FIVE ESTUARIES
OFFSHORE WIND FARM

FIVE ESTUARIES OFFSHORE WIND FARM

ENVIRONMENTAL STATEMENT

VOLUME 6, PART 5, ANNEX 4.15: APPORTIONING NOTE (TRACKED)

Application Reference	EN010115
Application Document Number	6.5.4.15
Revision	B
Pursuant to	Deadline 1
Ecodoc Number	005061244-02
Date	October 2024

In preparation of this document Five Estuaries Wind Farm Ltd has made reasonable efforts to ensure that the content is accurate, up to date and complete for purpose.

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
B	Oct-24	Deadline 1	GoBe	GoBe	VE OWFL

CONTENTS

TABLES

DEFINITION OF ACRONYMS

Term	Definition
BDMPS	Biologically Defined Minimum Population Scales
CRM	Collision Risk Modelling
DAS	Digital Aerial Survey
HRA	Habitats Regulations Assessment
MMF	Mean-Maximum Foraging
OWF	Offshore Windfarm
RIAA	Report to Inform Appropriate Assessment
SD	Standard Deviation
SPA	Special Protection Area
WTG	Wind Turbine Generators

GLOSSARY OF TERMS

Term	Definition
The Project	Refers to the Five Estuaries Offshore Wind Project
Array area	The area offshore within the order limits within which the generating stations will be situated (including wind turbine generators (WTG), offshore platforms and Inter-array cables).
Baseline	The status of the environment at the time of assessment without the development in place.
Habitats Regulations Assessment (HRA)	Habitats Regulations Assessment. A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

1 INTRODUCTION

1.1.1 This annex supplements the Report to Inform Appropriate Assessment (RIAA), with the aim of outlining the Project methodology and approach to the apportioning of impacts from the Five Estuaries (hereafter "VE") offshore wind farm (OWF) to ornithological receptors at designated sites screened in for assessment (see Environmental Statement: Volume 5, Report 4.2: HRA Screening Report) and the SNCBs recommended approach based on section 42 comments. The direct impact of VE OWF has been assessed and presented in the corresponding Offshore Ornithology Environmental Statement (ES) chapter (Volume 6, Part 2, Chapter 4: Offshore Ornithology) and Collision Risk Modelling (CRM) Annex (Volume 6, Part 5, Annex 4.8: Collision Risk Modelling Inputs and Outputs). The approach by which collision and displacement induced mortalities are apportioned to relevant sites is detailed within this report.

1.2 CONSULTATION

1.2.1 Table 1.1 outlines the consultations and the key issues raised with SNCBs regarding apportioning methods.

Table 1.1 Summary of consultation relating to apportioning.

Date and consultation phase/type	Consultation and key issues raised	Comment
February 2020 Pre-scoping ETG meeting	It was agreed to consider colony specific data where it is available in addition to the Woodward *et al*., (2019) ranges within the Report to Inform Appropriate Assessment.	Noted and implemented where appropriate.
June 2023 Section 42 comments	RSPB advise using site specific demographic data from Havergate Island regarding productivity rates when calculating the compensation quantum.	The use of productivity rates from Havergate Island has been discussed in this document.
	NE advise using multiple sources when apportioning LBBG to AOE SPA including tracking data. NE feel the NatureScot tool for apportioning may underestimate impacts.	Tracking data from AOE SPA has been considered in the apportioning methods.
	NE concerned at the inclusion of Dutch colonies in the LBBG apportioning due to lack of connectivity outlined in tracking studies.	Dutch colonies have been removed from apportioning calculations.

Date and consultation phase/type	Consultation and key issues raised	Comment
	For small offshore sites Natural England's best practice is to use site specific data on aging not the proportions from BDMPS (Furness, 2015).	Use of site-specific aging from Digital Aerial Survey (DAS) data has been used in the NE approach to LBBG apportioning.
August 2023 Post PEIR ETG comments	NE suggested using 100% apportioning to FFC SPA for Gannet as there is no connectivity with the Channel Islands colonies.	Recent tagging data from Alderney (Warwick-Evans *et al*, 2017) suggest that gannets from the colony do travel to VE site during breeding season (Section 2.2). It was agreed with Natural England to apportion 74% to FFC SPA (Natural England Ref: DAS/27347/464150, 29th January 2024).
January 2024 Natural England Discretionary Advice Service for the LBBG and Gannet Apportioning Update.	Natural England welcomes the omission of the French colony at Rouzic from the apportioning process due to tracking studies demonstrating a lack of connectivity, and the allocation of all gannets to the Flamborough and Filey Coast (FFC) SPA or Alderney Ramsar site. However, we question the number of birds currently apportioned to either of these sites. We believe the population quoted for Alderney Ramsar site (the Channel Islands) is incorrect. According to the reference given by VE, 8,540 apparently occupied sites (or pairs) were counted by the Alderney Wildlife Trust in their 2021 census. This is equivalent to 17,080 individual adults	We have agreed with this apportioning set out by Natural England for gannet and have apportioned 74% to FFC SPA. (Natural England Ref: DAS/27347/464150, 29th January 2024).

