, there are questions over the modelling approach. In particular, the modelling approach does not include any attempt to validate the model predictions, for example by: i) comparison of modelled densities of divers in certain places of particular interest e.g. in and around windfarms with the actual densities recorded or, ii) formal cross validation by exclusion of some of the survey data from the dataset used to construct the models and comparison of the densities



generated by those models with the withheld density data. We consider that model validation tests of this kind are necessary to establish the robustness of the model's predictions and so the degree of confidence can be placed in the findings. Once confidence has been established in the modelling approach, then an assessment of the extent of area affected and numbers of birds predicted to be displaced can be undertaken.

19. In addition, we note that the modelling undertaken in the German Bight (Vilela 2020) uses a more sophisticated Bayesian approach, which may also be appropriate for these projects and help address concerns

20. Given the questions around the validity of the modelling approach we suggest that a range of displacement figures are presented, based on:

- varying spatial extents of effect (including 7km from the Applicant's modelling, but also up to 12km, to reflect the evidence from the London Array monitoring).
- varying magnitudes of displacement and associated gradients with increasing distance (including the Applicant's modelled displacement of 33% within the windfarm footprint, associated gradient out to 7km and up to 100% within the windfarm area and associated gradient out to 11.5km to reflect the empirical studies that have reported much higher levels, typically 80-100% within windfarm footprints).

6) Conservation Objective to maintain diver abundance – major concern

21. As stated in REP1-172, the mortality rate as a result of displacement is not the main the area of concern to Natural England in relation to the Habitats Regulations Assessment. Even if no birds died as result of displacement, the fact remains that the distribution of the divers within the SPA has been changed and will most likely be further changed by the current developments, probably (given the absence of evidence of habituation) on a continuing/lasting basis, and the area of SPA that can support divers will have been reduced.

22. In addition, it is impossible to make direct comparisons between the abundance estimates due to the different survey platforms. When the Outer Thames Estuary SPA was classified in 2010, the best population estimate of the overwintering red-



throated diver population was 6,446 individuals (1989 to 2006/07, peak mean estimate). Technology and survey techniques have vastly improved since, and digital aerial imagery has become the new survey standard (HiDef Aerial Surveying Limited 2018). This has allowed more accurate counts of red-throated diver, and suggests that previous counts may have been underestimates (Goodship et al 2015). There is no way of knowing what the abundance of red throated divers in the SPA would have been prior to the construction of any of the windfarms if those surveys had been carried out using digital photographic means. Therefore, there is insufficient robust data to state confidently what impact the OWF's have had on RTD displacement and mortality and any impacts are inconsequential due to the 'apparent' changes in population. Natural England's advice is to consider the changes in relative abundance inside and outside of the windfarm areas. This will require an alternative approach to treating the visual and digital aerial data in the same way. Furthermore, by focussing on the mortality arising from displacement and the impact of that on population abundance, the assessment misses the key issue which is the need to reduce the frequency, duration and / or intensity of disturbance

7) Conservation Objective to maintain diver distribution – major concern

23. We note the Applicant's point that the number of divers that would be displaced from within and around East Anglia One North/East Anglia Two may be relatively small compared to the total number of divers recorded across the entire SPA. However, maintaining the abundance of divers is not the only Conservation Objective; there is also the objectives to maintain the distribution of divers, and to maintain the area of supporting habitat. The percentage of the SPA affected is significant. For East Anglia One North/East Anglia Two alone out to 8km is 9,019.56 hectares (2.3%), 10km is 12,867.84 hectares (3.28%). In combination with other plans and projects already built, the area of the SPA affected by some degree of displacement at, 8km is 158,033 hectares (40.2%) and 10km is 195,691 hectares (49.86%). We acknowledge that there is not complete displacement, but a gradual decline in the displacement levels the further divers get from a windfarm. These calculations do not account for the 2km buffer at EA1N, but there is still a significant area of the SPA subject to a change in the distribution of divers and a further reduction in available habitat when accounting for the buffer.



