



Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Gannet and Auk Cumulative Displacement Updates Technical Note

Revision A
Deadline 5
June 2023
Document Reference: 19.21

Title:	
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects Examination submission Gannet and Auk Cumulative Displacement Updates Technical Note	
PINS document no.: 19.21	
Document no.: C282-RH-Z-GA-00296	
Date:	Classification
June 2023	Final
Prepared by:	
Royal HaskoningDHV	
Approved by:	Date:
Felix Cryer, Equinor	June 2023

Table of Contents

1	Introduction	6
2	Gannet	7
3	Guillemot	11
4	Razorbill	16

Table of Tables

Table 1	Cumulative number of gannets at risk of operational phase OWF displacement	7
Table 2	Cumulative displacement matrix for gannet, with the ranges of displacement and mortality considered by the assessment shown in red	10
Table 3	Cumulative number of guillemots at risk of operational phase OWF displacement.....	11
Table 4	Cumulative displacement matrix for guillemot, with the ranges of displacement and mortality considered by the assessment shown in red (HP4 Applicant's approach)	14
Table 5	Cumulative displacement matrix for guillemot, with the ranges of displacement and mortality considered by the assessment shown in red (HP4 Natural England's approach)	15
Table 6	Cumulative number of razorbills at risk of operational phase OWF displacement.....	16
Table 7	Cumulative displacement matrix for razorbill, with the ranges of displacement and mortality considered by the assessment shown in red	19

Glossary of Acronyms

CIA	Cumulative Impact Assessment
DCO	Development Consent Order
DEL	Dudgeon Extension Limited
DEP	Dudgeon Offshore Wind Farm Extension Project
DOW	Dudgeon Offshore Wind Farm
EIA	Environmental Impact Assessment
ES	Environmental Statement
HP4	Hornsea Project Four
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
SEL	Scira Extension Limited
SEP	Sheringham Offshore Wind Farm Extension Project

Glossary of Terms

<p>Dudgeon Offshore Wind Farm Extension Project (DEP)</p>	<p>The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.</p>
<p>Sheringham Shoal Offshore Wind Farm Extension Project (SEP)</p>	<p>The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.</p>
<p>The Applicant</p>	<p>Equinor New Energy Limited. As the owners of SEP and DEP, Scira Extension Limited and Dudgeon Extension Limited are the named undertakers that have the benefit of the DCO. References in this document to obligations on, or commitments by, 'the Applicant' are given on behalf of SEL and DEL as the undertakers of SEP and DEP.</p>

1 Introduction

1. This document provides updated cumulative displacement tables for gannet, guillemot and razorbill (auks) as requested by Natural England within REP4-049:

Natural England further highlights that the EIA assessment for species subject to displacement (Auks, Gannet) has not been updated to reflect the correct Hornsea 4 figures (the presented numbers are taken from the Hornsea 4 PEIR). We recommend updated cumulative totals are presented for those species subject to displacement (auks, gannet) that incorporate the appropriate H4 figures.
2. This document supersedes the cumulative displacement tables for gannet and auks (guillemot and razorbill) originally provided in Environmental Statement (ES) **Appendix 11.2 - Information to Inform the Offshore Ornithology Cumulative Impact Assessment** [APP-196].
3. Figures from the Preliminary Environmental Information Reports (PEIR) of Rampion 2 (R2), North Falls (NF) and Five Estuaries (FE) have been included.
4. For guillemot (**Table 3**), various totals have been provided to account for the different approaches taken for Hornsea Project Four i.e. the ‘Applicant’s approach’ (Applicant here refers to Ørsted Hornsea Project Four Ltd) and ‘Natural England’s approach’. The Hornsea Project Four figures have been taken from the PINS document library for that project, see reference REP6-029.
5. For razorbill (**Table 6**), the Applicant notes that whilst an ‘Applicant’s approach’ and ‘Natural England’s approach’ has also been taken with respect to Hornsea Project Four, this does not affect the overall numbers of razorbill predicted to be at risk of displacement (as it does for guillemot). It should also be noted that the mean peak count values for razorbill for Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP) have also been corrected for an error within the ES **Appendix 11.2 – Information to Inform the Offshore Ornithology Cumulative Impact Assessment** [APP-196]. In this document, the mean peak counts for the breeding season and autumn migration season were mistakenly reversed during the production of displacement matrices. This has no effect on the overall annual mortality estimates used in the displacement estimate; however, these values have been corrected for completeness, and align with those that have been used in the **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision C)** [document reference 13.3].
6. Cumulative displacement matrices have also been included for each species.