Date and consultation phase/type	Consultation and key issues raised	Comment
	and much less than the 28,356 birds inputted by VE. Furthermore, the population count used for the FFC SPA was taken from the 2023 census instead of the more appropriately timed 2022 census i.e., when the counts would have been closer in time to the project survey and Alderney counts. The Seabird Monitoring Programme (SMP) quotes the 2022 census of gannets for the FFC SPA as 13,125 apparently occupied sites (AOS) or 26,250 breeding adults. Using the macros embedded in the 'apportioning update' spreadsheet provided by VE (20 December 2023) and these revised population figures, our provisional estimate indicates 74% of the gannets should be apportioned to the FFC SPA and 26% of the birds to the Ramsar site at Alderney in the Channel Islands.	
January 2024 Natural England Discretionary Advice Service for the LBBG and Gannet Apportioning Update.	Natural England examined the source material provided by VE for LBBG apportioning regarding urban colonies and agreed that 40% apportioning for AOE SPA was appropriate.	40% apportioning of adult LBBG for AOE SPA was used.

2 APPLICANT APPORTIONING METHODOLOGY

2.1 BIO-SEASONS

2.1.1 It is important to consider seasonality within the assessments because seabird behaviour and distributions change throughout the year. For example, species are present at different times of year depending on their migration patterns and during the breeding season birds attending their nests are restricted by the distance over which they can forage. Therefore, we assign species biologically defined seasons (bio-seasons) over which there are distinct differences in population sizes or distributions to more accurately assess the impact of OWFs over these periods. The bio-seasons used throughout the assessments underpinning the results presented within the RIAA were defined from Furness (2015) for all screened in species (see Volume 6, Part 2, Chapter 4: Offshore Ornithology, Volume 6, Part 5, Annex 4.8: Collision Risk Modelling Inputs and Outputs). Consequently, the impacts were apportioned to SPAs within each of these bio-seasons.

2.1.2 As can be seen in Table 2.1 some species have a different number of non-breeding bio-seasons to account for periods during which substantial migration of the species occurs through UK waters. Notably, in all cases the full breeding seasons (as opposed to migration-free breeding) were used, which incorporate the modal return to the colony through to the modal departure from the colony at the end of breeding (Furness, 2015). Using the full breeding season is generally considered a more precautionary approach because the impacts are apportioned to fewer colonies during the breeding season compared with the non-breeding season.

2.1.3 Furness (2015) defines the post-breeding (autumn) migration, and pre-breeding (spring) migration periods, based on the periods during which substantial migration of the species occurs through UK waters. As a result, the migration periods overlap somewhat with the UK breeding season and with the non-breeding season, since timing of migrations of birds from high latitude regions can differ from that of UK birds.

Table 2.1: Bio-seasons of species screened in for assessment, as defined by Furness (2015)

Species	Bio-season					
	Migration free breeding	Post-breeding migration	Return migration	Migration -free winter	Breeding	Non-breeding
Kittiwake	-	Aug - Dec	Jan - Apr	-	-	-
Lesser black-backed gull	-	Aug - Oct	Mar - Apr	Nov - Feb	Apr - Aug	-
Guillemot	-	-	-	-	Mar - Jul	Aug - Feb
Razorbill	-	Aug - Oct	Jan- Mar	Nov - Dec	Apr - Jul	-
Red-throated diver	-	Sep - Nov	Feb - Apr	Dec - Jan	-	-
Gannet	-	Sep - Nov	Dec - Mar	-	Mar - Sep	-

