



NORTH FALLS

Offshore Wind Farm

HABITATS REGULATIONS ASSESSMENT

**Draft In Principle Compensation Options
Review**

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HRA Draft In Principle Compensation Options Review

May 2023

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Glossary of Acronyms

AEoI	Adverse Effects on Integrity
DCO	Development Consent Order
EEZ	Exclusive Economic Zone
ETG	Expert Topic Group
KIMP	Kittiwake Implementation and Monitoring Plan
MPA	Marine Protected Areas
NAF	Nocturnal Activity Factor
NFOW	North Falls Offshore Wind Farm Ltd
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
RIAA	Report to Inform Appropriate Assessment
SNCB(s)	Statutory Nature Conservation Body(ies)
SoS	Secretary of State
SPA	Special Protection Area
UK	United Kingdom

Glossary of Terminology

Array areas	The two distinct offshore wind farm areas which together comprise North Falls Offshore Wind Farm.
Offshore export cable corridor	The corridor of seabed from array areas to the landfall within which the offshore export cables will be located.
Offshore export cables	The cables which bring electricity from the offshore substation platform to the landfall.
Offshore project area	The overall area of the array areas and the offshore export cable corridor.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.

1 Introduction

1. The North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') is a proposed extension to the existing Greater Gabbard Offshore Wind Farm (GGOW), located over 20km off the Suffolk coast in England.
2. The Applicant, North Falls Offshore Wind Farm Ltd (NFOW) is a consortium between Scottish and Southern Energy Renewables (SSER) Ltd and RWE Renewables UK Ltd (RWE), both of which are highly experienced developers.
3. A draft Report to Inform Appropriate Assessment (RIAA) has been completed to support consultation under Section 42 of the Planning Act (2008) and is provided alongside the Preliminary Environment Information Report (PEIR). Based on the finding of the draft RIAA, as well as lessons learned from other offshore wind farms in the southern North Sea, NFOW recognises that it may be requested to provide compensatory measures for certain Special Protection Areas (SPAs) and qualifying bird species due to potential adverse effects on integrity (AEol) associated with North Falls Offshore Wind Farm (OWF), in-combination with other projects (discussed further in Section 4).
4. This document provides a review of potential compensation measures for three SPAs and relevant qualifying species where there is a risk that the appropriate assessment for North Falls will conclude an AEol. These are kittiwake at Flamborough and Filey Coast SPA, lesser black-backed gull at the Alde-Ore Estuary SPA, and red-throated diver at the Outer Thames Estuary SPA.
5. The measures identified in this review could be used alone to deliver compensation for the predicted impact or as a suite of measures.
6. It is noted that the Energy Bill, currently passing through the UK Parliament, includes provision for establishment of a Marine Recovery Fund into which payments may be made by OWF projects and from which payments may be made towards compensation measures for adverse environmental effects of OWFs. Subject to this regulation, there may be the potential for a payment into the fund and the Applicant will continue to monitor progress of the Energy Bill and have regard to any legislative changes when preparing its DCO application. The Applicant is also open to considering other forms of strategic compensation, should they become available.

2 Consultation

7. An initial review of in-principle compensation measures was provided to Natural England and the Royal Society for the Protection of Birds (RSPB) (the ornithology Expert Topic Group (ETG)) in March 2022.
8. A summary of the comments received and responses is provided in Table 2.1.

Table 2.1 Consultation responses

Comment	Response / where addressed
Natural England – letter from Yolanda Foote 05 April 2022	
We welcome the in-principle compensations options review provided by North Falls. We note that before considering any compensation options,	Noted. Review of mitigation options is ongoing and will be

Comment	Response / where addressed
<p>North Falls should focus on the top of the mitigation hierarchy and ensure that options for avoidance/reduction of impacts has been exhausted first (e.g. by ensuring best practice mitigation in terms of raising turbine draught heights by as much as possible, maximising buffer between array and boundary of OTE SPA by as much as possible, routing of vessels from North Falls to avoid OTE SPA).</p>	<p>informed by the s42. consultation on the PEIR and draft RIAA.</p>
<p>We welcome that the key designated sites and features likely to require in-principle compensation proposals by North Falls of Flamborough and Filey Coast (FFC) SPA kittiwake, Alde-Ore Estuary (AOE) SPA lesser black-backed gull (LBBG) and Outer Thames Estuary (OTE) SPA red-throated diver (RTD) have been included in the compensation options review. We note that the Hornsea 4 project has submitted its DCO application and the examination for this project is currently ongoing. The auk numbers (particularly guillemot) appear to be particularly high at this site, especially during the post-breeding season, and there is the potential that NE's advice could be that an adverse effect on integrity (AEoI) cannot be ruled out for in-combination auk displacement during that examination. Therefore, there may be the requirement for any future projects in the North Sea contributing to the auk displacement in-combination total, which likely includes North Falls, to consider in-principle compensation options for FFC SPA auk features as well. Therefore, we recommend that North Falls keep up to date on development of advice on these matters during the Hornsea 4 examination.</p>	<p>Noted. It is understood from the most recent correspondence relating to Hornsea Project Four (HP4) (BEIS, 09 February 2023) that matters in relation to FFC SPA auk displacement have not yet been agreed. The Applicant will continue to monitor the HP4 DCO process, and relevant updates will be reflected in the North Falls assessment, as appropriate.</p>
<p>Potential Compensation for North Falls for Kittiwake from FFC SPA. Closure of sandeel fisheries. We consider that improving sandeel abundance and hence availability to kittiwakes would probably be the most ecologically effective compensation measure. Such a measure also has significant value as a long-term, strategic measure. We agree that there is currently no obvious mechanism available at present for OWF developers to adopt this as a compensatory measure, however, such a mechanism may appear in future. Therefore, we agree that there is merit in North Falls investigating the extent to which the OWF industry has engaged with Government on such matters, including progress on identifying mechanisms for strategic delivery of compensation.</p> <p>We also consider that improving prey availability could form the basis of adaptive management measures for the compensatory measure in the longer term, which we consider should be incorporated into the proposals.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Provision of artificial nesting structures: We note that there are a number of recently consented OWFs (Hornsea 3, Norfolk Vanguard and Norfolk Boreas) that are required to provide compensation for FFC SPA kittiwakes and who propose to achieve this by provision of coastal artificial nesting structures along the English North Sea Coast (Hornsea 3 proposing c. 1,800 nests, the two Norfolk projects proposing c. 900 nests at Lowestoft).</p> <p>Additionally, East Anglia One North and East Anglia Two are proposing to partner up with the Norfolk projects. We also understand that there is a planning requirement for alternative nest spaces to be provided when the Sizewell rigs are decommissioned. So, it appears likely that c. 3,000 new nest spaces will be required to be provided for by these projects. We note that it has always been unclear what the 'pool' of non-breeding or poorly-breeding kittiwakes is, and given the numbers of nests already proposed it is really hard to justify any more onshore structures. By contrast, it seems much more likely that availability of high-quality nest spaces offshore is limited. Therefore, we would recommend North Falls prioritise the development of potential offshore structures and locations. This could be either through repurposing and augmenting an existing structure scheduled for decommissioning, or through installation of a new structure.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>However, if the predicted impacts from a project are very small (e.g. 1-2 birds), it is unlikely to be sensible for that project to undertake compensation in the form of a structure alone. In such instances it may be more practical for that project to contribute to enhancing an existing scheme e.g. increasing</p>	<p>Noted. Compensation options (including discussion with other developers) will be considered further following consultation on</p>

Comment	Response / where addressed
<p>the benefits of something existing or planned. However, we note that this could also be complicated. So, in such circumstances it may be wiser for such projects to look to collaborate with those developments with broadly overlapping timescales, as well as any wider industry plans. Whilst we have not yet seen the number of predicted kittiwake collisions attributed to the FFC SPA from North Falls, if the predicted numbers were to fall into this category, then it may be wise for North Falls to consider/investigate at an early stage any potential to collaborate with projects such as Five Estuaries and possibly Rampion 2.</p>	<p>the draft RIAA included with the PEIR.</p>
<p>North Falls have also suggested creation of artificial structures in alternative locations, e.g. the North Sea coast of Scotland, or potentially the UK west coast. We note that consideration of any locations outside of England will require discussion of the appropriateness of any option with the relevant authorities and SNCBs before progressing any further. Consideration would also need to be given as to whether nest site availability is a limiting factor at any such locations, and also to whether there are any kittiwake SPA colonies in close proximity to such locations where there may be a risk that a structure may simply re-distribute birds away from the SPA(s).</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Alternative measures: Predator (great skua) management – this option would require discussion of the appropriateness of any option with the relevant Scottish authorities and NatureScot before progressing further. We highlight that in many locations the great skuas in question will also be SPA features. The merit and applicability of this measure is therefore highly questionable.</p>	<p>Agreed. This option will not be considered further.</p>
<p>Extension or designation of additional SPA for kittiwake or species of comparable ecological function – we note that it is difficult to find new areas that could be designated as an SPA and designation of sites is not an easy or certain process. Additionally, any areas that meet the requirement to be designated as SPAs (as set out in the JNCC SPA selection criteria) should have been or should be designated. Therefore, we do not recommend this option is considered further.</p>	<p>Agreed. This option will not be considered further.</p>
<p>Predator exclusion: We note that the SoS [Secretary of State('s)] decisions on Norfolk Vanguard and Boreas have said that their 'joint' compensation is for 4ha of land within the New Zealand-style predator exclusion fence. NE's advice at these projects has always been that 4ha is a minimum requirement, and that the AOE SPA needs to be put into good management regarding water levels and vegetation before the compensation can be installed. There is no agreement as yet on where within the land parcel of interest would be suitable for the exclusion fenced area to be located, or what targets for gull numbers should be on this land. Other constraints need to be duly addressed, such as avoiding impacts on SAC/SSSI habitats and on the Suffolk Coast and Heaths AONB. Hence there is no sense as yet as to whether an area of c. 4ha is sufficient for compensation for impacts from any more OWF projects beyond Norfolk Vanguard and Boreas. Indeed, Natural England's advice has questioned whether c. 4ha would be sufficient to compensate for the predicted impacts from Norfolk Vanguard and Boreas combined, let alone for the inclusion of impacts from further projects. We note that Vattenfall (Norfolk Vanguard and Boreas) and SPR (East Anglia One North and East Anglia Two) have both said that they would collaborate if compensation were required for this feature of the site for their projects: however it is unclear how the SoS will treat this proposed collaboration in any consent that might be granted to East Anglia One North/East Anglia Two.</p> <p>The issues highlighted above result in a highly uncertain situation for projects that follow in the planning system and will contribute to the in-combination collision total of LBBGs from the AOE SPA, such as North Falls and Five Estuaries. We recommend that North Falls be in close discussion with Vattenfall/SPR regarding their proposals. One additional option that could be considered by North Falls would be to collaborate with Five Estuaries on their own compensation scheme in another location, perhaps</p>	<p>Noted. Compensation options (including discussion with other developers) will be considered further following consultation on the draft RIAA included with the PEIR.</p>

Comment	Response / where addressed
<p>adjacent to but outside the SPA. We note that before settling on their compensation location, Vattenfall explored areas outside but adjacent to the AOE SPA that could be managed for LBBG. So, whilst we recommend North Falls to open discussions with Vattenfall regarding potential to collaborate with them, we also recommend North Falls also open discussions with Five Estuaries for collaboration and together begin their own explorations around where land might be secured, and habitat created for breeding LBBG adjacent to the AOE SPA.</p>	
<p>Reduction of fisheries by-catch: It is unclear at this stage whether SPA LBBGs are at particular risk of by-catch, or indeed whether there are any remedies available for gull by-catch. In this context, by-catch seems unlikely to provide any opportunities for compensation.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>[red-throated diver and the OTE SPA] Compensation for the reduction of available habitat due to displacement is difficult and before even considering compensatory measures, North Falls should focus on the top of the mitigation hierarchy and ensure that avoidance/reduction of impacts has been exhausted first before considering compensatory measures.</p>	<p>Noted. The Applicant will ensure full investigation of the mitigation hierarchy. However, it is considered prudent to address compensation options, in the event that these are required. This will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>A potential option for this issue would be to improve the quality of areas within the SPA e.g. through the creation of 'sanctuary' or 'reserve' areas, however, it is currently unclear as to what this might look like and how it would be secured. There is broad interest across the sector (including Defra and The Crown Estate) in a strategic approach where all developers (of all kinds) get together and try to rationalise/zone activities within diver SPAs to create sanctuary/reserve areas, both from individual cases and potentially also future leasing rounds. However, there is a significant amount of work required to achieve this strategic approach and as yet no ongoing project. We recommend North Falls tracks the progress of the East Anglia One North/East Anglia Two projects as well as engaging in cross-sector discussions regarding strategic initiatives.</p>	<p>Noted. Compensation options (including discussion with other developers) will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Vessel management: North Falls have suggested engagement with developers of other consented OWFs identified as causing, or with the potential to cause, displacement effects within the SPA, for example Galloper and Greater Gabbard to see if there was potential to reach agreements to direct vessel traffic associated with existing OWFs outside the SPA boundary as far as possible. The current East Anglia One North/East Anglia Two offer regarding OTE SPA RTD compensation includes formal re-routing of vessels from East Anglia Three and East Anglia One to reduce the amount of transiting through the SPA. NE are not persuaded by the effectiveness of this aspect of the East Anglia One North/East Anglia Two proposal, and it is by no means clear whether addressing the impacts of ongoing projects should be considered compensation, particularly given the conservation advice for the SPA has a 'reduce' target as regards displacement within the site. Therefore, we do not recommend North Falls progress with this option as compensation, though clearly this could form part of an impact reduction/mitigation package.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR. However, it is noted that the ExA did not agree with Natural England's position on this matter in respect of EA1N, and advised that the proposed re-routing of vessels associated with East Anglia Three OFW would represent an appropriate compensation measure because it would be additional to the requirements of the DCO for East Anglia Three OFW. In the HRA (BEIS 2022a), the SoS considered that, together with other measures, navigational management for East Anglia Three OFW and East Anglia One OFW vessels would represent appropriate compensation in relation to ensuring the overall coherence of the UK National Site Network.</p>
<p>Reduction of fisheries by-catch: A previous study by Kent & Essex IFCA indicated no significant concerns regarding the level of diver by-catch within</p>	<p>Noted, although it is understood that measures to address bycatch</p>

