



**DOGGER BANK  
CREYKE BECK**

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# **Ornithology addendum (relating to the cumulative and in-combination assessment)**



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# 1 Introduction

- 1.1.1 This addendum updates the assessment of cumulative and in-combination impacts for ornithological receptors as part of the work contained in the Environmental Statement (ES) and Information for Appropriate Assessment (IfAA) Report submitted to the Planning Inspectorate as part of the Development Consent Order (DCO) application for the Dogger Bank Creyke Beck wind farm development. This update is provided in response to the release of refined data for two Round 3 offshore wind farm projects – East Anglia ONE and Hornsea Project One (the first projects from the respective Round 3 Zones) that became available towards the end of and subsequent to the finalisation of the Dogger Bank Creyke Beck DCO submission package to the Planning Inspectorate.
- 1.1.2 This addendum is split into two parts. **Section 2** deals with changes to the ornithological assessment work presented in the Ornithology Technical Report (**Appendix 11A** to the ES) and the ornithology chapter of the ES (**Chapter 11**) as a result of the incorporation of the ornithological data from East Anglia ONE and Hornsea Project One. **Section 3** updates the relevant aspects of the Information for Appropriate Assessment which has been produced in line with the Habitats Regulations.
- 1.1.3 The information and assessment outcomes provided in the ES and the **IfAA Report** with respect to the Dogger Bank Creyke Beck project by itself remain unchanged and the revised assessment work only relates to cumulative and in-combination matters.
- 1.1.4 In the following sections, where considered appropriate, text from the original ES and **IfAA Report** is repeated in order to provide clear context for the new information. Otherwise, the relevant sections of the ES and **IfAA Report** to which the revised assessment work relates are cross-referenced. This addendum revises the information contained in some sections of the Environmental Statement and **IfAA report**, and these are clearly specified throughout this document. In respect of the ES, the revisions provided here relate to:
- Section 6.3 of **Appendix 11A** of the ES;
  - Section 10.3 of **Chapter 11** of the ES;
  - Section 7.7 of the **IfAA Report**.

## 2 Assessment of cumulative effects on bird populations

### 2.1 Introduction

- 2.1.1 This section of the addendum gives an overview of the changes that the incorporation of relevant data from the East Anglia ONE and Hornsea Project One projects make to the cumulative impact assessment section of the Dogger Bank Creyke Beck Ornithology Technical Report (**Appendix 11A** of the ES), specifically section 6.3.
- 2.1.2 In line with the way that the Ornithology Technical Report is set out, the following sections describe the key cumulative impacts in relation to the species screened into the assessment, the relevance of this data in respect of SPA populations and whether the incorporation of the additional data from East Anglia ONE and Hornsea Project One makes a difference in terms of the significance of the predicted impacts on ornithological interests.

### 2.2 Displacement effects

- 2.2.1 The changes set out in the following paragraphs and in **Table A1** and **Table A2**, revises the information and assessment outcomes provided in sections 6.3.5-6.3.8 of **Appendix 11A** of the ES and section 10.3 of **Chapter 11** of the ES.
- 2.2.2 The inclusion of the data from East Anglia ONE and Hornsea Project One increases the numbers of birds displaced from all projects considered to 1,635 to 4,153 for gannet, 28,276 to 40,876 for common guillemot, 6,454 to 12,694 for razorbill and 1,388 to 2,319 for puffin (see **Table A1**). Determination of mortality losses following displacement was provided for the above species and increased combined losses across all projects from 66 to 103 for gannet, 1,334 to 1,723 for guillemot, 380 to 521 for razorbill, and 87 to 135 for puffin.
- 2.2.3 Predicted mortalities for the above species from Hornsea Project One were apportioned to a number of Special Protection Areas (SPAs). No displacement mortalities resulting from East Anglia ONE were apportioned to SPAs. Thus, additional information for the Flamborough Head and Bempton Cliffs SPA (gannet, common guillemot, razorbill, and puffin), Coquet Island SPA (puffin), and the Farne Islands SPA (puffin) are now available (**Table A1** below – update of *Table 6.9* in **Appendix 11A** of the ES). For northern gannet, no birds potentially forming part of the designated breeding population of the Flamborough Head and Bempton Cliffs SPA would be affected by Hornsea Project One, hence the number of mortalities remains at 9 birds (solely from Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects).
- 2.2.4 For common guillemot, razorbill and puffin, the Flamborough Head and Bempton Cliffs SPA had not previously been considered in the North Sea cumulative assessment, since no robust assessment outcomes were available

from any other Environmental Statements at the time. Data for Dogger Bank Teesside A & B was effectively incorporated into the assessment outcomes with the data for Dogger Bank Creyke Beck, to provide a consolidated cumulative view of potential impact for development within the Dogger Bank Zone. With the inclusion of refined assessment data and apportioning to this SPA of displacement data from Hornsea Project One for common guillemot, razorbill, and Atlantic puffin a total of 197 birds (0.32%), 118 birds (0.53%), and three birds (0.3%) were predicted to be lost in total. For Atlantic puffin, the apportioning of losses to the Coquet Island SPA and the Farne Islands SPA from Hornsea Project One also leads to the inclusion of these protected sites in the overall cumulative assessment. However, only a negligible number of mortalities are predicted and the impact at the designated population level is not considered to be significant (see **Table A2**).

**Table A1** Predictions of the numbers of displaced birds obtained for additional offshore wind farm sites in the North Sea, used as part of the cumulative impact assessment (revision to Table 6.9 in Appendix 11A of the ES)

Site	Season	Northern gannet	Common guillemot	Razorbill	Little Auk	Atlantic puffin
Beatrice	Total		3,112	528		641
East Anglia ONE	Spring	65	430	120		
	Breeding	43				
	Autumn	1870				
	Winter	64	820	200		
	Total	2042	1250	320		
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Total	32	386	129		62
Gallop <sup>1</sup>	Breeding <sup>2</sup>					
	Winter <sup>2</sup>		3,219	342		
	Total		3,219	342		
London Array I/II	Total	162	2,400	250		
Hornsea Project One	Breeding	239	1,037	366		428
	Post-breeding		5,705	2926		
	Winter	237	4,609	2628		503
	Total	476	11,351	5920		931
Thanet <sup>1</sup>	Total	37	193 <sup>3</sup>	193 <sup>3</sup>		193 <sup>3</sup>
Dogger Bank Creyke Beck <sup>4</sup>	Breeding	421	5,019	281	-	82
	Winter	892	13,947	4,731	152	410
	Total	1,313	18,965	5,012	152	492
Dogger Bank Teesside A & B <sup>4</sup>	Breeding	229	3,947	193	-	51
	Winter	502	9,445	3,127	161	244
	Total	731	13,391	3,320	161	294
<b>TOTAL</b>		<b>4,153</b>	<b>40,876</b>	<b>12,694</b>	<b>313</b>	<b>2,319</b>

No specific displacement rates were presented; hence, it is assumed that all birds in the areas of the respective projects were displaced; 2 A total displacement estimate was obtained following the methodology used in the Dogger Bank Teesside A and B assessments, assuming that breeding populations were separate to non-breeding (post-breeding/migration/wintering) populations; 3 Impacts of displacement were predicted for all auks combined; a worst case was assumed by applying the combined estimate to each species; 4 Figures based on median population estimates are used for consistency across projects.

Table A2 Numbers of displaced birds and predicted mortalities (in brackets) apportioned to protected sites from other EIAs used in the cumulative assessment of displacement at the North Sea scale (percentage of the population affected is based on total mortalities)

Project	Protected site	Northern gannet		Common guillemot		Razorbill		Atlantic Puffin	
		No.	%	No.	%	No.	%	No.	%
Hornsea Project One	Flamborough Head & Bempton Cliffs	0	0	(127)	0.15	(79)	0.4	(3)	0.3
	Coquet Island							(9)	0.05
	Farne Islands							(18)	0.04
EOWDC	Fowlsheugh			88 (88)	0.2	30 (30)	0.6		
	Buchan Ness to Collieston			298 (298)	1.5	99 (99)	2.3		
Dogger Bank Creyke Beck A and B	Flamborough Head & Bempton Cliffs	101 (5)	0.03	2,555 (128)	0.13	518 (26)	0.09	1 (<1)	<0.01
	Coquet							24 (1)	<0.01
	Farne Islands							56 (3)	<0.01
	Fowlsheugh			936 (47)	0.06	146 (7)	0.07		
	Buchan Ness to Collieston			372 (19)	0.05	-	-		
Dogger Bank Teesside A & B	Flamborough Head & Bempton Cliffs	72 (4)	0.01	845 (42)	0.04	261 (13)	0.04	<1 (<1)	<0.01
	Coquet							16 (<1)	<0.01
	Farne Islands							37 (2)	<0.01
	Fowlsheugh			377 (19)	0.02	73 (4)	0.03		
	Buchan Ness to Collieston			144 (7)	0.02	-	-		
<b>Totals</b>	<b>Total Flamborough Head &amp; Bempton Cliffs</b>	<b>9</b>	<b>0.04</b>	<b>297</b>	<b>0.32</b>	<b>118</b>	<b>0.53</b>	<b>3</b>	<b>0.3</b>
	<b>Total Coquet</b>							<b>11</b>	<b>0.06</b>
	<b>Total Farne Islands</b>							<b>23</b>	<b>0.05</b>
	<b>Total Fowlsheugh</b>			<b>154</b>	<b>0.28</b>	<b>41</b>	<b>0.7</b>		
	<b>Total Buchan Ness</b>			<b>324</b>	<b>1.57</b>	<b>-</b>	<b>-</b>		

- 2.2.5 As a consequence of the incorporation of this additional data no changes to the existing impact predictions and assessment outcomes (impact significance ratings) for any of the species considered in the Ornithology Technical Report (see Section 6.3, **Appendix 11A** of the ES) are required. The same conclusions can be drawn with respect to the findings and assessment outcomes as reported in the Marine and Coastal Ornithology chapter (**Chapter 11**) of the ES.
- 2.2.6 As shown in **Table A1**, estimates of the numbers of displaced birds and those that might be expected to die are separated into different seasons for most other projects. For consistency with the overall cumulative impact strategy, whereby information is taken from other assessments, total estimates of the numbers of displaced birds and those that might be expected to die have been summed across seasons, even where these seasons may not be consistent with those used in the Dogger Bank Creyke Beck assessment.

## 2.3 Collision impacts

- 2.3.1 The changes set out in the following paragraphs and in **Table A3**, **Table A4** and **Table A5**, revises the information and assessment outcomes provided in sections 6.3.10-6.3.11 of **Appendix 11A** of the ES and section 10.3 of **Chapter 11** of the ES.
- 2.3.2 Predictions of seabird mortalities arising through collision during the operational phase of Hornsea Project One and East Anglia ONE is available for the following species: northern gannet, Arctic skua (Hornsea Project One only), great skua (Hornsea Project One only), black-legged kittiwake, lesser black-backed gull and great black-backed gull – see **Table A3** below (update of *Table 6.10* in **Appendix 11A** of the ES). Inclusion of these data increases the total collision mortalities across all of the projects examined as shown in **Table A4**.
- 2.3.3 Due to the changes in the total number of mortalities, the percentages of the national and biogeographic populations impacted are altered, as set out in **Table A4**. However, the increases in the percentage of the populations impacted at these levels would not alter the impact significance ratings already defined for these individual species in the Ornithology Technical Report (Appendix 11 of the ES).
- 2.3.4 Mortalities have been apportioned to protected sites as per **Table A5**. For northern gannet, the inclusion of apportioned mortalities to the Flamborough Head and Bempton Cliffs SPA from both East Anglia ONE and Hornsea Project One increases the total number of birds impacted from 742 to 839 birds and for black-legged kittiwake from 324 to 447 birds.

**Table A3** Annual collision estimates obtained for additional offshore wind farm sites in the North Sea, used as part of the ES cumulative impact assessment, assumes a 98% avoidance rate unless otherwise stated.

Wind Farm	Model Used	Northern fulmar	Northern gannet	Arctic skua	Great skua	Black-legged kittiwake	Lesser black-backed gull	Great black-backed gull	Common guillemot	Razorbill	Atlantic puffin
Beatrice	Band (2012) Option 1(*) / Option 3 (**)	13 <sup>1**</sup>	21 <sup>3**</sup>	11 <sup>1*</sup>	25 <sup>1*</sup>	44 <sup>1**</sup>		239 <sup>1**</sup>	27 <sup>1*</sup>	1 <sup>*</sup>	
Blyth Demonstrator	Band (2012) Option 1		15 <sup>2</sup>			10 <sup>2</sup>		33 <sup>2</sup>			
Breeveerten II	Band <i>et al.</i> (2007)		137				548	40			
Dudgeon	Band (2000)		597 <sup>4</sup>				153 <sup>3</sup>				
East Anglia ONE	Band (2012) Option 1		850 <sup>1</sup>			1,056 <sup>1</sup>	394 <sup>1</sup>	496 <sup>1</sup>			
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm	Band (2012) Option 2	2	17			34		12	3	1	
Galloper	Band <i>et al.</i> (2007)		112	4	27	148	661	104			
Greater Gabbard	Band (2000)				15 <sup>5</sup>		252 <sup>5</sup>				
Hornsea Project One	Band (2012) Option 4		27 <sup>3</sup>	9 <sup>1</sup>	<1 <sup>1</sup>	31 <sup>1</sup>	22 <sup>1</sup>	127 <sup>1</sup>			
Humber Gateway	Band (2000)		18 <sup>6</sup>	1 <sup>6</sup>	1 <sup>6</sup>	34 <sup>6</sup>	13 <sup>6</sup>	64 <sup>6</sup>			
Lincs	Band (2000)		9				34				
London Array I/II	Band (2000)		5 <sup>3</sup>								
Race Bank	Band (2000)	8	198				296	96	3	1	
Sheringham Shoal	Band (2000)		31				33				
Teesside	Band (2000)		2 <sup>7</sup>	1 <sup>7</sup>		28 <sup>7</sup>		33 <sup>7</sup>			
Thanet	Band (2000)		1			1	32	1			
Triton Knoll	Band (2000)	7	129		4	158	85	487	3		
Westernmost Rough	Band (2000)		1			1	1	1			
Creyke Beck A and B and Dogger Bank Teesside A and B <sup>8</sup>	Band (2012) Option 3	2 (1)	118 (60)	0 (0)	1 (1)	336 (217)	75 (34)	113 (53)	0 (0)	5 (3)	3 (2)
<b>TOTAL</b>		<b>32</b>	<b>2,288</b>	<b>26</b>	<b>73</b>	<b>1,881</b>	<b>2,599</b>	<b>1,846</b>	<b>36</b>	<b>8</b>	<b>3</b>

<sup>1</sup>Avoidance rate of 98% used; <sup>2</sup>Avoidance rate of 88% used; <sup>3</sup>Avoidance rate of 99% used; <sup>4</sup>Avoidance rate of 97% used; <sup>5</sup>Avoidance rate of 99.82% used; <sup>6</sup>Avoidance rate of 95% used; <sup>7</sup>Avoidance rate of 99.62% used; <sup>8</sup>Figures based on median population estimates are used for consistency across projects – Dogger Bank Teesside A and B values are provided in brackets.

**Table A4 Percentages of the national and biogeographic populations impacted through collision with the inclusion of data from East Anglia ONE and Hornsea Project One**

Species	Numbers impacted		National Population				Biogeographic population			
			%Population		%Background mortality		%Population		%Background mortality	
	ES	Add	ES	Add	ES	Add	ES	Add	ES	Add
Northern gannet	1411	2288	<1	<1	2.6	4.2	<1	<1	1.7	2.9
Kittiwake	794	1881	<1	<1	1.1	2.7	<1	<1	<1	<1
Lesser black-backed gull	2183	2599	<1; 1.8	<1; 2.1	6.7	8.1	<1	<1	4.0	4.9
Great black-backed gull	1223	1846	2.4; 1.6	3.0; 2.0	26.2	39.9	<1	<1	3.2	3.8
Arctic skua	17	26	<1	<1	<1	<1	<1	<1	<1	<1

**Table A5 Numbers of birds predicted to be lost from protected sites due to collision, using information from other EIAs, to assess the cumulative impact at the North Sea scale. Absence of information is represented by a dash “-”.**

Project	Protected site	Northern fulmar	Northern gannet	Black-legged kittiwake	Lesser black-backed gull	Great black-backed gull	Common guillemot	Razorbill	Atlantic puffin
Beatrice	East Caithness Cliffs	5	-	21	-	18	27	1	-
East Anglia ONE	Flamborough Head & Bempton Cliffs		91 <sup>1</sup>	108 <sup>2</sup>					
	Alde-Ore Estuary				16				
Hornsea Project One	Flamborough Head & Bempton Cliffs		6 <sup>3</sup>	15					
Dudgeon	Flamborough Head & Bempton Cliffs		597 <sup>4</sup>						
Triton Knoll	Flamborough Head & Bempton Cliffs	-	129 <sup>4</sup>	158	-	-	-	-	-
Dogger Bank Creyke Beck A and B and Teesside A and B	Flamborough Head & Bempton Cliffs	<1	16 <sup>3</sup>	166	-	-	<1	<1	<1
	Alde-Ore Estuary				3				
	East Caithness Cliffs	<1	-	28	-	1	<1	<1	<1
<b>Total Flamborough Head &amp; Bempton Cliffs</b>		-	<b>839</b>	<b>447</b>	-	-	-	-	-
<b>Alde-Ore Estuary</b>					<b>19</b>				
<b>Total East Caithness Cliffs</b>		<b>6</b>	-	<b>49</b>	-	<b>19</b>	<b>27</b>	<b>1</b>	<b>&lt;1</b>

<sup>1</sup> Collision total is for Option 1 of the Band Model and an avoidance rate of 98%. <sup>2</sup> Collision total is for Option 1 of the Band Model. <sup>3</sup> Collision total is for Option 3 of the Band Model and an avoidance rate of 99%. <sup>4</sup> All collision losses apportioned to the SPA

- 2.3.5 As a consequence of the incorporation of this additional data no changes to the existing impact predictions (see Section 6.3 of **Appendix 11A**) and assessment outcomes (impact significance ratings) for any of the species considered in the Ornithology Technical Report are required – as set out in *Table 6.13*, **Appendix 11A** of the ES. The same conclusions can be drawn with respect to the findings and assessment outcomes as reported in the Ornithology chapter (**Chapter 11**) of the ES.
- 2.3.6 The inclusion of East Anglia ONE also leads to a potential cumulative impact on the breeding lesser black-backed gull population of the Alde-Ore Estuary SPA (see **Table A5**). However, it should be noted that the contribution of Dogger Bank Creyke Beck to the overall total of 19 collision mortalities would be one non-breeding bird (<0.01% of the SPA population). The conclusion reached in the ES with respect to the cumulative impact at the national, biogeographic and protected site level for this species (would not alter (see paragraphs 6.3.57-6.3.60 in **Appendix 11A** of the ES and *Table 6.13*).



