



Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Review of 2022 Highly Pathogenic Avian Influenza (HPAI)
outbreak on relevant UK seabird colonies

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1 Introduction

1. This note provides a review of the known effects of Highly Pathogenic Avian Influenza (HPAI) on seabird colonies considered relevant to the assessment of the Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP). This has been undertaken at the request of Natural England and the Examining Authority (ExA) to inform the Examination of the SEP and DEP. This note has been prepared and submitted into examination at Deadline 4.
2. This note should be read in conjunction with the assessment of the effects on offshore ornithology receptors submitted to the Examination. The key documents are identified in **Table 1**.

Table 1: Key documents for the offshore ornithology assessment

Document	Reference
Environmental Statement (ES) Chapter 11 – Offshore Ornithology	APP-097
Environmental Statement Appendix 11.1 – Offshore Ornithology Technical Report	APP-195
Environmental Statement Chapter 4 – Project Description	APP-090
Report to Inform Appropriate Assessment (RIAA)	APP-059
Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note	REP1-056
Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B)	REP2-036

3. The requirement to consider the effects of HPAI on the offshore ornithology assessment has been discussed between the Applicant, Natural England and the ExA on a number of occasions. Most recently, the ExA's Second Written Questions [PD-012; Q2.12.1.2] requested:

'Highly Pathogenic Avian Influenza (HPAI)

 - a) *Applicant and NE, discuss and agree how the HPAI should be accounted for in the assessments including the relevant species, colonies, methodologies and data required.*
 - b) *Provide details of the agreed approach and what further information is required in relation to assessing HPAI effects on the ES data set.*
 - c) *Provide timetable for any additional evidence gathering and the timetable for submission of material in relation to the Examination Timetable.'*
4. Regarding points a) and b), the Applicant notes Natural England's response below that revision to the quantification of impacts already presented is not expected. However, Natural England has recommended an approach to considering HPAI as set out below. Regarding point c), the Applicant is not proposing evidence gathering in addition to that already provided within this note; however, as noted in **Section 5.2**, data from Scottish colonies have been requested from stakeholders but have not yet been received. If these data are received within the timeframe of the Examination, then the Applicant will provide an update to this document.
5. In response to Q2.12.1.2, Natural England has advised the Applicant (email of 25 April 2023):

'In regards to HPAI, Natural England requests the Applicant present a summary report of:

- *how species/colonies, relevant to SEP and DEP, have been affected by HPAI in 2022 - we would expect this to primarily refer to HPAI mortality data (NE held data supplied), from both English colonies and further afield and include some description of the limitations of these data.*
- *We do not expect any revision to the quantification of impacts already presented by SEP and DEP, instead this data will be used to contextualise the vulnerability of these populations to additional impacts.'*

6. As above, Natural England has also provided the Applicant with 2022 HPAI data (in the form of an Excel spreadsheet containing HPAI mortality data from a number of sites in England, including some seabird colonies).
7. This note is therefore submitted to the Examination to provide the information requested by the ExA and Natural England.

2 Background

8. HPAI H5N1 is a highly infectious strain of avian influenza, thought to have originated in Chinese poultry operations in 1996. The strain subsequently entered wild bird populations, with significant effects on UK populations reported from November 2021. To date, wild bird infections have been recorded primarily in wildfowl, seabird and raptor species, with significant mortality reported in breeding seabird colonies during the summer of 2022. This 2022 outbreak was considered unusual, as the virus was previously thought to be seasonal, with infections reported between autumn and spring and largely absent during the summer. Seabird species affected during summer 2022 included great skua, roseate, common, sandwich and arctic tern, guillemot, black-headed gull, kittiwake and gannet (Natural England, 2022, NatureScot, 2023 and RSPB, 2023).

3 Approach

9. The review considers available data from seabird colonies within the UK North Sea and Channel area, as defined by Furness (2015). This is the area within which SEP and DEP are located, and is considered an appropriate geographic scale to assess colonies with potential connectivity to SEP and DEP. The review considers all seabird species that have been assessed within ES **Chapter 11 Offshore Ornithology** [APP-097] and the **RIAA** [APP-059], and all English and Scottish seabird colonies within the UK North Sea and Channel, where data are available. Data has been sourced from Natural England (HPAI mortality data from a number of sites in England, including some seabird colonies) and colony specific information from Flamborough and Filey Coast and Scolt Head colonies. Data has been sought for Scottish colonies, but have not been received to date. However, a NatureScot (2023) report on HPAI in wild birds has been reviewed, with the relevant information incorporated here.