Comment	Response / where addressed
<p>the SPA. It is therefore rather unlikely that diver by-catch reduction offers any opportunity for compensatory measures, and so we do not recommend North Falls progress this option further.</p>	<p>were agreed by the SoS as secondary compensation for EA1N as they would close an important knowledge gap and could benefit several seabird species in the long term (BEIS 2022a). Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Closure of sandeel and sprat fisheries in OTE area – as noted above regarding FFC SPA kittiwake, there is no obvious mechanism available at present for OWF developers to adopt this as a compensatory measure, however, such a mechanism may appear in future. Therefore, there is merit in North Falls investigating the extent to which the OWF industry has engaged with Government on such matters. However, as noted in the review, the extent to which wintering divers are affected by prey availability in the SPA is unclear.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Provision of nesting rafts for breeding RTDs in the UK – RTDs breeding in the UK (Scotland) do not overwinter in the OTE SPA, the birds wintering in the OTE SPA are from Fenno-Scandia. Therefore, this proposal would not benefit the impacted site or the birds that use it. Additionally, the key concern is regarding habitat loss and redistribution of birds within the SPA rather than mortality, and hence providing more divers does not address the issue. Therefore, we do not recommend that North Falls prioritise this option.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Extension or designation of additional SPA for RTD or species of comparable ecological function – as noted above regarding FFC SPA kittiwake, we note that it is difficult to find new areas that could be designated as an SPA and designation of sites is not an easy or certain process. Additionally, any areas that meet the requirement to be designated as SPAs should have been or should be designated. Therefore, we do not recommend this option is considered further.</p>	<p>Agreed. This option will not be considered further.</p>
<p>RSPB - comments from Andrew Dodd, 22 March 2022</p>	
<p>2.1, para 6 - The legal test on the appropriate authority is that the necessary compensatory measures must be secured – not can be secured. It is a higher standard.</p>	<p>The legal test (as set out in the Conservation of Offshore Marine Habitats and Species Regulations 2017) is: “The appropriate authority must secure that any necessary compensatory measures are taken to ensure that the overall coherence of [the national site network] is protected”.</p>
<p>2.2, para 8 - We advise that no reliance is placed on a consultation draft Defra consultation document setting out best practice guidance for developing compensatory measures in relation to Marine Protected Areas]. We consider it has several fundamental flaws in its approach, some of which we touch on immediately below. We are attaching a copy of the RSPB's comments on the Defra consultation document so that you are aware of our concerns and how we will be approaching this issue.</p>	<p>RSPBs position on the draft Defra compensatory measures document is noted. At this stage, it is the Applicant's view that all potential compensation measures should be considered, and that options will be refined as the DCO application is progressed. This will include reference to available guidance at that time (including a final version of the Defra guidance, should this become available) and updated advice arising from other DCO applications.</p>

Comment	Response / where addressed
	<p>The Applicant also notes that the compensation measures RSPB disagrees with are those at the bottom of the hierarchy proposed in the draft Defra guidance. It is therefore the case that such measures would only be acceptable if the mitigation hierarchy and compensation measures above those in the hierarchy were not achievable. At this early stage the Applicant does not consider it reasonable or necessary to discount such measures, should they be available, but remains fully committed to adhering to the mitigation and compensation hierarchies in the development of the Project.</p> <p>Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>2.2, para 10 - Please note that the RSPB has objected strongly to this element of the Defra consultation document. Below is our comment on this point:</p> <p>“Our starting point is that we fundamentally disagree with the concept of compensation of “comparable ecological function” as defined in paragraph 49. Compensation must be targeted at the impacted feature(s) of the protected area and repairing the loss of coherence to the site network for the impacted feature(s). For the record, we are also concerned by use of the phrase “This is usually the same species, feature or habitat” in the definition of “Same ecological function” in paragraph 48. This appears to suggest that habitats and species are interchangeable: this is contrary to the need to recover declining species and habitats. One species or habitat cannot and should not be considered in place of another.</p> <p>We consider Defra’s suggested approach is unacceptable in respect of compensating for impacts on SPAs and SACs as it equates to “substitution”. In simple terms, a kittiwake does not provide “similar environmental benefit” to a guillemot or a gannet in respect of the coherence of the SPA network (the same can be said for different SAC features). We consider the suggested approach would undermine the purposes of the legislation to ensure the SPA or SAC network fulfils its role in helping to maintain each feature at favourable conservation status, is legally flawed and should be withdrawn from the guidance”</p>	<p>See response above.</p>
<p>2.2, para 11, Table 2.2, para 12 - The RSPB rejects levels 3 and 4 [of the compensation hierarchy, Table 2.2] for the reasons given above and requests that they are deleted and no longer considered by the ETG/project. For reasons given above [these] should be rejected as unacceptable at this stage in discussions.</p>	<p>See response above.</p>
<p>2.2, para 13 - [in relation to compensation options which may benefit a range of species, such as fisheries closure or management] However, the focus of the discussion must be on demonstrating the benefit to the impacted species (for the reasons given above)</p>	<p>Noted. See also response above.</p>
<p>2.2, para 14 - [in relation to the timescale for securing compensation measures] However, the starting point must be to meet the objective of</p>	<p>Noted. See also response above.</p>

Comment	Response / where addressed
<p>having fully ecologically functioning compensation in place in sufficient time to ensure:</p> <p>“the overall coherence of the National Site Network is protected” for the impacted species. This means that the loss of integrity to the National Site Network as a consequence of the plan or project is avoided. This affects lead in times for the compensation measures, reflecting the ecological requirements to be met.</p>	
<p>3.5, para 27 - [in relation to current status and specific targets for SPA qualifying features in Natural England’s designated sites view] We suggest these are incorporated here as highly relevant context. Both Kittiwake and LBBG have restore objectives which means there is a need for conservation (not compensation) measures designed to restore their SPA populations to a favourable level. This is directly relevant to the issue of additionality in respect of compensation. It is also directly relevant to the need to understand the pressures currently operating on those populations and which are the cause of any observed declines in productivity and population.</p>	<p>The requirement for additionality is noted and will be taken into consideration as compensation proposals are developed.</p>
<p>4.1, para 28 - [in relation to compensation seeking to offset the predicted mortality to the kittiwake breeding population at the SPA] Based on recent experience, we would recommend that there is very early discussion on how this “objective” can be proven and how that translates into detailed compensation objectives. These would then frame the search for possible compensation solutions. Important to start with what is “ecologically effective” to address the ecological functions affected by the predicted impacts. Please see p4-5 of our response to Defra’s consultation document. If we can reach agreement on that, it will help frame the discussion on possible compensation options, from which we can then apply a logical hierarchical approach, and apply any additional analysis that may help with that e.g. meta-population analysis. This applies to all species under consideration, not just kittiwake.</p>	<p>Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.</p>
<p>Table 4.1 - [in relation to provision of artificial colonies in areas where kittiwakes are unable to breed due to lack of natural nesting habitat] However, what has not been robustly demonstrated by any of those OWFs is whether or not lack of suitable nesting sites is a limiting factor on kittiwakes in those locations and therefore whether the compensation measure will be additional. We consider this is an essential step before bringing forward yet another proposed nesting structure. It aligns with the need to identify what is “ecologically effective”.</p>	<p>RSPBs position on this matter is noted. However, the Applicant considers that the principal of provision of artificial nest sites for kittiwakes is established as a suitable compensation measure (assuming that the feature is appropriately designed and located), given its acceptance for a number of consented OWFs.</p>
<p>4.2, para 30 - [in relation to three UK OWFs consented subject to compensation measures for kittiwake] Notwithstanding these consents and the other projects proposing the same measure, there remains the same underlying question of whether there is evidence of lack of nesting sites being a limiting factor.</p> <p>Most of these projects have simply adopted the same measure as it is potentially within their control to deliver</p>	<p>See response above.</p>
<p>4.3.1.1, para 39 - We consider this approach to calculating the potential benefits of a closure of regional sandeel fisheries to be too simplistic. We recommend that wherever this measure is pursued then appropriate population modelling work is agreed by specialists and applied to a range of agreed realistic scenarios to more properly assess the benefit.</p>	<p>Noted. It is expected that if this option was proposed (at a strategic level) then this would need to be supported by appropriate evidence, but this would be beyond the remit of North Falls in isolation.</p>
<p>4.3.1.2 para 40 - [provision of artificial nesting structures for kittiwake] See comments above on need to demonstrate lack of suitable nesting sites is a limiting factor. Likely needs strategic research to be carried out to identify if there is anywhere in the species’ range where this is a constraint.</p>	<p>See response above.</p>

Comment	Response / where addressed
4.3.2, para 41 - [provision of artificial nesting structures as an established compensation measure agreed by regulators] It may be “established” but it remains unproven as a compensation measure, and likely to remain that way for at least 10 years – even at the basic level of construction and monitoring first few years of colonisation.	See response above.
4.3.2, para 41 - See comments above. We consider there is a need for further work to establish [whether alternative compensation measures would be required for kittiwake] and have said so for each of the consented cases and those currently unconsented.	See response above.
4.3.2.2, para 44 - The RSPB opposes managing specialist avian predators to provide compensation for windfarm losses. This is underlined when each of the species mentioned are birds of conservation concern. Kittiwake is red-listed (severe decline). Great skua is amber listed and the UK population is internationally important.	Agreed. This option will not be considered further.
4.3.2.3, para 45 - [designating other SPAs for a given species to compensate for adverse effects on a species at an existing SPA] Please note that this is not legally possible for SPAs and so should be dropped now. Any site that “should be an SPA” is legally required to be classified as an SPA. Therefore there would be no additionality. This is distinct from classifying a compensation site as an SPA as that is specifically designed to restore the coherence of the damaged SPA network for the impacted species.	Agreed. This option will not be considered further for any species.
5.1, Table 5.1 - None of these reports [on proposed compensation measures for lesser black-backed gull] took proper account of the current situation at the Alde-Ore Estuary SPA in respect of the LBBG colony located at RSPB Havergate. Please refer to the RSPB’s Norfolk Vanguard submission (Nov 21) which outlines the current declines in productivity and population and for which the issue of mammalian predation and human disturbance are not relevant. Therefore, other factors are at play which require research to understand.	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.1, Table 5.1 - See the above comment. We do not consider predator exclusion fencing can be assumed to solve the underlying problems affecting the Alde-Ore Estuary SPA population. The problems it solves only address a subset of the factors suspected to be affecting this population and, based on RSPB Havergate, would not address current unknowns which are resulting in the described declines in productivity and population. Understanding these is critical to considering whether this part of the Suffolk coast is an appropriate location to consider deploying compensation measures for this species.	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.1, Table 5.1 - The evidence base for this is currently weaker than that for guillemot and razorbill, plus there is no proven measure to reduce bycatch for this species. It would require detailed research of the level and location of bycatch, along with reduction trials to identify a reliable bycatch reduction measure that could be implemented. The RSPB is not aware of any such research being in place at this time.	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.2, para 50 - See comments above which apply to the proposed measures adopted by Norfolk Boreas/Vanguard and others [for lesser black-backed gull at Alde Ore Estuary SPA]	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.2.3, para 58 - Please see RSPB comments on this putative measure [bycatch reduction proposal for East Anglia ONE North and TWO] to the Hornsea 4 examination (Annex B, Deadline 2). We do not consider the described proposal as acceptable given the lack of any evidence base for effective bycatch mitigation measures at this time. Substantive scientific, peer-reviewed evidence is required. The measures and timetable described here are inadequate	RSPB’s position is noted and will be taken into consideration when developing the North Falls compensation.

Comment	Response / where addressed
5.2.4, para 59 - [Galopper OWF mitigation for lesser black-backed gull] With the exception of the RSPB who consistently argued at the time that it was compensation.	Additional note to that effect added to Section 6.2.4.
5.3, para 60 - We welcome agreement on the need to understand what factors are driving declines in productivity and population at the Alde-Ore. Until this is properly understood, we do not consider it safe to rely on the predator fencing solution that has been adopted to date.	Noted.
5.3.1.1, para 62 - RSPB November 2021 submission to Norfolk Vanguard consultation updates this information [decline of lesser black-backed gull at Alde-Ore Estuary SPA] and counters the narrative that it is mainly foxes driving the current decline. We note that this fails to reference the RSPB research carried out in 2010/11 which highlighted a number of potential factors (including fox predation) but concluded that further research was required to identify the key factors. This research was first referenced by the RSPB in its submissions to the Galopper OWF examination yet is persistently ignored	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.3.1.1, para 63 - Another factor ignored by all of these suggestions for locating the compensation in the Alde-Ore area is that it would expose any birds using the compensation to the same risk of collision as the current SPA population. This questions the sustainability of it as a compensation measure.	The Applicant does not accept this point. Although it is the case that 'new' birds arising from compensation could be exposed to collision risk, such a risk remains extremely low, and this would not limit the ability to compensate for any population loss. This is particularly the case as compensation would be required at a level above a 1:1 ratio, and that loss calculations are considered to be precautionary.
5.3.1.1, para 64 - We consider this figure (which has somehow survived several iterations across several wind farm projects) is wholly unrealistic. Unfortunately no wind farm developer has yet amended their calculations in light of the information the RSPB presented on this matter going back to 2020. This is what we set out in our response to the original Norfolk Vanguard compensation consultation in April 2020 based on our experience of managing the main colony at RSPB Havergate Island. It argues for a more realistic approach to calculating LBBG breeding density. "Norfolk Vanguard base their area calculations on an assumption that LBBG nest density at the SPA probably averages less than 1 pair/m2. Unfortunately, this is a gross over-estimate based on the RSPB's Havergate Island experience. Breeding densities range from approximately 0.005 pairs/m2 (or 200 pairs in 4ha) in good quality habitat (Doveys) to approximately 0.002 pairs/m2 across 100ha of mixed habitat currently used by c.1500-2000 pairs of LBBG across Havergate Island as a whole." It would be sensible to review the range of breeding LBBG densities at key SPA colonies, and where possible an assessment of productivity levels in different habitats to get a more sensible assessment of likely breeding densities.	RSPB's position is noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.3.1.2, para 66 - [Reduction of fisheries bycatch] See above – this requires significant targeted multi-year, peer-reviewed research and trials before it can be considered a viable compensation option.	Noted.
5.4, para 67 - See comments above. We do not accept this level of confidence given the current situation with the main colony at RSPB Havergate and the need to understand the other factors driving declines there.	Noted. Compensation options will be considered further following consultation on the draft RIAA included with the PEIR.
5.4, para 67 - We consider [measures to increase productivity and breeding numbers of lesser black-backed gulls at sites more distant from the Alde-Ore SPA] should be an early part of the discussions given our concerns.	Noted. Compensation options will be considered further following

Comment	Response / where addressed
	consultation on the draft RIAA included with the PEIR.

3 Legislation and Guidance

3.1 Habitats Regulations and requirement for compensation

9. The Habitats Regulations¹ transpose the EU Habitats (92/43/EEC) and Birds (2009/147/EC) Directives into UK law, and ensure they are operable after the UK exit from the EU. The regulations place an obligation on ‘competent authorities’ to carry out an appropriate assessment of any proposal likely to significantly affect a designated European site, to seek advice from Natural England and not to approve an application that would have an adverse effect on the integrity of a designated site unless certain conditions are met. These conditions are that there are no alternative solutions, and that the plan or project can only proceed if there are imperative reasons of over-riding public interest (IROPI) and if any necessary compensatory measures can be secured. The competent authority in the case of the proposed Project is the Secretary of State for Energy Security and Net Zero (hereafter referred to as SoS).
10. The assessment of alternative solutions and IROPI case for the Project will be progressed separately and therefore this document focuses on potential compensatory measures.
11. It is noted that the Energy Bill proposes enabling provisions for amendments to the Habitats Regulations and makes provision for strategic compensation including the establishment of a Marine Recovery Fund. The Applicant will continue to monitor progress of the Energy Bill and have regard to any legislative changes when preparing its DCO application.