## 3 Assessment of in-combination effects on SPA designated bird populations

### 3.1 Introduction

- 3.1.1 This section of the addendum sets out changes to the in-combination assessment for the HRA in respect of the addition of data from the East Anglia ONE and Hornsea Project One wind farm projects.
- 3.1.2 In the following sections, the in-combination assessment is presented for each of the main receptors (European site(s) and features) as for the assessment of the project alone. The relevant projects defined by the categories set out above are listed and an assessment conclusion in light of the conservation objectives applicable to the relevant sites is provided.

### 3.2 Identification of receptors for in-combination assessment

- 3.2.1 The assessment of potential impacts on seabirds, waterbirds and migrant birds detailed in Section 6 of the **IfAA Report**, indicates that the nature and magnitude of potential impact likely to arise from the proposed wind farm development varies according to bird groups and individual species.
- 3.2.2 A brief summary of the predicted impacts of Dogger Bank Creyke Beck in respect of the relevant species and bird groups is provided here in order to determine for which of these the potential for in-combination impacts could be significant. If it has been determined that for Dogger Bank Creyke Beck alone that a potential impact on an ornithological receptor is insignificant then it is concluded that an in-combination impact with other projects, that would be of significance, would be highly unlikely to arise and can be discounted.

#### Habitat loss and alteration

- 3.2.3 Available data and evidence indicates that benthic habitat loss as a result of the installation of wind turbines and other structures in the development footprint for Dogger Bank Creyke Beck would not affect the overall prey resource available to foraging seabirds. No significant impact on designated seabird populations is therefore predicted. The same conclusion is drawn with regard to the other projects, including East Anglia ONE and Hornsea Project One. In particular, the widely dispersed and small-scale nature of habitat loss and alteration would be highly unlikely to have a cumulative impact with regard to the foraging resource of individual breeding colonies.
- 3.2.4 Seabird prey resources (specifically fish) within the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B project development areas could be temporarily affected by increased underwater noise levels during construction. However, this effect would be localised to the immediate area of piling works, non-cumulative and temporary displacement of the resource is predicted rather than loss or decrease in availability. A similar conclusion is reached in relation to the in-combination impact

with other projects, including Hornsea Project One and East Anglia ONE. In relation to habitat loss and alteration, no significant impact on designated seabird populations is therefore predicted and no adverse effect on the integrity of designated populations of the SPAs screened into the assessment for their sea bird species is predicted.

## Disturbance and displacement

3.2.5 The disturbance and displacement analysis presented in Section 6.6 of the **IfAA Report** reveals that this impact would be of relevance and of potential significance for the following species of seabirds:

- Common guillemot;
- Razorbill; and
- Atlantic puffin.

3.2.6 Although no displacement impact is predicted for northern gannet from Dogger Bank Creyke Beck alone, cumulatively it is recognised that there is the possibility that displacement from a number of offshore wind farms could be of potential concern. The potential in-combination displacement impact on northern gannet is therefore considered and assessed (see Section 7.7. of the **IfAA Report**).

3.2.7 For all other seabird species and migrants no in-combination assessment is considered necessary as there would be no significant disturbance and displacement impacts during either construction or operation of Dogger Bank Creyke Beck.

## Barrier effects

3.2.8 Analysis of potential barrier effects was presented for a number of breeding seabird species deriving from SPAs for which Dogger Bank Creyke Beck could act as a barrier to them reaching potential foraging grounds. The assessment concluded that small barrier effects could arise for:

- Northern fulmar;
- Northern gannet;
- Black-legged kittiwake;
- Common guillemot; and
- Razorbill.

3.2.9 Apart for northern fulmar and black-legged kittiwake originating from Flamborough Head and Bempton Cliffs SPA, where over 1% of the breeding population of these species could be affected, for all SPA designated populations of the above species the barrier effect posed by Dogger Bank Creyke Beck was assessed as being not significant. This suggests that in-combination effects would be unlikely to arise. However, consideration is given to the potential combined effect that other wind farm projects may have on foraging birds of the species listed above. For all other species of seabirds it is considered that no in-combination barrier effects would arise.

3.2.10 As for Dogger Bank Creyke Beck, the same methodology to determine the potential barrier effect on migratory bird species is applied with respect to other offshore wind farm projects, where relevant data is available.

## Collision risk and mortality

3.2.11 Collision risk modelling for the Dogger Bank Creyke Beck project has demonstrated that potential impacts that would be significant at designated site populations would only arise with respect to a few species of seabirds. A summary of the predicted annual collision totals for the key seabird species present in the project area is provided in **Table A6** (original *Table 7.11* in the **IfAA Report**).

**Table A6** Predicted seasonal collision risk estimates for study species within Dogger Bank Creyke Beck using a 98% avoidance rate (99% for northern gannet)

Species	Mean		Considered for in-combination assessment
	Breeding	Non-breeding	
Northern fulmar	1 (1-1)	<1 (<1-1)	No
Northern gannet	20 (16-23)	41 (34-47)	Yes
Arctic skua	1 (<1 -<1)	<1 (<1-2)	No
Great skua	<1 (<1-1)	<1 (<1-1)	No
Black-legged kittiwake	150 (131-168)	68 (59-76)	Yes
Lesser black-backed gull	25 (17-37)	10 (6-16)	Yes
Great black-backed gull	9 (5-13)	44 (31-60)	Yes
Common guillemot	<1 (<1-<1)	<1 (<1-<1)	No
Razorbill	<1 (<1-<1)	3 (2-4)	No
Atlantic puffin	<1 (<1-<1)	2 (2-3)	No

3.2.12 For the purposes of the in-combination assessment of collision risk, the species considered are therefore restricted to the following: northern gannet, black-legged kittiwake, lesser black-backed gull and great black-backed gull. For all other species of seabird, the annual collision losses predicted for Dogger Bank Creyke Beck are deemed to be insignificant and therefore no in-combination assessment is considered necessary.

3.2.13 Collision risk modelling for migrant bird species that may pass through Dogger Bank Creyke Beck revealed that at the Great Britain population level the overall predicted annual losses would be insignificant. It is therefore not expected that, in-combination with other projects, collision losses of migrants during operation of Dogger Bank Creyke Beck would be significant. No specific species sensitivities were identified through the assessment work. Therefore, if information on collision losses from other projects is available, all of the species analysed for the project by itself will be considered in respect of potential in-combination impacts.

## Screening of relevant offshore wind farm projects

3.2.14 The majority of marine birds that occur in Dogger Bank Creyke Beck during the breeding season may originate from a restricted number of protected sites that are within foraging range of the development area. Foraging range during the breeding season can effectively be used as a means of establishing the geographical area

over which potential interactions between projects is defined and therefore the specific wind farm projects that need to be considered. Birds that are present outwith the defined breeding seasons or during the breeding season as non-breeders, and migrants that pass through the area in autumn and spring, are not constrained to particular protected sites and could potentially originate from sites over a much wider geographical area. Therefore, the populations potentially impacted by Dogger Bank Creyke Beck outside of the breeding season could also potentially be impacted by wind farm projects across a much wider geographical spread than during the breeding season. A full list of the offshore wind farms in the wider North Sea region that were initially considered for the ornithological cumulative impact assessment is provided in *Appendix 8* in **Appendix 11A** of the ES. The appendix also states which of these projects are within foraging range of the protected sites identified to be of relevance to Dogger Bank Creyke Beck.

- 3.2.15 Further screening was undertaken to refine this list based on the criteria set out at the beginning of this section of the report. The results of this further screening, along with justification for the exclusion of particular projects from the in-combination assessment are provided in **Table A7** and **Table A8** (update of *Tables 7.12* and *7.13* in the **IfAA Report**).
- 3.2.16 Review of the available assessment information for these projects in the form of environmental statements and appropriate assessments has been undertaken to obtain the relevant data to enable the in-combination assessment to be undertaken. In some cases information is unavailable for particular projects to inform the in-combination assessment for one or more specific impacts (see **Table A7** and **A8**), and this is reflected in the assessment work presented in subsequent sections.
- 3.2.17 For the in-combination assessment no attempt has been made to standardise estimates using the same assumptions as presented in this assessment, as, based on the information presented on other assessments, this would have only be possible in some cases. In addition the values/assumptions used in other assessments may have been agreed with statutory advisors and/or be specific to those projects and thus it would not be appropriate to use standardised estimates here. The assumptions used in deriving displacement and collision risk estimates in other assessments are highlighted where these differ from those used in this assessment.

### 3.3 Impacts on breeding sea bird populations

#### Disturbance / displacement to breeding sea bird populations

- 3.3.1 The assessment of disturbance / displacement has been carried out as one for the construction, operation, and decommissioning phases, as at any one time there is likely to be a combination of wind farms under construction or already in operation, and ultimately being decommissioned. This approach also better reflects the view, taken here, that displacement represents effective habitat loss and can therefore be treated as a single (albeit long term) impact on the population levels of affected species.

**Table A7** Offshore wind farm projects included in the in-combination assessment and impacts considered in available project assessment materials

Project	UK Round	Status	Collision	Disturbance	Reference
Beatrice	Scottish	Consent Application Submitted	Yes	Yes	Arcus 2012, 2013
Blyth Demonstration Site	-	Consent Application Submitted	Yes		Narec (2012)
Breeveerten II		Consent Authorised	Yes		
Dogger Bank Teesside A & B	3	Concept / Early Planning	Yes	Yes	Forewind
Dudgeon	2	Consent Authorised	Yes		ECON 2010, Royal Haskoning DHV (2013)
East Anglia ONE	3	Consent Application Submitted	Yes	Yes	EAOW (2013)
European Offshore Wind Development Centre		Consent Authorised	Yes	Yes	Technip 2012
Galloper	2 - extension	Consent Authorised	Yes	Yes	Royal Haskoning 2010, 2011
Greater Gabbard	2	Fully Commissioned	Yes		Banks et al. 2006
Hornsea Project One	3	Consent Application Submitted	Yes	Yes	SMart Wind (2013)
Humber Gateway	2	Consent Authorised	Yes		E.ON 2007
Lincs	2	Partial Generation / Construction	Yes		Centrica Energy 2007a
London Array	2	Fully Commissioned	Yes	Yes	RPS (2005)
Race Bank	2	Consent Authorised	Yes		Amec 2009
Sheringham Shoal	2	Fully Commissioned	Yes		Scira Offshore Energy Ltd 2006
Teesside	1	Partial Generation / Construction	Yes		EDF 2004
Thanet	2	Fully Commissioned	Yes	Yes	Royal Haskoning 2005
Triton Knoll	2	Consent Authorised	Yes		Npower Renewables 2010, 2012
Westermost Rough	2	Consent Authorised	Yes		RPS 2009

**Table A8** Offshore wind farm projects excluded from the in-combination assessment and reasons for exclusion

<b>Project</b>	<b>UK Round</b>	<b>Status</b>	<b>Developer</b>	<b>Reason for Exclusion from in-combination assessment</b>
Blyth	1	Fully Commissioned 2000	E.ON	Site became operational prior to bird survey period for Dogger Bank.
Gunfleet Sands I and II	1	Fully Commissioned 2009	Dong Energy	Site became operational prior to bird survey period for Dogger Bank.
Kentish Flats	1	Fully Commissioned 2005	Vatenfall	Site became operational prior to bird survey period for Dogger Bank.
Lynn and Inner Dowsing	1	Fully Commissioned 2009	Centrica	Site became operational prior to bird survey period for Dogger Bank.
Scroby Sands	1	Fully Commissioned 2004	E.ON	Site became operational prior to bird survey period for Dogger Bank.
Firth of Forth Bravo and Alpha projects	3	Consent Application Submitted	SeaGreen 2012	Forewind are aware that the Firth of Forth project is shortly to submit additional information relating to their application as is permitted under the section 36 application process (applicable in Scotland under the Electricity Act). It is anticipated that this will significantly alter the number of birds likely to be impacted through collision and also displacement effects as originally outlined in their submitted ES. These changes are likely to have important consequences for attribution of impacts to specific designated SPA populations and hence confidence in the submitted information and assessment outcomes is low and the project has been screened out.
Moray Firth	3	Concept/Early Planning	Moray Offshore Renewables Ltd. 2012	As noted above for the Firth of Forth projects and as has been demonstrated by the submission of additional information by the Beatrice project it is expected that this project, which falls under section 36 of the Electricity Act (as it is within Scottish waters) will also provide a submission of additional environmental information on ornithological impacts as part of the examination process. As a result, there is low confidence that the values presented in the submitted ES will remain the same.
Near na Gaoithe	Scottish	Consent Application Submitted	Mainstream 2012	As noted above for the Firth of Forth projects and as has been demonstrated by the submission of additional information by the Beatrice project it is expected that this project, which falls under section 36 of the Electricity Act (as it is within Scottish waters) will also provide a submission of additional environmental information on ornithological impacts as part of the examination process. As a result, there is low confidence that the values presented in the submitted ES will remain the same.

- 3.3.2 Guidance on the assessment of disturbance/displacement at the cumulative scale is provided in King *et al.* (2009). In the absence of resource competition, the effect of cumulative displacement would be negligible. However, such an assumption may not be correct given that areas used by seabirds for foraging may be close to carrying capacity. Since there is currently no simple method to determine carrying capacity, King *et al.* (2009) recommend that cumulative displacement should be calculated by summing displacement effects from each of the contributing developments.
- 3.3.3 In assessing the potential impacts of displacement, estimates are required both of the numbers of birds predicted to be displaced and then of the numbers of these that might be expected to die following displacement. Following the overall Forewind Cumulative Impact Assessment strategy, information regarding the potential impacts of displacement was taken from impact assessments or environmental statements where available and no attempt has been made to estimate values in other cases.
- 3.3.4 Estimates of numbers of displaced birds were obtained by reviewing environmental statements for planned offshore wind farms in the North Sea. In some cases, while population estimates may have been provided, specific displacement estimates were not available. Thus the sites for which data were available only represent a subset of those considered in the cumulative assessment in the North Sea region as a whole.
- 3.3.5 The cumulative assessment presented here considers only those projects for which estimates were provided of the numbers of displaced birds that might then be expected to die (see **Table A9** – update of *Table 7.14* in the **IfAA Report**). In many instances, while predictions were provided of the numbers of birds that might be expected to be displaced, no information was provided on the likely mortality rates of these birds (often, as mortality was considered as part of the sensitivity of species to this effect – see Maclean *et al.* 2009). As with displacement rates, mortality rates considered varied between projects, some providing results for a range of rates and carrying through either a worst case or ‘realistic’ value into the assessment.
- 3.3.6 Where estimates are available for other projects and apportioned to protected sites, these have been added to respective apportioned estimates for Dogger Bank Creyke Beck to assess potential impacts at the European site level. If apportioning to specific European sites has not been undertaken then an indication of potential impact at national and biogeographic contexts is provided.

### Northern gannet

- 3.3.7 While northern gannet is likely to display a high displacement rate (assigned as 75% - see *Section 4.3* in **Appendix 11A** of the ES) it is considered, on the basis of habitat flexibility, to have a very high tolerance to this effect. For Dogger Bank Creyke Beck by itself, a 0% mortality rate as a result of displacement was assigned to this species. However, it is recognised that cumulatively the habitat loss resulting from a number of large offshore wind farm projects could reach a habitat availability threshold that becomes significant. Therefore, a precautionary 5% mortality rate (see *Section 6.6* of the HRA Report ), which reflects the potential for the loss of relatively large areas of available foraging habitat, has been assumed for displaced birds for the in-combination assessment.

**Table A9** Predictions of the numbers of displaced birds obtained for additional offshore wind farm sites in the North Sea for which quantitative displacement data has been presented

Wind Farm Development	Season	Northern gannet	Common guillemot	Razorbill	Atlantic puffin
Dogger Bank Creyke Beck	Breeding	229	3,947	193	51
	Winter	502	9,445	3,127	244
Dogger Bank Teesside A & B	Breeding	192	1,072	88	31
	Winter	390	4,502	1,604	166
Beatrice			3,112	528	641
East Anglia One	Spring	65	430	120	
	Breeding	43			
	Autumn	1,870			
	Winter	64	820	200	
European Offshore Wind Development Centre		32	386	129	62
Galloper <sup>1</sup>	Breeding <sup>2</sup>				
	Winter <sup>2</sup>		3,219	342	
Hornsea Project One	Breeding	239	1,037	366	428
	Post-breeding		5,705	2,926	
	Winter	237	4,609	2,628	503
London Array		162	2,500	250	
Thanet		37	193 <sup>3</sup>	193 <sup>3</sup>	193 <sup>3</sup>
<b>Total</b>		<b>4,062</b>	<b>42,159</b>	<b>12,694</b>	<b>2,319</b>

<sup>1</sup> No specific displacement rates were presented; hence, it is assumed that all birds in the areas of the respective projects were displaced; <sup>2</sup> A total displacement estimate was obtained following the methodology used in the Dogger Bank Creyke Beck assessment, assuming that breeding populations were separate to non-breeding (post-breeding/migration/wintering) populations; <sup>3</sup> Impacts of displacement were predicted for all auks combined; a worst case was assumed by applying the combined estimate to each species.