2.2 BREEDING SEASON APPORTIONING

2.2.1 Apportioning impacts from VE to specific designated (breeding) seabird populations during the breeding season was undertaken using the interim guidance from NatureScot, (2018) and the best practice guidance from Natural England (Parker *et al*, 2022). Breeding adults are limited in the distance and number of days over which they can forage by the need to return regularly to the nest site, therefore it can be expected that a high proportion of adult birds potentially affected by offshore wind farm impacts can be attributed to colonies within foraging range. The NatureScot (2018) guidance provides an evidence led approach which uses this principle and thus calculates which colonies estimated collision and displacement induced mortalities are likely to be attributed to during the breeding bio-season. This guidance was deemed the most appropriate to use for assessing the impact from VE. Additionally, this approach has been widely used and well established for use throughout the UK. The methodology calculates an estimated proportion of breeding adults associated with each colony based on the following parameters:

- The population size of each colony;
- The distance from each colony (geometric centre) to Project arrays (geometric centre); and
- The proportion of sea within the mean-maximum foraging (MMF) range +1 Standard Deviation (SD) of the colony, as published by Woodward et al. (2019).

2.2.2 NatureScot (2018) guidance states using the following equation for apportioning calculations:

$$Weight = \left(\frac{Colony\ Population}{Sum\ of\ Populations}\right) \times \left(\frac{Sum\ of\ Distance^2}{Colony\ Distance^2}\right) \times \left(\frac{\frac{1}{Colony\ Sea\ Proportion}}{Sum\ of\ \frac{1}{Sea\ Proportions}}\right)$$

2.2.3 The guidance (NatureScot, 2018 & Parker *et al*, 2022) suggests including colonies in the apportioning calculations that are within the MMF range of the species. However, it is worth noting that in the UK, it is becoming more widely expected that designated sites should be screened based on the MMF range +1SD presented in Woodward *et al.* (2019). On this basis, all designated Special Protection Areas (SPAs) and Ramsar sites within MMF range +1SD were included.

2.2.4 As well as using the NatureScot (2018) guidance, this was supplemented with tagging data as requested by Natural England for both lesser black-backed gulls at the Alde-Ore Estuary (AOE) SPA and gannets at Flamborough and Filey Coast (FFC) SPA.

DISTANCE FROM COLONY TO PROJECTS

2.2.5 Distances were calculated using Geographic Information Systems (GIS) and were measured from geometric centre of the colony to geometric centre of the Project's array. Where straight line distances crossed over land, at-sea distances were calculated by clipping the RTD Irwin density data to the relevant area (ECC, ECC with buffer) and calculating an average density. Where there were multiple colonies for an SPA within MMF range or MMF range +1SD then each colony was considered separately, therefore distances were based on the centre of each colony rather than the centre of the SPA. Note that assessing from geometric centre is the proposed approach given within the NatureScot (2018) apportioning guidance. However, where sites were within MMF range +1SD from edge of colony to edge of array but were beyond MMF range +1SD when going from centre to centre, these SPAs were still included in the apportioning analysis as there is still potential connectivity with the wind farm.

PROPORTION OF SEA WITHIN FORAGING RANGE

2.2.6 The area of suitable foraging habitat within the sea for each species from each colony was calculated as follows: using GIS, a buffer was drawn around each colony for each species equivalent to their MMF range +1SD. The foraging area used for all species was only considered to be the at sea area, therefore any land, estuaries or freshwater bodies of water were excluded. Where areas of sea were within foraging range from the colony by straight line but were further than foraging range when assuming birds only travel over sea, these areas were excluded manually. The resultant area was then converted into a proportion by dividing this area by the area of the circle with radius equal to the species specific MMF range +1SD.

2.2.7 Using the calculation and parameters described above, a resultant weighting for each colony within foraging range was calculated.

2.2.8 An overview of the input values and resulting apportionment to the Flamborough and Filey Coast (FFC) SPA for gannet and Alde-Ore Estuary (AOE) SPA for lesser-black backed gull is presented in Table 2.3 and Table 2.4 respectively as per NatureScot (2018) methodology.

APPORTIONING ADULTS IN THE POPULATION

2.2.9 To calculate the proportion of mortalities that would be attributed to each SPA, the NatureScot (2018) apportioning tool requires the number of breeding adults that are impacted by the OWF (as opposed to individuals which are calculated by CRM and displacement). For the Applicants approach to the assessment, the proportion of adults in the population during the breeding season was derived from the tables in Appendix A of Furness (2015) and is presented in Table 2.2 below. These adult proportions are only applied during the breeding season apportioning.

2.2.10 The site-specific DAS data for aged birds is unreliable and incomplete with over 50% of birds unaged for three key species, kittiwake, lesser black-backed gull and gannet. Guillemot, razorbill and red-throated diver were not aged from the DAS data. The aging of lesser black-backed gulls from DAS data can be complex with difficulties differentiating between juvenile and immature birds as well as the inability to separate birds that are 3rd and 4th calendar year or adult-like birds.