2 Gannet

Table 1 Cumulative number of gannets at risk of operational phase OWF displacement

Tier	OWF	Estimated number of birds at risk of displacement			
		Breeding	Autumn migration	Spring migration	Year round
1	Beatrice	151	0	0	151
1	Beatrice Demonstrator	-	-	-	-
1	Blyth Demonstration Project	-	-	-	-
1	Dudgeon	53	25	11	89
1	East Anglia ONE	161	3,638	76	3,875
1	European Offshore Wind Deployment Centre	35	5	0	40
1	Galloper	360	907	276	1,543
1	Greater Gabbard	252	69	105	426
1	Gunfleet Sands	0	12	9	21
1	Hornsea Project One	671	694	250	1,615
1	Humber Gateway	-	-	-	-
1	Hywind	10	0	4	14
1	Kentish Flats	-	-	-	-
1	Kentish Flats Extension	0	13	0	13
1	Kincardine	120	0	0	120
1	Lincs	-	-	-	-
1	London Array	-	-	-	-
1	Methil	23	0	0	23

Tier	OWF	Estimated number of birds at risk of displacement			
		Breeding	Autumn migration	Spring migration	Year round
1	Moray Firth (EDA)	564	292	27	883
1	Race Bank	92	32	29	153
1	Rampion	0	590	0	590
1	Scroby Sands	-	-	-	-
1	Sheringham Shoal	47	31	2	80
1	Teesside	1	0	0	1
1	Thanet	-	-	-	-
1	Westermost Rough	-	-	-	-
2	Dogger Bank Creyke Beck Projects A and B	1,155	2,048	394	3,597
2	Firth of Forth Alpha and Bravo	2,956	664	332	3,952
2	Hornsea Project Two	457	1,140	124	1,721
2	Near na Gaoithe	1,987	552	281	2,820
2	Triton Knoll	211	15	24	250
3	Dogger Bank Teesside Projects A and B	2,250	887	464	3,601
3	East Anglia ONE North	149	468	44	661
3	East Anglia THREE	412	1,269	524	2,205
3	East Anglia TWO	192	891	192	1,275
3	Hornsea Project Three	1,333	984	524	2,841
3	Inch Cape	2,398	703	212	3,313
3	Moray West	2,827	439	144	3,410
3	Norfolk Boreas	1,229	1,723	526	3,478

Tier	OWF	Estimated number of birds at risk of displacement			
		Breeding	Autumn migration	Spring migration	Year round
3	Norfolk Vanguard	271	2,453	437	3,161
	TOTAL: TIERS 1-3	20,367	20,544	5,011	45,922
4	Hornsea Project Four	976	790	401	2167
	TOTAL: TIERS 1-3 plus Hornsea Project Four	21,343	21,334	5,412	48,089
5	Rampion 2 (PEIR)	98	78	45	221
5	North Falls (PEIR)	68	453	245	766
5	Five Estuaries (PEIR)	233	640	67	940
	TOTAL: TIERS 1-4 plus R2, NF and FE	21,742	22,505	5,769	50,016
4	DEP (ES Mean)	417	343	47	807
4	SEP (ES Mean)	23	295	11	28
-	TOTAL: All projects plus SEP and DEP (Mean)	22,182	23,143	5,827	50,851

Table 2 Cumulative displacement matrix for gannet, with the ranges of displacement and mortality considered by the assessment shown in red