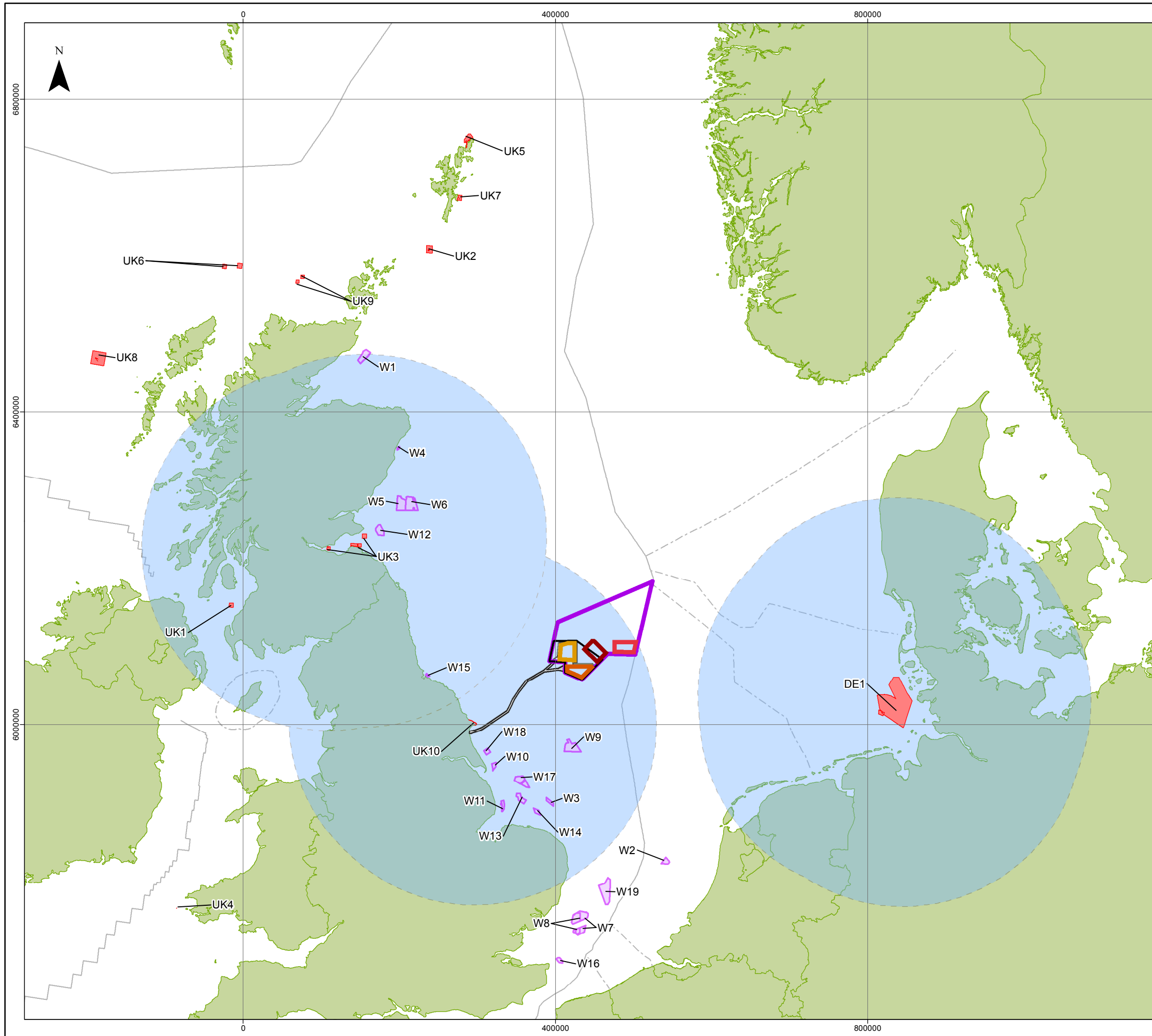
3.3.8 Only two SPAs are within mean maximum foraging range of Dogger Bank Creyke Beck, as shown in **Figure A1** (update of *Figure 7.5* in the **IfAA Report**; reference list presented in **Table A10**, which defines the spatial limits for the inclusion of other projects that could potentially also affect breeding birds deriving from these two SPAs.

3.3.9 Predictions of the numbers of gannet potentially displaced were available for six additional projects – Dogger Bank Teesside A & B, East Anglia ONE, the European Offshore Wind Development Centre (EOWDC), Hornsea Project One, London Array and Thanet (see **Table A9**). The cumulative number of birds estimated to be displaced across these projects was 4,062 (summing estimates from different seasons where provided, following the assumption used in this assessment that these would be different birds).



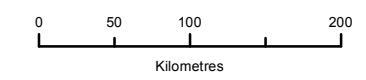
**Table A10 Projects and European site reference list for Figure A1**

<b>Projects and site name reference list</b>
<b>Projects</b>
Beatrice Offshore Wind Farm (W1)
Breeveerten II Offshore Wind Farm (W2)
Dudgeon Offshore Wind Farm (W3)
East Anglia One Offshore Wind Farm (W19)
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm (W4)
Firth of Forth Alpha Offshore Wind Farm (W5)
Firth of Forth Bravo Offshore Wind Farm (W6)
Galloper Offshore Wind Farm (W7)
Greater Gabbard Offshore Wind Farm (W8)
Hornsea Project One Offshore Wind Farm (W9)
Humber Gateway Offshore Wind Farm (W10)
Lincs Offshore Wind Farm (W11)
Nearr na Gaoithe Offshore Wind Farm (W12)
Race Bank Offshore Wind Farm (W13)
Sheringham Shoal Offshore Wind Farm (W14)
Teesside Offshore Wind Farm (W15)
Thanet Offshore Wind Farm (W16)
Triton Knoll Offshore Wind Farm (W17)
Westernmost Rough Offshore Wind Farm (W18)
<b>Sites</b>
Ailsa Craig SPA (UK1)
Fair Isle SPA (UK2)
Forth Islands SPA (UK3)
Grassholm SPA (UK4)
Hermaness, Saxa Vord and Valla Field SPA (UK5)
North Rona and Sula Sgeir SPA (UK6)
Noss SPA (UK7)
St Kilda SPA (UK8)
Sule Skerry and Sule Stack SPA (UK9)
Flamborough Head and Bempton Cliffs SPA (UK 10)
Seevogelschutzgebiet Helgoland SPA (DE1)



**LEGEND**

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Export cable corridor
- Temporary works area
- Wind farm
- Special Protection Area (SPA)
- Northern gannet mean maximum range - 230km



Data Source:  
Offshore wind farm boundaries © Crown Copyright, 2013,  
Environmental Designations © European Environment Agency, 2012

PROJECT TITLE  
**DOGGER BANK CREYKE BECK**  
HRA Addendum

DRAWING TITLE  
**Figure A1 Northern gannet foraging ranges  
in relation to offshore wind farm projects  
considered for the in-combination assessment**

VER	DATE	REMARKS	Drawn	Checked
1	27/09/2013	Final	FK	PT

DRAWING NUMBER:  
**9X1254/CBPHRA/22/R1**

SCALE 1:5,000,000 PLOT SIZE A3 DATUM WGS84 PROJECTION UTM31N



3.3.10 Mortality losses following displacement have been calculated for four projects (Dogger Bank Creyke Beck, Dogger Bank Teesside A & B, East Anglia ONE and Hornsea Project One). A total of 66 birds were predicted to be lost through mortality following displacement from the Creyke Beck A and B and Dogger Bank Teesside A & B projects (75% displacement and 5% mortality). For East Anglia ONE (see EAOW 2013a) a maximum loss of 30 birds is calculated (based on 70% displacement and 10% mortality) and for Hornsea Project One (70% displacement and 2% mortality during the breeding season and 1% mortality during the non-breeding season) a maximum loss of 7 birds (SMart Wind 2013).

3.3.11 For Dogger Bank Creyke Beck and Dogger Bank Teesside A and B, apportioning of the affected birds to individual SPAs is presented in **Table A11** (*Table 7.15 in the IfAA Report*). For the SPAs that are within the mean maximum foraging range of Dogger Bank Creyke Beck, the cumulative population affected by both Dogger Bank projects is 0.04% (comprising five breeding adult birds and four non-breeding birds) for the Flamborough Head and Bempton Cliffs SPA and 0.02% (comprising eight breeding adult birds and nine non-breeding birds) for the Forth Islands SPA. The full apportioning breakdown of the SPA populations affected by the Dogger Bank Creyke Beck and Teesside A & B projects is presented in *Table A9.48c in Appendix 9 of Appendix 11A* of the ES.

**Table A11** Apportioning of displacement and mortality impact for northern gannet to European sites predicted as a result of in-combination displacement during operation of Dogger Bank Creyke Beck and Dogger Bank Teesside A and B

Site name	Breeding		Non-breeding		Total	
	No.	% popn	No.	% popn	No.	% popn
Fair Isle	0	0	2	0.01	2	0.01
Forth Islands	8	0.01	23	0.01	31	0.02
Flamborough Head and Bempton Cliffs	5	0.03	4	0.01	9	0.04
Hermaness, Saxa Vord and Valla Field	0	0	10	0.01	10	0.01
Noss	0	0	4	0.01	4	0.01
Sule Skerry and Sule Stack	0	0	2	0.01	2	0.01
<b>Transboundary sites</b>						
Cote de Granit Rose-Sept Iles	0	0	8	0.01	8	0.01
Seevogelschutzgebiet Helgoland	0	0	0.1	0.01	0.1	0.01

3.3.12 Calculated mortality losses from the East Anglia ONE project are not attributed to any specific SPA, but instead the overall change in background mortality rate for the North Sea population across differing seasons is considered (EAOW 2013a). In this respect, no in-combination contribution to the potential impact on the Flamborough Head and Bempton Cliffs SPA from East Anglia ONE can be defined.

3.3.13 For Hornsea Project One, during the breeding season, a total of three adult bird mortalities resulting from displacement were apportioned to the Flamborough Head and Bempton Cliffs SPA. Of the two predicted mortalities that could arise during the

non-breeding period none were apportioned to the Flamborough Head and Bempton Cliffs SPA. No mortality losses were apportioned to other SPAs.

- 3.3.14 Combining the predicted mortality losses for Dogger Bank Creyke Beck, Dogger Bank Teesside A and B and Hornsea Project One, a total of eight adult birds during the breeding season would be lost from the Flamborough Head and Bempton Cliffs SPA population (<0.04% of the population). Of the four non-breeding birds apportioned to the SPA from Dogger Bank Creyke Beck and Dogger Bank Teesside A & B, as a minimum it is assumed that three of these are adult birds. In total, therefore, displacement losses would equate to 11-12 adult birds from the designated breeding population of the Flamborough Head and Bempton Cliffs SPA. This would represent 0.06% of the designated population.
- 3.3.15 Given the small population effect for all SPA populations assessed the overall conclusion is that in-combination with other projects Dogger Bank Creyke Beck would not result in a displacement impact that would constitute an adverse effect on the integrity of the screened SPAs designated for their northern gannet populations.

### Common guillemot

- 3.3.16 Common guillemot exhibits a medium vulnerability to activities in the marine environment and, therefore, is likely to show a disturbance response. It has a medium sensitivity to the effects of displacement (i.e. effective habitat loss) and, therefore, is considered to have some tolerance to this effect. A precautionary 50% displacement rate during operation of Dogger Bank Creyke Beck has been assumed and a mortality rate of 5% following displacement assigned across both the breeding and non-breeding seasons. The mortality rate is based on knowledge of the foraging ecology of this species and the magnitude of the habitat loss that could occur as a result of displacement from the wind farm development area (see below). As discussed in Section 6.3 of the **IfAA Report** and in Furness (2013) (see **Appendix 11B** of the ES) this is viewed as a precautionary mortality rate and it is anticipated that the actual rate would be lower than this. Based on these values it was concluded in the **IfAA Report** (see Section 6.6) that the predicted mortality of 669 birds would not have an adverse effect on the integrity of any of the designated populations screened into the assessment.
- 3.3.17 Predictions of the numbers of birds potentially displaced by other projects were available for eight additional projects as set out in **Table A9**. The cumulative number of birds estimated to be displaced across these projects is 42,159 (summing estimates from different seasons where provided, following the assumption used in this assessment that these would be different birds).
- 3.3.18 Six SPAs are within mean maximum foraging range of Dogger Bank Creyke Beck, as shown in **Figure A2** (update of *Figure 7.6* in the **IfAA Report**; site and project reference list presented in **Table A12**), which defines the spatial limits for the inclusion of other projects that could potentially also affect breeding birds deriving from these SPAs.

**Table A12 Projects and European site reference list for Figure A2**

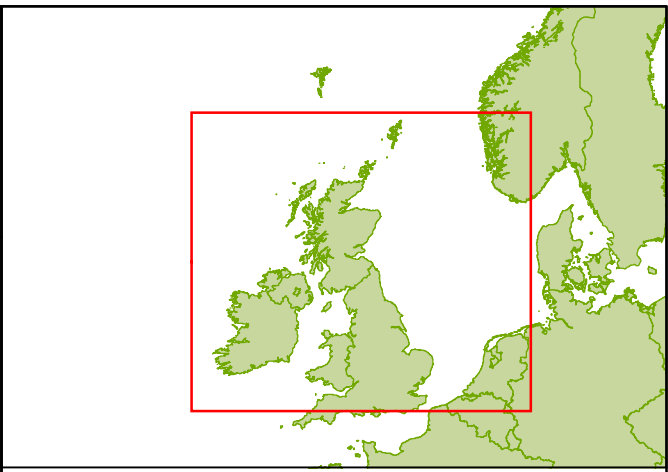
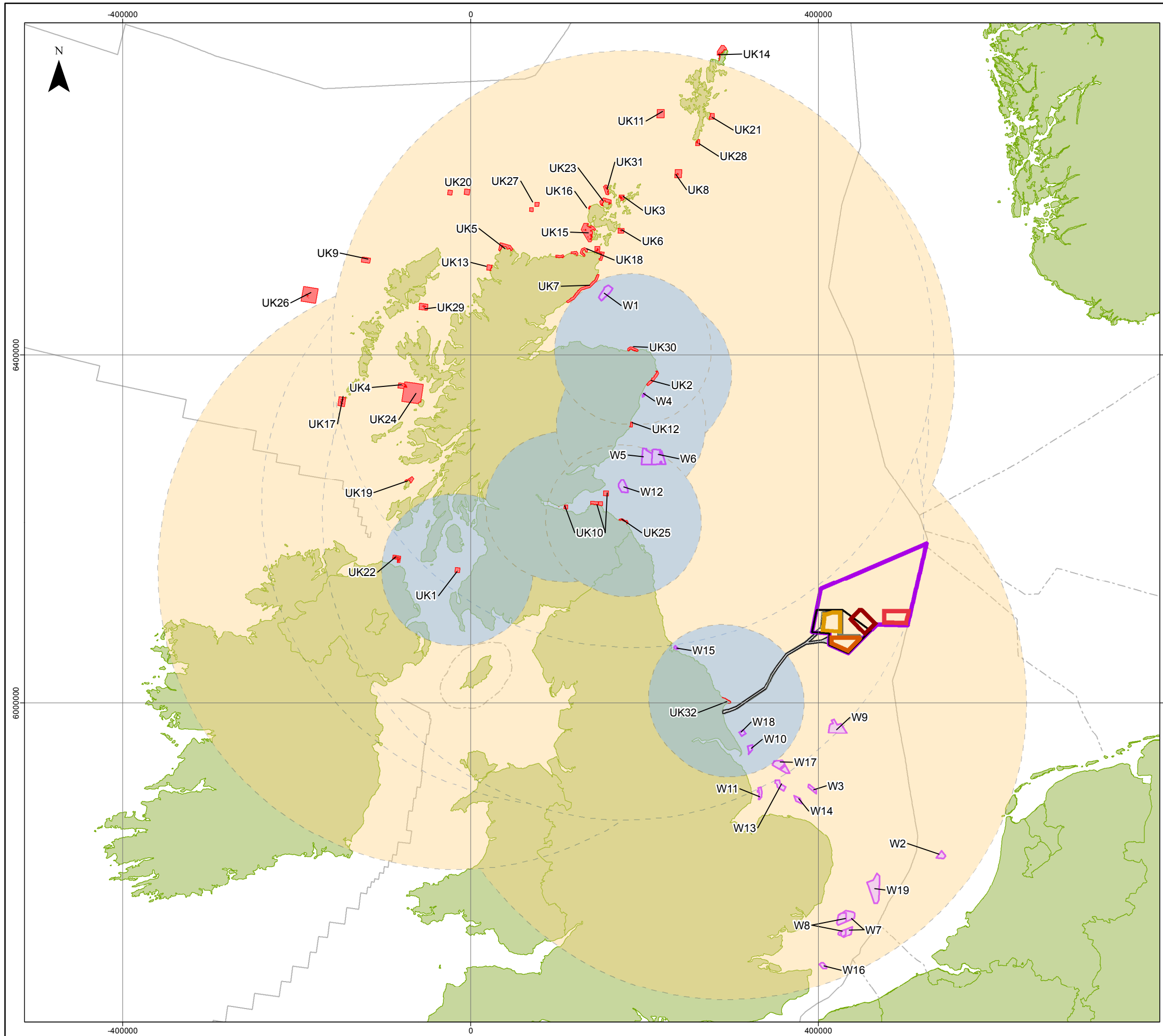
<b>Projects and site name reference list</b>
<b>Projects</b>
Beatrice Offshore Wind Farm (W1)
Breeveerten II Offshore Wind Farm (W2)
Dudgeon Offshore Wind Farm (W3)
East Anglia One Offshore Wind Farm (W19)
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm (W4)
Firth of Forth Alpha Offshore Wind Farm (W5)
Firth of Forth Bravo Offshore Wind Farm (W6)
Galloper Offshore Wind Farm (W7)
Greater Gabbard Offshore Wind Farm (W8)
Hornsea Project One Offshore Wind Farm (W9)
Humber Gateway Offshore Wind Farm (W10)
Lincs Offshore Wind Farm (W11)
Nearr na Gaoithe Offshore Wind Farm (W12)
Race Bank Offshore Wind Farm (W13)
Sheringham Shoal Offshore Wind Farm (W14)
Teesside Offshore Wind Farm (W15)
Thanet Offshore Wind Farm (W16)
Triton Knoll Offshore Wind Farm (W17)
Westernmost Rough Offshore Wind Farm (W18)
<b>Sites</b>
Ailsa Craig SPA (UK1)
Buchan Ness to Collieston Coast SPA (UK2)
Calf of Eday SPA (UK3)
Canna and Sanday SPA (UK4)
Cape Wrath SPA (UK5)
Copinsay SPA (UK6)
East Caithness Cliffs SPA (UK7)
Fair Isle SPA (UK8)
Flannan Isles SPA (UK9)
Forth Islands SPA (UK10)
Foula SPA (UK11)
Fowlsheugh SPA (UK12)
Handa SPA (UK13)
Hermaness, Saxa Vord and Valla Field SPA (UK14)
Hoy SPA (UK15)
Marwick Head SPA (UK16)

Projects and site name reference list
Mingulay and Berneray SPA (UK17)
North Caithness Cliffs SPA (UK18)
North Colonsay and Western Cliffs SPA (UK19)
North Rona and Sula Sgeir SPA (UK20)
Noss SPA (UK21)
Rathlin Island SPA (UK22)
Rousay SPA (UK23)
Rum SPA (UK24)
St Abb`s Head to Fast Castle SPA (UK25)
St Kilda SPA (UK26)
Sule Skerry and Sule Stack SPA (UK27)
Sumburgh Head SPA (UK28)
The Shiant Isles SPA (UK29)
Troup, Pennan and Lion`s Heads SPA (UK30)
West Westray SPA (UK31)
Flamborough Head and Bempton Cliffs SPA (UK 32)

3.3.19 Estimates of the numbers of displaced birds that might be expected to die were only available for Dogger Bank Creyke Beck, Dogger Bank Teesside A & B, East Anglia ONE, the EOWDC project and Hornsea Project One. **Table A13** sets out the displacement and mortality rates and predicted mortalities for each of the above projects.