2.2.11 Given that the uncertainties with aging are from non-adult birds and that some ages are less likely to be recorded than others, the Project does not believe that the DAS data is reliable enough to use for adult apportioning. The results from the DAS data and the national proportions found in Furness (2015) for each species can be found in Table 2.2.

2.2.12 The data presented in Furness (2015) are considered to provide a more accurate representation of population age structure than site-based data, since only a small proportion of individuals for each species could be positively aged within the latter, especially due to the low number of recorded birds during the non-breeding season within the site-specific surveys. During the full breeding bio-season the proportion of adult birds within the array was derived from Appendix A: Table 16 of Furness (2015) for the FFC SPA.

2.2.13 Both the Project and Natural England approaches to apportioning adults are presented in this note for lesser black-backed gull and gannet.

2.2.14 This provides a resultant proportion of adult mortalities attributed to each colony. Where an SPA consists of more than one colony, the total number of birds apportioned to that SPA is the sum of birds apportioned to each constituent colony.

Table 2.2: The proportion of adults in the population during the breeding season, derived from Furness (2015) and the proportion of adults from the site-specific DAS data

Species	Proportion of adults during the breeding season (Furness, 2015)	Proportion of adults from site-specific DAS data	Sabbatical rate (Marine Scotland, 2017)	Proportion of adults during the breeding season including sabbaticals (Furness, 2015	Proportion of adults from site-specific DAS data including sabbaticals	Proportion of birds aged from site-specific DAS data
Kittiwake	0.532	0.880	0.1	0.48	0.79	0.431
Lesser black-backed gull	0.595	0.800	0.35	0.39	0.51	0.414
Guillemot	0.575	-	0.07	0.53	-	-
Razorbill	0.571	-	0.07	0.53	-	-
Red-throated diver	-	-	-	-	-	-
Gannet	0.552	0.820	0.1	0.50	0.74	0.465

SABBATICAL RATES

2.2.15 During any given year there will be a proportion of the adult population of any species that will not breed. There is a range of likely reasons for this, with some birds being limited by ecological constraints that do not allow birds to breed in a given year (e.g., poor weather conditions or food availability), while other long-lived species will regularly make an adaptive decision to avoid breeding in certain years to ensure long term survival and future breeding opportunities (Reed *et al*., 2015; Leith *et al*., 2022; Desprez *et* al., 2011). This behaviour is evidenced across a wide range of species, including kittiwake (e.g., Desprez *et al*., 2011) and auks (e.g., Reed *et al*., 2015).

2.2.16 Sabbatical rates (representing the proportion of birds not breeding in a given year) were incorporated into the assessment where available to provide a more accurate approach to the number of adults using the array area that are actually breeding in the SPAs that given year.

2.2.17 Rates used are presented in Table 2.2 and are based on available guidance and literature. The sabbatical rates presented align with those recommended by Marine Scotland for the Seagreen Phase 1 Offshore Project (Marine Scotland, 2017).

2.2.18 For guillemot and razorbill, the rate used aligns with long-term guillemot data (1982 – 2014) from the Isle of May, finding an average sabbatical rate of 7% across this period (Reed *et al*., 2015), while other research also shows that between 5 and 10% of guillemots will not breed in a given year (Harris and Wanless, 1995). Though research on razorbill is limited, their similar life history to guillemots means that the value of 7% is also considered relevant.

2.2.19 In kittiwake, a 22-year mark-recapture study of 9,970 individuals shows that kittiwakes avoid breeding ~10% of the time, aligning with the Marine Scotland (2017) advised rate, though notably the study does not calculate an average as this was not the study aim (Desprez *et al*., 2011).

2.2.20 For lesser black-backed gull, research has also shown that up to 40% of individuals which have previously bred may fail to breed in a given year, and therefore the value of 35% advocated by Marine Scotland (2017) is considered to be both relevant and sufficiently precautionary.

2.2.21 Research on gannets is limited, however, given their life history, being a long-lived seabird and generally having (up to) one chick per annum, a relatively high proportion of birds each year is also expected to exhibit this behaviour based on available research in species with similar life history traits (e.g., red-footed booby; Cubaynes *et al*., 2010). Therefore, the value of 10% advocated by Marine Scotland (2017) is considered to be a sufficiently precautionary value until further evidence is available.