		Mortality (%)										
		1	2	3	4	5	10	20	30	50	80	100
Displacement (%)	10	51	102	153	203	254	509	1017	1526	2543	4068	5085
	20	102	203	305	407	509	1017	2034	3051	5085	8136	10170
	30	153	305	458	610	763	1526	3051	4577	7628	12204	15255
	40	203	407	610	814	1017	2034	4068	6102	10170	16272	20340
	50	254	509	763	1017	1271	2543	5085	7628	12713	20340	25426
	60	305	610	915	1220	1526	3051	6102	9153	15255	24408	30511
	70	356	712	1068	1424	1780	3560	7119	10679	17798	28477	35596
	80	407	814	1220	1627	2034	4068	8136	12204	20340	32545	40681
	90	458	915	1373	1831	2288	4577	9153	13730	22883	36613	45766
	100	509	1017	1526	2034	2543	5085	10170	15255	25426	40681	50851

3 Guillemot

Table 3 Cumulative number of guillemots at risk of operational phase OWF displacement

Tier	OWF	Estimated number of birds at risk of displacement		
		Breeding	Non-breeding	Year round
1	Beatrice	13,610	2,755	16,365
1	Beatrice Demonstrator	No estimate available		
1	Blyth Demonstration Project	1,220	1,321	2,541
1	Dudgeon	334	542	876
1	East Anglia ONE	274	640	914
1	European Offshore Wind Deployment Centre	547	225	772
1	Galloper	305	593	898
1	Greater Gabbard	345	548	893
1	Gunfleet Sands	0	363	363
1	Hornsea Project One	9,836	8,097	17,933
1	Humber Gateway	99	138	237
1	Hywind	249	2,136	2,385
1	Kentish Flats	0	3	3
1	Kentish Flats Extension	0	4	4
1	Kincardine	632	0	632
1	Lincs & LID	582	814	1,396
1	London Array	192	377	569
1	Methil	25	0	25

Tier	OWF	Estimated number of birds at risk of displacement		
		Breeding	Non-breeding	Year round
1	Moray Firth (EDA)	9,820	547	10,367
1	Race Bank	361	708	1,069
1	Rampion	10,887	15,536	26,423
1	Scroby Sands	No estimate available		
1	Sheringham Shoal	390	715	1,105
1	Teesside	267	901	1,168
1	Thanet	18	124	142
1	Westermost Rough	347	486	833
2	Dogger Bank Creyke Beck A	5,407	6,142	11,549
2	Dogger Bank Creyke Beck B	9,479	10,621	20,100
2	Firth of Forth Alpha	13,606	4,688	18,294
2	Firth of Forth Bravo	11,118	4,112	15,230
2	Hornsea Project Two	7,735	13,164	20,899
2	Near na Gaoithe	1,755	3,761	5,516
2	Triton Knoll	425	746	1,171
3	Dogger Bank Teesside A	3,283	2,268	5,551
3	Dogger Bank Teesside B	5,211	3,701	8,912
3	East Anglia ONE North	4,183	1,888	6,071
3	East Anglia THREE	1,744	2,859	4,603
3	East Anglia TWO	2,077	1,675	3,752
3	Hornsea Project Three	13,374	17,772	31,146

Tier	OWF	Estimated number of birds at risk of displacement		
		Breeding	Non-breeding	Year round
3	Inch Cape	4,371	3,177	7,548
3	Moray West	24,426	38,174	62,600
3	Norfolk Boreas	7,767	13,777	21,544
3	Norfolk Vanguard	4,320	4,776	9,096
	TOTAL: TIERS 1-3	170,621	170,874	341,495
4	Hornsea Project Four (Applicant's approach)	9,382	20,326	29,708
4	Hornsea Project Four (Natural England's approach)	9,382	36,965	46,347
-	TOTAL: TIERS 1-3 plus Hornsea Project Four (Applicant's approach)	180,003	191,200	371,203
-	TOTAL: TIERS 1-3 plus Hornsea Project Four (Natural England's approach)	180,003	207,839	387,842
5	Rampion 2 (PEIR)	185	13,020	13,205
5	North Falls (PEIR)	1,103	4,497	5,600
5	Five Estuaries (PEIR)	1,201	3,698	4,899
-	TOTAL: TIERS 1-4 plus R2, NF and FE and using Hornsea Project Four Applicant's approach	182,492	212,415	394,907
-	TOTAL: TIERS 1-4 plus R2, NF and FE and using Hornsea Project Four Natural England's approach	182,492	229,054	411,546
4	DEP (ES Mean)	3,839	14,887	18,726
4	SEP (ES Mean)	1,085	1,095	2,180
-	TOTAL: All projects using Hornsea Project Four Applicant's approach plus SEP and DEP (Mean)	187,416	228,397	415,813