3.2 Guidance on Compensation

12. Defra has published for consultation a document setting out best practice guidance for developing compensatory measures in relation to Marine Protected Areas (MPA) (Defra 2021a). Finalised guidance subject to consultation comments was due by the end of March 2022, but has not yet been published. Defra (2021a) sets out the following principles that compensation should satisfy:
 - “Link to the conservation objectives for the site or feature and address the specific damage caused by the permitted activity;

¹ The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended including by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019).

- Focus on providing the same ecological function for the species or habitat that the activity is damaging OR, where this is not technically possible, provide functions and properties that are comparable to those that originally justified designation;
- Not negatively impact on any other sites or features;
- Ensure the overall coherence of designated sites and the integrity of the MPA network; and
- Be able to be monitored to demonstrate that they have delivered effective and sustainable compensation for the impact of the Project. The monitoring and management strategy must require further action to be taken if the compensation is not successful.”

13. In relation to the second bullet point above, the guidance proposes a hierarchy approach (shown in Table 3.1).

Table 3.1 Compensation hierarchy (source: Defra, 2021a)

Hierarchy of Measures	Description
1. Address same impact at same location	Address the specific impact caused by the permitted activity in the same location (within the site boundary)
2. Same ecological function different location	Provide the same ecological function as the impacted feature; if necessary, in a different location (outside of the site boundary)
3. Comparable ecological function same location	Provide ecological functions and properties that are comparable to those that originally justified the designation in the same location as the impact
4. Comparable ecological function different location	Provide ecological functions and properties that are comparable to those that originally justified designation; if necessary, in a different location (outside of the site boundary)

14. Defra (2021a) states that the ‘same ecological function refers to a feature, habitat, or species that provides the same environmental benefit to the environment as the one that is impacted as a result of a marine activity. This is usually the same species, feature or habitat. Comparable ecological function refers to a feature, habitat, or species that provides similar but not exactly the same, environmental benefit’. It is also stated, ‘On rare occasions it may be that other measures delivering wider ecological systems benefits will be the only option for compensation. These opportunities should be identified through developer discussions with the Statutory Nature Conservation Bodies (SNCBs) during the pre-application discussions’.

15. In relation to impacts on SPAs and qualifying bird species, the hierarchy of measures is interpreted for the purposes of this report as shown in Table 3.2. It is considered that addressing the same impact means addressing the effect on the population, for example compensating for predicted increase in population mortality rate from collision and/or displacement from OWFs).

Table 3.2 Compensation hierarchy as interpreted for bird features of SPAs

Hierarchy of Measures	Description for bird features of SPAs
1. Address same impact at same location	Address the specific impact caused by the permitted activity on the same bird species in the same location (within the site boundary)
2. Same ecological function different location	Address the same impact on the same species in a different location.
3. Comparable ecological function same location	Address the specific impact caused by the permitted activity on an ecologically similar species in the same location.
4. Comparable ecological function different location	Address the same impact on an ecologically similar species in a different location.

16. This interpretation of Defra (2021a) thus opens up a range of options, including applying compensation measures for the same or an ecologically similar and/or closely related species in areas distant from a given protected site.
17. Sections 4, 6 and 7 below consider potential compensatory measures for kittiwake, lesser black-backed gull and red-throated diver, including measures to address the same impact at the same location (where feasible) and alternative measures, reflecting options 2, 3 and/or 4 in Table 3.1. These measures are largely based on the findings of strategic reviews of potential compensation measures for UK seabirds, commissioned by Defra / CEFAS and Crown Estate Scotland on behalf of the Scottish Offshore Wind Energy Council (MacArthur Green 2013, 2021). Some of the options identified are more likely to be specific to a given species, for example predator control measures or provision of artificial nesting structures; whereas others, such as closure or restrictions on harvesting of sandeel fisheries, would be likely to benefit a range of species.
18. The guidance states that the compensatory measures should be secured before the impact takes place, recognising that ideally the compensation would be functioning prior to impact occurring but that this is not always feasible: “Where this is not possible, it is important that necessary licences are in place, finances are secured, and realistic implementation plans have been agreed with the appropriate bodies to demonstrate that the compensatory measure is secured.”

4 Quantification of effect on relevant designated sites

4.1 Introduction

19. For the purposes of developing a long list of potential in principle compensatory measures to inform consultation, the following effects, species and SPAs are considered:
 - Collision risk:
 - Kittiwake at the Flamborough and Filey Coast SPA
 - Lesser black backed gull at the Alde Ore Estuary SPA
 - Displacement (from the array areas during operation):
 - Red throated diver at the Outer Thames Estuary SPA

20. These are SPAs and qualifying features where a risk of AEol has been identified in relation to North Falls.
21. An overview of the location and all qualifying features of these three SPAs is provided below. The information is taken from SPA citations, conservation objectives and/or departmental briefs as produced by Natural England and available on their website. All three SPAs have overarching conservation objectives as follows:
 - To ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:
 - The extent and distribution of the habitats of the qualifying features.
 - The structure and function of the habitats of the qualifying features.
 - The supporting processes on which the habitats of the qualifying features rely.
 - The populations of each of the qualifying features.
 - The distribution of qualifying features within the site.
22. Natural England's designated sites view² includes supplementary information on conservation objectives for all SPAs in England, with further detailed information on the current status of SPA qualifying features and specific targets (e.g. for SPA population size).
23. The predicted magnitude of effects of North Falls on the species and SPAs listed above is included below. This is based on the draft RIAA prepared to accompany the PEIR.
24. The RIAA will be updated following s.42 consultation and further refinement of the design envelope. The final RIAA will be submitted with the DCO application and any changes to the conclusions will be reflected in the compensatory measures plan. This review of potential compensatory measures is therefore provided without prejudice of the conclusions of the final RIAA for North Falls.
25. This document aims to aid the refinement of compensation options to enable the selection of measures to take forward. In due course, an in-principle compensation measures plan will be prepared for North Falls which will detail the proposals and will be informed by the scale of effects at North Falls as identified by the final RIAA prepared for the DCO submission.
26. The predicted effects of the Project, both alone and in-combination with other projects, on kittiwake (Flamborough and Filey Coast SPA), lesser black-backed gull (Alde-Ore Estuary SPA) and Outer Thames Estuary (red-throated diver) are presented in the draft RIAA. The Project-alone effects on these features (as quantified in the draft RIAA) will inform compensation, should this be required, and are summarised below for information.

² <https://designatedsites.naturalengland.org.uk/>

4.2 Flamborough and Filey Coast SPA – kittiwake

4.2.1 SPA overview

27. The Flamborough and Filey Coast SPA was designated in 2018, as a geographical extension to the former Flamborough Head and Bempton Cliffs SPA, which was designated in 1993.
28. The SPA is located on the Yorkshire coast between Bridlington and Scarborough. It is composed of two sections; in the north running from Cunstone Nab to Filey Brigg, and in the south from Speeton, around Flamborough Head, to South Landing. The seaward boundary extends 2km offshore of the two sections.
29. The coastal areas of the SPA cover cliffs supporting internationally important breeding populations of seabirds, the marine extension includes areas close to the colony used by seabirds for maintenance behaviours (loafing, preening etc).
30. The qualifying species of the SPA are kittiwake *Rissa tridactyla* (breeding), gannet *Morus bassanus* (breeding), guillemot *Uria aalge* (breeding), and razorbill *Alca torda* (breeding, as well as an internationally important assemblage of breeding seabirds).

4.2.2 Kittiwake

31. Specific attributes and targets identified by Natural England (2022) for kittiwake at Flamborough and Filey Coast include:
 - Restore the size of the breeding population at a level which is above 83,700 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
 - Restore safe passage of birds moving between nesting and feeding areas.
 - Restore the distribution, abundance and availability of key food and prey items (e.g. sandeel, sprat, cod, squid, shrimps) at preferred sizes.

4.2.2.1 Effect: Collision risk

4.2.2.1.1 Project alone effects

32. The draft RIAA presents an assessment of predicted collision mortality affecting kittiwake from Flamborough and Filey Coast SPA. Three WTG design scenarios and two nocturnal activity factors (NAFs) have been modelled, predicting total mean annual collision mortality of 28.7 to 52.3 kittiwakes, of which 6.1 to 10.7 collisions per annum would be apportioned to breeding adults from Flamborough and Filey Coast SPA (draft RIAA, Section 7.4.3.1.3). These values have been calculated using an avoidance rate of 98.9% (from SNCBs, 2014); however, Natural England has recently advised that a revised avoidance rate of 99.2% should be applied, which would reduce collision risk values above by approximately 27%.

4.2.2.1.2 In-combination effects

33. The in-combination assessment presented in the draft RIAA predicts total kittiwake mortality apportioned to Flamborough and Filey Coast SPA for all relevant projects (including the 'worst case' value of 10.7 birds from North Falls)

of 607 (draft RIAA, Section 7.4.3.1.5). This is reduced to 461 birds if OWFs consented subject to compensation for kittiwake are excluded.

4.2.2.2 Draft RIAA conclusion

34. For kittiwake at the Flamborough Filey Coast SPA, collision risk from the project alone would not adversely affect the integrity of Flamborough and Filey Coast SPA.
35. An adverse effect from in-combination collision mortality from North Falls and other OWFs in the UK North Sea cannot be excluded.

4.3 Alde-Ore Estuary SPA – lesser black-backed gull

4.3.1 SPA overview

36. The Alde Ore Estuary SPA, situated on the east Suffolk coast, covers the estuary complex of the rivers Alde, Burley and Ore, including Havergate Island and the Orfordness shingle spit. A variety of habitats for breeding and wintering birds are contained within the site boundary, including vegetated shingle, intertidal mudflats, semi-improved grazing marsh, saltmarsh and saline lagoons.
37. The qualifying species of the SPA are marsh harrier *Circus aeruginosus* (breeding), avocet *Recurvirostra avosetta* (breeding and non-breeding), ruff *Philomachus pugnax* (non-breeding), redshank *Tringa totanus* (non-breeding), lesser black-backed gull *Larus fuscus* (breeding), Sandwich tern *Sterna sandvicensis* (breeding) and little tern *Sterna albifrons* (breeding).

4.3.2 Lesser black-backed gull

38. Specific attributes and targets identified by Natural England (2021a) for lesser black-backed gull at the Alde-Ore Estuary include:
 - Restore the size of the breeding population to a level which is above 14,074 breeding pairs whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
 - Reduce the frequency, duration and / or intensity of disturbance affecting roosting, nesting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.
 - Reduce predation and disturbance caused by native and non-native predators.

4.3.2.1 Effect: collision risk

4.3.2.1.1 Project alone effects

39. The draft RIAA presents an assessment of predicted collision mortality affecting lesser black-backed gulls from Alde-Ore Estuary SPA. Three design scenarios and two NAFs have been modelled, predicting total mean annual collision mortality of 10.7 to 18.8 lesser black-backed gulls, of which 3.6 to 6.1 collisions per annum would be apportioned to breeding adults from Alde-Ore Estuary SPA (draft RIAA, Section 7.3.3.1.3). These values have been calculated using an avoidance rate of 99.5% (from SNCBs, 2014); however, Natural England has

recently advised that a revised avoidance rate of 99.4% should be applied, which would increase collision risk values above by approximately 20%.

4.3.2.1.2 In-combination effects

40. The in-combination assessment presented in the draft RIAA predicts total lesser black-backed gull mortality apportioned to Alde-Ore Estuary SPA for all relevant projects (including the 'worst case' value of 6.1 birds from North Falls) of 47 (draft RIAA, Section 7.3.3.1.4). This is reduced to 44 birds if OWFs consented subject to compensation for lesser black-backed gull are excluded.

4.3.2.2 Draft RIAA conclusions

41. Predicted collisions at North Falls alone would not have an adverse effect on the Alde-Ore Estuary SPA breeding population of lesser black-backed gull.

42. The potential for adverse effects on the SPA population from in-combination collisions with North Falls and other OWFs within the UK North Sea and Channel cannot be excluded.

4.4 Outer Thames Estuary SPA – red-throated diver

4.4.1 SPA overview

43. The Outer Thames Estuary SPA is an offshore area adjacent to the east coast of England between the counties of Norfolk (on the north side) and Kent (on the south side) and extending into the North Sea. It includes areas of shallow and deeper water, high tidal current streams and a range of mobile mud, sand, silt and gravely sediments extending into the marine environment, incorporating areas of sand and mud banks often exposed at low tide (Natural England undated).

44. The qualifying species of the SPA are red-throated diver *Gavia stellata* (non-breeding), little tern *Sterna albifrons* (breeding) and common tern *Sterna hirundo* (breeding). The SPA was first designated in 2010 for red-throated diver only, and an extension to the boundary was classified in 2017 for the additional features little and common tern.

4.4.2 Red-throated diver

45. Specific attributes and targets identified by Natural England (2019) for red-throated diver at the Outer Thames Estuary include:

- Maintain the size of the non-breeding population at a level which is at or above 18,079 individuals, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.
- Reduce the frequency, duration and / or intensity of disturbance from human activity affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.

4.4.2.1 Effect: Displacement during operation

4.4.2.1.1 Project alone effects

46. The draft RIAA presents an assessment of predicted displacement mortality affecting red-throated diver from the Outer Thames Estuary SPA (draft RIAA, Section 7.2.3.1.3). The predicted mortality under the 'worst case' scenario presented in the RIAA is from zero to 14 birds (assuming 1% and 10% mortality

of displaced birds respectively). This would increase background mortality within the SPA by between 0% and 0.35%.

47. The RIAA also presents the total area of the SPA where red-throated divers would be potentially subject to displacement effects within a 12km buffer around North Falls, and the effective area of the SPA that would be impacted taking into account the decline in the predicted % of birds displaced with distance from the boundary. The total area potentially subject to displacement effects is 149km², equivalent to 3.8% of the SPA area. The area of effective displacement is estimated to be 46-48km², equivalent to approximately 1% of the SPA. Taking into account areas that are within 12km of existing Greater Gabbard and London Array windfarms, where these 12km buffers overlap the North Falls buffer (and are therefore assumed to be subject to existing displacement effects), the net effective area impacted by North Falls would be less than 1% of the SPA.
48. As well as overlapping partially with the 12km buffers of other OWFs (London Array and Greater Gabbard), the area of the SPA within a 12km buffer of North Falls also overlaps almost completely (all except for 1.5km²) with IMO Ship-routeing measures (draft RIAA Figures 7-1 and 7-2). Shipping traffic is also identified as a source of disturbance and displacement for red-throated divers (Mendel et al. 2019, Schwemmer et al. 2011, Bellebaum et al. 2006).