GANNET AND LESSER BLACK-BACKED GULL BREEDING SEASON APPORTIONING

2.2.22 Gannet apportioning for the breeding season is presented in agreement with Natural England as 74.0% apportioned to FFC (Table 2.3). The approach used has apportioned 26.0% to colonies in the Alderney West Coast and Burhour Islands Ramsar site using the most recent colony counts for Alderney West Coast and Burhour Islands Ramsar in 2021 and the FFC SPA counts from 2022 (most relevant counts to the DAS data and Alderney counts). The Alderney colonies were selected due to connectivity with the sites as found in the tagging studies from the island (Warwick-Evans *et al*, 2017).

2.2.23 The lesser black-backed gull apportioning for the AOE SPA is 40.0% of the birds found in VE. The apportioning considers several large local colonies from non-SPA sites, in line with the approach used by East Anglia One North and East Anglia 2 (MacArthur Green *et al*, 2020). Rock (2021) found that the Felixstowe port and town population was estimated at 1,572 pairs, while MacArthur Green *et al* (2020) used further local urban colony numbers, 250 pairs at Ipswich, 2,000 pairs at Lowestoft and 1,200 pairs at Great Yarmouth and Southtown. Other colonies within nearby SPAs at Hamford Water (600 pairs) and Outer Trial Bank (1,300 pairs) were also used. The 1,749 pairs found at AOE SPA equates to just 20% of the East Anglian population based on these figures. However, as VE is closest to the AOE SPA VE OWFL consider the apportioning of 40.0% to be a highly precautionary estimate of the lesser black-backed gulls using the VE site area. Based on the evidence provided above Natural England have agreed that 40% is a suitable apportioning for the AOE SPA.

2.2.24 Studying the most recent tracking data (Green *et al*, 2023) found no (12 birds) or low (7 birds) interaction with VE from 19 tagged birds from AOE SPA in 2020. The data from 2019 where 30 birds were tagged at the AOE SPA showed more interaction within the VE area, although the majority had moderate to no connectivity. In both years the tagged birds utilised the south section of VE more often than the north (Green *et al*, 2023).

Table 2.3: Gannet calculation values following the NatureScot Apportionment methodology (NatureScot 2018)

Colony Name	Distance from VE (km)	Count (FFC - Clarkson *et al*, 2022) (Alderney – Alderney Wildlife Trust, 2021)	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
FFC	276	26,250	52.4	0.019	76176.000	0.868	0.740
Alderney West Coast & Burhour Islands Ramsar	380.7	17,080	51.1	0.020	144932.490	0.304	0.259

Table 2.4: Lesser black-backed gull calculation values following the NatureScot Apportionment methodology (NatureScot 2018), with colonies forming the Alde-Ore Estuary SPA in bold. (Felixstowe numbers taken from Rock, 2021)

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Arc Pit RSPB	137.5	12	35.5	0.03	18906.25	0.001	0.000
Ashford (urban)	98.6	8	49.6	0.02	9728.70	0.001	0.000
Berney Marshes	73.8	40	68.5	0.01	5439.99	0.005	0.001
Bexhill 1 (urban)	171.6	6	33.7	0.03	29446.56	0.000	0.000
Bexhill 2 (urban)	172.3	6	34.3	0.03	29687.29	0.000	0.000
Birchington (urban)	66.3	80	49.4	0.02	4398.06	0.019	0.004
Blakeney Point	159.8	8	53.7	0.02	25536.04	0.000	0.000
Breydon Water	75.3	36	70.7	0.01	5675.12	0.005	0.001
Brighton 2 (urban)	219.4	2	34.4	0.03	48136.36	0.000	0.000
Brighton 3 (urban)	220.4	4	34.2	0.03	48576.16	0.000	0.000
Brighton 4 (urban)	220.7	2	34.1	0.03	48708.49	0.000	0.000

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Burntwick Island	103.0	6	40.6	0.02	10608.01	0.001	0.000
Burrowes Pit RSPB	138.5	0	35.6	0.03	19182.25	0.000	0.000
Canterbury	84.9	6	48.2	0.02	7212.73	0.001	0.000
Chelmsford Town	109.6	4	28.0	0.04	12019.93	0.001	0.000
Clacton Railway Station	61.7	6	44.5	0.02	3808.32	0.002	0.000
Cobmarsh Island	79.5	4	37.8	0.03	6314.43	0.001	0.000
Cuckmere Haven to Birling Gap	197.2	0	34.3	0.03	38887.84	0.000	0.000
Eastbourne 1 (urban)	190.0	1	34.5	0.03	36100.00	0.000	0.000
Eastbourne 3 (urban)	188.0	2	33.9	0.03	35344.00	0.000	0.000
Eastbourne 4 (urban)	187.3	4	33.8	0.03	35081.29	0.000	0.000
Elmley RSPB Reserve	95.5	0	43.8	0.02	9128.63	0.000	0.000