Tier	OWF	Estimated number of birds at risk of displacement		
		Breeding	Non-breeding	Year round
-	TOTAL: All projects using Hornsea Project Four Natural England's approach plus SEP and DEP (Mean)	187,416	245,036	432,452

Table 4 Cumulative displacement matrix for guillemot, with the ranges of displacement and mortality considered by the assessment shown in red (HP4 Applicant's approach)

		Mortality (%)										
		1	2	3	4	5	10	20	30	50	80	100
Displacement (%)	10	416	832	1247	1663	2079	4158	8316	12474	20791	33265	41581
	20	832	1663	2495	3327	4158	8316	16633	24949	41581	66530	83163
	30	1247	2495	3742	4990	6237	12474	24949	37423	62372	99795	124744
	40	1663	3327	4990	6653	8316	16633	33265	49898	83163	133060	166325
	50	2079	4158	6237	8316	10395	20791	41581	62372	103953	166325	207907
	60	2495	4990	7485	9980	12474	24949	49898	74846	124744	199590	249488
	70	2911	5821	8732	11643	14553	29107	58214	87321	145535	232855	291069
	80	3327	6653	9980	13306	16633	33265	66530	99795	166325	266120	332650
	90	3742	7485	11227	14969	18712	37423	74846	112270	187116	299385	374232
	100	4158	8316	12474	16633	20791	41581	83163	124744	207907	332650	415813

Table 5 Cumulative displacement matrix for guillemot, with the ranges of displacement and mortality considered by the assessment shown in **red** (HP4 Natural England's approach)

		Mortality (%)										
		1	2	3	4	5	10	20	30	50	80	100
Displacement (%)	10	432	865	1297	1730	2162	4325	8649	12974	21623	34596	43245
	20	865	1730	2595	3460	4325	8649	17298	25947	43245	69192	86490
	30	1297	2595	3892	5189	6487	12974	25947	38921	64868	103788	129736
	40	1730	3460	5189	6919	8649	17298	34596	51894	86490	138385	172981
	50	2162	4325	6487	8649	10811	21623	43245	64868	108113	172981	216226
	60	2595	5189	7784	10379	12974	25947	51894	77841	129736	207577	259471
	70	3027	6054	9081	12109	15136	30272	60543	90815	151358	242173	302716
	80	3460	6919	10379	13838	17298	34596	69192	103788	172981	276769	345962
	90	3892	7784	11676	15568	19460	38921	77841	116762	194603	311365	389207
	100	4325	8649	12974	17298	21623	43245	86490	129736	216226	345962	432452

4 Razorbill

Table 6 Cumulative number of razorbills at risk of operational phase OWF displacement

Tier	OWF	Estimated number of birds at risk of displacement				
		Breeding	Autumn migration	Winter	Spring migration	Year round
1	Beatrice	873	833	555	833	3,094
1	Beatrice Demonstrator	No estimate available				
1	Blyth Demonstration Project	121	91	61	91	364
1	Dudgeon	256	346	745	346	1,693
1	East Anglia ONE	16	26	155	336	533
1	European Offshore Wind Deployment Centre	161	64	7	26	258
1	Galloper	44	43	106	394	587
1	Greater Gabbard	0	0	387	84	471
1	Gunfleet Sands	0	0	30	0	30
1	Hornsea Project One	1,109	4,812	1,518	1,803	9,242
1	Humber Gateway	27	20	13	20	80
1	Hywind	30	719	10		759
1	Kentish Flats and Extension	No estimate available				
1	Kincardine	22				22
1	Lincs & LID	45	34	22	34	134
1	London Array	14	20	14	20	68
1	Methil	4	0	0	0	4