4 Limitations

10. In its email of 25 April 2023, Natural England highlighted the limitations to the available HPAI mortality data for seabird colonies from 2022. This is primarily due to the difficulty in establishing accurate mortality numbers where colonies are difficult to observe/access, where restrictions in access were in place to minimise HPAI spread, and/or where birds that die may not be at the colony (e.g. at sea, with it being known that dead gannets, for example, have been recorded during aerial surveys at various offshore sites in the North Sea). There is, therefore, high uncertainty around the actual mortality numbers, and it is reasonable to assume that available data on the numbers of dead birds recorded at colonies represent an underestimate of actual mortality. Specifically, Natural England stated:

'Mortality estimates

The mortality data is a minimum estimate of impacts and likely under-represents total impacts because of mortality that has gone unobserved and/or unreported (away from the site, at sea etc).

NNC SPA Sandwich tern

Some of the key impacts are at NNC SPA. The estimates are about 10% adult mortality of Sandwich Terns, and this is likely to be an underestimate. The European Sandwich Tern network estimated that around 30% of the adult breeding population of Sandwich Tern in Europe was lost.

FFC SPA gannet

Gannet mortality records at FFC are quite low, this is partly because the disease took a while to reach FFC and partly because mortality is harder to judge on cliffs, so again this is likely to be an underestimate. Impacts on Gannet in other parts of the UK were much worse, which could have implications for the FFC population.'

5 Summary of HPAI effects on relevant seabird colonies

5.1 England

5.1.1 Black-headed gull

11. A total HPAI mortality of 663 black-headed gulls was recorded in England during 2022, with adult mortality representing approximately 0.19% of the England breeding population (**Table 2**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range (which is considered an appropriate measure of potential typical connectivity during the breeding season) from SEP and DEP (c. 19km; Woodward et al., 2019), and this species has not been screened in to the assessment of likely significant effect as a qualifying feature of any SPA [APP-059]. The ES [APP-097] estimated a small number of mortalities (annual mean <2) as a result of collision at SEP and DEP, assessed as a minor adverse effect. Any reduction in the wider black-headed gull population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. Given the low connectivity between breeding

colonies and SEP and DEP, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 2: Black-headed gull recorded HPAI mortality 2022 (England)

	Breydon Water	Coquet	Cornwall beaches	Farnes	Frampton & Freiston	Lindisfarn e	Minsmere	Old Hall Marshes	Saltholme	Scolt Head	Totals
Adult		121		30	19		15		2	180	367
Chick	9			104	72		5		3		193
Unknown			2	70	23	3		5			103
Total	9	121	2	204	114	3	20	5	5	180	663
Colony adult count ¹	0	10,586	0	1,088	3,972	0	1,736	610	2,396	4,960	-
Adult mortality as percentage of colony population	n/a	1.14%	n/a	2.76%	0.48%	n/a	0.86%	0.00%	0.08%	3.63%	-
Estimated England Breeding population ²											188,216
Adult mortality as percentage of England population											0.19%
¹ Most recent pre-2022 count from SMP database ()											
² From data provided by Natural England											

5.1.2 Common gull

12. A total HPAI mortality of two common gulls was recorded in England during 2022, with this mortality representing approximately 4.5% of the small English breeding population if it is assumed that both of the reported dead birds were breeding adults (**Table 3**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range from SEP and DEP (c. 50km; Woodward et al., 2019), and this species has not been screened in to the assessment of likely significant effect as a qualifying feature of any SPA [APP-059]. The ES [APP-097] estimated a small number of mortalities (annual mean <4, predominantly outside of the breeding season) as a result of collision at SEP and DEP, assessed as a minor adverse effect. Any reduction in the wider common gull population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. Given the low connectivity between breeding colonies and SEP and DEP, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 3: Common gull recorded HPAI mortality 2022 (England)