24. The Applicant suggests that a similar amount of divers are predicted to be displaced compared to their modelling approach when the alternative approach of 100% displacement of birds out to 4km is considered. With regard to this, firstly there are questions over whether the Applicant's modelling approach underestimates the levels of displacement due to not accounting for the change in survey platform. Therefore, the level of displacement is likely to be underestimated due to the issue of not correcting for the different survey platforms. Secondly, the SPA Conservation Objectives are not simply about maintaining abundance targets. There are also objectives to maintain the distribution of the interest feature throughout the SPA, and to maintain the extent of supporting habitat. Finally, the post construction monitoring from London Array reports that the number of divers displaced in a gradient out to 11.5km was greater than the assumption that 100% of birds were displaced up to 4km.
25. As previously stated, even if no birds die as a result of the displacement, a separate but equally important issue, dictated by the full suite of conservation objectives for the SPA is the continuing (and apparently permanent) change in distribution of the interest feature. **This compromises the ability of the supporting habitat within the SPA to continue to support the same numbers and distribution of birds as before.**

8) Ecological consequences of displacement – major concern

26. We acknowledge that the likely consequences (lethal or otherwise) of displacement that results from the concentration of more birds into a smaller area of sea distant from all windfarms is not known and may indeed be small. However, while many of the statements made in this section of the report in support of the conclusion that the effects will be minimal and of no significance are justified, some are not and so the case is overstated. For example, it is incorrect to state that "*in the absence of highly aggregated regions for this species, it appears unlikely that existing or planned windfarms occupy sites of particular importance for this species..... hence the first mechanism above (exclusion from preferred foraging areas) is not considered to be applicable*".
27. By definition the SPAs include the areas of highest average density, usually assessed over a period of several years, and within those there are often certain areas that persistently hold the highest densities. One might infer from this that



the SPA boundary includes the most suitable habitat for the species and that within those there are areas of particularly high suitability. Certain windfarms have already been constructed within the most heavily used areas and have excluded birds from those preferred areas.

28. The Applicant has stated that red throated divers appear to be capable of a high degree of mobility in winter, and therefore they will be able to find alternative foraging areas, albeit in some cases distant from the original area of displacement. This may be true, but this fails to acknowledge the critical point that in the context of this Habitats Regulations Assessment, displacement of birds from inside to outside an SPA that would otherwise support them means that the integrity of the site has been compromised. The site would no longer be making the contribution that it otherwise would to the favourable conservation status of the species or the coherence of the Natura 2000 network for that species.
29. Furthermore, in the context of this Habitats Regulations Assessment, all the Conservation Objectives of the SPA must be considered. In this case the Conservation Objectives include an objective to maintain or restore the distribution of qualifying features within the site. Furthermore, the Supplementary Advice on Conservation Objectives for the red-throated diver feature of this SPA specify a target to: “**Reduce** the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed”. It may be that no birds at all die as a result of the displacement, but it is in the light of these Conservation Objectives it is still possible that an AEoI on the SPA will result from one or more of the other conservation objectives not being fulfilled.

9) Legal protections afforded to the Outer Thames Estuary SPA – major concern

30. Baseline: The reference to a ‘baseline’ for assessment of the effects of a proposed plan or project is not found in the Habitats Directive or either of the two domestic statutory instruments and leads to incorrect conclusions. We note that the inclusion of the wind farms within the OTE SPA that received consent prior to the existence of the SPA as part of the in-combination assessment of EA1N and EA2 is included. However, Natural England advise that these existing windfarms (and those that became operational before the current RTD population figures were



established) should be included as a matter of law and not 'for illustrative purposes' only.

31. Significance of impact: The use of the term 'significance of disturbance' (paragraph 69), and the suggestion that it should be considered by reference to the 'objectives for the whole region or an EU Member State' is incorrect.
32. We agree that it is necessary to consider the significance of the disturbance resulting from the projects, but in the context of the effect of disturbance on the integrity of the SPA itself, and not in a regional or other spatial context. Natural England's view is that there is strong evidence to confirm that the presence of wind turbines does constitute significant disturbance to red-throated divers. **This appears to be long term based on the lack of any evidence showing diver habituation to the presence of offshore windfarms.**
33. As per our Deadline 1 Appendix A4 [REP1-172] submission we advise that the Examining Authority base their assessment on an in-combination assessment that includes all projects that were not constructed at the time of the surveys to inform the SPA notification i.e. those projects constructed after 2002-2008. It was the spatial variation in the birds' density at that time which informed the analysis that determined the size and shape of the SPA.
34. Natural England's Supplementary Advice on Conservation Objectives for the Outer Thames Estuary SPA can be found at: <https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK9020309&SiteName=outer+thames+estuary&SiteNameDisplay=Outer+Thames+Estuary+SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=3>
35. Within the 'disturbance caused by human activity' attribute for red-throated diver, the supporting notes state:

"Disturbance should be judged as significant if an action (alone or in combination with other effects) impacts on (water)birds in such a way as to be likely to cause impacts on populations of a species through either:

- *changed local distribution on a continuing basis; and/or*
- *changed local abundance on a sustained basis; and/or*



- *the reduction of ability of any significant group of birds to survive, breed, or rear their young.”*

36. It is due to **a changed local distribution on a continuing basis** that we consider there is significant disturbance. The key point is that the phrase “likely to cause impacts on populations of a species...” does NOT say “population abundance or size”. This means that significant disturbance can be disturbance that impacts the population through changing its local distribution on a continuing basis – regardless of what that means for the population’s size and abundance

37. Natural England acknowledges that the abundance objective is likely to be maintained. However, our concerns are whether the distribution of the divers are changed on a continuing basis, and whether the SPA is able to support divers throughout the whole of the SPA. The key point is that the disturbance attribute has a target to “restore” and so that is not favourable and that relates to the headline objective to maintain or restore the distribution of qualifying features within the site – which is a separate high level Conservation Objective to the population one.

10) In-combination – major concern

38. As stated in our advice submitted at Deadline 1 (REP1 -172) the data regarding RTD that effectively determined the current size, shape and boundary of the SPA was derived from surveys undertaken before all but one of the relevant offshore windfarms were constructed (the earliest survey data even preceded the operation of Kentish Flats). Therefore, we advise that an in-combination assessment of the level of displacement should include all the projects that have become operational since that baseline understanding of the distribution of RTD was established, namely:

- London Array
- Gunfleet Sands I, II and III
- Kentish Flats and Kentish Flats Extension
- Greater Gabbard
- Thanet.



39. With regards to East Anglia Two, the monitoring results from London Array post construction monitoring suggest that displacement distances are up to 11.5km. Until the Applicant's modelling addresses our concerns raised in the above sections, we continue to advise that East Anglia Two and the above projects are included in the in-combination assessment.

11) Shipping data – moderate concern

40. For shipping we note that there was a choice to convert shipping traffic into a rasterized map. This decision needs more consideration as there does not seem to be much precedent for this in the literature. The concern with the use of shipping data like this is that there are areas where shipping traffic is simply 0, and those pixels could fall directly next to a shipping lane, which means that a gradient effect could be missed. Convention is to use distance to shipping lanes.

41. In addition to concerns detailed above regarding treating all shipping as a static variable and not as distance to shipping lane; we are unclear whether it is appropriate to assume the same level of shipping in 2012 compared to 2002 – 2008.

12) Assumed Increases in Red Throated Diver Numbers – moderate concern

42. We acknowledge that estimated abundance of the RTD population within the SPA has increased significantly over the period within which several windfarms have been constructed within it. However, it is important not to infer from this that it is a fact that the actual population abundance has significantly increased. This is because of the fundamental shift in the survey method used over that period. That the two digital surveys in 2018 yielded an average population abundance greater than the average in 2013 also cannot be used to infer with any confidence that the population has increased over that time period. The first of the two surveys conducted in 2018 yielded a population abundance estimate that was lower than on either of the two surveys in 2013. Only the last survey in 2018 yielded a number in excess of 20,000. The fact that this was recorded was a matter of chance, and similar short-lived peaks in abundance are highly likely to have been missed in previous years as surveys are only a snap-shot in time. Therefore, we advise that the Applicant appears to be confusing abundance and distribution targets.



13) Model evaluation – minor concern

43. We note that nine models were evaluated, using three different error structures (Poisson, Tweedie, negative binomial). This is convention with General Algebraic Modelling System (GAMs) and the authors have treated this appropriately. However, one point here is that the Poisson distribution as used in the code (i.e., the `Poisson()` family) may not necessarily be the most appropriate for zero-inflated data in all cases. Best practice for zero-inflated Poisson data would be to use the `ziP()` family (i.e., zero-inflated Poisson). Whilst it is unlikely that this would drastically change the outputs of the modelling, it should be explored in case it does help to explain a little more of the variance in the data.