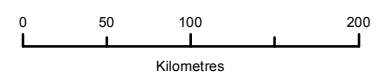
**Table A13** Predicted numbers of common guillemot subject to displacement and mortality for relevant wind farm developments

Wind Farm Development	Season	Displacement rate	No of birds displaced	Mortality rate	No. of mortalities
Dogger Bank Creyke Beck	Breeding	50%	3,947	5%	197
	Winter	50%	9,445	5%	472
Dogger Bank Teesside A & B	Breeding	50%	1,072	5%	54
	Winter	50%	4,502	5%	225
East Anglia ONE	Spring	30%	430	10%	43
	Winter	30%	820	10%	82
EOWDC			386	100%	386
Hornsea Project One	Breeding	30	1,037	10%	104
	Post-breeding	30	5,705	2%	114
	Winter	30	4,609	1%	46
<b>Total</b>			<b>31,953</b>		<b>1,723</b>



**LEGEND**

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Export cable corridor
- Temporary works area
- Wind farm
- Special Protection Area (SPA)
- Common guillemot mean maximum range - 84km
- Common guillemot maximum range - 340km



Data Source:  
 Offshore wind farm boundaries © Crown Copyright, 2013,  
 Environmental Designations © European Environment Agency, 2012

PROJECT TITLE  
**DOGGER BANK CREYKE BECK**  
 HRA Addendum

DRAWING TITLE  
**Figure A2 Common guillemot foraging ranges  
 in relation to offshore wind farm projects  
 considered for the in-combination assessment**

VER	DATE	REMARKS	Drawn	Checked
1	27/09/2013	Final	FK	PT

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SCALE 1:4,500,000 PLOT SIZE A3 DATUM WGS84 PROJECTION UTM31N



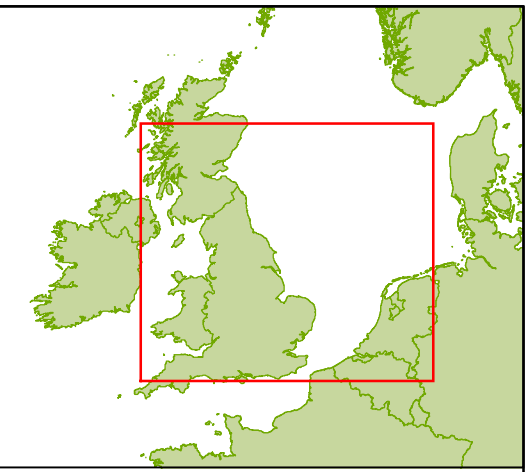
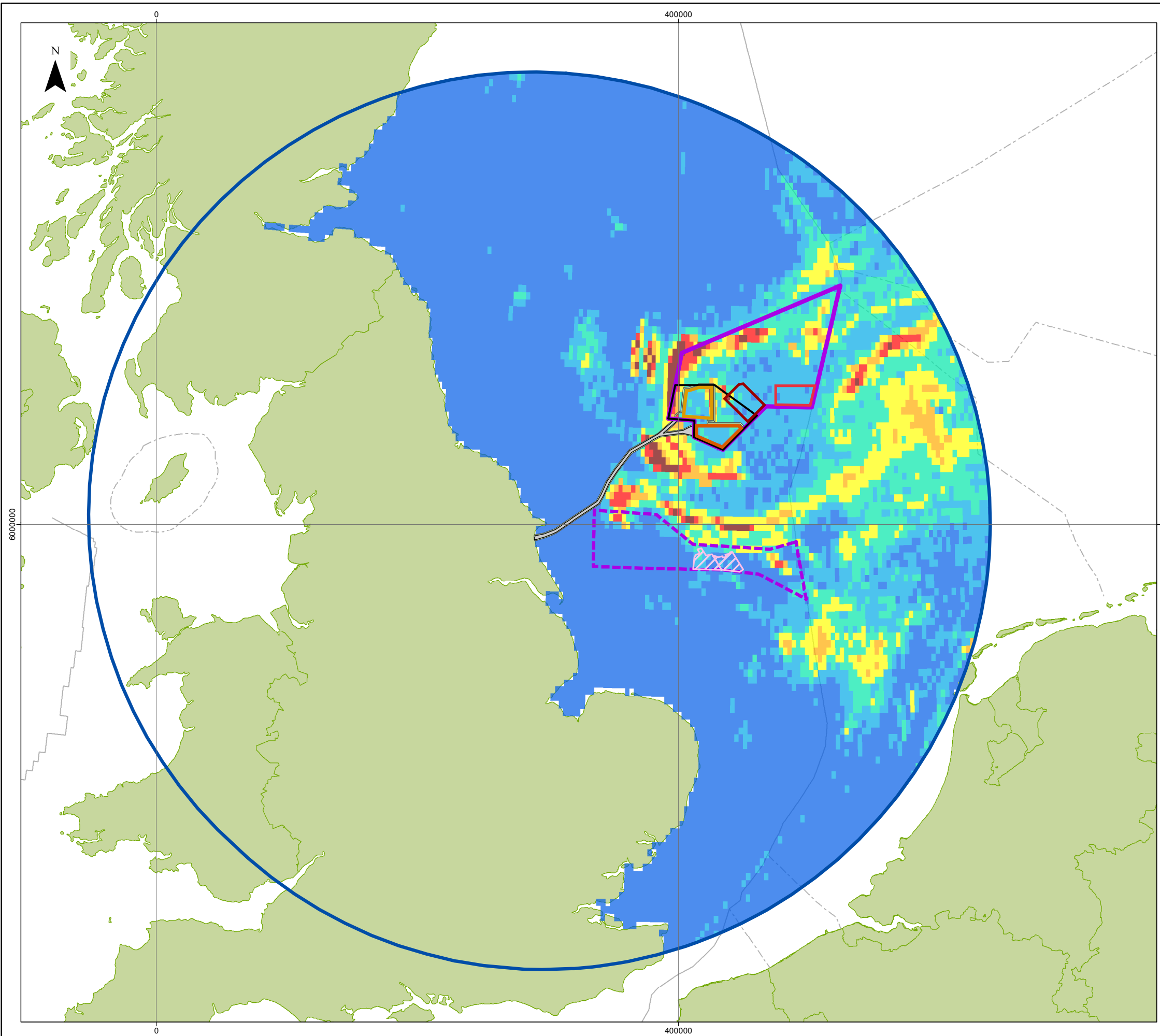


- 3.3.20 For Dogger Bank Creyke Beck and Dogger Bank Teesside A & B, apportioning of the affected birds to individual SPAs is presented in **Table A13** (update of *Table 7.16* in the **IfAA Report**). As would be expected, birds from the same SPAs affected by Dogger Bank Creyke Beck would also be affected by Dogger Bank Teesside A & B.
- 3.3.21 In terms of the apportioning totals to individual SPAs, combined losses for Dogger Bank Creyke Beck and Dogger Bank Teesside A & B would be 0.17% of the designated breeding common guillemot population of the Flamborough Head and Bempton Cliffs SPA. For the other SPAs that are within the maximum foraging range of Dogger Bank Creyke Beck, the cumulative population affected by both Dogger Bank projects is 0.11% or less. The full apportioning breakdown of the SPA populations affected by the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects is presented in *Tables A9.56a-c* in *Appendix 9* of **Appendix 11A** of the ES.
- 3.3.22 For Hornsea Project One, displacement mortalities that may occur during the breeding season have been attributed to the Flamborough Head and Bempton Cliffs SPA as this is the closest SPA and is within the maximum foraging range of guillemot reported in Thaxter *et al.* (2012). At other times of the year, birds from a number of possible east coast and potentially further afield colonies may be present in the Hornsea Zone and therefore mortalities could potentially be apportioned to a number of SPAs. The assessment work presented in the Hornsea Project One HRA assumes that a certain percentage (in direct proportion to the colony size) of the birds present could derive from the Flamborough Head and Bempton Cliffs SPA and therefore some of the mortalities can be apportioned to this SPA. The remaining mortalities are not apportioned to any other SPAs.
- 3.3.23 The calculated mortalities for East Anglia ONE are considered in the context of increase in mortality relative to the baseline mortality rate for the national population of common guillemot and no apportioning of losses to specific SPAs is provided (EAOW 2013b). Calculated mortalities for this project have therefore not been considered in the apportioned in-combination totals presented here.
- 3.3.24 Birds affected by the EOWDC were apportioned to two SPAs – Buchan Ness to Collieston and Fowlsheugh. Both of these SPAs are at the furthest extent of the foraging range of this species from Dogger Bank Creyke Beck (330km and 305km respectively to the nearest part of the development area).

### **Flamborough Head and Bempton Cliffs SPA**

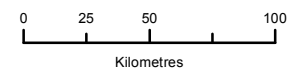
- 3.3.25 For Dogger Bank Creyke Beck and Dogger Bank Teesside A & B, the combined displacement impact would affect 0.17% of the breeding common guillemot population at the Flamborough Head and Bempton Cliffs SPA. For Hornsea Project One, the predicted losses for this SPA are 127 adult birds, which equates to 0.15% of the SPA population. Together these projects would therefore result in the loss of 0.32% of the designated common guillemot population. No attempt has been made here to normalise the approach to calculating overall mortality losses (i.e. applying the same displacement and mortality rates used for Dogger Bank Creyke Beck to the Hornsea Project One data) and the overall total is therefore derived from two approaches using different values.

- 3.3.26 As discussed in Section 6.3 of the **IfAA Report** the location of Dogger Bank Creyke Beck in relation to available good quality sandeel foraging habitat indicates that the overall loss of foraging resource to common guillemot deriving from Flamborough Head and Bempton Cliffs would be negligible.
- 3.3.27 Using data from the Danish Vessel Monitoring System (VMS), see Section 6.3 of the **IfAA Report**, as a proxy for sandeel habitat (i.e. foraging resources), it is calculated that the percentage loss of good quality habitat via displacement from Dogger Bank Teesside A & B would represent a total of 0.5% of available habitat within the maximum foraging area, giving, with Dogger Bank Creyke Beck, a combined total loss of 1.97% of habitat (see **Figure A3** and Section 7.7 in the **IfAA Report**).
- 3.3.28 The very small area of resource affected by the proposed development indicates that, should displacement occur, that there are extensive areas of good quality foraging habitat available to breeding common guillemot outside of the development area. For non-breeding common guillemot the area available for them to re-distribute into is even greater (i.e. much of the North Sea).
- 3.3.29 The calculations of percentage loss given in *Table 7.17* of the **IfAA Report** take into account habitat quality and the overall percentage loss of total available foraging habitat within the total available foraging area would be much less. However, it is possible that the better quality habitat, as defined by the higher density VMS data, provides a greater proportion of the overall prey resource taken by birds and therefore potential loss would have greater consequences than the loss of other areas. Without knowledge of whether the habitat used within the foraging range is at carrying capacity, it is not possible to determine if there is likely to be a direct proportional relationship between the area of good quality habitat lost and potential effect on populations. A precautionary mortality rate of 5% (applicable to birds throughout the year) was therefore selected in order to reflect this uncertainty and to take account of other potential factors that may play a role in the overall availability of prey resources (e.g. fluctuations in sandeel stocks).
- 3.3.30 It is notable that similar mortality rates have been used in determining the displacement impact of the Hornsea One Offshore Wind Farm (SMart Wind 2013). Applying the VMS data to the footprint of Hornsea Project One (see **Figure A3**) it can be seen that there is very limited overlap with any areas of defined high quality sandeel / foraging habitat for auks and, therefore, that the cumulative foraging habitat loss is unlikely to be significantly greater than that for Dogger Bank Creyke Beck and Dogger Bank Teesside A & B combined. This suggests that the selected mortality rate of 5% is also sufficient to allow for potential cumulative displacement effects of a number of offshore wind farms.
- 3.3.31 This calculated combined loss of potential available good quality foraging habitat for both projects in the Dogger Bank Zone still suggests that the adopted 5% mortality rate for this species is precautionary and that the displacement effect of both projects would not lead to any significant decline in breeding productivity and therefore the population level of the SPA.



**LEGEND**

- Dogger Bank Zone
  - Tranche boundary
  - Dogger Bank Teesside A
  - Dogger Bank Teesside B
  - Dogger Bank Creyke Beck A
  - Dogger Bank Creyke Beck B
  - Export cable corridor
  - Temporary works area
  - Hornsea Project One
  - Hornsea Zone
  - Common guillemot maximum range - 340km
- Danish sandeel satellite (VMS) density**
- 0 to 2 (7,137)
  - 2 to 5 (1,740)
  - 5 to 10 (1,236)
  - 10 to 20 (657)
  - 20 to 40 (201)
  - 40 to 80 (99)
  - Over 80 (63)



Data Source:  
 VMS © Ministeriet for Fødevarer, Landbrug og Fiskeri, 2012,  
 Round 3 offshore wind farm boundary © Crown Copyright, 2013

PROJECT TITLE  
**DOGGER BANK CREYKE BECK**  
 HRA Addendum

DRAWING TITLE  
**Figure A3 Overlay of Danish sandeel fishery VMS data within the foraging range of common guillemot from Flamborough Head and Bempton Cliffs SPA and footprint of development areas for Dogger Bank Creyke Beck, Dogger Bank Teesside A & B and Hornsea Project One**

VER	DATE	REMARKS	Drawn	Checked
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DRAWING NUMBER:  
**9X1254/CBPHRA/28/R2**

SCALE 1:3,000,000 PLOT SIZE A3 DATUM WGS84 PROJECTION UTM31N



### *Buchan Ness to Collieston SPA*

- 3.3.32 A cumulative impact of 324 birds lost through mortality following displacement was calculated for the Buchan Ness to Collieston SPA, representing 1.6% of the population of this site (see *Appendix 13* in **Appendix 11A** of the ES). The Dogger Bank Creyke Beck contribution to this overall total is 0.05% (18 birds) indicating that by far the greater impact would be from the EOWDC (based on the data as presented in the assessment). It should also be noted that of the 18 predicted mortalities for Dogger Bank Creyke Beck, three would be of breeding birds (i.e. <0.01% of the SPA breeding population). This very low percentage of the population affected reflects the location of Dogger Bank Creyke Beck at the furthest part of the foraging range of common guillemot from Buchan Ness.
- 3.3.33 The calculated percentage of the population affected suggests that the overall potential contribution to any in-combination impact on the breeding population of common guillemot from Dogger Bank Creyke Beck is not significant. While other projects that could potentially lead to a greater cumulative displacement and mortality impact on the common guillemot population of the Buchan Ness to Collieston SPA have not been screened into this in-combination assessment (for the reasons set out in **Table A8**), it is clear that, regardless of the overall potential cumulative impact on the population, any in-combination contribution from Dogger Bank Creyke Beck would always remain at a negligible level.

### *Fowlsheugh SPA*

- 3.3.34 Based on the EOWDC data, a cumulative impact of 154 birds lost through mortality following displacement is calculated for the Fowlsheugh SPA, representing 0.28% of the population of this SPA (see **Table A14**). The contribution of Dogger Bank Creyke Beck to this cumulative total is 0.06% (<0.02% of the breeding population). This cumulative level of predicted impact is not considered to be significant. The predicted <0.02% impact on the breeding population resulting from operation of Dogger Bank Creyke Beck is unlikely to be significant in any cumulative total, particularly when considered in the context of a number of projects for which assessment outputs are not yet fully realised and that are much closer to the core foraging range of common guillemot from this SPA.

### *Conclusion for Common Guillemot*

- 3.3.35 Given the small population effect for all SPA populations assessed the overall conclusion is that in-combination with other projects Dogger Bank Creyke Beck would not result in a displacement impact that would constitute an adverse effect on the integrity of the screened SPAs designated for their common guillemot populations.