4.4.2.1.2 In-combination effects

49. The in-combination assessment presented in the draft RIAA was not able to present predicted red-throated diver mortality numbers from all OWFs screened into the assessment (predictions are available from a model developed for East Anglia One North and TWO but Natural England did not endorse the use of this model for North Falls due to concerns about aspects of the model (see draft RIAA, Section 7.2.3.1.3.2)).
50. The area of the Outer Thames Estuary SPA within 12km of an OWF, where red-throated divers may be subject to some displacement effects, is 1939km² or 49% of the SPA area, excluding North Falls, and 2009km², 51% of the SPA area, including North Falls. An estimate of the effective area of the SPA impacted by displacement from OWF projects (taking account of predicted reductions in the proportion of birds displaced with distance from an OWF) predicts that, excluding North Falls, 697-878km² would be impacted, equivalent to 18-23% of the total SPA area. Including North Falls would increase this to 730-919km², 19-23% of the SPA.

4.4.2.2 Draft RIAA conclusion

51. The draft RIAA concludes no AEol on the Outer Thames Estuary SPA, either from the Project alone or in-combination. However, this document includes compensation for red-throated diver in response to consultation feedback received to date with Natural England and RSPB. This compensation is provided without prejudice of the Applicant's assessment conclusions.

5 Review of potential compensation for kittiwake

5.1 Review of potential compensation measures

52. The key potential impact of OWFs on kittiwake for which compensation is likely to be required is collision with turbines. This is assumed always to result in mortality that is additive to that affecting the population in the absence of OWFs. Thus compensation would seek to offset the predicted project alone mortality to the kittiwake breeding population at the SPA, by increasing the breeding success of the population and/or reducing mortality from other factors. As described above, the predicted year round mortality from the Project alone is 10.7 birds under the worst-case WTG scenario.
53. Reviews of possible compensation measures for seabirds (MacArthur Green 2021a, 2013) have identified potential measures for kittiwake as listed in Table 5.1 below.

Table 5.1 Potential compensation measures for kittiwake (after MacArthur Green 2021, 2013)

Measure	Summary of evidence base
Closure of sandeel and sprat fisheries close to breeding areas	Kittiwakes breeding at colonies bordering the North Sea feed predominantly on sandeels. Studies at different colonies (e.g. Shetland, Foula, Isle of May, Flamborough and Filey Coast), some covering periods where regional sandeel fisheries have been closed, have shown a positive relationship between sandeel abundance and kittiwake breeding success. This in turn influences whether colonies increase or decrease in size). Based on past closures of sandeel fisheries, there is evidence that sandeel stocks in the southern North Sea would recover in the short to medium term in response to such closures or to restrictions on harvesting levels, and, such management would likely be the most effective action to support recovery of North Sea kittiwake populations. It has the potential to increase survival rates to the extent that the resulting recruitment of adults to the breeding population would be an order of magnitude greater than the losses from current estimates of the in-combination collision mortality at existing OWFs in UK waters of the North Sea.
Provision of additional nesting habitat – artificial structure – for new kittiwake breeding colonies	Kittiwakes will readily use a range of artificial nest sites – harbour walls, buildings, bridges, oil and gas platforms, purpose-built structures – where natural sites (narrow cliff ledges) are not available. Providing new artificial colonies in areas where kittiwakes are unable to breed due to lack of natural nesting habitat is a potential compensation measure for mortality due to OWFs (and has been proposed for a number of developments – see text below). Evidence indicates that artificial sites have the potential for higher breeding success than natural sites which is important in terms of potential for compensation to offset collision mortality.
Predator eradication (mink, feral cat, rat) / exclusion (foxes, great skuas)	Predation on kittiwake nests by mammals is rare because nests tend to be inaccessible. Great skuas predate kittiwakes breeding in north and west Scotland, but not in colonies bordering the southern North Sea.

5.2 Compensation measures at other OWFs

54. To date, five UK OWFs have been consented subject to providing compensation measures for kittiwake, i.e. Hornsea Project Three, Norfolk Boreas, Norfolk Vanguard, East Anglia ONE North and East Anglia TWO.
55. Hornsea Three, consented on 31 December 2020, has provided a kittiwake compensation plan (GoBe Consultants and Ørsted 2020) relating to predicted in-combination effects on the kittiwake population at the Flamborough and Filey

Coast SPA. The objective is to deliver 73 adult (breeding age) kittiwake into the regional (East Atlantic) population per annum through the delivery of four artificial nesting structures each capable of supporting a minimum of 404-467 pairs of nesting kittiwake. The number of adult kittiwakes to be delivered is equivalent to the estimated contribution of Hornsea Three (a predicted annual collision rate of 65-73 birds) to the in-combination collision risk total for this species from OWFs. A review of potential locations for artificial nesting habitat was undertaken (Ørsted 2020) and two preferred zones identified: East Anglia (the coastline between Lowestoft and Sizewell) and North-East (coastline between the Tees Estuary and south of Seaham). Other areas considered to be less preferable were Newcastle, Seaham and Sunderland, Scarborough and Great Yarmouth. The Kittiwake Implementation and Monitoring Plan (KIMP) for Hornsea Three (Gobe Consultants and Niras 2023) identifies four sites for artificial nesting structures. In the North East zone these comprise approximately one acre of land purchased by Orsted at the Old Hartlepool Yacht Club (in the harbour area), and an un-named site described as confidential and commercially sensitive; and in the East Anglia zone two nearshore areas respectively 0.99km from the shoreline off Lowestoft, and 1.43km off Minsmere. Orsted has agreements in place with The Crown Estate (TCE) for the nearshore areas, giving them the right to exercise the option to call upon TCE to grant a lease. The artificial nest structures to be created as compensation for Hornsea Three are due to be in place for three breeding seasons prior to the planned onset of operation of the OWF (Department of Energy Security and Net Zero, 2023). Planning permission for the Hartlepool Yacht Club site was granted on appeal early in 2023 and marine licences for the East Anglia sites are expected to be granted by MMO by Q1 2023 (Gobe Consultants and Niras 2023).

56. Monitoring and adaptive management is proposed for the Hornsea Three artificial nesting structures as follows (Gobe Consultants and Niras 2023):

- Pre-construction baseline counts (colony counts and basic productivity) at existing kittiwake colonies within about 20km of artificial nesting sites from 2021, prior to implementation of compensation, to continue throughout construction and operation of the OWF (currently expected to be 35 years).
- Monitoring of artificial nest structures (colonisation counts followed by colony counts and basic productivity) from the first breeding season after construction to continue throughout the construction and operational phase of the OWF.
- Monitoring for natal breeding dispersal through colour-ringing of kittiwake chicks at artificial nesting structures where it is safe to do so. It is accepted that it is not possible with current tagging technology to quantitatively measure natal dispersal and re-sightings of colour-ringed birds are likely to be low (for example If fledglings from an artificial structure were to breed at Flamborough and Filey Coast the chances of spotting them are low due to restricted visibility of nests at this colony), but colour-ringing should provide some information on interchange of birds between colonies.
- Monitoring for adult survival by colour-ringing breeding adult kittiwakes and a systematic re-sighting programme at an artificial nesting structure, where it is practicable and safe to do so.

- Diet studies involving analysis of regurgitates from handled birds at an onshore artificial nesting structure and neighbouring colonies, to estimate frequency of occurrence and biomass proportions of prey species.
 - Monitoring of the artificial nesting structures will inform whether there is a surplus or debt of kittiwakes with respect to the compensation target of 73 birds. Adaptive management will be an iterative process which combines management measures and subsequent monitoring with the aim of improving effectiveness of the measures, whilst also updating knowledge and improving decision making over time. Potential measures include extension of artificial nesting structures to provide more nesting space, relocation of structures, provision of supplementary food and response to HPAI outbreaks.
57. The Hornsea Three compensation works also include a commitment to research prey availability and the possibility of practical management measures to increase this. JNCC has been contracted by Orsted to review kittiwake diet studies and foraging distributions at UK colonies and assess current and possible future fish prey availability to kittiwakes. The aim is to design follow-on research to increase understanding of the responses and resilience of kittiwake populations to spatio-temporal changes in fish prey availability, and to help inform future prey management measures as part of future compensatory options (Gobe Consultants and Niras 2023).
58. The Kittiwake Implementation and Monitoring Plan for Hornsea Three (Gobe Consultants and Niras 2023) also refers to Orsted participation in the Offshore Wind Industry Council's Developer Group, and funding of research at the Universities of Aberdeen and the Highlands and Islands to investigate the effects of predicted future oceanographic changes on primary productivity, fish migration and top predators such as seabirds. (It is understood that this is not part of the compensation measures for kittiwake at Hornsea Three).
59. Norfolk Boreas was consented on 10 December 2021, subject to compensation measures to provide 14 adult kittiwakes per year to be recruited into the Flamborough and Filey Coast SPA population (BEIS 2021). The options for location of additional nesting areas for kittiwakes in the in-principle compensation plan for Norfolk Boreas were offshore structures within the Order Limits of the OWF (although the likely higher risk of collision for these birds was a consideration), offshore structures outside the Order Limits, and enhancements/additions to existing artificial structures used by kittiwakes for nesting at Lowestoft and along the River Tyne. Mention was also given to Dunbar and the Kent coast, although these options were not considered further (MacArthur Green 2020). Subsequent considerations led to the Lowestoft Port option being taken forward, with this location deemed suitable because of the existing presence of nesting kittiwake in the vicinity, proximity to the sea and accessibility for construction and monitoring purposes (MacArthur Green and Royal HaskoningDHV 2022c). The artificial nesting structure will be located on the outer wall of Lowestoft Port, near the existing kittiwake nest wall. Landowner agreements and planning permission have been secured to enable the required works to proceed. The terms of the Option agreement with Associated British Ports provide for a lease of 40 years and a potential extension of up to 25 years. The design of the nesting structures has been informed by the findings of a study on the factors determining nesting success at existing artificial nesting structures

(e.g. in terms of exposure to sun, rain and wind, protection from predators and distance to the sea). A modular design is proposed to allow for incorporation of additional nesting ledge spaces to increase capacity, and there is facility for access to nests from within the structures to provide for monitoring with minimal disturbance to nesting birds. An estimated 145 nests are required to provide the required compensation for the Norfolk Boreas project, with the compensatory measures being undertaken in conjunction with those for Norfolk Vanguard (a combined total of 360 nests, see below, although the proposed artificial nesting structure has potential to accommodate up to 432 nests).

60. The consent for Norfolk Vanguard, announced on 11 February 2022, is also subject to compensation measures for kittiwake. The objective is to provide 21 adult kittiwakes per year which could be recruited into the Flamborough and Filey Coast SPA population, with compensation measures in place four full breeding seasons before the operation of the first wind turbine (BEIS 2022b). The compensation measures identified were the provision and monitoring of artificial structures for kittiwake at the Port of Lowestoft (MacArthur Green 2021b), with the work to provide these structures currently being undertaken in conjunction with that for the Norfolk Boreas project (as detailed above), and subject to a joint KIMP (MacArthur Green and Royal HaskoningDHV 2022c). In the case of the Norfolk Vanguard project, 215 nests are estimated to be required for the compensation (MacArthur Green and Royal HaskoningDHV 2022c).
61. Monitoring set out in the Norfolk Projects KIMP includes:
 - Numbers of pairs / AONs and productivity (eggs and chicks), using photographs to allow individual nests to be tracked.
 - Chicks and adults to be fitted with colour rings and standard BTO metal rings (initially respectively for the first 10 and 5 years of monitoring, with possible extension).
 - Investigation of any relationships between nest position and breeding success;
 - Diet studies through collection of pellets and/or regurgitated material during handling of birds.
 - Counts of the regional kittiwake population within 100km (onshore locations) and monitoring of regional productivity and possibly colour / BTO ringing of chicks from a sample of locations.
 - Ring re-sighting campaigns for adults and juvenile/sub adult birds, to be coordinated with regional monitoring (above) and other kittiwake research, particularly at Flamborough and Filey Coast.
 - Consideration given to fitting adult birds in the compensation population with GPS tags to investigate ranging behaviour.
62. The Norfolk Projects KIMP refers to possible adaptive management measures including the potential to accelerate recruitment to artificial nest structures (e.g. decoy birds and call playback), structural modifications to nest structures, supplementary feeding and provision of nesting material.

63. The Norfolk Projects KIMP also refers to strategic approaches to kittiwake compensation, noting that the modular design of the artificial nesting structure would be capable of accommodating sufficient nests for East Anglia ONE North and East Anglia TWO (see below), although kittiwake compensation for these projects would require to be approved separately. The hope is also stated that the monitoring will be conducted collaboratively with other interested parties, including OWF developers providing kittiwake compensation and seabird interest groups / researchers.
64. East Anglia ONE North and East Anglia TWO were both consented on 31 March 2022. The consents were subject to compensation measures to increase the productivity of the southern North Sea kittiwake population and, hence, compensate for the loss of a predicted 0.7 and 0.8 adult kittiwake per year from the SPA population due to the potential effects associated with East Anglia ONE North and East Anglia TWO, respectively (BEIS 2022a,c). For each project, this is to be achieved via the provision of nesting structures to accommodate 100 breeding pairs, which would supplement existing onshore colonies reliant on artificial nesting structures (e.g. at Lowestoft and/or River Tyne). The compensation measures must be in place for at least four full breeding seasons before the operation of the first wind turbine and would be maintained until either (i) the decommissioning of the projects or (ii) a determination by the SoS that the compensation was no longer required, whichever was later (BEIS 2022d,e). As outlined above, at least some of this compensation may be facilitated by the work already undertaken at Lowestoft Port for the Norfolk Boreas and Norfolk Vanguard projects, whilst the design of the nesting structures is also informed by the findings of the study into factors determining nesting success at existing artificial nesting structures (MacArthur Green and Royal HaskoningDHV, 2022a,b,c). These measures have been provided despite the estimated annual collision mortality for kittiwakes at each OWF being very small and representing less than 1% of the in-combination collision mortality for this SPA population.
65. Noting that there are a number of existing proposals for the creation of artificial structures for kittiwakes as compensation for the effects of OWFs, and that others may come forward in the near future, the Applicant for East Anglia ONE North and TWO has stated they would seek to work with other developers collaboratively and strategically, where possible (MacArthur Green and Royal HaskoningDHV 2021b,c).
66. These locations of artificial structures described above are all outside the Flamborough and Filey Coast SPA. It is assumed there is no lack of natural nesting habitats (cliff ledges) within the SPA. The population was estimated at 83,700 pairs in 1987 (albeit a figure that is disputed and may be an over-estimate e.g. Coulson 2011, Clarkson et al. 2022), 51,535 pairs in 2017 (Aitken et al 2017) and 44,574 pairs in 2022 (Clarkson et al. 2022) Thus, artificial structures, where kittiwakes potentially have higher breeding success than at natural sites, might not be adopted in this area.
67. At the time of writing, The KIMP for the Norfolk Projects has been approved by the SoS while that for Hornsea Three has been subject to consultation but not yet approved. A Kittiwake Plan of Work for the Kittiwake Compensation Steering Group for East Anglia ONE North and TWO has been approved by the SoS.