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Faversham (buildings)	86.5	10	47.3	0.02	7476.14	0.001	0.000
Felixstowe Docks	52.3	3144	51.1	0.02	2733.25	1.142	0.266
Flanders Mare	93.2	0	44.5	0.02	8691.45	0.000	0.000
Folkestone Rooftops	95.0	6	50.5	0.02	9019.14	0.001	0.000
Fox's Marina / Ipswich Docks	65.5	21	47.5	0.02	4293.07	0.005	0.001
Gillingham Business Park (urban)	110.8	0	40.9	0.02	12284.74	0.000	0.000
Great Cob Island	81.2	0	37.3	0.03	6589.28	0.000	0.000
Great Yarmouth	73.0	1500	55.8	0.02	5329.00	0.256	0.060
Greenborough	103.0	33	41.3	0.02	10601.72	0.004	0.001
Hamford Water	55.5	166	48.0	0.02	3076.58	0.057	0.013
Harbour Heights/Newhaven	206.8	6	34.1	0.03	42766.24	0.000	0.000

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Hastings 2 (urban)	166.5	2	33.3	0.03	27722.25	0.000	0.000
Hastings 3 (urban)	165.5	2	33.5	0.03	27390.25	0.000	0.000
Havergate Island	**42.4**	**3048**	**58.1**	**0.02**	**1793.81**	**1.483**	**0.346**
Holkham NNR	169.3	10	50.5	0.02	28662.49	0.000	0.000
Hollesley Marsh	44.7	4	56.7	0.02	1996.69	0.002	0.000
Holme Dunes NNR	189.9	0	43.1	0.02	36062.01	0.000	0.000
Hove 2	223.5	4	34.5	0.03	49952.25	0.000	0.000
Hove 4	223.6	0	34.5	0.03	49996.96	0.000	0.000
Hunstanton Town	191.7	2	43.7	0.02	36748.89	0.000	0.000
Littlehampton 2	226.8	2	34.4	0.03	51438.24	0.000	0.000
Lowestoft	59.8	4000	70.5	0.01	3573.58	0.805	0.188
Maidstone (buildings)	118.3	16	43.0	0.02	13987.32	0.001	0.000
Maplin Bank	86.3	2	41.6	0.02	7452.65	0.000	0.000
Marden	125.6	2	45.7	0.02	15785.07	0.000	0.000

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Margate, Kingsgate, Ramsgate & Broadstairs (urban)	60.0	40	50.1	0.02	3598.66	0.011	0.003
Medway City Estate (urban)	113.3	12	39.3	0.03	12825.77	0.001	0.000
Minsmere RSPB (Scrape & Beach)	43.3	4	64.2	0.02	1872.20	0.002	0.000
Mocketts Saltmarsh	90.2	4	45.2	0.02	8130.08	0.001	0.000
Nor Marsh RSPB	107.9	4	40.2	0.02	11643.64	0.000	0.000
North Point Pit	152.3	12	34.6	0.03	23195.29	0.001	0.000
Orfordness Beach (Orford Ness 1)	**40.8**	**450**	**58.8**	**0.02**	**1667.93**	**0.233**	**0.054**
Outer Trial Bank	210.8	1164	34.9	0.03	44436.64	0.038	0.009
Packingshed Island	79.6	4	37.8	0.03	6338.03	0.001	0.000
Pewet Island	80.8	20	37.8	0.03	6529.77	0.004	0.001

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Quarry Wood Industrial Estate (urban)	120.8	8	42.0	0.02	14597.19	0.001	0.000
Ransomes and Rapiar (Industrial Site)	65.2	30	47.9	0.02	4248.70	0.007	0.002
Ransomes Euro Park (urban)	61.4	100	49.3	0.02	3771.16	0.027	0.006
Rat Island	74.1	16	39.9	0.03	5485.95	0.004	0.001
Reavels (Industrial Site)	67.2	28	47.1	0.02	4509.62	0.007	0.002
Rustington (urban)	205.6	4	33.7	0.03	42271.36	0.000	0.000
Rye Harbour Industry	152.0	10	34.6	0.03	23104.00	0.001	0.000
Rye Harbour SSSI	153.8	0	34.1	0.03	23654.44	0.000	0.000
Seaford 3	201.9	4	33.5	0.03	40763.61	0.000	0.000
Shell Ness (Isle of Sheppey)	92.2	0	44.0	0.02	8493.44	0.000	0.000