**Table A14** Apportioning of displacement and mortality impact for common guillemot to European sites as a result of in-combination displacement during operation of Dogger Bank Creyke Beck (Figures provided show the percentage of the designated SPA breeding population affected and, in brackets, the number of individual mortalities)

Site name	Dogger Bank Creyke Beck			Dogger Bank Teesside A & B			EOWDC	Hornsea Project One <sup>2</sup>	All projects total % of Popn
	Breeding	Non-breeding <sup>1</sup>	Total	Breeding	Non-breeding <sup>1</sup>	Total			
Buchan Ness to Collieston Coast SPA	0.01 (3)	0.04 (16)	0.05 (19)	0	0.02 (7)	0.02 (7)	1.5 (299)	0	1.57 (325)
Cape Wrath SPA	0	0.04 (1)	0.04 (1)	0	0.02 (1)	0.02 (1)	0	0	0.06 (2)
Calf of Eday SPA	0	0.04 (18)	0.04 (18)	0	0.02 (8)	0.02 (8)	0	0	0.06 (26)
Copinsay SPA	0	0.04 (11)	0.04 (11)	0	0.02 (5)	0.02 (5)	0	0	0.06 (16)
East Caithness Cliffs SPA	0	0.04 (131)	0.04 (131)	0	0.02 (58)	0.02 (58)	0	0	0.06 (189)
Fair Isle SPA	0	0.04 (16)	0.04 (16)	0	0.02 (7)	0.02 (7)	0	0	0.06 (23)
Farne Islands SPA	0.036 (23)	0.04 (40)	0.08 (63)	0.05 (8)	0.02 (18)	0.025 (26)	0	0	0.11 (89)
Forth Islands SPA	0.02 (6)	0.04 (18)	0.06 (24)	0.01 (2)	0.02 (8)	0.03 (10)	0	0	0.09 (34)
Flamborough Head and Bempton Cliffs SPA	0.092 (76)	0.04 (51)	0.13 (127)	0.02 (20)	0.02 (23)	0.04(43)	0	0.15 (127)	0.32 (297)
Foula SPA	0	0.04 (19)	0.04 (19)	0	0.02 (8)	0.02 (8)	0	0	0.06 (27)
Fowlsheugh SPA	0.017 (10)	0.04 (37)	0.06 (47)	0.004 (2)	0.02 (16)	0.024 (18)	0.15 (89)	0	0.23 (154)
Hermaness, Saxa Vord and Valla Field SPA	0	0.04(6)	0.04 (6)	0	0.02 (3)	0.02 (3)	0	0	0.06 (9)
Hoy SPA	0	0.04 (7)	0.04 (7)	0	0.02 (3)	0.02 (3)	0	0	0.06 (10)
Marwick Head SPA	0	0.04 (15)	0.04 (15)	0	0.02 (7)	0.02 (7)	0	0	0.06 (22)

Site name	Dogger Bank Creyke Beck			Dogger Bank Teesside A & B			EOWDC	Hornsea Project One <sup>2</sup>	All projects total % of Popn
	Breeding	Non-breeding <sup>1</sup>	Total	Breeding	Non-breeding <sup>1</sup>	Total			
North Caithness Cliffs SPA	0	0.04(58)	0.04 (58)	0	0.02 (26)	0.02 (26)	0	0	0.06 (84)
Noss SPA	0	0.04 (18)	0.04 (18)	0	0.02 (8)	0.02 (8)	0	0	0.06 (26)
Rousay SPA	0	0.04 (3)	0.04 (3)	0	0.02 (1)	0.02 (1)	0	0	0.06 (4)
St Abb's Head to Fast Castle SPA	0.024 (15)	0.04 (36)	0.06 (51)	0.01 (5)	0.02 (16)	0.026 (21)	0	0	0.09 (72)
Sule Skerry and Sule Stack SPA	0	0.04 (5)	0.04 (5)	0	0.02 (2)	0.02 (2)	0	0	0.06 (7)
Sumburgh Head SPA	0	0.04(4)	0.04 (4)	0	0.02 (2)	0.02 (2)	0	0	0.06 (6)
Troup, Pennan and Lions Heads SPA	0	0.04 (13)	0.04 (13)	0	0.02 (6)	0.02 (6)	0	0	0.06 (19)
West Westray SPA	0	0.04 (10)	0.04 (10)	0	0.02 (4)	0.02 (4)	0	0	0.06 (14)
<b>Transboundary sites</b>									
Cap d'Erquy – Cap Frehel SPA	0	0.04 (0.3)	0.04 (0.3)	0	0.02 (0.1)	0.02 (0.1)	0	0	0.06 (0.4)
Cote de Granit Rose-Sept Iles SPA	0	0.04 (0.01)	0.04 (0.01)	0	0.02 (0.01)	0.02 (0.01)	0	0	0.06 (0.02)
Seevogelschutzgebiet Helgoland SPA	0	0.04 (3)	0.04 (3)	0	0.02 (1)	0.02 (1)	0	0	0.06 (4)
Hallands Vardero SPA	0	0.04 (0.01)	0.04 (0.01)	0	0.02 (0)	0.02 (0)	0	0	0.06 (0.01)

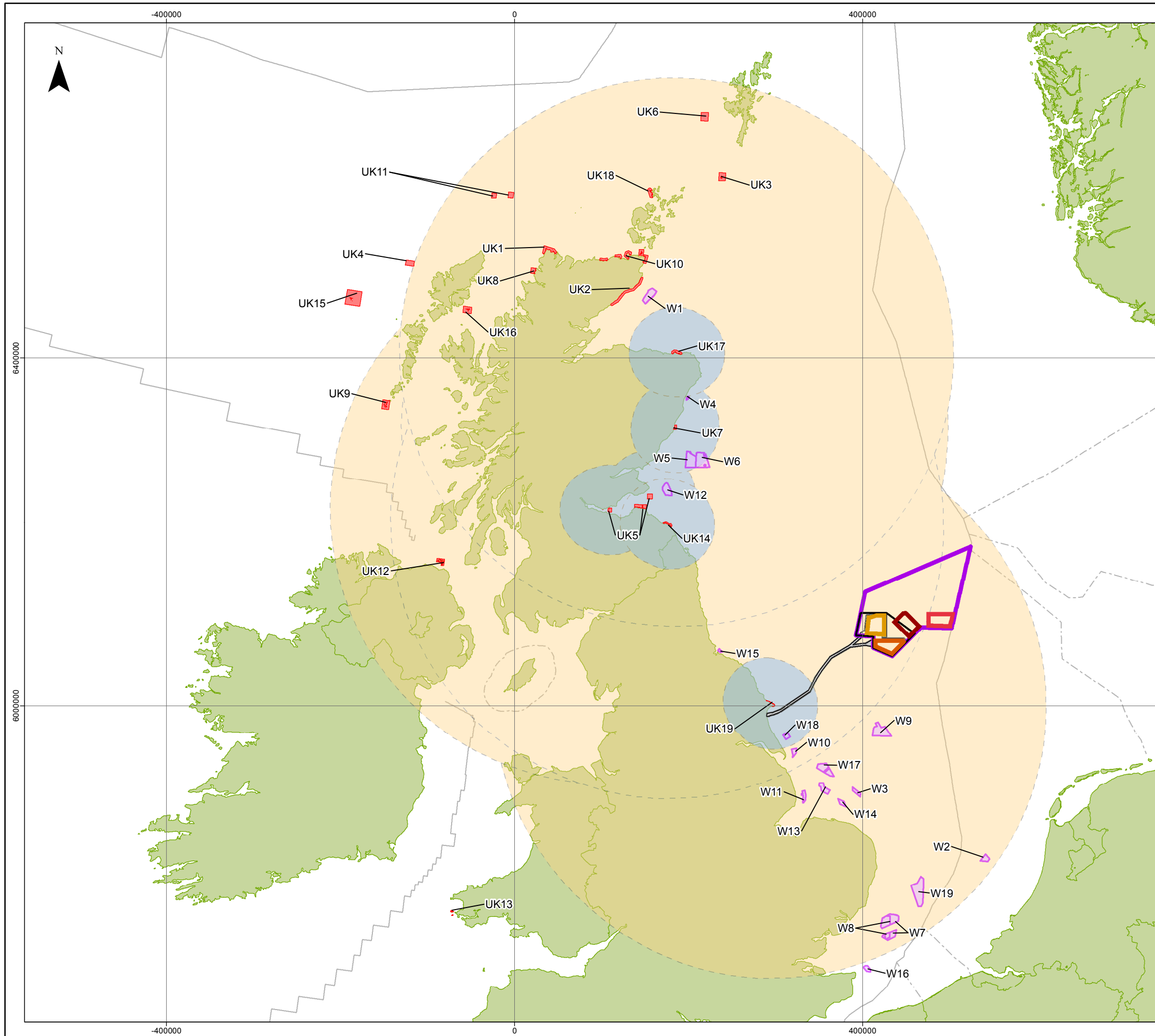
1 – The total number of birds (provided in brackets) is for all birds (i.e. adults and immature). It is assumed that two thirds (67%) of these non-breeding birds are adults.

2 – Adult birds only.



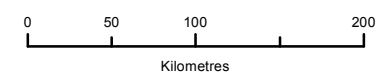
## **Razorbill**

- 3.3.36 Razorbill exhibits a medium vulnerability to activities in the marine environment and therefore is likely to show a disturbance response. It has a medium sensitivity to the effects of displacement (i.e. effective habitat loss), and therefore is considered to have some tolerance to this effect. A precautionary 50% displacement rate during operation of Dogger Bank Creyke Beck has been assumed and a mortality rate of 5% following displacement assigned across both the breeding and non-breeding seasons. The mortality rate is based on knowledge of the foraging ecology of this species and the magnitude of the habitat loss that could occur as a result of displacement from the wind farm development area (see below). As discussed in Section 6.3 of the **IfAA Report** and in Furness (2013) (see **Appendix 11B** of the ES) this is viewed as a precautionary mortality rate and it is anticipated that the actual rate would be lower than this. Based on these values it was concluded in the **IfAA Report** (see Section 6.6) that the predicted mortality of 164 birds would not have an adverse effect on the integrity of any of the designated populations screened into the assessment.
- 3.3.37 Five SPAs are within mean maximum foraging range of Dogger Bank Creyke Beck, as shown in **Figure A4** (update of *Figure 7.7* in the **IfAA Report**; the site and project references shown on the figure are listed in **Table A15**), which defines the spatial limits for the inclusion of other projects that could potentially also affect breeding birds deriving from these SPAs.
- 3.3.38 Predictions of the numbers of birds potentially displaced by other projects were available for eight additional projects (see **Table A9**). The cumulative number of birds estimated to be displaced across these projects was 11,381 (summing estimates from different seasons where provided, following the assumption used in this assessment that these would be different birds).
- 3.3.39 Estimates of the numbers of displaced birds that might be expected to die were only available for Dogger Bank Creyke Beck, Dogger Bank Teesside A & B, East Anglia ONE, the EOWDC project and Hornsea Project One. **Table A16** sets out the displacement and mortality rates and predicted mortalities for each of the above projects.
- 3.3.40 Apportioning of the affected birds to individual SPAs is presented in **Table A17** (update of *Table 7.18* in the **IfAA Report**).
- 3.3.41 The SPA population impact at this SPA is 0.13% for Dogger Bank Creyke Beck and Dogger Bank Teesside A and B combined. For the other SPAs that are within the maximum foraging range of Dogger Bank Creyke Beck, the cumulative population affected by both Dogger Bank projects is between 0.1-0.12%. The full apportioning breakdown of the SPA populations affected by the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects is presented in *Tables A9.59a-c* in *Appendix 9* of **Appendix 11A** of the ES.



**LEGEND**

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Export cable corridor
- Temporary works area
- Wind farm
- Special Protection Area (SPA)
- Razorbill mean maximum range - 49km
- Razorbill maximum range - 312km



Data Source:  
Offshore wind farm boundaries © Crown Copyright, 2013,  
Environmental Designations © European Environment Agency, 2012

PROJECT TITLE  
**DOGGER BANK CREYKE BECK**  
HRA Addendum

DRAWING TITLE  
**Figure A4 Razorbill foraging ranges  
in relation to offshore wind farm projects  
considered for the in-combination assessment**

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DRAWING NUMBER:  
**9X1254/CBPHRA/25/R1**

SCALE 1:4,500,000 PLOT SIZE A3 DATUM WGS84 PROJECTION UTM31N

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**Table A15 Projects and European site reference list for Figure A4**

<b>Projects and site name reference list</b>
<b>Projects</b>
Beatrice Offshore Wind Farm (W1)
Breeveerten II Offshore Wind Farm (W2)
Dudgeon Offshore Wind Farm (W3)
East Anglia One Offshore Wind Farm (W19)
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm (W4)
Firth of Forth Alpha Offshore Wind Farm (W5)
Firth of Forth Bravo Offshore Wind Farm (W6)
Galloper Offshore Wind Farm (W7)
Greater Gabbard Offshore Wind Farm (W8)
Hornsea Project One Offshore Wind Farm (W9)
Humber Gateway Offshore Wind Farm (W10)
Lincs Offshore Wind Farm (W11)
Nearr na Gaoithe Offshore Wind Farm (W12)
Race Bank Offshore Wind Farm (W13)
Sheringham Shoal Offshore Wind Farm (W14)
Teesside Offshore Wind Farm (W15)
Thanet Offshore Wind Farm (W16)
Triton Knoll Offshore Wind Farm (W17)
Westernmost Rough Offshore Wind Farm (W18)
<b>Sites</b>
Cape Wrath SPA (UK1)
East Caithness Cliffs SPA (UK2)
Fair Isle SPA (UK3)
Flannan Isles SPA (UK4)
Forth Islands SPA (UK5)
Foula SPA (UK6)
Fowlsheugh SPA (UK7)
Handa SPA (UK8)
Mingulay and Berneray SPA (UK9)
North Caithness Cliffs SPA (UK10)
North Rona and Sula Sgeir SPA (UK11)
Rathlin Island SPA (UK12)
Skokholm and Skomer SPA (UK13)
St Abb's Head to Fast Castle SPA (UK14)
St Kilda SPA (UK15)
The Shiant Isles SPA (UK16)
Troup, Pennan and Lion's Heads SPA (UK17)
West Westray SPA (UK18)
Flamborough Head and Bempton Cliffs SPA (UK 19)

**Table A16 Predicted numbers of razorbill subject to displacement and mortality for relevant wind farm developments**

Wind Farm Development	Season	Displacement rate	No of birds displaced	Mortality rate	No. of mortalities
Dogger Bank Creyke Beck	Breeding	50%	193	5%	7
	Winter	50%	3,127	5%	157
Dogger Bank Teesside A & B	Breeding	50%	88	5%	5
	Winter	50%	1,604	5%	80
East Anglia One	Spring	30%	120	10%	12
	Winter	30%	200	10%	20
EOWDC			129	100%	129
Hornsea Project One	Breeding	40%	366	10%	37
	Post-breeding	40%	2,926	2%	59
	Winter	40%	2,628	1%	26
<b>Total</b>			<b>11,381</b>		<b>530</b>

3.3.42 For Hornsea Project One, displacement mortalities that may occur during the breeding season have been attributed to the Flamborough Head and Bempton Cliffs SPA as this is the closest SPA, although it is at a distance greater than the maximum foraging range of razorbill reported in Thaxter *et al.* (2012). At other times of the year, birds from a number of possible east coast and potentially further afield colonies may be present in the Hornsea Zone and therefore mortalities could potentially be apportioned to a number of SPAs. The assessment work presented in the Hornsea Project One HRA assumes that a certain percentage (in direct proportion to the colony size) of the birds present could derive from the Flamborough Head and Bempton Cliffs SPA and therefore some of the mortalities can be apportioned to this SPA (SMart Wind 2013). The remaining mortalities are not apportioned to any other SPAs.

3.3.43 The calculated mortalities for East Anglia ONE are considered in the context of increase in mortality relative to the baseline mortality rate for the national population of common guillemot and no apportioning of losses to specific SPAs is provided (EAOW 2013b). Calculated mortalities for this project have therefore not been considered in the apportioned in-combination totals presented here.

3.3.44 Birds affected by the EOWDC were considered to potentially derive from two SPAs – Fowlsheugh and Buchan Ness to Collieston. However, apportioning was only undertaken with respect to the Fowlsheugh SPA (a total of 30 birds at 100% mortality) as it was stated that although razorbill breeds at the Buchan Ness to Collieston SPA it is not a qualifying species.

**Table A17** Apportioning of displacement and mortality impact for razorbill to European sites as a result of in-combination displacement during operation of Dogger Bank Creyke Beck (Figures provided show the percentage of the designated SPA breeding population affected and, in brackets, the number of predicted individual mortalities)

Site name	Dogger Bank Creyke Beck			Dogger Bank Teesside A & B			EOWDC	Hornsea Project One	All projects total % of Popn
	Breeding	Non-breeding <sup>1</sup>	Total %	Breeding	Non-breeding <sup>1</sup>	Total %			
Cape Wrath SPA	0	0.07 (3.3)	0.07 (3.3)	0	0.03 (1.8)	0.03 (1.8)	0	0	0.1 (5.1)
East Caithness Cliffs SPA	0	0.07 (24.3)	0.07 (24.3)	0	0.03 (13)	0.03 (13)	0	0	0.1 (37.3)
Fair Isle SPA	0	0.07 (1.9)	0.07 (1.9)	0	0.03 (1)	0.03 (1)	0	0	0.1 (2.9)
Farne Islands SPA	0.01 (0.1)	0.07 (0.8)	0.08 (0.9)	0.01 (0.1)	0.03 (0.4)	0.04 (0.5)	0	0	0.12 (1.4)
Forth Islands SPA	0 (0.3)	0.07 (6.4)	0.07 (6.7)	0.01 (0.2)	0.03 (3.4)	0.04 (3.6)	0	0	0.11 (10.3)
Flamborough Head and Bempton Cliffs SPA	0.02 (4.5)	0.07 (21.5)	0.09 (26)	0.01 (4.4)	0.03 (11.4)	0.04 (15.8)	0	0.4 (79) <sup>2</sup>	0.53 (121)
Foula SPA	0	0.07 (4.7)	0.07 (4.7)	0	0.03 (2.5)	0.03 (2.5)	0	0	0.1 (7.2)
Fowlsheugh SPA	0 (0.2)	0.07 (7.2)	0.07 (7.4)	>0 (0)	0.03 (3.8)	0.03 (3.8)	0.6 (30) <sup>3</sup>	0	0.7 (41.2)
North Caithness Cliffs SPA	0	0.07 (3.4)	0.07 (3.4)	0	0.03 (1.8)	0.03 (1.8)	0	0	0.1 (5.2)
St Abb's Head to Fast Castle SPA	0.01 (0.2)	0.07 (4.3)	0.08 (4.5)	<0.01 (0.3)	0.03 (2.3)	0.03 (2.6)	0	0	0.11 (7.1)
Troup, Pennan and Lions Heads SPA	0	0.07 (3.5)	0.07 (3.5)	0	0.03 (1.9)	0.03 (1.9)	0	0	0.1 (5.4)
West Westray SPA	0	0.07 (1.3)	0.07 (1.3)	0	0.03 (0.7)	0.03 (0.7)	0	0	0.1 (2.0)
<b>Transboundary sites</b>									
Cap d'Erquy – Cap Frehel SPA	0	0.07 (0.02)	0.07 (0.02)	0	0.03 (0.01)	0.03 (0.01)	0	0	0.1 (0.03)
Chausay SPA	0	0.07 (0.03)	0.07 (0.03)	0	0.03 (0.02)	0.03 (0.02)	0	0	0.1 (0.05)
Cote de Granit Rose-Sept Iles SPA	0	0.07 (0.04)	0.07 (0.04)	0	0.03 (0.02)	0.03 (0.02)	0	0	0.1 (0.06)

Site name	Dogger Bank Creyke Beck			Dogger Bank Teesside A & B			EOWDC	Hornsea Project One	All projects total % of Popn
	Breeding	Non-breeding <sup>1</sup>	Total %	Breeding	Non-breeding <sup>1</sup>	Total %			
Ouessant-Molene SPA	0	0.07 (0.01)	0.07 (0.01)	0	0.03 (0)	0.03 (0)	0	0	0.1 (0.01)
Seevogelschutzgebiet Helgoland SPA	0	0.07 (0.03)	0.07 (0.03)	0	0.03 (0.02)	0.03 (0.02)	0	0	0.1 (0.05)

1 – The total number of birds (provided in brackets) is for all birds (i.e. adults and immature). It is assumed that two thirds (67%) of these non-breeding birds are adults.