68. In principle compensation measures for kittiwakes at the Flamborough and Filey Coast SPA are also available for a number of OWFs at pre- or post DCO examination stages. Thus, the Sheringham Shoal and Dudgeon Extension Projects outline proposals for without prejudice compensation measures which are provided in relation to the predicted collision mortality of 6.4 adult kittiwakes from the SPA population as a result of these projects (as determined from estimates updated since submission – Royal HaskoningDHV 2023). These proposals comprise the following package of possible measures:
- Prey enhancement through sandeel stock recovery and ecosystem-based management (aimed to increase both adult survival rates and breeding productivity).
 - Nest site enhancements to improve breeding success.
 - Construction of new onshore or offshore artificial breeding sites for kittiwake.
69. Of the above possible measures, prey enhancement via reduction in fishing pressure on sandeels (a key prey for kittiwake) in UK waters would have the potential to provide compensation that greatly exceeded losses to the SPA population due to the Sheringham Shoal and Dudgeon Extension Projects and, indeed, due to the overall in-combination effects from OWFs (MacArthur Green and Royal HaskoningDHV 2021a). However, this measure would require delivery at a strategic level (e.g. via action by the UK Government). Nest enhancements to improve breeding success would focus on locations where there is potential for high levels of breeding productivity but where human actions or site design constrain this and could be delivered at the project level, whilst construction of further artificial nest sites could be undertaken via collaboration with other OWF projects (given that other projects are already providing this as a compensation measure) (MacArthur Green and Royal HaskoningDHV 2021a).
70. Hornsea Project Four (which is at post-DCO examination stage) provides details of without prejudice compensation measures for kittiwake (as well as gannet, guillemot and razorbill) at Flamborough and Filey Coast as part of the DCO application (GoBe and RHDHV 2021). The proposal is to provide structure(s) (onshore and offshore) that can sustain a breeding population of kittiwakes to produce sufficient breeding adults to compensate for the estimated impact of the Project (a predicted annual mortality of 21.2 breeding adults from the SPA, GoBe 2021b). This would be through repurposing an existing oil and gas platform proposed for decommissioning or constructing new offshore or onshore structure(s) in an extensive area of search in the southern North Sea (encompassing coastal stretches in Suffolk and from Scarborough to Blyth, and an extensive offshore area bounded approximately by the 12nm limit along the southeast, the Hornsea OWF projects along the northwest and the Norfolk Vanguard and Boreas OWF projects along the southwest – Ørsted 2022).
71. For the OWFs referred to above, Table 5.2 shows the estimated (project alone) annual collision mortality of breeding adult kittiwakes from Flamborough and Filey Coast SPA, and, for consented OWFs, the target for creation of artificial nest sites.

Table 5.2 Compensation targets / estimated annual collision mortality for breeding adult kittiwake at Flamborough and Filey Coast SPA, and targets for creation of artificial nest sites (consented sites only) for OWFs in the UK North Sea

OWF Project	Compensation target / estimated annual collision mortality for kittiwake from Flamborough and Filey Coast SPA breeding population (project alone)	Target for creation of nest sites (consented sites only)
Hornsea Project Three	73	404-467
Norfolk Boreas	14	145
Norfolk Vanguard	21	215
East Anglia ONE North	0.7	100
East Anglia TWO	0.8	100
Hornsea Project Four	21	n/a
Dudgeon and Sheringham Shoal Extension Projects	6	n/a
North Falls	6 - 11	n/a

5.3 Potential compensation measures for North Falls

72. As described above, five OWFs in the southern North Sea have recently been consented subject to compensation measures for kittiwake at Flamborough and Filey Coast SPA. This indicates that the view of the Competent Authority is that current in-combination mortality levels from OWFs in the southern North Sea represent an AEoI for kittiwake at Flamborough and Filey SPA. It seems likely, therefore, that any further OWFs coming forward for consent in this area which are predicted to increase the in-combination collision mortality will require compensation measures for kittiwake. As detailed in Section 4.2, the predicted collision risk from North Falls in relation to the adult breeding population of the Flamborough and Filey Coast SPA is 6.1 to 10.7 adult kittiwakes per annum, as determined in the draft RIAA. The aim of the compensation is to offset the predicted mortality to the kittiwake breeding population at the SPA, by increasing the breeding success of the population and/or reducing mortality from other factors.

5.3.1 Address same impact at same location

5.3.1.1 Closure of sandeel fisheries

73. Closure (or potential management to restrict harvests) of sandeel fisheries in areas used for foraging by kittiwakes breeding at Flamborough and Filey Coast would probably be the most effective compensation measure for collision mortality, as sandeel abundance would be expected to increase and result in increased breeding success of kittiwakes (Table 5.1). Closure of regional sandeel fisheries was estimated to increase sandeel productivity at the Isle of May by 0.5 chicks per pair (Frederiksen et al. 2004). If the same increase could be achieved through closure of sandeel fisheries in foraging areas of kittiwakes breeding at Flamborough and Filey Coast the breeding population, estimated at 51,535 pairs

in 2017 (Aitken et al. 2017), could potentially produce more than 25,000 additional fledglings per year and in due course, based on estimated demographic parameters (Horswill and Robinson 2015), more than 12,000 four year old adults available to recruit into the breeding population per year (MacArthur Green 2021). This far exceeds the in-combination annual collision mortality of kittiwakes from regional OWFs in UK waters of the North Sea, recently estimated at 607 birds (draft RIAA, Section 7.4.3.1.5). This strategic measure however is beyond the remit of an OWF developer or developers to implement, as it would require action by the UK Government (MacArthur Green 2021). Given international commitments to address global temperature rises due to climate change, and ambitious UK Government policy and targets for expansion of renewable energy and in particular offshore wind, there would seem to be an incentive at national level to address constraints on the industry including adverse effects on UK seabird populations.

74. The UK fisheries policy authorities have stated that they recognise that urgent actions are required to protect stocks of sandeel and Norway pout, and that continued removal through industrial fishing methods could result in further declines of threatened and vulnerable species such as seabirds, cetaceans and seals, and also affect commercial fish stocks. Consultations have recently completed on a call for evidence in relation to future management of these forage fish species in the context of the UK Marine Strategy and the Fisheries Act 2020³. A further consultation on spatial management measures for industrial sandeel fishing was launched by Defra in March 2023 (closing 30 May 2023)⁴, identifying closure of all or some sandeel management areas within English North Sea waters as a preferred option, with implementation through secondary legislation, licence conditions or a combination. A report accompanying the consultation includes an Ecopath with Ecosim (EwE) foodweb model of the North Sea which predicts a 7% (95% confidence intervals 4-8%) increase in seabird biomass in response to prohibition of industrial sandeel fishing in UK North Sea waters (Natural England, Cefas and JNCC undated). However, conditions for sandeel recruitment are likely to worsen under climate change, and monitoring of sandeel closures off Scotland's east coast suggests that fisheries closures may not guarantee increases in sandeels and seabird numbers. The Applicant will continue to monitor developments in this area.

5.3.1.2 *Provision of artificial nesting structures to increase breeding populations and productivity in the southern North Sea*

75. As described above, compensation measures to provide additional breeding adult kittiwakes to recruit into the Flamborough and Filey Coast SPA population, to replace predicted losses from collisions, have been accepted for five consented OWFs and are currently proposed as without-prejudice compensation measures for other OWFs. A comprehensive review of the potential location of sites for creation of new kittiwake colonies that could supply recruits to the Flamborough

³ <https://www.gov.uk/government/consultations/future-management-of-sandeel-and-norway-pout-in-uk-waters-call-for-evidence/outcome/summary-of-responses>

⁴ <https://consult.defra.gov.uk/wg-management-measures-for-industrial-sandeel-fishing/consultation-on-spatial-management-measures-for-in/>

and Filey Coast SPA (Ørsted, 2020) has identified a number of potential onshore and offshore sites for installing artificial nest structures or for enhancing / expanding existing artificial structures. Thus, there would seem to be opportunities for North Falls to find suitable location(s) to implement such measures. This is a measure that could be implemented by North Falls alone – by identifying site(s) and securing the necessary agreements for management or by working in collaboration with other OWF developers, subject to commercial agreements. Based on the current practice for securing compensation measures for kittiwake for consented OWFs described above, any artificial nesting structures identified as compensation measures for North Falls may need to be in place for three breeding seasons before the Project becomes operational.

5.3.2 Alternative measures

76. The provision of artificial nesting structures for kittiwakes in areas which could supply new recruits to the Flamborough and Filey SPA population, as described above, has already been agreed as compensation for five consented OWFs and is therefore an established measure agreed by Regulators. It is considered also to have a high level of evidence for success (MacArthur Green 2013). Even though a number of OWF developers are also proposing the same measure at sites along the east coast of England and offshore within the southern North Sea, there would seem to be scope for North Falls to find suitable location(s) to implement such measures. Thus, it is deemed unlikely that alternative compensatory measures would be required.

77. If required, the following measures could be considered further.

5.3.2.1 *Provision of artificial nesting structures to increase breeding populations and productivity in alternative locations*

78. Measures to increase kittiwake productivity and breeding numbers at sites more distant from Flamborough and Filey Coast SPA could be considered; at other existing breeding colonies or through creation of new colonies by providing suitable structures elsewhere on the North Sea coast of the UK (and potentially also the west coast). It has been suggested that creation of artificial colonies for kittiwakes would be successful only in areas with no available unoccupied natural habitat (as is the case along the east coast of England from Lincolnshire to Kent). However, there could still be merit in provision of artificial nesting habitat where large areas of natural nesting habitat (cliff ledges) exist, such as Scotland. Breeding success at large cliff-nesting colonies may be reduced as a result of density dependent competition for food in the surrounding waters. Creation of small breeding aggregations on artificial structures in areas between large natural colonies could potentially result in higher breeding success if there is reduced intra-specific competition and higher nest site quality (MacArthur Green 2021).

6 Review of potential compensation for lesser black backed gull

6.1 Review of potential compensation measures

79. As for kittiwake, the key potential impact of OWFs on lesser black-backed gull for which compensation is likely to be required is collision with turbines, which is assumed always to result in mortality that is additive to that affecting the

population in the absence of OWFs. Thus, compensation would seek to offset the predicted mortality to the lesser black-backed gull breeding population at the SPA, by increasing the breeding success of the population and/or reducing mortality from other factors.

80. Reviews of possible compensation measures for seabirds (MacArthur Green 2021, 2013; MacArthur Green and Royal HaskoningDHV 2021a) have identified potential measures for lesser black-backed gull as listed in Table 5.1 below.

Table 6.1 Potential compensation measures for lesser black-backed gull (after MacArthur Green 2021, MacArthur Green and Royal HaskoningDHV 2021a, MacArthur Green 2013)

Measure	Summary of evidence base
Closure of sandeel and sprat fisheries close to breeding areas	Lesser black-backed gulls feed to some extent on small pelagic fish during the breeding season, although the species has a varied diet and forages in terrestrial as well as marine areas. Closure of sprat and sandeel fisheries close to SPA breeding colonies may have some benefits in terms of increased productivity but the ability of this species to exploit a wide range of food sources means that any such benefits from fisheries closures may be minimal. Therefore, this option is not considered further.
Predator control at breeding colonies	Predation by foxes and mink may reduce breeding success and adult survival at breeding colonies, and predation by rats may also reduce productivity. Eradication of predators from island colonies can be achieved; for mainland colonies predator control is a traditionally established technique although this requires ongoing management as new predator populations continually migrate into areas and re-establish quickly if culling ceases. Predator-exclusion fencing is considered to be an effective alternative option.
End culling	Until 2019 lesser black-backed gulls could be legally culled under the General Licence with no requirement to report on numbers killed. Licence conditions have changed, and reporting is required which should provide data to assess the population effects (MacArthur Green and Royal HaskoningDHV 2021a). At present, however, the potential impacts of this option on a particular SPA population cannot be assessed and it is not considered further at this stage.
Reduce fisheries bycatch	Gull species including lesser black-backed gull may be susceptible to bycatch in UK fisheries and could benefit from reduction in bycatch. While the specific benefits of this measure for a given SPA breeding population may be difficult to predict and measure, bycatch reduction has been suggested as a secondary compensation measure for lesser black-backed gull and the Alde-Ore estuary in relation to East Anglia ONE North and TWO.

6.2 Compensation measures at other OWFs

81. To date, four OWFs in the southern North Sea have been consented subject to compensation for lesser black-backed gulls breeding at the Alde-Ore Estuary SPA; Norfolk Boreas, Norfolk Vanguard, East Anglia ONE North and East Anglia TWO.

6.2.1 Norfolk Boreas

82. The predicted annual collision mortality of lesser black-backed gulls from the Alde-Ore Estuary SPA population for Norfolk Boreas is 2.1 individuals per year (BEIS, 2021).

83. The compensation to be delivered by Norfolk Boreas is a protected area for nesting lesser black-backed gulls will be established at Orford Ness within the SPA, to be surrounded by predator-proof fencing. This will facilitate exclusion of foxes – key predators of lesser black-backed gulls in this area – and other mammals, from nesting areas.
84. These proposals were set out in response to a request during the DCO examination for in principle compensation measures (Royal HaskoningDHV 2020). Post-examination and prior to consent being given, Norfolk Boreas was requested to provide further information on compensation proposals for lesser black-backed gull, to satisfy the SoS that sufficient detail was available to demonstrate that a package of measures could be delivered according to the requirements of the Habitats Regulations (BEIS 2021). In this correspondence Norfolk Boreas Ltd indicated they were working with ScottishPower Renewables to deliver strategic compensation measures for several offshore wind farms and provided more detail in relation to the implementation and monitoring of compensation measures for lesser black-backed gull at the Alde-Ore Estuary. They also confirmed that a parcel of land had been identified as a predator exclusion area and negotiations were ongoing with the landowner over lease of the site.
85. Subsequent to the above, plans have been developed to enclose a 6ha area of land at Orford Ness with mammalian predator-proof fencing. This is considered sufficient to support a lesser black-backed gull breeding colony capable of delivering a minimum of 14.1 adult birds into the breeding population each year and, hence, provide compensation for both the Norfolk Boreas and Norfolk Vanguard projects (MacArthur Green and Royal HaskoningDHV 2022d). This is based on delivering compensation at a ratio of 3:1 (with the predicted collision mortality of lesser black-backed gulls from the Alde-Ore Estuary SPA due to Norfolk Vanguard being 2.6 adults per year – see below). A survey of the proposed 6ha site has been undertaken to establish its likely suitability, with vegetation management to be undertaken in some areas to improve the suitability for nesting (including trials of different cutting regimes during the first year in which the enclosure is established to improve understanding of preferred nesting conditions). Landowner agreements have been reached (a 40 year lease) to enable the required works to proceed and the fencing is due to be in place by early 2023, four years before the first operation of turbines due in 2027.
86. Fence inspections and monitoring for predator intrusions will be undertaken for the compensation area year round, most frequently in the breeding season. Within the compensation area monitoring will be undertaken over the first three years to count the number of pairs / apparently occupied nests (AON) of lesser black-backed gull, estimate productivity (number of eggs chicks and fledged young per pair, and record relevant observations such as predation or disturbance events. Additional monitoring, subject to any restrictions due to Highly Pathogenic Avian Influenza, will comprise colour-ringing of chicks and opportunistic collection of pellets / regurgitates for diet studies. The intensity of monitoring may be reduced in later years subject to consultation with the Lesser Black Backed Gull Steering Group. Should monitoring indicate that compensation measures have been ineffective in increasing the number of adult lesser black-backed gull available to recruit to the SPA population, then adaptive management measures to address

this will be required. Measures that may be considered include additional habitat management to enhance suitability for lesser black-backed gull (e.g. closer sward mowing, creation of bare ground), supplementary feeding of chicks) (MacArthur Green and Royal HaskoningDHV 2022d).