Tier	OWF	Estimated number of birds at risk of displacement				
		Breeding	Autumn migration	Winter	Spring migration	Year round
1	Moray Firth (EDA)	2,423	1,103	30	168	3,724
1	Race Bank	28	42	28	42	140
1	Rampion	630	66	1,244	3,327	5,267
1	Scroby Sands	No estimate available				
1	Sheringham Shoal	106	1,343	211	30	1,690
1	Teesside	16	61	2	20	99
1	Thanet	3	0	14	21	37
1	Westermost Rough	91	121	152	91	455
2	Dogger Bank Creyke Beck A	1,250	1,576	1,728	4,149	8,703
2	Dogger Bank Creyke Beck B	1,538	2,097	2,143	5,119	10,897
2	Firth of Forth Alpha	5,876	-	1,103	-	6,979
2	Firth of Forth Bravo	3,698	-	1,272	-	4,970
2	Hornsea Project Two	2,511	4,221	720	1,668	9,119
2	Near na Gaoithe	331	5,492	508	-	6,331
2	Triton Knoll	40	254	855	117	1,265
3	Dogger Bank Teesside A	834	310	959	1,919	4,022
3	Dogger Bank Teesside B	1,153	592	1,426	2,953	6,125
3	East Anglia ONE North	403	85	54	207	749
3	East Anglia THREE	1,807	1122	1,499	1,524	5,952
3	East Anglia TWO	281	44	136	230	692

Tier	OWF	Estimated number of birds at risk of displacement				
		Breeding	Autumn migration	Winter	Spring migration	Year round
3	Hornsea Project Three	630	2,020	3,649	2,105	8,404
3	Inch Cape	1,436	2,870	651	-	4,957
3	Moray West	2,808	3,544	184	3,585	10,121
3	Norfolk Boreas	630	263	1,065	345	2,303
3	Norfolk Vanguard	879	866	839	924	3,508
-	TOTAL: TIERS 1-3	32,124	35,100	24,095	32,531	123,848
4	Hornsea Project Four	386	4,311	455	449	5,600
-	TOTAL: TIERS 1-3 plus Hornsea Project Four	32,510	39,411	24,550	32,980	129,448
5	Rampion 2 (PEIR)	44	18	22	2,130	2,214
5	North Falls (PEIR)	168	266	2,565	1,860	4,859
5	Five Estuaries (PEIR)	90	284	1,046	756	2,176
-	TOTAL: TIERS 1-4 plus R2, NF and FE	32,812	39,979	28,183	37,726	138,697
4	DEP (ES Mean) ¹	923	3,741	845	320	5,829
4	SEP (ES Mean) ¹	316	759	686	144	1,905
-	TOTAL: All projects plus SEP and DEP (Mean)	34,051	44,479	29,714	38,190	146,431

¹ Values have been corrected for an error in the presented data in the ES [Appendix 11.2 – Information to Inform the Offshore Ornithology Cumulative Impact Assessment](#) [APP-196], which resulted in the mean peak counts for the breeding season and autumn migration season being mistakenly reversed. The year-round totals used in the displacement assessment are unchanged.

Table 7 Cumulative displacement matrix for razorbill, with the ranges of displacement and mortality considered by the assessment shown in red

		Mortality (%)										
		1	2	3	4	5	10	20	30	50	80	100
Displacement (%)	10	146	293	439	586	732	1464	2929	4393	7322	11714	14643
	20	293	586	879	1171	1464	2929	5857	8786	14643	23429	29286
	30	439	879	1318	1757	2196	4393	8786	13179	21965	35143	43929
	40	586	1171	1757	2343	2929	5857	11714	17572	29286	46858	58572
	50	732	1464	2196	2929	3661	7322	14643	21965	36608	58572	73216
	60	879	1757	2636	3514	4393	8786	17572	26358	43929	70287	87859
	70	1025	2050	3075	4100	5125	10250	20500	30751	51251	82001	102502
	80	1171	2343	3514	4686	5857	11714	23429	35143	58572	93716	117145
	90	1318	2636	3954	5272	6589	13179	26358	39536	65894	105430	131788
	100	1464	2929	4393	5857	7322	14643	29286	43929	73216	117145	146431