2 – Adult birds only

3 – Assumption of 100% mortality of apportioned birds. A 10% mortality of 3 birds is also quoted in the HRA for the EOWDC.

### Flamborough Head and Bempton Cliffs SPA

- 3.3.45 For Dogger Bank Creyke Beck and Dogger Bank Teesside A & B, the combined displacement impact would affect 42 birds (0.13% of the SPA population, including adults and immature birds). Of these, a total of 9 birds (0.03% of the SPA population) would be breeding birds. For Hornsea Project One, the predicted losses for this SPA are 79 adult birds, which equates to 0.4% of the SPA population. Together these projects would therefore result in the loss of 0.53% of the designated razorbill population. No attempt has been made here to normalise the approach to calculating overall mortality losses (i.e. applying the same displacement and mortality rates used for Dogger Bank Creyke Beck to the Hornsea Project One data) and the overall total is therefore derived from two approaches using different values.
- 3.3.46 As discussed in Section 6.3 of the IfAA Report the location of Dogger Bank Creyke Beck in relation to available good quality sandeel foraging habitat indicates that the overall loss of foraging resource to razorbill deriving from Flamborough Head and Bempton Cliffs would be negligible. Using data from the Danish Vessel Monitoring System (VMS), see Section 6.3, as a proxy for sandeel habitat (i.e. foraging resources), it is calculated that the percentage loss of good quality habitat via displacement from Dogger Bank Teesside A & B would represent a total of 0.5% of available habitat within the maximum foraging area, giving, with Dogger Bank Creyke Beck, a combined total loss of 2.13% of habitat (see Section 7.7 in the **IfAA Report**).

### Fowlsheugh SPA

- 3.3.47 Based on the EOWDC data, a cumulative impact of 41 birds lost through mortality following displacement is calculated for the Fowlsheugh SPA, representing 0.7% of the population of this SPA (see **Table A17**). The Dogger Bank Creyke Beck contribution to this overall total is 0.07% (7 birds) indicating that by far the greater impact would be from the EOWDC (based on 100% mortality rate of the displaced birds as presented in the assessment). It should also be noted that of the 7 predicted mortalities for Dogger Bank Creyke Beck, less than one breeding bird would be affected (i.e. <0.01% of the SPA breeding population). This very low percentage of the population affected reflects the location of Dogger Bank Creyke Beck at the furthest limit of the foraging range of razorbill from Fowlsheugh.
- 3.3.48 The calculated percentage of the population affected suggests that the overall potential contribution to any in-combination impact on the breeding population of razorbill from Dogger Bank Creyke Beck is not significant. While other projects that could potentially lead to a greater cumulative displacement and mortality impact on the razorbill population of the Fowlsheugh SPA have not been screened into this in-combination assessment (for the reasons set out in the introduction), it is clear that, regardless of the overall potential cumulative impact on the population, any in-combination contribution from Dogger Bank Creyke Beck would always remain at a negligible level.

### Conclusion for Razorbill

- 3.3.49 Given the small population effect for all SPA populations assessed the overall conclusion is that in-combination with other projects Dogger Bank Creyke Beck would not result in a displacement impact that would constitute an adverse effect on the integrity of the screened SPAs designated for their razorbill populations.



## Atlantic puffin

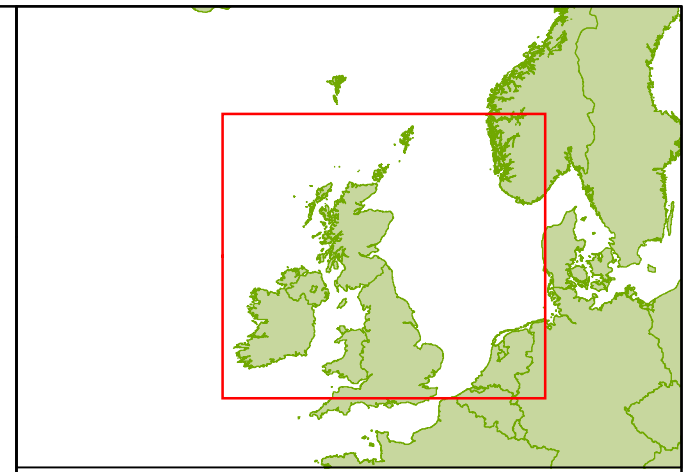
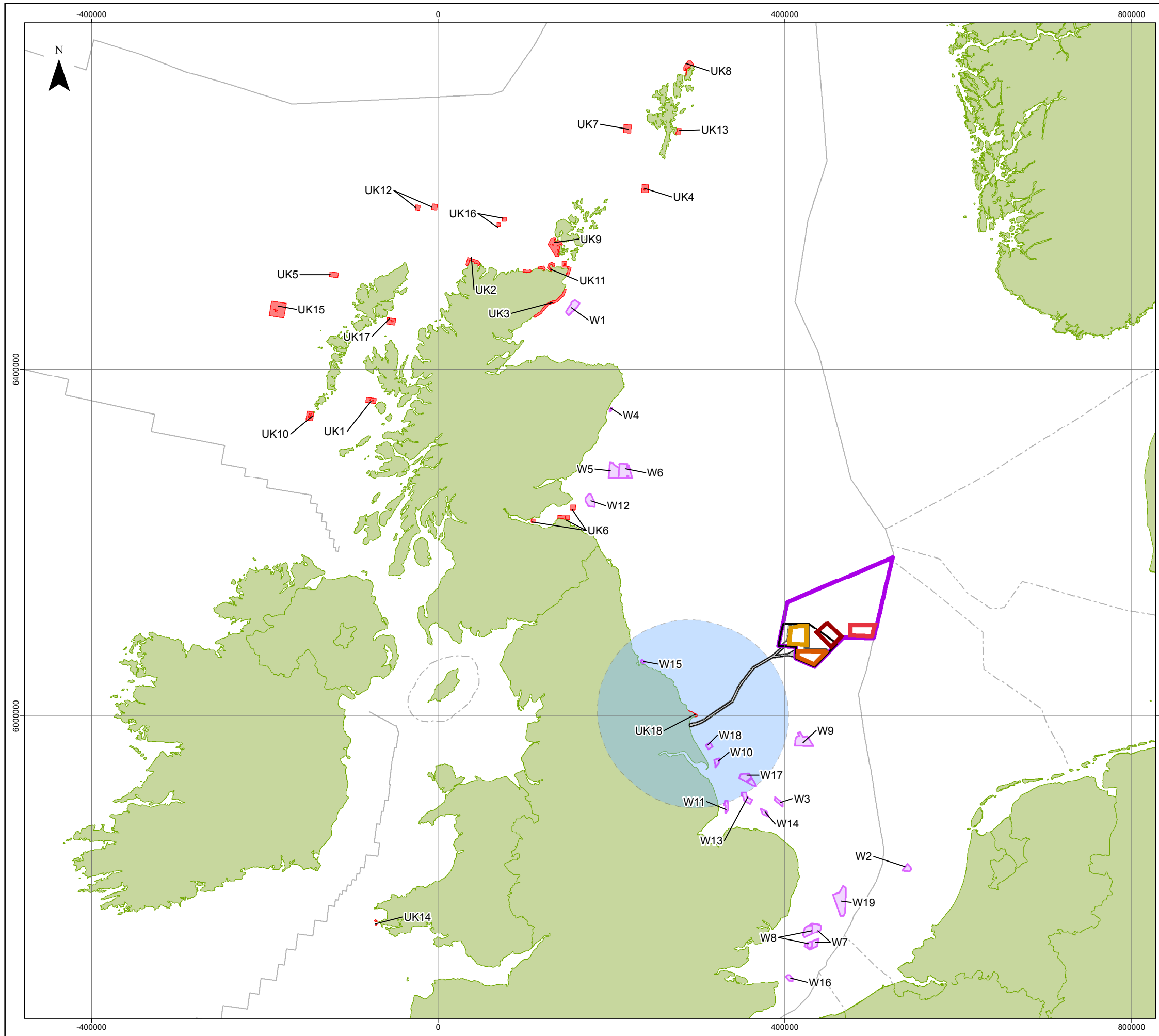
3.3.50 Atlantic puffin exhibits a low vulnerability to activities in the marine environment and, therefore, is likely to show a limited disturbance response. It has a medium sensitivity to the effects of displacement (i.e. effective habitat loss) and, therefore, is considered to have some tolerance to this effect.

3.3.51 Predictions of the numbers of birds potentially displaced by other projects were available for four additional projects – Dogger Bank Teesside A & B, EOWDC, Hornsea Project One and Thanet (see **Table A9**). The cumulative number of birds estimated to be displaced across these projects was 1,485 (summing estimates from different seasons where provided, following the assumption used in this assessment that these would be different birds). Estimates of the numbers of displaced birds that might be expected to die were, apart from Thanet, available for all of the other projects listed above (see **Table A18**). The displacement and mortality rates applied to Dogger Bank Teesside A & B are the same as for Dogger Bank Creyke Beck.

**Table A18** Predicted numbers of Atlantic puffin subject to displacement and mortality for relevant wind farm developments

Wind Farm Development	Season	Displacement rate	No of birds displaced	Mortality rate	No. of mortalities
Dogger Bank Creyke Beck	Breeding	50%	51	5%	3
	Winter	50%	244	5%	12
Dogger Bank Teesside A & B	Breeding	50%	31	5%	2
	Winter	50%	166	5%	8
EOWDC			62	100%	62
Hornsea Project One	Breeding	40%	428	10%	43
	Post-breeding	40%		2%	
	Winter	40%	503	1%	5
<b>Total</b>			<b>1,485</b>		

3.3.52 Apportioning of the affected birds to individual SPAs was not undertaken for EOWDC and is therefore only available for Dogger Bank Creyke Beck, Dogger Bank Teesside A & B (see *Tables A9.62a-c* in *Appendix 9* of **Appendix 11A** of the ES) and Hornsea Project One. It should be noted that Dogger Bank Creyke Beck is not within the mean maximum foraging range of any SPA designated breeding populations and therefore the attributed losses relate to non-breeding birds only (see **Figure A5** – update of *Figure 7.8* in the **IfAA Report**; the site and project references for the figure are listed in **Table A19**). The same situation applies to Dogger Bank Teesside A & B. Hornsea Project One is within the maximum foraging range of Atlantic puffin from the Flamborough Head and Bempton Cliffs SPA.



**LEGEND**

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Export cable corridor
- Temporary works area
- Wind farm
- Special Protection Area (SPA)
- Atlantic puffin mean maximum range - 105km

0 50 100 200  
Kilometres

Data Source:  
Offshore wind farm boundaries © Crown Copyright, 2013,  
Environmental Designations © European Environment Agency, 2012

PROJECT TITLE  
**DOGGER BANK CREYKE BECK**  
HRA Addendum

DRAWING TITLE  
**Figure A5 Atlantic puffin foraging ranges  
in relation to offshore wind farm projects  
considered for the in-combination assessment**

VER	DATE	REMARKS	Drawn	Checked
1	27/09/2013	Final	FK	PT

DRAWING NUMBER:  
**9X1254/CBPHRA/26/R1**

SCALE 1:4,500,000 PLOT SIZE A3 DATUM WGS84 PROJECTION UTM31N



**Table A19 Projects and European site reference list for Figure A5**

<b>Projects and site name reference list</b>
<b>Projects</b>
Beatrice Offshore Wind Farm (W1)
Breeveerten II Offshore Wind Farm (W2)
Dudgeon Offshore Wind Farm (W3)
East Anglia One Offshore Wind Farm (W19)
European Offshore Wind Development Centre / Aberdeen Offshore Wind Farm (W4)
Firth of Forth Alpha Offshore Wind Farm (W5)
Firth of Forth Bravo Offshore Wind Farm (W6)
Galloper Offshore Wind Farm (W7)
Greater Gabbard Offshore Wind Farm (W8)
Hornsea Project One Offshore Wind Farm (W9)
Humber Gateway Offshore Wind Farm (W10)
Lincs Offshore Wind Farm (W11)
Nearr na Gaoithe Offshore Wind Farm (W12)
Race Bank Offshore Wind Farm (W13)
Sheringham Shoal Offshore Wind Farm (W14)
Teesside Offshore Wind Farm (W15)
Thanet Offshore Wind Farm (W16)
Triton Knoll Offshore Wind Farm (W17)
Westernmost Rough Offshore Wind Farm (W18)
<b>Sites</b>
Canna and Sanday SPA (UK1)
Cape Wrath SPA (UK2)
East Caithness Cliffs SPA (UK3)
Fair Isle SPA (UK4)
Flannan Isles SPA (UK5)
Forth Islands SPA (UK6)
Foula SPA (UK7)
Hermaness, Saxa Vord and Valla Field SPA (UK8)
Hoy SPA (UK9)
Mingulay and Berneray SPA (UK10)
North Caithness Cliffs SPA (UK11)
North Rona and Sula Sgeir SPA (UK12)
Noss SPA (UK13)
Skokholm and Skomer SPA (UK14)
St Kilda SPA (UK15)
Sule Skerry and Sule Stack SPA (UK16)
The Shiant Isles SPA (UK17)
Flamborough Head and Bempton Cliffs SPA (UK 18)

3.3.53 The relatively small number (25) of puffin affected by both Dogger Bank Creyke Beck and Dogger Bank Teesside A & B results in near zero percentage impact on relevant SPA populations (see *Table A9.62c* in *Appendix 9* of **Appendix 11A** of the ES). Essentially this also means that the overall potential contribution to any in-combination impact of Dogger Bank Creyke Beck on the designated populations of Atlantic puffin is non-significant.

3.3.54 In respect of Hornsea Project One, during the breeding season, affected adult puffin are apportioned to three SPAs – Flamborough Head and Bempton Cliffs, Coquet Island and the Farne Islands. Coquet Island and the Farne Islands are located at a distance from the Hornsea Project One development area that is greater than their maximum foraging range. However, apportioning to these SPAs has been undertaken on the basis that during the breeding season the Hornsea Project One area supports numbers of Atlantic puffin significantly higher than the total population of the Flamborough Head and Bempton Cliffs SPA (980 individuals) indicating that either non-breeding birds are present or that breeding birds from other SPAs are using the area. Based on the breeding population size, the distance of each colony from the Hornsea Project One development area and the proportion of the total area within the species’ foraging range, a mortality loss of three adult birds is attributed to the Flamborough Head and Bempton Cliffs SPA, nine adult birds to the Coquet Island SPA and 18 adult birds to the Farne Islands SPA. The combined impact of these losses at the population level for each of these SPAs is provided in **Table A20**.

**Table A20** Apportioning to SPAs of predicted Atlantic puffin mortalities arising from displacement (Percentage of the designated SPA breeding population affected shown and, in brackets, the number of individual mortalities)

SPA	Season	Dogger Bank Creyke Beck	Dogger Bank Teesside A & B	Hornsea Project One	Totals (No. and % of popn)
Flamborough Head and Bempton Cliffs	Breeding	0 (0)	0 (0)	3	3 (0.3)
	Non-breeding	0.04 (<0.01)	0.02 (<0.01)	0	0.06 (<0.01)
Coquet Island	Breeding	0 (0)	0 (0)	9	9 (0.05)
	Non-breeding	1.2 (<0.01)	2 (<0.01)	N/C	3.2 (<0.02)
Farne Islands	Breeding	0 (0)	0 (0)	18	18 (0.04)
	Non-breeding	4.8 (<0.01)	4.6 (<0.01)	N/C	9.4 (<0.02)

3.3.55 It is considered, on the basis of the precautionary displacement and mortality values adopted, that displacement impacts would not have any consequences for SPA designated Atlantic puffin populations. The very small impact of Dogger Bank Creyke Beck at the population level for all SPA populations assessed indicates that in-combination with other projects Dogger Bank Creyke Beck would not result in a displacement impact that would constitute an adverse effect on the integrity of the screened SPAs designated for their Atlantic puffin populations.

## Collision risk to sea bird populations

- 3.3.56 Collision estimates for the four species under consideration were obtained from the ESs for the offshore wind farms in the North Sea as listed in **Table A7**. It should be noted that for some of the projects, notably the latest Round 3 and Scottish projects, that collision risk estimates from a range of avoidance rates and Band model options are presented in the assessment materials (ES and HRA). The mortality figures derived by individual projects are presented in **Table A21** and used for the purposes of the in-combination assessment presented here. Unless stated in the footnotes to **Table A21** (update of *Table 7.19* in the **IfAA Report**), all of the collision mortality estimates provided are for a 98% avoidance rate.
- 3.3.57 The following sections deal with the predicted impact of the collision losses on individual species and specific designated SPA populations where apportioning from the projects listed in **Table A21** has been undertaken.