6.2.2 Norfolk Vanguard

87. As stated above, the predicted annual collision mortality of lesser black-backed gulls from the Alde-Ore Estuary SPA population for Norfolk Vanguard is 2.6 individuals per year (BEIS, 2022b).
88. The compensatory measures to be delivered by Norfolk Vanguard are the same as described above for Norfolk Boreas, on the basis that the proposed measures would more than compensate for predicted collision mortality from both of these OWFs.

6.2.3 East Anglia North One and TWO

89. East Anglia ONE North and TWO were both consented subject to the provision of compensation measures to enhance the breeding success of lesser black-backed gulls within part of the Alde-Ore Estuary SPA due to predicted collision mortality of 0.3 and 1.6 adult birds from the SPA population at the East Anglia ONE North and East Anglia TWO projects, respectively (BEIS 2022a,c). The SoS HRA states that breeding success is to be enhanced by establishing a 4ha fenced enclosure to exclude mammalian predators, with this enclosure considered to have the potential to support the 14,000 breeding pairs required to restore the population in accordance with the target identified in the SACOs for the SPA (Natural England 2023). Regular checks would be undertaken to maintain the integrity of the fence, whilst habitat within the enclosure would be managed to ensure it was suitable for nesting. The breeding population within the enclosure would be monitored and adaptive management measures, such as playback of calls and use of decoys, considered if the initial colonisation of the enclosure is slow (BEIS 2022a,c). The measures would be maintained until either (i) the decommissioning of the projects or (ii) a determination by the SoS that the compensation was no longer required, whichever was later.
90. The above compensatory measures are considered to have the potential to over-compensate for the predicted effects of the East Anglia ONE North and East Anglia TWO projects on the Alde-Ore Estuary SPA population and it was considered that these measures could be delivered via collaboration with the Norfolk Boreas and Norfolk Vanguard projects (for which details of the compensatory measures are outlined above). Thus, it now seems likely the 6ha fenced enclosure at Orford Ness (as described in Section 6.2.1) will also be used to deliver the compensation for the East Anglia ONE North and east Anglia TWO projects, with this measure considered to provide sufficient compensation capacity for all four projects (MacArthur Green and Royal HaskoningDHV 2022d).
91. Additionally, a secondary measure was also suggested for East Anglia ONE North and TWO, involving a package of measures aimed at providing indirect compensation through reduction of seabird bycatch in fisheries (MacArthur Green and Royal HaskoningDHV 2021a,b). This would involve the establishment of a by-catch reduction group, monitoring of by-catch in the fisheries off East Anglia for a

period of one year, investigation of alternative fishing gear designs to reduce bycatch and at-sea testing. As well as providing compensation for lesser black-backed gull at the Alde-Ore Estuary, this measure was also considered to have the potential to benefit populations of guillemot, razorbill, gannet and gull species at the Flamborough and Filey Coast SPA. It is recognised that predicting and correlating any population increases at specific SPAs with reductions in bycatch would be challenging, but the successful design and adoption of such measures to reduce bycatch off East Anglia could provide a model for use elsewhere in the UK. As such, it could provide benefits to UK seabird populations that would greatly exceed predicted mortality from OWFs. Although this approach is not being taken forward as a formal element of the compensatory measures for the Alde-Ore Estuary SPA lesser black-backed gull population, it is included in the compensatory measures for the Outer Thames Estuary SPA red-throated diver population (see below), and it is recognised that it also has the potential to benefit the Alde-Ore Estuary SPA lesser black-backed gull population (BEIS 2022a,c).

92. At the time of writing, the Lesser Black-backed Implementation and Monitoring Plan for the Norfolk Projects (Boreas and Vanguard) has been approved by the SoS. So far as is known, no implementation and monitoring plan has yet been prepared for East Anglia ONE North and TWO.
93. Besides the consented projects referred to above, there are currently no OWFs at pre- or post DCO Examination stages with in principle compensation measures for lesser black-backed gull at the Alde-Ore Estuary SPA (Table 6.2).

Table 6.2 Predicted collision mortality of breeding adult lesser black-backed gull from the Alde-Ore Estuary SPA and summary of compensation measures at recently consented OWFs in the southern North Sea and projects at post, during or pre-DCO examination stage

OWF Project	Estimated annual collision mortality for lesser black-backed gull from the Alde-Ore SPA breeding population (project alone)	Status and details of any compensation measures
Norfolk Boreas	2.1	Consented subject to compensation at a 3:1 ratio (to deliver 14.1 adult birds jointly into the population each year)
Norfolk Vanguard	2.6	
East Anglia ONE North	0.3	Consented subject to compensation. SoS agreed that recruitment of 0.3 adult lesser black-backed gulls into the SPA population each year would provide compensation, and that the provision of approximately 4Ha of nesting habitat would provide sufficient overcompensation (BEIS 2022a)
East Anglia TWO	1.6	Consented subject to compensation. SoS agreed that recruitment of 1.6 adult lesser black-backed gulls into the SPA population each year would provide compensation, and that the provision of approximately 4Ha of nesting habitat would provide sufficient overcompensation (BEIS 2022b)
Hornsea Project Four	0	Post-DCO examination, no proposed compensation

OWF Project	Estimated annual collision mortality for lesser black-backed gull from the Alde-Ore SPA breeding population (project alone)	Status and details of any compensation measures
Dudgeon and Sheringham Shoal Extension Projects	0	At DCO examination, no proposed compensation
North Falls	3.6 – 6.1	n/a

6.2.4 Galloper Offshore Wind Farm

94. The Appropriate Assessment for Galloper Offshore Wind Farm (DECC, 2013) concluded that an adverse effect on the integrity of lesser black backed gull could not be ruled out unless the Project mitigated for the potential mortalities associated with collision risk from the wind farm. This mitigation was secured through a Section 106 agreement, comprising funds for SPA management measures, targeted at improving conditions for the lesser black backed gull breeding colony at the National Trust’s Orfordness reserve. These were identified as: controlling predators (mainly foxes); reducing disturbance to nesting birds by dog walkers and anglers; fencing; warden patrol; vegetation management; education and signage, a monitoring and adaptive feedback element, whereby different or further site management measures would be adopted in response to new information on recorded chick productivity and LBBG population levels. While not considered compensation at that time (although the position of RSPB was that it was compensation), the measure has similarities to the compensatory measures proposed for East Anglia ONE North, East Anglia TWO and Norfolk Boreas and Norfolk Vanguard.

6.3 Potential compensation measures for North Falls

95. As described above, four OWFs in the southern North Sea have recently been consented subject to compensation measures for lesser black-backed gull at the Alde-Ore Estuary SPA. This indicates that the view of the Competent Authority is that current in-combination mortality levels from OWFs in the southern North Sea represent an AEoI for lesser black-backed gull at this SPA. It seems likely, therefore, that any further OWFs coming forward for consent which are predicted to increase the in-combination collision mortality to this population will require compensation measures for lesser black-backed gull. As detailed in Section 4.3, the effects from the Project are predicted to result in a collision mortality of 3.6 to 6.1 adult lesser black-backed gulls per annum from the Alde-Ore Estuary SPA, as determined in the draft RIAA (Section 7.3.3.1.3 of the draft RIAA, Table 6.2). The aim of the compensation is to offset the predicted collision mortality to the breeding population at the SPA, by increasing the size and breeding success of the population and/or reducing mortality from other factors.

6.3.1 Address same impact at same location

6.3.1.1 *Predator exclusion*

96. As described above, compensation measures to exclude predators from an area within the Alde-Ore Estuary SPA used by breeding lesser black-backed gull have been accepted for four consented OWFs in the southern North Sea. The predator exclusion – aimed primarily at foxes – is predicted to reduce losses of eggs and nestlings, which would offset the predicted losses of lesser black-backed gulls from the SPA population due to collisions at OWFs.
97. The large-scale decline of lesser black-backed gull at the Alde-Ore Estuary SPA, from a peak of 23,400 pairs in 2000 to a 5 year mean of 1,940 pairs 2011-2015, has been attributed mainly to large scale abandonment of the colony in response to predation by foxes (Ross-Smith et al 2014; Mavor et al 2001, 2003). As an example of the speed of decline, at Orfordness, 75% of 23,000 nests failed due to fox predation in 2000, and, in the absence of fox control, the breeding population at that site declined to 6,500 pairs by 2002 (Mavor et al., 2001, 2003, MacArthur Green and Royal HaskoningDHV 2022d).
98. Given the context of this large-scale decline and the very small numbers of birds for which compensation has been identified (1.6-2.1 predicted collisions per year at for Norfolk Boreas; respectively the Applicants and Natural England’s preferred parameters, Royal HaskoningDHV 2020; and 2.6 for Norfolk Vanguard, MacArthur Green 2021c, plus the 2.2 birds per year at East Anglia ONE North and TWO, MacArthur Green and Royal HaskoningDHV 2022a,b), the Applicant for East Anglia ONE North and TWO suggests the potential for collaboration with other OWF developers in a proportionate way to deliver compensation measures (with this considered a likely scenario – see above). As a longer-term option, it is further suggested that a strategic fund could be set-up and administered by an appropriate body, such as the local planning authority, in consultation with Natural England and the landowners responsible for managing the Alde-Ore Estuary SPA. This could determine the level of contribution payable by a project (in proportion to impact) and how those contributions would be used to compensate for impacts on the SPA population.
99. These suggestions indicate that there would be an option for North Falls to approach the other developers with a view to collaboration in relation to the compensation measures for lesser black-backed gull at the Alde-Ore Estuary SPA. The specific measures set out for Norfolk Boreas (see 6.2.1 above) are currently being developed with input from Natural England (MacArthur Green and Royal HaskoningDHV 2022d), and there is good evidence to suggest that the establishment of a predator exclusion area would be successful in terms of facilitating an increase in the SPA breeding population. Given a potential nesting density in suitable habitat of less than 1 pair per square metre, it is considered that a predator exclusion area of six hectares could readily support a population of several hundred pairs of lesser black-backed gulls, with the potential to produce sufficient offspring to more than compensate for the currently predicted in-combination collision mortality at OWFs (MacArthur Green and Royal HaskoningDHV 2022d).
100. If collaboration with other OWF developers is not considered appropriate for any reason, North Falls could consider identifying a separate area for establishing an

additional predator-exclusion zone for breeding lesser black-backed gulls. This could be within the Alde-Ore Estuary SPA or in areas outside but close to the SPA boundary. Research would be required into appropriate areas, based on the recent and current distribution of breeding lesser black-backed gulls and suitable habitats, and negotiation with landowners and managers.

6.3.1.2 *Reduction of fisheries bycatch*

101. As described above, East Anglia ONE North and TWO proposed a secondary compensation measure, involving a programme of work to investigate seabird bycatch off the East Anglian coast, and to trial measures to reduce bycatch, with this apparently considered to have the potential to be a suitable measure (Section 6.2.3 above). In the event this measure was not adopted as compensation for lesser black-backed gull when East Anglia ONE North and TWO were consented. While lesser black-backed gulls may be susceptible to bycatch, it is likely that this has less potential than predator exclusion to facilitate recovery of the Alde-Ore SPA breeding population in the short term. This could however be considered as a component of the compensation plan, if required as it seems to be a credible and innovative proposal which may also provide wider benefits to seabird qualifying features of other SPAs.

6.4 **Alternative measures**

102. The provision of predator exclusion area(s) for lesser black-backed gull within the Alde-Ore Estuary SPA, or in areas outside but close to the SPA boundary, as described above, has a high potential for success, and there would also seem to be potential for collaboration with other OWF developers to share costs. Thus, at this stage no detailed suggestions are made of alternative compensation measures. If this were to be explored further, measures to increase productivity and breeding numbers of lesser black-backed gulls at sites more distant from the Alde-Ore SPA could be considered. Given the widespread adoption by this species of artificial sites in towns and cities, emphasis could be given to 'natural' breeding colonies which might be declining for similar reasons to those at the Alde-Ore, or to the creation of suitable habitat for new colonies. These measures could be explored on the North Sea coast of the UK (and potentially also the west coast).
103. Measures to investigate the susceptibility of lesser black-backed gulls to seabird bycatch, the possible population effects of any bycatch mortality, and techniques to reduce or eliminate bycatch, as proposed for East Anglia ONE North and TWO, could also be considered.

7 **Review of potential compensation for red throated diver**

7.1 **Review of potential compensation measures**

104. For red-throated diver the requirement for compensation would be to offset the impacts of displacement from an OWF on an SPA population. In the case of North Falls, the OWF would not be within a SPA but it would be sufficiently close to the boundary of the Outer Thames Estuary SPA that red-throated divers within the SPA are likely to be displaced.

105. Reviews of possible compensation measures for seabirds (MacArthur Green 2013, 2021) have identified a number of potential measures for red-throated diver. These are listed in Table 7.1 below.

Table 7.1 Potential compensation measures for red-throated diver (after MacArthur Green 2021, 2013)

Measure	Summary of evidence base
Reduce disturbance from vessel activity	A number of studies have demonstrated the effect of ship traffic in displacing red-throated divers during the non-breeding season. Management to reduce vessel activity in areas used by concentrations of non-breeding birds could reduce disturbance and displacement and improve over-winter survival and body condition.
Closure of sandeel and sprat fisheries close to wintering areas	There is some evidence to suggest that non-breeding red-throated divers feed mainly on small pelagic fish such as sprats, juvenile herring and sandeels. Reduction of fishing pressure on these fish stocks is expected to increase their abundance and to improve over-winter survival and body condition of red-throated divers.
Provision of nesting rafts at breeding areas	There is good evidence that provision of nesting rafts increases the breeding success of red-throated divers. All else being equal, this would result in increased numbers of juveniles recruiting into the population and in due course (the age of first breeding is three years) increased numbers of breeding adults. This could offset any adverse effects on over-winter survival as a result of displacement from OWFs during the non-breeding season.
Closure of sandeel and sprat fisheries close to breeding areas	Red-throated divers in Shetland and Orkney feed sandeels to their chicks and reduced sandeel abundance in Shetland in the late 1980s was linked to declines in the numbers of breeding red-throated divers. Breeding red-throated divers are also likely to feed on sprat. Reduced fishing mortality on these fish species close to breeding areas is likely to increase their abundance and increase breeding productivity, and consequently numbers, of red-throated divers.
Prevention of oil spills	Red-throated divers are very vulnerable to oil spills as they spend a high proportion of their time on the sea surface, especially during the non-breeding period. Oil spill risk has however declined since the mid-20 th century and it seems likely that there is little that could be done to reduce risks further, given the existing measures in place. Thus this measure is not considered further.