	Gibraltar Point	Lindisfarne	Totals
Unknown		1	1
Adult	1		1
Total	1	1	2
Colony adult count ¹	0	0	-
Adult mortality as percentage of colony population	n/a	n/a	
Estimated England Breeding population ²	44		
Adult mortality as percentage of England population	4.55%		
¹ Most recent pre-2022 count from SMP database () ² From JNCC (https://jncc.gov.uk/our-work/common-gull-larus-canus/#annual-abundance-and-productivity-by-geographical-area-england)			

5.1.3 Common tern

13. A total HPAI mortality of 1,161 common terns was recorded in England during 2022, with the recorded adult mortality representing approximately 9.2% of the England breeding population (**Table 4**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range from SEP and DEP (c. 18km; Woodward et al., 2019). The **RIAA** [APP-059] concludes that there would be no adverse effect on site integrity (alone and in-combination) for common tern from either North Norfolk Coast SPA or Greater Wash SPA. The ES [APP-097] estimated a small number of mortalities (annual mean <1.5) as a result of collision at SEP and DEP, assessed as a minor adverse. Any reduction in the wider common tern population as a result of HPAI would be expected to result in a

proportionate reduction in any collision effects. Given the low level of connectivity between breeding colonies and SEP and DEP, the small number of predicted collisions, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 4: Common tern recorded HPAI mortality 2022 (England)

	Breydon Water	Coquet	Farnes	Frampton & Freiston	Lindisfarne	Minsmere	Rye Harbour	Saltholme	Scolt Head	Totals
Adult	199	737	6	9	1	100	10	5	22	1,089
Chick	51			9				1		61
Unknown			10	1						11
Total	250	737	16	19	1	100	10	6	22	1,161
Colony adult count ¹	54	3,552	130	170	32	440	80	356	134	-
Adult mortality as percentage of colony population	n/a	21%	5%	5%	3%	23%	13%	1%	16%	-
Estimated England Breeding population ²										11,788
Adult mortality as percentage of England population										9.24%
¹ Most recent pre-2022 count from SMP database ()										
² From data provided by Natural England										

5.1.4 Gannet

14. A total HPAI mortality of 802 gannets was recorded in England during 2022, with adult mortality representing approximately 3% of the England breeding population (**Table 5**). This includes 259 dead birds recorded at the Flamborough and Filey Coast (FFC) SPA but, as set out above, it is considered likely that this represents an underestimate. Clarkson et al. (2022) and Cope et al. (2022) also noted that gannet productivity at FFC reduced significantly in 2022, from an average of c. 0.8 chicks/pair in previous years to less than 0.36 chicks/pair in 2022. It would seem likely that other birds recovered along the east coast may also be associated with FFC SPA (together with Bass Rock, which is part of the Forth Islands SPA, and potentially other colony populations from further north in Scotland). The **RIAA [APP-059]** and **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B) [REP2-036]** conclude that there would be no adverse effect on site integrity (alone and in-combination) for FFC SPA, with the predicted total mean mortality (from collisions and displacement combined) due to the project alone effects for SEP and DEP being 2.9 birds. **The Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note (Revision B) [REP3-089]** estimated a small number of mortalities (annual mean <1.5) as a result of collision at SEP and DEP, and the ES [APP-097] estimated displacement mortality of 6.81-9.08; for SEP and DEP which was assessed as minor adverse. Any reduction in the wider gannet population as a result of HPAI would be expected to result in a proportionate reduction in any collision/displacement effects at SEP and DEP. At this stage, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA because of the very small level of mortality predicted to occur as a result of the effects from SEP and DEP. However, it is recognised that this species is a source of concern, and it is unlikely that the full effects will be known until after the 2023, and subsequent, breeding seasons, and once the likelihood of continued occurrence of HPAI and the rate of population recovery is understood.