### Northern gannet

- 3.3.58 Data on predicted collision estimates for northern gannet is available for 18 additional projects, with the cumulative annual collision mortality estimated as 1,780 birds per year from these projects (see **Table A21**). It should be noted that this cumulative figure comprises estimates derived from a range of collision risk modelling considerations including variations in the type of model used (i.e. options of the basic Band model) and avoidance rates.
- 3.3.59 Dogger Bank Creyke Beck is within mean maximum foraging range of two designated SPAs where the species is a designated feature - Flamborough Head and Bempton Cliffs SPA and Forth Islands SPA. Birds occurring outwith the breeding season may originate from a wider suite of designated sites (see *Table A9.33c* in *Appendix 9* of **Appendix 11A** of the ES).
- 3.3.60 Attribution of northern gannet collision mortalities during the breeding season from Hornsea Project One is undertaken with respect to the Flamborough Head and Bempton Cliffs SPA only. However, consideration is also given to the impact of the loss of 10 non-breeding birds attributed to the Forth Islands SPA.
- 3.3.61 Attribution of northern gannet collision mortalities from the East Anglia ONE project is undertaken with respect to the Flamborough Head and Bempton Cliffs SPA and cumulatively with other wind farm projects in respect of the populations of the North Sea and East Coast colonies (many of which are designated SPAs). However, as only specific attributed data is available for the Flamborough Head and Bempton Cliffs SPA, assessment in respect of East Anglia ONE is restricted to consideration of this SPA only.

### Flamborough Head and Bempton Cliffs SPA

- 3.3.62 Out of the total annual collision losses calculated for Dogger Bank Creyke Beck, eight birds (five breeding adults, two non-breeding adults and one immature) were attributed to the Flamborough Head and Bempton Cliffs SPA. For Dogger Bank Teesside A & B, losses were calculated as eight birds (five breeding adults and two non-breeding adults and one immature).

**Table A21 Annual collision mortality estimates for marine seabirds for Dogger Bank Creyke Beck and other projects**

Wind Farm Development	Model Used	Northern gannet	Black-legged kittiwake	Lesser black-backed gull	Greater black-backed gull
Dogger Bank Creyke Beck	Band (2012) Option 3	60 <sup>1</sup>	217	34	53
Dogger Bank Teesside A & B	Band (2012) Option 3	58 <sup>1</sup>	119	41	60
Beatrice	Band (2012) Option 3	21 <sup>1</sup>	44		239
Blyth Demonstrator	Band (2012) Option 3	15 <sup>2</sup>	10 <sup>2</sup>		33 <sup>2</sup>
Breeveerten II	Band <i>et al.</i> (2007)	137		548	40
Dudgeon	Band (2000)	597 <sup>3</sup>		153 <sup>1</sup>	
East Anglia ONE	Band (2012) Option 3	46 <sup>1</sup>	33	107	115
European Offshore Wind Development Centre	Band (2012) Option 2	17	34		12
Galloper	Band <i>et al.</i> (2007)	112	148	661	104
Greater Gabbard	Band (2000)			252 <sup>4</sup>	
Hornsea Project One	Band (2012) Option 4	27 <sup>1</sup>	31	22	127
Humber Gateway	Band (2000)	18 <sup>5</sup>	34 <sup>5</sup>	13 <sup>5</sup>	64 <sup>5</sup>
London Array I/II	Band (2000)	5 <sup>1</sup>			
Lincs	Band (2000)	9		34	
Race Bank	Band (2000)	494 <sup>5</sup>	241 <sup>5</sup>	296	96
Sheringham Shoal	Band (2000)	31		33	
Teesside	Band (2000)	2 <sup>6</sup>	28 <sup>6</sup>		33 <sup>6</sup>
Thanet	Band (2000)	1	1	32	1
Triton Knoll	Band (2000)	129	158	85	487
Westermost Rough	Band (2000)	1	1	1	1
<b>Total</b>		<b>1,780</b>	<b>1,099</b>	<b>2,312</b>	<b>1,465</b>

<sup>1</sup>Avoidance rate of 99%; <sup>2</sup>Avoidance rate of 88% used; <sup>3</sup>Avoidance rate of 97% used – due to capacity reduction, overall collision total likely to be significantly lower; <sup>4</sup>Avoidance rate of 99.82% used; <sup>5</sup>Avoidance rate of 95% used; <sup>6</sup>Avoidance rate of 99.62% used. Figures based on median population estimates are used for consistency across projects.

3.3.63 In addition to the apportioning undertaken for the assessment of the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects, collision estimates have been attributed to the Flamborough Head and Bempton Cliffs SPA from the other projects included in **Table A22** (adapted from RWE Npower Renewables 2013 and update of *Table 7.20* in the **IfAA Report**).

**Table A22** Annual collision estimates (mortalities) for northern gannet and black-legged kittiwake attributed to Flamborough Head and Bempton Cliffs SPA for offshore wind farm projects in the Greater Wash and Dogger Bank (figures in brackets are for adult birds)

Wind Farm Development	Northern gannet	Northern gannet – adults losses at 99%	Black-legged kittiwake
Dogger Bank Creyke Beck	8 (7) <sup>1</sup>	7	109 (101)
Dogger Bank Teesside A & B	8 (7) <sup>1</sup>	7	57 (53)
Dudgeon	111 (40)	20	-
East Anglia ONE	4 <sup>1</sup>	4	3 (<3)
Hornsea Project One	9 (6) <sup>1</sup>	6	17 (15)
Humber Gateway	8 (3)	2	14
Lincs	5 (1)	1	-
Race Bank	66 (24)	12	12 (7)
Sheringham Shoal	16 (4)	2	-
Triton Knoll	129 (89)	45	158 (104)
Westermost Rough	1	0.5	1
<b>Total</b>	<b>365 (186)</b>	<b>106.5</b>	<b>371 (297)</b>

<sup>1</sup> Avoidance rate of 99%. All other figures are derived from the Triton Knoll HRA where collision estimates from other projects were normalised to a 98% avoidance rate

3.3.64 Based on figures provided in the respective project Environmental Statements and appropriate assessments / HRA Reports the cumulative collision estimate for northern gannet for all projects for the Flamborough Head and Bempton Cliffs SPA amounts to 365 individual birds (186 adults). The calculated loss for all birds equates to up to 1.7% of the population at this site, or 0.9% if only adult birds are counted. The increase in background mortality, using the figure for adult birds is 14.5% (see *Table A9.33c* in *Appendix 9* of **Appendix 11A** of the ES), which suggests that the cumulative total could be significant.

3.3.65 As discussed in Section 6.6 of the **IfAA Report**, the PBR model/calculation developed for the Triton Knoll development indicates that the PBR for northern gannet at Flamborough Head and Bempton Cliffs lies between 286 to 393 adult birds, depending on the population growth rate used and whether a correction factor is applied to the population count.

3.3.66 Based on this PBR analysis, the cumulative annual loss of an estimated 186 adult birds from the population is well below the lower PBR limit (65% of the PBR total). It is also considered that the total loss calculated for the wind farms screened into the



assessment is a significant overestimate. The main reason for this is that for all projects, apart from Dogger Bank Teesside A & B, East Anglia ONE and Hornsea Project One, collision losses were calculated using lower avoidance rates (typically 98%, but also 97% (Dudgeon)). A 99% avoidance rate is now considered more likely to represent the strong macro-avoidance response of this species (Krijgsveld *et al.* 2011, RWE Npower Renewables 2013).

- 3.3.67 If a 99% avoidance rate is applied to the other projects listed in **Table A21** for which lower avoidance rates (typically 98%) were used in determining collision mortalities, then the total annual collision losses would reduce to a total annual collision loss of 107 adult birds (0.5% of the breeding population). It should also be noted that the comparatively high collision estimates determined for Race Bank and Dudgeon are based on the use of Option 1 of the Band collision risk model and these values would be significantly decreased in adopting Option 3 of the model.
- 3.3.68 Additionally, for Race Bank and Dudgeon attribution to the Flamborough Head and Bempton Cliffs SPA was not undertaken at the time of the individual assessments. For the Triton Knoll in-combination assessment work, the calculated annual mortality losses attributable to the SPA from the Race Bank project were based on the calculated density of gannet within the project area. The Environmental Statement for Race Bank notes that peaks in northern gannet abundance were recorded from July through to October (i.e. outside of the breeding season), suggesting that many of the birds observed at Race Bank represented birds moving through the area following breeding from colonies further to the north. This point is also noted in the Hornsea Project One HRA Report, with the conclusion that “the proportion of the 494 collisions attributable to breeding Flamborough Head and Bempton Cliffs SPA birds will be low, particularly if converted to a 99% avoidance rate” (Smart Wind 2013). The analysis of satellite-tracking data presented in Wakefield *et al.* (2013) also indicates that Race Bank (and Dudgeon wind farm) are both outside of the regular foraging range of northern gannet from Flamborough Head and Bempton Cliffs.
- 3.3.69 The appropriate assessment undertaken for the Dudgeon wind farm did not consider the impact of northern gannet collision losses on the Flamborough Head and Bempton Cliffs SPA, indicating that it was considered not to represent a likely significant effect on the designated population. The Dudgeon scheme has recently been revised with a reduction in the number of wind turbines from 178 to 78 and capacity from 520MW to 400MW. Further supplementary environmental information (SEI) has been provided by Dudgeon Offshore Wind Limited to DECC and the MMO determine whether this change alters any of the original assessment findings (Royal Haskoning 2013). With regard to potential collision risk estimates for northern gannet, the SEI report does not update the position with regard to the original assessment and notes that “mortalities at Dudgeon have potential to impact local populations, although there is little evidence of these birds using the site to forage other than sporadically during summer”.
- 3.3.70 The population of northern gannet at the Flamborough Head and Bempton Cliffs SPA is, given the significant increase in size since designation (see *Appendix 1* in **Appendix 11A** of the ES), in favourable condition. Taking solely the potential that an estimated 107 adult mortalities (based on a 99% avoidance rate) could arise from the combined impact of collision for all of the wind farm projects considered, it is

apparent that the combined loss would be significantly below the lower PBR threshold calculated for the gannet population of the Flamborough Head and Bempton Cliffs SPA. Based on this, it is concluded that the predicted cumulative collision losses would not have an adverse effect on the designated northern gannet population of the Flamborough Head and Bempton Cliffs SPA.

### Forth Islands SPA

- 3.3.71 In the **IfAA Report**, in-combination collision losses were only attributed from Dogger Bank Teesside A & B, as the assessment for all other projects did not undertake attribution or the project areas are located outside the mean maximum foraging range of birds from this SPA. It should be noted that Dogger Bank lies beyond the mean maximum foraging range (230km) of this SPA and therefore attribution is based on tagging data (Wakefield *et al.* 2013) which indicates potential use of the area by gannet from the Firth of Forth colonies.
- 3.3.72 A total of 10 non-breeding mortalities are apportioned to this SPA from Hornsea Project One, representing 0.001% of the breeding population. Northern gannet collision losses associated with the Beatrice project were not attributed to this, or any other SPAs (Arcus, 2013). Cumulatively, the total collision losses apportioned to the SPA from the combined Dogger Bank Creyke Beck, Dogger Bank Teesside A & B projects and Hornsea Project One constitutes 0.04% of the designated population (0.01% of the breeding population), see *Table A9.50c* in *Appendix 9* of **Appendix 11A** of the ES.
- 3.3.73 A threshold mortality that could be sustained for the Bass Rock gannet colony (part of the Forth Islands SPA) was calculated as part of the WWT (2012) PVA analysis for this species. This mortality threshold was calculated as 2,000 birds. On the basis of this PVA work, the predicted cumulative loss of up to 67 additional adults (representing a 0.7% increase in background mortality) from Dogger Bank Creyke Beck, Dogger Bank Teesside A & B (see *Table A9.50c* in *Appendix 9* of **Appendix 11A** of the ES) and Hornsea Project One is significantly below the likely threshold of mortality increase at which a decline in the population of northern gannet at the Forth Islands SPA would be likely to occur. Based on this, it is concluded that the predicted cumulative collision losses would not have an adverse effect on the designated northern gannet population of the Forth Islands SPA.

### Black-legged kittiwake

- 3.3.74 Data on predicted collision estimates for black-legged kittiwake are available for 12 additional projects with the cumulative collision estimate for black-legged kittiwake is calculated as 1,099 birds per year from these projects (see **Table A21**).
- 3.3.75 Dogger Bank Creyke Beck is within foraging range of two SPAs where the species is a designated feature - Flamborough Head and Bempton Cliffs SPA and the Farne Islands SPA. Birds occurring outwith the breeding season may originate from a wider suite of sites. Attribution of black-legged kittiwake collision mortalities determined for the East Anglia ONE project is undertaken with respect to the Flamborough Head and Bempton Cliffs SPA only. For Hornsea Project One attribution is to a total of 21 SPAs, although collisions during the breeding season are attributed solely to the Flamborough Head and Bempton Cliffs SPA as this is the only site within mean maximum foraging range of the wind farm development. The small

number of non-breeding collision mortalities attributed to other SPAs is not significant at the population level (see Table B2 in Annex B of the Hornsea Project One HRA Report – Smart Wind (2013)). The revised assessment of in-combination collision impact for this species therefore deals solely with this SPA.

### **Flamborough Head and Bempton Cliffs SPA**

- 3.3.76 Out of the total annual collision losses calculated for Dogger Bank Creyke Beck, 109 birds (90 breeding adults, 11 non-breeding adults and eight immature) were attributed to the Flamborough Head and Bempton Cliffs SPA. For Dogger Bank Teesside A & B, losses were calculated as 57 birds (45 breeding adults, eight non-breeding adults and four immature) – see *Table A9.52c* in *Appendix 9* of **Appendix 11A** of the ES. In addition to the apportioning undertaken for Dogger Bank Creyke Beck and Dogger Bank Teesside A & B, collision estimates have been attributed to the Flamborough Head and Bempton Cliffs SPA from a number of other offshore wind farm developments (see **Table A22**).
- 3.3.77 The cumulative collision estimate for black-legged kittiwake for all projects for the Flamborough Head and Bempton Cliffs SPA amounts to 371 individual birds (or 298 adults). The calculated loss equates to 0.41% of the population (all birds) or 0.33% of the adult breeding population at this site. The increase in background mortality is 5.9% (see *Table A9.35c* in *Appendix 9* of **Appendix 11A** of the ES), which suggests that the cumulative total could be significant.
- 3.3.78 To date, no species specific population modelling work (i.e. PVA or PBR) has been undertaken in respect of this species for the Dogger Bank Creyke Beck project. PBR calculations for black-legged kittiwake for the Flamborough Head and Bempton Cliffs SPA colony are, however, available from assessment work undertaken for the Triton Knoll Offshore Wind Farm (RWE Npower Renewables, 2012) and for Hornsea Project One (SMart Wind 2013).
- 3.3.79 The Triton Knoll PBR works, as recorded in the Ornithology Statement of Common Ground between Natural England, JNCC and RWE Npower Renewables, provides a PBR figure of 381 of adult kittiwake that could be removed annually from the Flamborough Head and Bempton Cliffs SPA population without having a detrimental effect on the sustainable growth of the population.
- 3.3.80 It should be noted that the PBR modelling reported in the Triton Knoll ornithology SoCG was based on a very precautionary *f* value of 0.1 (the *f* factor is a user-defined parameter designed to reflect levels of concern about the management of the species in question, with a value of 0.1 reflecting populations of high concern in decline) and a population ( $N_{min}$ ) value based on a lower population (75,234 birds) than revised population estimates for this species (89,040 birds) (Natural England 2013). Natural England in their written representation to the Triton Knoll application note that although there has been a long-term decline in the black-legged kittiwake population at Flamborough Head, recent data from representative study plots indicates that productivity remains comparably high, and numbers of breeding adults are stable or increasing (Aitken *et al.* 2011, quoted in JNCC and Natural England 2012 – Annex C). This is, in part, reflected in the population estimate for the proposed SPA extension to the Flamborough Head and Bempton Cliffs, where, based on 2008-2011 data, the black-legged kittiwake population is given as 89,040 birds (Natural England 2013). This figure is 15.5% higher than the 2008 population

count used in deriving the PBR used in the Triton Knoll assessment. Based on these factors, it is therefore likely that a higher PBR than 381 adult kittiwake can be justified, as discussed below.

- 3.3.81 For Hornsea Project One, SMart Wind (2013), present both a PBR calculation and PVA model for black-legged kittiwake at Flamborough Head. The PBR is discussed here as the results can be compared with those determined for the Triton Knoll project.
- 3.3.82 The PBR used for assessment purposes and as presented in the Hornsea Project One HRA Report (Appendix J) is given as 1,023 adult birds (SMart Wind 2013). This PBR is, in comparison to that determined for the Triton Knoll assessment, calculated on the basis of a revised population estimate (see above), the use of a higher  $f$  value (0.2, as opposed to 0.1) and although not accurately stated in the Appendix, an  $r_{\max}$  value of 0.125 (as opposed to 0.1). The use of the higher  $f$  value in comparison to the calculation for Triton Knoll, as discussed above, reflects the observation that the numbers of breeding adult black-legged kittiwake at Flamborough Head is stable or increasing and productivity is comparably high. As an  $f$  value of 0.1 is generally taken to apply to threatened or endangered species / populations, the selection of a higher  $f$  value for the calculation of the Hornsea Project One PBR would, on this basis, appear justified. The use of a different  $f$  value also reflects the view that the value can be updated depending on the status of the species population (Dillingham and Fletcher 2008).
- 3.3.83 Solely taking account of the increase in the black-legged kittiwake population observed since publication of the Triton Knoll PBR, gives a revised PBR of 409 (using an  $f$  value of 0.1,  $r_{\max}$  of 0.1 and  $N_{\min}$  of 81,850). If, as, discussed above, a higher  $f$  value of 0.2 is also used, then the PBR increases to 818. The  $N_{\min}$  value derived for use in the Hornsea Project One PBR calculation is conservative and is taken as the lower bound of the 60% confidence limit and reflects the approach to the calculation of  $N_{\min}$  given in Dillingham and Fletcher (2008). Natural England have also advocated the use of a conservative value for  $N_{\min}$  in previous considerations of PBR calculations (e.g. Triton Knoll, RWE Npower Renewables, 2012) and consider that a correction factor of 10% should be applied to population counts (i.e. population count – 10% =  $N_{\min}$ ). If the Natural England approach is used then  $N_{\min}$  would be 80,136 and the PBR would be 400 ( $f$ 0.1) or 800 ( $f$ 0.2).
- 3.3.84 Based on this analysis, the cumulative annual loss of an estimated 298 adult birds from the population is below the precautionary PBR derived for the Triton Knoll assessment (77% of total PBR) and significantly below values that are considered to be more representative of the current status of the black-legged kittiwake population at Flamborough Head and Bempton Cliffs SPA. This suggests that the predicted cumulative collision losses for the Flamborough Head and Bempton Cliffs SPA black-legged kittiwake population would be below a threshold at which adverse population effects would be expected to occur.
- 3.3.85 Based on this the predicted in-combination collision losses would not have an adverse effect on the designated black-legged kittiwake population of the Flamborough Head and Bempton Cliffs SPA.