7.2 Compensation for red-throated diver displacement at other OWFs

106. To date, East Anglia ONE North and East Anglia TWO are the only UK OWFs that have been consented subject to providing compensation measures for red-throated diver during the non-breeding season. The compensation is required to offset the displacement and re-distribution of red-throated divers within the Outer Thames Estuary SPA, which is predicted to occur as a response to the presence of these OWFs (MacArthur Green and RHDHV 2021a, 2022a). As red-throated divers are also displaced by ships (Mendell et al. 2019, Schwemmer et al. 2011, Bellebaum et al. 2006), the compensatory measures involve the re-routing of vessel traffic associated with the operational East Anglia ONE and consented East Anglia THREE wind farms to avoid transiting the SPA between 1st November and 31st March, which represents the core non-breeding period for the species. This primary measure is within the control of the developer of the East Anglia ONE North and East Anglia TWO OWFs, because ScottishPower Renewables are the developer for all four of these OWFs. These compensatory measures will reduce

displacement of red-throated divers within the SPA to an extent which is predicted to be nine times greater than the displacement that is predicted to occur due to the East Anglia ONE North and East Anglia TWO wind farms (BEIS 2022d,e).

107. In addition, a proposal to undertake research into ornithological by-catch reduction and subsequently, if suitable gear types are identified that reduce by-catch, fund a voluntary fishing gear change scheme is included in the latest East Anglia ONE North and East Anglia TWO compensatory measures (MacArthur Green and Royal HaskoningDHV 2022a,b) and is to be taken forward as a secondary compensatory measure (BEIS 2022d,e).
108. A further secondary compensation measure suggested by MacArthur Green and RHDHV (2021a) is that further compensation could potentially be achieved through modification or restrictions to current heavily used shipping lanes within the SPA to direct vessels away from areas currently avoided by red-throated divers, again during the non-breeding period. This would require agreement with other sea-users and relevant authorities and is not included in the measures required for the East Anglia ONE North and East Anglia TWO projects.

7.3 Potential compensation measures for North Falls

109. As described above, two OWFs in the southern North Sea have recently been consented subject to compensation measures for red-throated diver at the Outer Thames Estuary SPA. This indicates that the view of the Competent Authority is that current in-combination effects from OWFs in the vicinity of the Outer Thames Estuary SPA represent an AEoI for the SPA red-throated diver population. As detailed in Section 4.4, the effects from the Project are predicted to result in an additional mortality from displacement of one to 14 birds from this SPA population, whilst the effective area across which the displacement effects encroach is predicted to approximate to 1% of the SPA area (although the net effective area is less than this due to effects from existing OWFs and IMO ship routing measures). The aim of the compensation, if required, would be to offset the displacement effects on the non-breeding red-throated diver population at the SPA (either by reducing displacement effects within the SPA from other sources or reducing mortality from other causes within the SPA population), or else reducing mortality and / or increasing breeding productivity within other UK SPA populations of this species.

7.3.1 Address same impact at same location

7.3.1.1 Vessel management

110. This would require measures to offset displacement of red-throated diver within the Outer Thames Estuary SPA caused by North Falls. In relation to the conservation objectives for red-throated divers at the SPA, displacement may have two implications. The first is effects on body condition and survival of red-throated divers during the non-breeding season through potential exclusion from preferred foraging areas and potential increase in densities of birds and competition for fish prey in areas not subject to displacement effects from OWFs. Assessments of displacement for red-throated divers (and other seabirds) from OWFs are based on estimating the numbers of birds which will be displaced and the proportion of those birds that die. The advice from Natural England in relation

to North Falls is that displacement effects should be considered out to 12km from the OWF boundary, while recognising that the extent of displacement will reduce with distance from the boundary⁵. If the predicted increase in population mortality from displacement is of a magnitude that may cause population level effects and risk a population decline, then this would constitute an AEol in relation to the conservation objective to maintain or restore the SPA population of a qualifying feature.

111. Displacement of red-throated divers from OWFs within an SPA boundary may also change the distribution of birds within the SPA, resulting in lower densities in areas closer to OWFs and higher densities in areas more distant from turbine arrays.
112. Natural England (2021b) set out their advice on the implications for East Anglia ONE North and TWO OWFs for the high-level conservation objectives of the Outer Thames Estuary SPA. They advised no AEol alone or in-combination for either project in relation to the objective to maintain or restore the SPA population of red-throated diver, recognising that the population is unlikely to have declined since designation in 2010, despite the construction of additional OWFs. However, in relation to the objectives relating to the distribution of qualifying features within the site, the extent and distribution of the habitats of the qualifying features, the structure and function of the habitats of the qualifying features and the supporting processes on which the habitats of the qualifying features rely, they concluded AEol for East Anglia ONE North alone, and in-combination AEol for both ONE North and TWO. Thus, the Natural England view is not just that the conservation objective relating to the distribution of red-throated divers within the site is affected, but that there is AEol in relation to four of the five high-level SPA conservation objectives.
113. An Outline Method Statement for North Falls⁶ was provided to Natural England on 2 July 2021. In their response⁷, Natural England commented that they are not aware of any feasible compensatory measures for displaced red-throated diver at Outer Thames Estuary SPA. However, this was prior to the consent decisions for the East Anglia ONE North and East Anglia TWO projects, which are subject to the compensatory measures detailed above. Based on the agreed compensatory measures for these two projects, the secondary compensation proposal for East Anglia ONE North involving the modification of existing heavily-used shipping lanes within the SPA during the non-breeding period to reduce red-throated diver displacement could potentially be a viable measure. Therefore, it is considered that there could be merit in exploring this more strategic approach further with the aim of estimating whether there could be benefits in terms of 'opening up' additional areas for the species within the SPA by reducing shipping traffic, that could offset displacement from OWFs. However, it would require agreement with relevant authorities and sea-users which is likely to be challenging.

⁵ E.g. Natural England comments on outline method statement for North Falls, 2 July 2021, which reference their advice in relation to East Anglia ONE North and TWO (Natural England 2020)

⁶ Memo from North Falls Project Team to NE and RSPB dated 2 July 2021, ref 004046105-01

⁷ Undated document attached to email from NE Marine Lead Advisor dated 26 August 2021

114. A step towards such a strategic measure might be to engage with developers of other consented OWFs identified as causing, or with the potential to cause, displacement effects within the SPA. If there was potential to reach agreements to direct vessel traffic associated with existing OWFs outside the SPA boundary as far as possible this might go some way towards compensating for displacement from existing OWFs. Consideration would be required of the scale of effect from reduced vessel traffic from OWFs in relation to the predicted project alone and in-combination displacement of red-throated divers within the Outer Thames Estuary SPA.

7.3.1.2 *Reduction of fisheries bycatch*

115. As described above, the compensation for East Anglia ONE North and TWO includes a secondary measure, involving a programme of work to investigate seabird bycatch off the East Anglian coast, and to trial measures to reduce bycatch (Section 7.2). An option for North Falls could therefore be to collaborate with the trials of the East Anglia ONE North and Two projects and/or provide bycatch reduction measures if these trials are found to be successful.

7.3.2 *Alternative measures*

7.3.2.1 *Closure of sandeel and sprat fisheries in the Outer Thames Estuary area*

116. With reference to the measures listed in Table 7.1 above, closure of sandeel and sprat fisheries close to the Outer Thames Estuary SPA could be considered, subject to a review of current harvesting levels in this area. This potential compensation measure could be considered to fall into the category of same site, comparable ecological function, as it would address the same species and SPA, but would not directly address the impact pathway of displacement. Measures to increase the prey resource, if successful, could increase the over-winter survival and body condition of over-wintering red-throated divers. This could potentially offset any reduction in survival and body condition due to displacement, although any benefits of this measure would however be difficult to quantify as the relationship between prey abundance and survival of red-throated divers is not known, and implementation would require government intervention.

7.3.2.2 *Provision of nesting rafts for breeding red-throated divers*

7.3.2.2.1 *UK breeding population*

117. Provision of nesting rafts at breeding areas for red-throated divers in the UK could be considered as a comparable ecological function at a different location (the UK breeding population is located in north and west Scotland). Adult birds breeding in the UK winter in Scottish waters (Furness 2015), so measures to enhance breeding productivity would potentially benefit Scottish marine SPAs for non-breeding red-throated divers, as well as within SPAs for breeding birds, if management measures were to be targeted at breeding SPA populations. Thus, there could be benefits for the UK SPA network for red-throated diver.

118. This compensation option was considered for East Anglia ONE North but was discounted on the basis that red-throated divers wintering in the southern North Sea breed in Fennoscandia and Russia (MacArthur Green and RHDHV 2021a, Furness 2015); thus it was considered that measures to improve the breeding success of the UK population would not benefit the Outer Thames Estuary SPA population. However, this decision for East Anglia ONE North and TWO was made

prior to the publication of the draft Defra (2021) guidance and in light of the Defra (2021) compensation hierarchy, this compensatory measure, aimed at benefits to the same species but for a different sub-population (the UK population is part of the same biogeographic population as the birds over-wintering in the SPA) breeding in a location distant from the SPA, could be considered to support the overall coherence of the network. The provision of nesting rafts is a proven technique for enhancing the breeding productivity of red-throated divers (MacArthur Green 2021, 2013).

119. To monitor the success of providing nesting rafts would require surveillance of breeding birds to record productivity and possibly measures of chick body condition. So far as is known, a survey of the UK breeding population has not been carried out since 2006 (Dillon et al. 2009), possibly because of lack of funds. There could be merit in providing funding for a repeat national breeding survey, which would provide context on the status of the population.

7.3.2.2.2 Biogeographic breeding population

120. As discussed above, the population of red-throated divers that winters in the southern North Sea breeds in remote areas of Fennoscandia and Russia. There is potential to enhance breeding success of this population through provision of nesting rafts (MacArthur Green and Royal HaskoningDHV 2022a). With reference to the Defra (2021) compensation hierarchy, this would fall under the option of same ecological function different location (Section 3.2 above).

121. This potential compensation measure could be employed to enhance the breeding productivity of the population of red-throated divers that winters in the Outer Thames Estuary SPA, and therefore the number of birds present in winter.

7.3.2.3 *Closure of sandeel and sprat fisheries in UK breeding areas for red-throated divers*

122. Measures to reduce fishing mortality are likely to increase sandeel and sprat abundance in offshore areas used for foraging by breeding red-throated divers in the UK, and in turn likely to result in an increase in breeding productivity and breeding numbers (MacArthur Green 2021). As for measures to reduce fishing mortality in wintering areas, however, this would require agreement from fishing authorities and fishing vessels. Effects on adult survival might be difficult to quantify but benefits to chick survival and body condition should be measurable. Breeding red-throated divers tend to feed close to coasts (the mean maximum foraging range is 9km, Woodward et al. 2019). Sandeel fisheries in some areas of Scottish waters are not active⁸ so consideration would be required as to the location of active sandeel fisheries relative to the core foraging areas for breeding birds.

7.3.2.4 *Additional SPA management for red-throated diver*

123. As noted in the advice from Natural England (Table 2.1), a potential compensation option could be to improve the quality of areas within the Outer Thames Estuary

⁸ <https://marine.gov.scot/sma/assessment/case-study-sandeels-scottish-waters>

SPA e.g. through the creation of 'sanctuary' or 'reserve' areas, however, it is currently unclear as to what this might look like and how it would be secured.

124. Natural England notes that this is being considered across the sector (including by Defra and The Crown Estate) as a potential strategic approach. The Applicant will continue to monitor progress of this, and any other strategic measures and this will be considered further following consultation on the draft RIAA included with the PEIR.

8 Summary of compensation options review

125. Summaries of the potential compensation options for kittiwake at Flamborough and Filey Coast SPA, lesser black-backed gull at the Alde-Ore Estuary SPA and red-throated diver at the Outer Thames Estuary SPA are included (respectively) in Table 8.1, Table 8.2 and Table 8.3.
126. The options suggested for primary consideration initially, and discussion with the Expert Topic Group (ETG) for North Falls are:
- Kittiwake
 - Establish, manage and monitor alternative nesting structure(s) on the east coast of England and/or offshore in the southern North Sea, and/or enhancement of existing artificial structures used by kittiwake.
 - Lesser black-backed gull
 - Establish, manage and monitor predator exclusion area(s) at the Alde-Ore Estuary SPA.
 - Red-throated diver
 - Management measures for vessels associated with OWFs in the Outer Thames Estuary SPA to minimise disturbance within the Outer Thames Estuary SPA;
 - Establish, manage and monitor nesting rafts for red-throated divers within an area of the UK breeding range (for example north and west Scotland, subject to engagement with devolved governments) or in transboundary areas used for nesting by the biogeographic population which winters in the southern North Sea.
127. For kittiwake and lesser black-backed gull, the compensation approaches would directly address the predicted collision impacts of North Falls on the target SPA, by boosting productivity of breeding populations to replace losses to collisions. For kittiwake the aim would be to establish new breeding populations outside the SPA which would provide recruits to the SPA population, whereas for lesser black-backed gulls the aim would be to increase the breeding numbers within or close to the SPA.
128. For red-throated diver the first approach is aimed at compensating for displacement within the Outer Thames Estuary SPA.
129. The second approach for red-throated diver is for measures for the same species but at site(s) distant from the Outer Thames Estuary SPA, during the breeding rather than the non-breeding season (for which the SPA is designated), and

potentially (should the UK breeding population be targeted) for a different sub-population of red-throated divers to that using the SPA. It is put forward based on the proposals set out in the Defra (2021a) best practice guidance for developing compensation measures for Marine Protected Areas, which provides scope for applying compensation measures for the same or an ecologically similar species in areas distant from an SPA (noting that this guidance remains in draft subject to the outcomes of the consultation). Applying measures to benefit red-throated divers breeding in the UK could be considered to support the overall coherence of the UK SPA network, with benefits for SPAs for non-breeding and potentially breeding SPAs in Scotland. The UK population of red-throated divers is also part of a wider biogeographic population which includes birds which over-winter at the Outer Thames Estuary and breed in Fennoscandia (Furness 2015).