Table 5: Gannet recorded HPAI mortality 2022 (England)

	Brading Marshes	Coquet	Cornwall beaches	Dungeness	Farnes	FFC	Gibraltar Point	Lindisfarne	Scolt Head	The Lizard	Weymouth	Totals
Adult	1	6		1	1		3		2	15		29
Adult/subadult						55						55
Chick						90				1		91
Unknown			381		2	114		125			5	627
Total	1	6	381	1	3	259	3	125	2	16	5	802
Colony adult count ¹	0	0	0	0	0	26,784	0	0	0	0	0	
Adult mortality as percentage of colony population	n/a	n/a	n/a	n/a	n/a	0.21%	n/a	n/a	n/a	n/a	n/a	
Estimated England Breeding population ²												26,784
Adult mortality as percentage of England population												2.99%
¹ Most recent pre-2022 count from SMP database ()												
² From SMP database (pre-2022)												

5.1.5 Great black-backed gull

15. A total HPAI mortality of 26 great black-backed gulls was recorded in England during 2022, with adult mortality representing approximately 0.7% of the England breeding population (**Table 6**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range from SEP and DEP (c. 59km; Woodward et al., 2019), and this species has not been screened in to the assessment of likely significant effect as a qualifying feature of any SPA [APP-059]. The ES [APP-097] estimated a small number of mortalities (annual mean 0.5 birds) as a result of collision at SEP and DEP (projects alone), assessed as minor adverse. Any reduction in the wider great black-backed gull population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. Given the low connectivity between breeding colonies and SEP and DEP, the small number of predicted collisions for this species, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 6: Great black-backed gull recorded HPAI mortality 2022 (England)

	Coquet	Farnes	Rye Harbour	Total
Adult		1	20	21
Subadult	1			1
Chick		1		1
Unknown		3		3
Total	1	5	20	26
Colony adult count ¹	0	40	4	-
Adult mortality as percentage of colony population	n/a	2.50%	n/a	-
Estimated England Breeding population ²	2,982			
Adult mortality as percentage of England population	0.70%			
¹ Most recent pre-2022 count from SMP database (████████████████████)				
² From data provided by Natural England				

5.1.6 Guillemot

16. A total HPAI mortality of 3,775 guillemots was recorded in England during 2022, with adult mortality representing approximately 0.04% of the England breeding population (**Table 7**). The majority of dead birds were recorded from the Farne Islands, from which SEP and DEP are located beyond the mean maximum foraging range of this species (c. 73km Woodward et al., 2019), and therefore there would be no significant breeding season connectivity between SEP and DEP and this SPA. No HPAI mortality from FFC SPA has been reported, which is also beyond the mean maximum plus one standard deviation foraging range from the SEP and DEP sites (when guillemot tracking data from Fair Isle are excluded – see [APP-059]). The ES [APP-097] estimated guillemot mortality of between 63 and 1,463 birds at SEP and

DEP due to displacement, which was assessed as minor adverse. Any reduction in the wider guillemot population as a result of HPAI would be expected to result in a proportionate reduction in any displacement effects. Given the lack of breeding season connectivity between breeding colonies and SEP and DEP, small predicted effects from SEP and DEP on the wider population, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 7: Guillemot recorded HPAI mortality 2022 (England)

	Coquet	Cornwall beaches	Farnes	Gibraltar Point	Lindisfarn e	Scot Head	Total
Adult	25		122	1		1	149
Chick			2,532				2,532
Unknown		6	888		200		1,094
Total	25	6	3,542	1	200	1	3,775
Colony adult count ¹	0	0	95,585	0	0	0	
Adult mortality as percentage of colony population	n/a	n/a	0.13%	n/a	n/a	n/a	
Estimated England Breeding population ²							370,288
Adult mortality as percentage of England population							0.04%
¹ Most recent pre-2022 count from SMP database ()							
² From data provided by Natural England							

5.1.7 Herring gull

17. A total HPAI mortality of 786 herring gulls was recorded in England during 2022, with adult mortality representing approximately 1.9% of the England breeding population (**Table 8**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range from SEP and DEP (c. 59km; Woodward et al., 2019), and this species has not been screened in to the assessment of likely significant effect as a qualifying feature of any SPA [APP-059]. The ES [APP-097] estimated a small number of mortalities (annual mean 0.25) as a result of collisions at SEP and DEP, assessed as minor adverse. Any reduction in the wider herring gull population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. Given the low connectivity between breeding colonies and SEP and DEP, the small number of predicted collisions for this species, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 8: Herring gull recorded HPAI mortality 2022 (England)