## Lesser black-backed gull

- 3.3.86 A total of 394 collision mortalities (including a total of 45 breeding adult birds) are predicted for the East Anglia ONE project and 22 (18 during the breeding season) for Hornsea Project One.
- 3.3.87 For East Anglia ONE, the loss of 45 adult birds during the breeding season was assessed in relation to the regional breeding population, resulting in an increase relative to the baseline mortality rate of 5.08%, considered to be a negligible magnitude impact on the regional breeding population (EAOW 2013c). Mortality of birds during the winter is assessed as leading to a 0.34% increase in the baseline mortality of the international wintering population resulting in a negligible magnitude impact. East Anglia ONE is within mean maximum foraging range of the lesser black-backed gull population of the Alde-Ore Estuary SPA. Apportioning of collision mortalities during the breeding season to this SPA indicates that 14 adult birds could be lost from this population. Inclusive of birds outside of the breeding season, a total of 20 birds (16 adults) were apportioned to the SPA (EAOW 2013c). A PVA model developed for the project determined that an additional mortality of 20 adult lesser black-backed gulls would result in a negligible effect on the number of breeding pairs of lesser black-backed gulls expected to be present at the Alde-Ore Estuary SPA after 25 years under the medium scenario. The assessment work for East Anglia ONE therefore concluded that there would not be an adverse effect on breeding lesser black-backed gulls or the integrity of the Alde-Ore Estuary SPA due to collision mortality arising from the operation of East Anglia ONE.
- 3.3.88 Hornsea Project One is beyond maximum foraging range of any SPAs and impacts during the breeding season were not apportioned to any SPAs. Outwith the breeding season five adult birds are apportioned to two non-UK SPAs (see Table B.3 of the Hornsea Project One HRA Report – Smart Wind (2013)). No birds were apportioned to the Alde-Ore Estuary SPA.
- 3.3.89 No SPAs supporting breeding populations of lesser black-backed gull are within mean maximum foraging range of Dogger Bank Creyke Beck. Therefore, any potential in-combination collision impact relates solely to non-breeding birds, which could potentially derive from a number of SPAs (18 screened into the assessment) situated around the North Sea.
- 3.3.90 For Dogger Bank Creyke Beck, for all SPAs combined, the total number of predicted collision losses is 34 birds (see *Table A9.36c* in *Appendix 9* of **Appendix 11A** of the ES). Apportioned across the relevant SPAs, this total number of collision losses represents 0.01% of individual SPA populations, including the Alde-Ore Estuary SPA (predicted loss of 1.2 non-breeding birds) and a background increase in mortality of 0.09%. This very small impact indicates that any contribution of collision losses due to operation of the Dogger Bank Creyke Beck development would be non-significant when combined with collision losses attributed to Dogger Bank Teesside A & B (see *Table A9.53c* in *Appendix 9* of **Appendix 11A** of the ES) or any other project and no in-combination impact would arise. Consequently, it is concluded that no adverse in-combination effect on the integrity of lesser black-backed gull populations of the SPAs screened into the assessment would arise.

## Great black-backed gull

- 3.3.91 A total of 115 collision mortalities (using option 3 of the Band model) are predicted for the East Anglia ONE project. These losses are not attributed to any specific SPAs, but considered in relation to the North Sea population, for which it is calculated that the collision losses would result in a change in the baseline mortality rate from 7% to 7.08%. It is considered that this level of additional mortality would have little impact on the current population trends of the North Sea greater black-backed gull population and less on the total flyway population (EAOW 2013d).
- 3.3.92 Hornsea Project One is beyond maximum foraging range of any SPAs and although 15 collision mortalities during this period were considered to be of SPA designated birds no impacts on designated SPAs were concluded. Outwith the breeding season 27 collision mortalities are predicted for birds belonging to SPA designated populations (see Table B.5 of the Hornsea Project One HRA Report – SMart Wind (2013)).
- 3.3.93 No SPAs supporting breeding populations of great black-backed gull are within mean maximum foraging range of Dogger Bank Creyke Beck. Therefore, any potential in-combination collision impact relates solely to non-breeding birds, which could potentially derive from a number of SPAs (17 screened into the assessment) situated around the North Sea.
- 3.3.94 For all SPAs combined, the total number of predicted collision losses is six birds (see *Table A9.37c* in *Appendix 9* of **Appendix 11A** of the ES). Apportioned across the relevant SPAs, this total number of collision losses represents 0.06% of individual SPA populations and a background increase in mortality of 0.35%. This very small impact indicates that any contribution of collision losses due to operation of the Dogger Bank Creyke Beck development would be negligible when combined with collision losses attributed to Dogger Bank Teesside A & B (see *Table A9.54c* in *Appendix 9* of **Appendix 11A** of the ES) or any other project and no in-combination impact would arise. Consequently, it is concluded that no adverse in-combination effect on the integrity of great black-backed gull populations of the SPAs screened into the assessment would arise.

## Collision risk to migrant bird populations

- 3.3.95 As reported in Section 6.6 of the Dogger Bank Creyke Beck **IfAA Report**, predicted collision loss estimates for migrant bird populations that may pass through the Dogger Bank Creyke Beck development area indicate that for all of the species examined the losses are negligible at the Great Britain population level and therefore also at the SPA suite level (which is just a subset of the GB population and therefore the same proportional impact applies).
- 3.3.96 The very small collision losses demonstrate that the contribution to any in-combination impact that could arise from Dogger Bank Creyke Beck would not be significant.
- 3.3.97 Examination of data available from the other wind farm projects screened into the in-combination assessment revealed that consideration of this potential impact is generally lacking. Data is available for Dogger Bank Teesside A & B, Beatrice, Breeveerten II, the European Offshore Wind Development Centre, Hornsea Project One, Lincs and Teesside developments.

- 3.3.98 A similar exercise has been undertaken for Dogger Bank Teesside A & B and the results of this collision modelling combined with the results for Dogger Bank Creyke Beck. As can be seen from **Table A23** (update of *Table 7.21* In the **IfAA Report**) for all species for which their migratory route potentially overlaps with Dogger Bank Creyke Beck, the potential impact would represent less than 0.1% (significantly less than 0.1% for many species) of the reference population. This indicates that cumulatively collision losses of the combined Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects would not be significant for all SPAs supporting the listed migratory species.
- 3.3.99 For Hornsea Project One, potential collision risk and mortality estimates were calculated for twelve selected species of waterbird (seven waders and five waterfowl) based on a relatively high proportion of birds occurring within the regional SPAs close to the proposed Hornsea Project One wind farm development.
- 3.3.100 For each of the twelve species assessed the migration model, Migropath, was used to calculate the proportion of the population likely to pass through the Hornsea Project One development site (APEM 2012). Of the species assessed, the greatest percentage of the GB and Ireland population predicted to pass through the Hornsea Project One development site is that of the taiga bean goose (13.9% of the GB and Ireland population) although no collisions were predicted. For the remaining eleven species, the percentage of the GB and Ireland populations passing through the Hornsea Project One development site were estimated as being less than 10%. The collision risk modelling predicted low numbers of collisions for most of the species, with the highest mortalities predicted for wigeon (20 birds) and lapwing (48 birds). Assessment of these losses against reference populations is not provided in the APEM (2012) report. The calculated collision mortalities for the selected species assessed for Hornsea Project One project are included in **Table A23** and the combined impact with respect to the percentage of the GB and GB/Ireland population provided. The inclusion of the estimated collision losses for the migratory species assessed for Hornsea Project One project does not lead to any changes in the conclusions reached regarding the combined impact of the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects and for all of the species examined the total collision losses would represent significantly less than 0.1% of the relevant GB and GB and Ireland populations.
- 3.3.101 For the other projects for which quantitative data is available, collision losses were only presented for two species, barnacle goose and common scoter, for which the migratory routes overlap with Dogger Bank Creyke Beck. For both species the estimated collision losses when combined with those for Dogger Bank Creyke Beck and Dogger Bank Teesside A & B would be less than 0.1% of the reference populations (see Table 6.11 in **Appendix 11A** of the ES).
- 3.3.102 Consequently, it is concluded that no in-combination adverse effect on the integrity of those designated migratory SPA populations for which collision risk has been identified would arise.

## Barrier effect on foraging sea birds (breeding populations) and migrant bird populations

- 3.3.103 There is considerable uncertainty regarding the assessment of barrier effects posed by offshore wind farms. Assessment of the potential cumulative effects for seabirds from their breeding colonies has not been attempted because of:
- The difficulties in assessing the magnitude of the potential impacts of this effect;
  - The complexities in the numbers of potential projects affecting birds foraging from different colonies (see Appendix 9 in **Appendix 11A** of the ES); and
  - The potential cumulative impacts of barrier effects from multiple wind farms are not likely to be additive (King *et al.* 2009), and thus are problematic to quantify.
- 3.3.104 Given the above, consideration of the cumulative impact of barrier effects in the HRA Report was therefore confined to assessment of wind farm development within the confines of the Dogger Bank Zone (i.e. the in-combination impact for the Dogger Bank Creyke Beck and Dogger Bank Teesside A & B projects). It is also notable that such a position is taken with regard to the assessment presented in the Hornsea Project One HRA Report, which provides the following conclusion following the screening stage of the HRA; “No LSEs have been identified to be arising from barrier effects with Project One alone. All the seabirds recorded within Subzone 1 have significantly large foraging ranges during breeding and non-breeding periods (e.g. Wernham *et al.* 2002). Many of the species migrate many thousands of kilometres each year and therefore are capable of flying around or over offshore wind farms should they choose to do so. The geographical spread of the offshore sites will ensure that it is unlikely that any individual bird will encounter an in-combination barrier effect during migration or passage and no in-combination impacts that will cause a LSE will occur ” (SMart Wind 2013).
- 3.3.105 The same comments given above with regard to Hornsea Project One project also apply to migrant bird populations interacting with Dogger Bank Creyke Beck and Dogger Bank Teesside A & B and no further in-combination impacts are identified to those originally assessed in the **IfAA Report**.



**Table A23** Assessment of in-combination annual collision risk for migrant birds for Dogger Bank Creyke Beck, Dogger Bank Teesside A & B and Hornsea Project One wind farm developments

<b>Species</b>	<b>Dogger Bank Creyke Beck and Teesside A &amp; B - collisions</b>	<b>Hornsea Project One annual collisions</b>	<b>Total % GB or GB/Ireland population</b>
Bean goose	0.11	0	<0.1%
Barnacle goose (Svalbard population)	0.05	-	<0.1%
Light-bellied brent goose (Svalbard population)	0.01	-	<0.1%
Common shelduck	3.58	2	<0.1%
Eurasian wigeon	25.15	20	<0.1%
Gadwall	0.38	-	<0.1%
Eurasian teal	5.96	-	<0.1%
Mallard	19.76	-	<0.1%
Northern pintail	0.8	-	<0.1%
Northern shoveler	0.54	-	<0.1%
Common pochard	2.28	-	<0.1%
Tufted duck	5.66	-	<0.1%
Greater scaup	0.02	-	<0.1%
Common scoter	0.21	-	<0.1%
Velvet scoter	0.14	-	<0.1%
Common goldeneye	1.56	-	<0.1%
Red-breasted merganser	0.01	-	<0.1%
Goosander (breeding males)	0.001	-	<0.1%
Goosander (non-breeding)	0.34	-	<0.1%
Great bittern	0.02	-	<0.1%
Great crested grebe	0.53	-	<0.1%
Slavonian grebe	0.02	-	<0.1%
Hen harrier (breeding)	0.003	-	<0.1%

Species	Dogger Bank Creyke Beck and Teesside A & B - collisions	Hornsea Project One annual collisions	Total % GB or GB/Ireland population
Hen harrier (non-breeding)	0.08	-	<0.1%
Eurasian coot	1.16	-	<0.1%
Eurasian oystercatcher (non-breeding)	8.51	-	<0.1%
Common ringed plover (non-breeding)	1.47	-	<0.1%
Golden plover (non-breeding)	15.52	16	<0.1%
Grey plover	4.21	2	<0.1%
Northern lapwing	33.78	48	<0.1%
Red knot	13	12	<0.1%
Sanderling	3.33	-	<0.1%
Dunlin <i>Calidris alpina schinzii</i> & <i>C. a. arctica</i> (passage)	0.27	-	<0.1%
Dunlin <i>Calidris alpina alpina</i> (passage & winter)	27.25	10	<0.1%
Ruff	0.21	-	<0.1%
Common snipe	38.3	-	<0.1%
Black-tailed godwit	0.22	0	<0.1%
Bar-tailed godwit	5.08	2	<0.1%
Whimbrel	0.97	-	<0.1%
Eurasian curlew (non-breeding)	7.67	-	<0.1%
Greenshank	0.002	-	<0.1%
Common redshank (breeding)	0.33	-	<0.1%
Common redshank Icelandic population (non-breeding)	10	-	<0.1%
Common redshank European population (non-breeding)	2.28	-	<0.1%
Ruddy turnstone	1.83	-	<0.1%
Short-eared owl	0.12	-	<0.1%
European nightjar	0.06	-	<0.1%

## 4 Conclusions

- 4.1.1 This addendum incorporates assessment data from two Round 3 offshore wind farm developments (East Anglia ONE and Hornsea Project One) that are relevant to the assessment of cumulative (EIA) and in-combination (HRA) impacts on ornithological receptors.
- 4.1.2 The original assessment data used in determining cumulative and in-combination impacts for Dogger Bank Creyke Beck are updated with respect to consideration of disturbance and displacement of seabirds, collision risk to seabirds and migrants and barrier effects. Re-assessment of the potential cumulative and in-combination impacts using the revised data set is undertaken and any changes in the original assessment outcomes given in the ES and **IfAA Report** are discussed.
- 4.1.3 For the cumulative impact of the wind farm developments considered, the additional data from East Anglia ONE and Hornsea Project One would not alter the assessment outcomes contained in the ES (Section 10.3 in **Chapter 11** and Section 6.3 in **Appendix 11A**) for Dogger Bank Creyke Beck. No changes to the defined significance ratings for seabird displacement and collision impacts at protected site, national and biogeographic population levels are required, and therefore the assessment conclusions remain the same. Similarly, the assessed significance of cumulative impacts on migrant bird populations as a result of barrier effects and collision risk would remain as stated in the ES.
- 4.1.4 The inclusion of data relating to seabird displacement and collision mortality from East Anglia ONE and Hornsea Project One leads to small increases in the determined in-combination population impacts for several designated SPA populations. These changes are set out in **Table A24**. In respect of displacement-linked mortality it should be noted that no apportioning to specific SPAs is provided in the East Anglia ONE assessment and therefore all changes in the percentage of the populations affected relate to the inclusion of data from Hornsea Project One. Based on the revised in-combination data, it can be stated that, for all of the populations where an in-combination impact is identified, the original conclusions made in the IfAA Report (Section 7.7) still stand, and that no adverse effect on the integrity of any designated SPA populations would arise as a result of the assessed in-combination impacts.

**Table A24 Summary of assessment findings for seabird displacement and collision impacts with the inclusion of data from East Anglia ONE and Hornsea Project One**

Species	Flamborough Head and Bempton Cliffs	Coquet Island	Farne Islands	Forth Islands	Alde-Ore Estuary
<b>Displacement</b>					
Northern gannet	3 additional adult mortalities from Hornsea Project One. Population impact changes from 0.04 to 0.06%	N/A	N/A	N/A	N/A
Common guillemot	127 additional adult mortalities from Hornsea Project One. Population impact changes from 0.17 to 0.32%	N/A	N/A	N/A	N/A
Razorbill	79 additional adult mortalities from Hornsea Project One. Population impact changes from 0.13 to 0.53%	N/A	N/A	N/A	N/A
Atlantic puffin	3 additional adult mortalities from Hornsea Project One. Population impact changes from 0.01 to 0.3%	9 additional adult mortalities. Population impact changes from 0.02 to 0.05%	18 additional adult mortalities. Population impact changes from 0.02 to 0.04%	N/A	N/A
<b>Collision</b>					
Northern gannet	13 additional mortalities (10 adults) from Hornsea Project One and East Anglia ONE. Population impact changes from 1.65 to 1.72%. Revised in-combination total for adult mortalities below available range of PBR threshold values for this species at Flamborough Head and Bempton Cliffs SPA.	N/A	N/A	10 non-breeding birds apportioned from Hornsea Project One (0.001% of population). No increase to 0.04% in-combination population impact.	N/A
Black-legged kittiwake	20 additional mortalities (18 adults) from Hornsea Project One and East Anglia ONE. Population impact changes from 0.39 to 0.41%. Revised in-combination total for adult mortalities below PBR threshold values for this species at Flamborough Head and Bempton Cliffs SPA.	N/A	N/A	N/A	N/A
Lesser black backed gull	N/A	N/A	N/A	N/A	20 birds apportioned from the East Anglia ONE project. 1 non-breeding bird from DBCB. No in combination impact.

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