130. The measures proposed for kittiwake and lesser black-backed gull are feasible and there is scientific evidence to suggest they would be successful. They have already been 'formally' agreed by Regulators as compensation for consented OWFs. For each species it would be possible for North Falls to pursue compensation measures independently, but there could be merit in seeking to agree collaborative approaches with other OWF developers with OWFs predicted to affect the same SPA populations. This would potentially expand the reach / scale of measures and benefits to seabird populations, and allow for strategic management and monitoring, as well as facilitating cost-sharing.
131. The measures proposed for red-throated diver are also considered feasible and likely to succeed based on scientific evidence.
132. A number of secondary measures have also been identified for initial discussion with the North Falls ETG. These are flagged in Table 8.1, Table 8.2 and Table 8.3.
133. They include strategic measures of fisheries management (closure/ reductions in harvest of sand eel and sprat fisheries) and seabird by-catch reduction, which have the potential for widescale benefits to UK seabird populations which would far outweigh predicted losses to collision and displacement from OWFs. While prey management measures would require government action, it would be worth pursuing any opportunities that may arise to engage in strategic discussions with relevant stakeholders. For example, in relation to fisheries for sandeel, Defra (2022) issued a call for evidence on future management of this species and Norway pout⁹, in the context that climate change is negatively impacting the health of these forage fish populations, and this could result in further declines of threatened species such as seabirds which rely on them as a food source. Subsequent to this, Defra (2023) has launched a further consultation over spatial management measures for industrial sandeel fishing in the UK North Sea¹⁰ (see paragraph 74 above).

⁹ <https://www.gov.uk/government/consultations/future-management-of-sandeel-and-norway-pout-in-uk-waters-call-for-evidence/outcome/summary-of-responses>

¹⁰ <https://consult.defra.gov.uk/wg-management-measures-for-industrial-sandeel-fishing/consultation-on-spatial-management-measures-for-in/>

134. Trial measures to address seabird bycatch have been agreed as compensation measures for East Anglia ONE North and TWO (BEIS 2022a,c) and identified as in principle measures for Hornsea Project Four (GoBe 2021c).
135. In due course an in-principle compensation measures plan may be prepared for North Falls. This will be informed by the scale of effects at North Falls as identified in the RIAA for DCO submission, which will take account of consultations on the PEIR and draft RIAA, and any subsequent modifications in the Project Design Envelope.

Table 8.1 Summary of potential compensation measures - kittiwake

Possible measure and method	Proposed delivery mechanism(s)	Rag and rationale Deliverability	Spatial scale/ Location	Overall potential feasibility
Artificial nesting structures	Developer identifies a suitable location(s) and funds the implementation of artificial nesting structures	This measure has been proposed as compensation for kittiwake for a number of offshore wind farms and agreed for five consented sites. To date, proposals have been primarily focused on onshore delivery of structures, however kittiwake will also use offshore structures and this approach should also be considered.	Although the scope for this to continue to provide compensation for kittiwake at FFC SPA will reach capacity at some stage, it is considered that there is still an opportunity for North Falls to pursue this approach.	Feasible subject to identifying an appropriate location. There is a precedent available for this being used to consent other projects and detailed reviews of potential sites have been carried out by other OWF developers..
Strategic - prey management	NFOW to consider engaging with relevant government bodies and provide support as appropriate and proportionate to deliver full or partial closure of sandeel fishery in the North Sea to improve fish stocks. Measure would be delivered by relevant government body	Evidence strongly indicates this would have a very large beneficial effect on FFC SPA kittiwake productivity (and also for other species which feed on sandeel). The legal deliverability of this mechanism requires the support of and action from the UK Government to instigate fisheries closure measures. NFOW could contribute to this process as appropriate and proportionate, to support the UK Government in delivering this measure.	For practical reasons, fisheries management would need to be at a significant spatial scale to be ecologically meaningful and would go beyond the levels likely to be required of a single project, hence a strategic measure is considered most appropriate.	Potentially feasible at a strategic level, subject to government intervention. Defra has launched a consultation (March to May 2023) on spatial management of industrial sandeel fisheries.
Reduction of bycatch	Developer funds fisheries management to reduce by-catch Measure is delivered by relevant government body	Kittiwakes have not been identified as vulnerable to fisheries bycatch. Strategic measures aimed at reduction of fisheries bycatch have agreed for East Anglia ONE North and TWO in relation to red-throated diver at the Outer Thames Estuary SPA. Hornsea Project Four has also proposed such measures for gannet, guillemot and razorbill and the Flamborough and Filey Coast SPA (GoBe consultants 2021c)	Unknown	Not likely to provide sufficient benefit in the UK population. Not considered further.
Predator management	Developer identifies a suitable measure/location and funds the implementation of predator management	It has been clearly demonstrated at numerous locations that removal of predatory mammals (e.g. rats) leads to recoveries in seabird populations. However, kittiwakes at natural sites tend to nest on cliff-ledges which are inaccessible to mammalian predators and this is not an issue at Flamborough and Filey Coast SPA. Predation by great skuas – another protected seabird - does take place at colonies in the north and west of Scotland and this could be considered under the Defra (2021) hierarchy of approach.	Great skua predation on eggs, chicks and adult kittiwakes breeding in north and west Scotland appears to be contributing to declines. Removal of great skuas nesting close to kittiwake colonies and preventing the re-establishing of breeding within a given distance of a colony could increase kittiwake survival productivity. The scale of removal required would be agreed with Natural England and NatureScot.	Literature searches for this report suggest that exclusion of great skuas has not been trialled as a management measure so its feasibility and chance of success is unknown. Feedback from ETG stakeholders (Section 2) indicates that this measure is not supported. Great skua has a restricted world distribution and Scotland supports about 60% of the global population (JNCC 2021a), so it is considered unlikely that proposals to manage the Scottish population would be agreed by Regulators. Great skuas also appear to have been severely affected by HPAI in the Northern Isles of Scotland in 2022, which may have implications for the population status in the medium to long term. Not considered further.
Designation of additional SPAs	Developer funds the site selection and designation process of establishing a new SPA or extension/variation to an existing SPA.	Defra (2021) states that although technically possible, no process currently exists for designating MPAs as a compensatory measure. Ongoing engagement with Defra is required to understand what alternative process would be required and as with prey management, government intervention would be required. Also likely to be separate consultation process on designation and so outcomes potentially uncertain.	The spatial scale of a designation would need to be suitable to provide a meaningful benefit to the relevant species. There may be scope for a species to be added to an existing designation if its population has increased (since the last review) to a point where it now qualifies.	Recognising Natural England's feedback that any areas that meet the requirement to be designated as SPAs should have been or should be designated. This measure is not considered further.

Table 8.2 Summary of potential compensation - lesser black backed gull

Possible measure and method	Proposed delivery mechanism(s)	Rag and rationale Deliverability	Spatial scale/ Location	Overall potential feasibility
Predator management	Developer identifies a suitable measure/location and funds the implementation of predator management	It has been clearly demonstrated at numerous locations that removal of predatory mammals (e.g. rats) leads to recoveries in seabird populations. Predator exclusion targeted at foxes has been agreed as a compensation measure for lesser black-backed gull at the Aldre-Ore Estuary for the consented Norfolk Boreas and Norfolk Vanguard OWFs, this is the same SPA and population for which North Falls may be required to deliver compensation.	Information on a suitable location and spatial scale for predator exclusion at the Alde-Ore Estuary is available from compensation cases worked up for Norfolk Boreas, Norfolk Vanguard and (in principle) for East Anglia North ONE and TWO.	Feasible and highly likely to be effective. An understanding of the number of birds required to be compensated for will be available when the collision risk assessment for North Falls is complete.
Strategic - prey management	NFOW to consider engaging with relevant government bodies and provide support as appropriate and proportionate to deliver partial closure of sandeel fishery in the North Sea to improve fish stocks.	Lesser black-backed gulls feed to some extent on small pelagic fish during the breeding season, although the species has a varied diet and forages in terrestrial as well as marine areas. Thus the species may be able to compensate for reductions in prey fish by seeking alternative food sources. Closure of sprat and sandeel fisheries close to SPA breeding colonies may have some benefits in terms of increased productivity The legal deliverability of this mechanism requires the support of and action from the UK Government to instigate fisheries closure measures. NFOW could contribute to this process as appropriate and proportionate to support the UK Government in delivering this measure.	For practical reasons, fisheries management would need to be at a significant spatial scale to be ecologically meaningful and would go beyond the levels likely to be required of a single project, hence a strategic measure would be most appropriate.	Not considered a key measure specifically for lesser black-backed gulls but would benefit a range of seabird species. Potentially feasible at a strategic level, subject to government intervention. Not considered further at this stage.
Strategic - Reduction of bycatch	Fisheries management to reduce by-catch	Lesser-black-backed gulls may be vulnerable to fisheries bycatch mortality. Strategic measures aimed at reduction of fisheries bycatch have been proposed by East Anglia ONE North and TWO as a potential secondary measure in relation to lesser black-backed gull at the Alde-Ore Estuary SPA (and gannet, guillemot and razorbill and the Flamborough and Filey Coast SPA).	The in principle compensation case worked up for East Anglia North ONE and TWO suggests a package of measures to be implemented at the scale of East Anglian offshore waters. While the Applicant for East Anglia ONE North and TWO has offered to take a key role in coordinating the proposed package of measures, this measure would aim to support current government research and objectives for by-catch reduction.	The specific benefits of this measure for a given SPA breeding population may be difficult to predict and measure. Reducing bycatch mortality may however be sufficient for ongoing scientific studies of seabird colonies to detect positive changes (MacArthur Green and Royal HaskoningDHV 2022a)
Designation of additional SPAs	Developer funds the site selection and designation process of establishing a new SPA or extension/variation to an existing SPA.	Defra (2021) states that although technically possible, no process currently exists for designating MPAs as a compensatory measure. Ongoing engagement with Defra is required to understand what alternative process would be required and as with prey management, government intervention would be required. Also likely to be separate consultation process on designation and so outcomes potentially uncertain.	The spatial scale of a designation would need to be suitable to provide a meaningful benefit to the relevant species. There may be scope for a species to be added to an existing designation if its population has increased (since the last review) to a point where it now qualifies.	Recognising Natural England's feedback that any areas that meet the requirement to be designated as SPAs should have been or should be designated. This measure is not considered further.

Table 8.3 Summary of potential compensation - red throated diver

Possible measure and method	Proposed delivery mechanism(s)	Rag and rationale		
		Deliverability	Spatial scale/ Location	Overall potential feasibility
Offset displacement from North Falls OWF within the Outer Thames Estuary SPA	Navigation measures to reduce ship-disturbance to red-throated divers within the SPA associated with vessel traffic for consented OWFs.	Would depend on co-operation with other OWF developers.	The Outer Thames Estuary SPA	Potentially feasible. There is strong evidence that red-throated divers are displaced by shipping traffic and modifications could reduce displacement within the SPA. Shipping management measures have been agreed as compensation for East Anglia ONE North OWF.
	Strategic measures for all shipping within the SPA during the over-wintering period for red-throated divers, for example modification to shipping lanes and speed restrictions	Strategic measure would require agreement from other sea-users and relevant authorities	The Outer Thames Estuary SPA	Potentially feasible at a strategic level, subject to government intervention
Provision of nesting rafts for UK breeding population	Developer identifies a suitable location and funds the provision of nesting rafts and monitoring.	Could be delivered by individual OWF developers, however a strategic approach involving Regulators and other OWF developers would be desirable.	To be confirmed – the UK breeding population is distributed through the west and north of Scotland, it is likely that a sub-area could be identified for conservation management	There is strong evidence that provision of nesting rafts increases the breeding success of red-throated divers, and the technique is tried and tested. Enhancement of the UK breeding population (located in West and North Scotland) would probably not directly benefit the Outer Thames Estuary SPA wintering population (which is thought to breed in Fennoscandia and Russia) but could be considered as a comparable ecological function at a different location.
Provision of nesting rafts for biogeographic breeding population	As above.	As above	To be confirmed. The population of red-throated divers that winters in the southern North Sea breeds in remote areas of Fennoscandia and Russia.	As above, there is strong evidence that provision of nesting rafts increases the breeding success of red-throated divers.
Strategic - prey management in the Outer Thames area of the southern North Sea	NFOW to consider engaging with relevant government bodies and provide support as appropriate and proportionate to deliver partial closure of sandeel and sprat fisheries in the North Sea to improve fish stocks. Measure is delivered by relevant government body	The legal deliverability of this mechanism requires the support of and action from the UK Government to instigate fisheries closure measures. NFOW could contribute to this process as appropriate and proportionate to support the UK Government in delivering this measure.	For practical reasons, fisheries management would need to be at a significant spatial scale to be ecologically meaningful and would go beyond the levels likely to be required of a single project, hence a strategic measure would be most appropriate.	Potentially feasible at a strategic level, subject to government intervention There is some evidence for likely benefits to red-throated diver over-winter survival and body condition. This would potentially also benefit a range of seabird species during the non-breeding season. There are likely to be challenges in monitoring this measure in terms of changes to survival rates of red-throated divers.
Strategic - prey management in offshore areas used by breeding red-throated divers in the UK	NFOW to consider engaging with relevant government bodies and provide support as appropriate and proportionate to deliver partial closure of sandeel and sprat fisheries in breeding areas for red-throated divers to improve fish stocks. Measure is delivered by relevant government body.	The legal deliverability of this mechanism requires the support of and action from the UK Government to instigate fisheries closure measures. NFOW could contribute to this process as appropriate and proportionate to support the UK Government in delivering this measure.	For practical reasons, fisheries management would need to be at a significant spatial scale to be ecologically meaningful and would go beyond the levels likely to be required of a single project, hence a strategic measure would be most appropriate.	Potentially feasible at a strategic level, subject to government intervention. As for nesting rafts, measures to benefit the UK breeding population would not directly benefit the Outer Thames Estuary SPA. Red-throated divers breeding in North Scotland have been observed to feed sandeels to chicks, and probably also take sprat if available. Reduction of fishing mortality is likely to increase abundance of prey fish and benefit breeding red-throated divers. This would potentially also benefit a range of seabird species during the breeding season. There may be uncertainty about the response of sandeels to reduction in fishing mortality. Other factors may influence whether or not this would result in an increase in abundance (including plankton biomass and increases in predatory fish populations; MacDonald et al. 2019). That said, sandeel fisheries in some areas of Scottish waters are closed and have previously been closed for the benefit of breeding seabirds (https://marine.gov.scot/sma/assessment/case-study-sandeels-scottish-waters).
Designation of additional SPAs	Developer funds the site selection and designation process of establishing a new SPA or extension/variation to an existing SPA.	Defra (2021) states that although technically possible, no process currently exists for designating MPAs as a compensatory measure. Ongoing engagement with Defra is required to understand what alternative process would be required and as with prey management, government intervention would be required. Also likely to be separate consultation	The spatial scale of a designation would need to be suitable to provide a meaningful benefit to the relevant species. There may be scope for a species to be added to an existing designation if its	Recognising Natural England's feedback that any areas that meet the requirement to be designated as SPAs should have been or should be designated. This measure is not considered further.

Possible measure and method	Proposed delivery mechanism(s)	Rag and rationale		Overall potential feasibility
		Deliverability	Spatial scale/ Location	
		process on designation and so outcomes potentially uncertain.	population has increased (since the last review) to a point where it now qualifies.	
Additional SPA management for red-throated diver	Developer funds strategic measure. Measure is delivered by relevant government body.	Ongoing engagement with Defra and Natural England is required to understand feasibility and mechanism	To be confirmed - As a strategic measure, the Project's contribution would be expected to be proportionate to the effect, as part of a measure with a larger spatial scale.	Ongoing engagement with Defra and Natural England is required to understand feasibility and mechanism

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