Colony Name	Distance from VE (km)	Count	Percentage sea	1/P(Sea)	Distance^2	Resulting Weight for colony	Proportional Weight of colony
Snettisham RSPB	201.7	0	35.9	0.03	40682.89	0.000	0.000
Southtown	73.0	900	55.8	0.02	5329.00	0.153	0.036
Stiffkey	159.7	28	52.3	0.02	25504.09	0.001	0.000
Sunken Island	80.6	2	37.4	0.03	6494.51	0.000	0.000
Whitstable (urban)	83.2	14	46.5	0.02	6914.24	0.002	0.001
Total	**8878.8**	**15075**	**3111.3**	**1.74**	**1329411.74**	**4.291**	**1.000**
Alde-Ore Estuary SPA Total	-	**3498.0**	**-**	**-**	**-**	**-**	**0.3999**

2.3 NON-BREEDING SEASON APPORTIONING

2.3.1 Outside of the breeding bio-season, the population of birds contains a mix of individuals from UK breeding colonies and from further away, therefore, a much lower percentage of birds can be attributed to any particular breeding colony population. Apportionment for VE during the non-breeding bio-seasons was undertaken by calculating the proportion that each SPA colony population contributes to the nonbreeding bio-geographical population. This approach is agreed the best current practice by UK Statutory Nature Conservation Bodies (Nature Scot, 2018 & Parker *et al*, 2022)), and used the following equation:

$$\frac{Designated\ site\ population\ size}{Regional\ population\ size}\ x\ Proportion\ of\ population\ that\ remain\ during\ season$$

2.3.2 The resulting apportionment is presented in Table 2.5 below.

Table 2.5: Species bio-season apportionment of BDMPS population to SPAs as derived from Furness (2015) during the non-breeding season and the apportionment using the methods agreed with Natural England for lesser black-backed gull and gannet.

Species	Bio-season	SPA	% Apportioned to SPA
Kittiwake	Return migration	FFC	7.19
	Post-breeding migration		5.44
Lesser black-backed gull	Return migration	AOE	3.33
	Full breeding		~~35.5~~40.0
	Post-breeding migration		3.33
	Migration-free winter		4.92
Guillemot	Non-breeding	Farne Islands	3.73
		FFC	4.41
Razorbill	Return migration	FFC	3.38
	Post-breeding migration		3.38

Species	Bio-season	SPA	% Apportioned to SPA
	Migration-free winter		0.91
Gannet	Return migration	FFC	6.23
	Full breeding		74.0
	Post-breeding migration		4.85

2.4 COLONY POPULATION SIZES

2.4.1 Once apportioned, the impacts from VE on relevant designated sites, were assessed against both citation counts, and more recent counts provided in Table 2.6. Citation counts were based on the citation documents provided for relevant sites (Natural England, 2021). More recent colony sizes were based on data provided in the Seabird Monitoring Programme Database (JNCC, 2020) for all species except red throated diver which was based on Iden et al. (2019). The count data used was based on the year/s corresponding to the baseline surveys (2019 – 2021) or the closest year available. Where more than one colony count was available during the baseline survey years, the average of all counts was used. All counts were converted into the number of individual breeding adults. Counts used in the assessment for screened in sites are presented in Table 2.6 below.

Table 2.6: Population abundance data used in assessment for screened in sites and features, with citation and most recent counts and year.

Site	Species	Citation count (individuals) (year)	Updated count (year)
Outer Thames Estuary SPA	Red-throated diver	**6,466** (1989-2006/07)	**22,280** (2019)
Flamborough and Filey SPA	Gannet	**16,938** (2008-2012)	**30,466** (2023)
	Guillemot	**83,214** (2008-2011)	**149,980** (2022)
	Razorbill	**21,140** (2008-2012)	**61,346** (2022)
	Kittiwake	**89,040** (1987)	**89,148** (2022)
Farne Islands SPA	Guillemot	**65,751** (2010-2014)	**64,042** (2019)
	Razorbill	**572** (2001)	**427** (2019)
Alde-Ore Estuary SPA and Ramsar	Lesser black-backed gull	**28,140** (1994/97)	**3,498** (2022/23)

3 SUMMARY

LESSER BLACK-BACKED GULL

3.1.1 The adult apportioning of lesser black-backed gull is presented in two ways:

- VE approach – 0.39 (Furness with sabbaticals)
- NE approach – 0.80 (site specific DAS data)

3.1.2 The Project believes that VE approach is the most appropriate results as the approach is evidence driven, which provides a balanced and appropriately conservative assessment of the impacts. Uncertainties in parameters have been included in collision risk modelling and results have been presented with associated confidence intervals.