14) Effects of Bathymetry – minor concern

44. It seems that bathymetry has a strong influence on predictions across the whole site (i.e. the predicted output closely matches the patterns in bathymetry). Thus, interpretation of these partial dependence plots needs to be done with care because they are not a representation of the exact relationship in space, just a partial relationship when taking into account the other parameters. Therefore, in areas where distance to coast is <15km, if another parameter has a stronger positive effect than the negative effect of distance to coast in that range, the model could still predict higher densities.

15) Comments on Appendices 1 - 3 of REP3-049

45. Advice provided for the main body of the document also apply to Appendices 1 and 3

46. Appendix 2: The literature review appears to be a thorough review of the available evidence relating to red-throated diver displacement, although it is noted that the Final Year Ornithological Report for London Array is within the References on page 32, but not included in the Literature Review. It should also be noted that the date of the up to date version of that report is 2020, as the 2018 version in the References on page 32 does not include Natural England and MMO's comments.



Interim comments on Offshore In-principle Monitoring Plan [REP03-040]

47. Natural England agrees that ornithological monitoring should be targeted to address residual impacts, evidence gaps or uncertainty of most relevance to the proposed East Anglia ONE North project and the specific species. We agree that should focus on monitoring the extent of displacement on red-throated diver and undertaken as part of a pre- and post construction monitoring programme. This will be particularly important if a design is consented where the buffer is less than 10km or less than the to be agreed modelled extent of displacement. Natural England will provide at Deadline 5 further advice on specific hypothesis/positions to be tested/validated by the post construction monitoring
48. Natural England's advice is that EA2 should be included as part of an in-combination assessment for the Outer Thames Estuary SPA. Therefore, comments made by Natural England in relation to the East Anglia ONE North IPMP, also apply to EA2.

Comments on Offshore commitments [REP3-073]

49. At the Expert Topic Group meeting on 20th June 2019, the Applicant provided details of proposals to move the boundary of EA2 (which previously was immediately adjacent to the SPA) to 8.3km away from the SPA at its nearest point. The Applicant's explained that while the site reduction was primarily to mitigate seascape impacts, it has also resulted in the EA2 windfarm site now being further from the Outer Thames Estuary (OTE) Special Protection Area (SPA) and therefore significantly reducing any displacement impacts from EA2. Natural England acknowledged that there would be now significantly reduced effects on OTE SPA from operational windfarm array displacement from EA2, and advised a similar approach to be taken with EA1N.
50. Whilst, it was possible to reduce the array footprint for EA2 resulting in the nearest turbine being 8.3km from the Outer Thames Estuary SPA; Natural England acknowledges the constraints on the Applicant's options for relocation of EA1N.
51. Natural England notes that the Applicant's view is that the 2km does not mitigate the displacement effects, only reduces them by 8%. Although there is uncertainty



on the exact number of red throated diver that may be displaced, it is clear that the extent of supporting habitat extends well beyond 2km. So, whether the extent of displacement is 7km as the Applicant's suggest from their recent modelling or 11.5km that was concluded from the London Array's monitoring within the Outer Thames Estuary, the buffer needs to be significantly increased from 2km. Without an increase in the distance between the proposed array and the SPA boundary an adverse effect on integrity from the EA1N project alone cannot be ruled out as a result of displacement reducing the ability of the supporting habitat and a change in the distribution of red throated divers on an ongoing basis.

Detailed comments on Best Practise Protocol for minimising disturbance to RTD [REP3-074]

52. Natural England welcomes the submission of the broad principles for a best practice protocol for minimising disturbance to red throated diver. We note that the intention is that the protocol will be adopted and provided as part of the project environmental management plan (PEMP) and to be approved by MMO. Although we note that detail will be included at a later stage, it would be beneficial to provide some additional detail in this document of the expectations and detail that will be required to sign of this mitigation measure prior to commencement of construction for example: -

- How will it be demonstrated that planned works during construction and operation phases are avoiding the sensitive periods between November and March?
- Were it is not possible to avoid works during the sensitive period how will vessel movements be managed to minimise disturbance to SPA features?
- Provided details of particular works when vessels will be required to leave existing navigational routes through the SPA.

53. Low flying helicopter flights over the SPA are also likely to cause disturbance. If the use of helicopters is likely then we advise that is also covered under a protocol for minimising disturbance.