ALL OTHER SPECIES

~~3.1.2~~3.1.3 The apportioning to SPA and aging has been agreed with Natural England for all other species and is presented using one method.

4 REFERENCES

Calladine, J. & Harris, M.P. (2008), 'Intermittent breeding in the Herring Gull Larus argentatus and the Lesser Black-backed Gull Larus fuscus', IBIS, 139, 2.

Cubaynes, S., Doherty, P.F., Schreiber, E.A. & Gimenez, O. (2010), ' To breed or not to breed: a seabird's response to extreme climatic events', Biology Letters, 7, 2.

Desprez, M., Pradel, R., Cam, E., Monnat, J-Y. & Giminez, O. (2011), 'Now you see him, now you don't: experience, not age, is related to reproduction in kittiwakes', Proc Royal B, 278, 1721.

Furness, R.W. (2015), 'Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS), Natural England Commissioned Reports, Number 164.

Green, R.M., Thaxter, C.B., Johnston, D.T., Boersch-Supan, P.H., Bouten, W. & Burton, N.H.K. (2023), 'Assessing movements of Lesser Black-backed Gulls using GPS tracking devices in relation to the Galloper Wind Farm.

Harris, M.P. & Wanless, S. (1995), 'Survival and non-breeding of adult Common Guillemots Una aalge', ibis, 137, 2.

Irwin, C., Scott, M., S., Humphries, G. & Webb, A. (2019), HiDef report to Natural England - Digital video aerial surveys of red-throated diver in the Outer Thames Estuary Special Protection Area 2018. Natural England Commissioned Reports, Number 260.

JNCC. (2022), 'Seabird Monitoring Programme', [Accessed November 2022]. Available at: [redacted]

MacArthur Green & Royal HaskoningDHV (2020). 'East Anglia ONE North and East Anglia TWO Offshore Windfarms Offshore Ornithology Cumulative and In-Combination Collision Risk Update.

[redacted]

Leith, F.W., Grigg, J.L., Barham, B.J., Barham, P.J., Ludynia, K., McGeorge, C., Mdluli, A., Parsons, N.J., Waller, L.J. & Sherley, R.B. (2022), 'Intercolony variation in reproductive skipping in the African penguin', Ecology and Evolution, 12, 9.

Natural England. (2021), 'Designated Sites View', [Accessed November 2022]. Available at: [redacted]

NatureScot. (2018), Interim Guidance on apportioning impacts from marine renewable developments to breeding seabird populations in SPAs. Available at:h[redacted]

Parker, J., Fawcett, A., Banks, A., Rowson, T., Allen, S., Rowell, H., Harwood, A., Ludgate, C., Humphrey, O., Axelsson, M., Baker, A. & Copley, V. (2022c). Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase III: Expectations for data analysis and presentation at examination for offshore wind applications. Natural England. Version 1.2. 140 pp.

Reed, T., Harris, M.P. & Wanless, S. (2015), 'Skipped breeding in common guillemots in a changing climate: restraint or constraint?', Front. Ecol. Evol. 3.

Rock, P. (2021) Gulls breeding at the Port of Felixstowe

Warwick-Evans, V., Atkinson, P.W., Walkington, I. & Green, J.A. (2017) Predicting the impacts of wind farms on seabirds: An individual-based model. Journal of Applied Ecology. 2018; 55:503-515

Woodward, I., Thaxter, C.B., Owen, E., and Cook, A.S.C.P. (2019), 'Desk-based revision of seabird foraging ranges used for HRA screening', British Trust for Ornithology research report number 724.

FIVE ESTUARIES
OFFSHORE WIND FARM

PHONE 0333 880 5306
EMAIL fiveestuaries@rwe.com
WEBSITE www.fiveestuaries.co.uk
ADDRESS Five Estuaries Offshore Wind Farm Ltd
Windmill Hill Business Park
Whitehill Way, Swindon, SN5 6PB
COMPANY NO Registered in England and Wales
company number 12292474