	Brading Marshes	Coquet	Cornwall beaches	Dungene ss	Farnes	FFC	Gibraltar Point	Lindisfa rne	Old Hall Marshes	Rye Harbour	The Lizard	Weymouth	Total
Adult	1	6			87	1	17			450	1		563
Adult/sub adult				84									84
Subadult		9					3						12
Chick			3		33								36
Unknown			40		16			30	4			1	91
Total	1	15	43	84	136	1	20	30	4	450	1	1	786
Colony adult count ¹	2	8	0	104	1,496	702	0	0	0	10	288	0	-
Adult mortality as percentage of colony population	50.00%	75.00%	n/a	0.00%	5.82%	0.14%	n/a	n/a	n/a	n/a	0.35%	n/a	-
Estimated England Breeding population ²													29,998
Adult mortality as percentage of England population													1.88%
¹ Most recent pre-2022 count from SMP database ()													
² From SMP database (pre-2022)													

5.1.8 Kittiwake

18. A total HPAI mortality of 925 kittiwakes was recorded in England during 2022, with adult mortality representing approximately 0.5% of the England breeding population (Table 9). SEP and DEP are located within the mean maximum foraging range (c.156km; Woodward et al., 2019) of the FFC SPA. The **Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note (Revision B)** [REP3-089] estimated mean annual mortality as a result of collision at SEP and DEP of 12.41 birds, assessed as minor adverse. The **RIAA** [APP-059] and **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B)** [APP2-036] conclude that there would be no project-alone adverse effect on site integrity in respect of FFC SPA, but that an in-combination effect could not be discounted. Accordingly, derogation and compensation is proposed for this feature, which would ensure that SEP and DEP would not contribute to the in-combination effect. Any reduction in the wider kittiwake population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. At this stage, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA, particularly given the small level of the predicted effects on the Flamborough and Filey Coast SPA population (i.e. a mean of 6.4 adult collisions per annum from SEP and DEP). However, it is recognised that this species is a source of concern, and it is unlikely that the full effects will be known until after the 2023, and subsequent, breeding seasons, and once the likelihood of continued occurrence of HPAI and the rate of population recovery is understood.

Table 9: Kittiwake recorded HPAI mortality 2022 (England)

	Coquet	Farnes	FFC	Gibraltar Point	Lindisfarn e	Minsmere	Total
Adult	88	593	5			1	687
Subadult				1			1
Chick		27	2				29
Unknown		203			5		208
Total	88	823	7	1	5	1	925
Colony adult count ¹	932	8,804	91,008	0	0	0	
Adult mortality as percentage of colony population	9.44%	6.74%	0.01%	n/a	n/a	n/a	
Estimated England Breeding population ²					144,702		
Adult mortality as percentage of England population					0.47%		
¹ Most recent pre-2022 count from SMP database ()							
² From data provided by Natural England							

5.1.9 Lesser black-backed gull

19. A total HPAI mortality of 207 lesser black-backed gulls was recorded in England during 2022, with adult mortality representing approximately 0.3% of the England breeding population (**Table 10**). No colonies identified within the mortality data provided by Natural England are within the mean maximum foraging range from SEP and DEP (c. 127km; Woodward et al., 2019), with no mortality from HPAI being recorded in data provided by Natural England within the Alde-Ore Estuary SPA population. The **Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note (Revision B)** [REP3-089] estimated mean annual mortality as a result of collision at SEP and DEP of 2.21 birds, assessed as minor adverse. The **RIAA** [APP-059] and **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B)** [APP2-036] conclude that there would be no adverse effect on site integrity (either alone or in-combination) in respect of Alde-Ore Estuary SPA, which is located approximately 114km from SEP, as the closest of the two projects. Any reduction in the wider lesser black-backed gull population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects. Given the low connectivity between breeding colonies and SEP and DEP, the small number of predicted collisions for this species, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 10: Lesser black-backed gull recorded HPAI mortality 2022 (England)

	Coquet	Farnes	Totals
Adult	11	11	22
Subadult	179		179
Chick		5	5
Unknown		1	1
Total	190	17	207
Colony adult count ¹	28	1,362	-
Adult mortality as percentage of colony population	39.29%	0.81%	-
Estimated England Breeding population ²			64,208
Adult mortality as percentage of England population			0.32%
¹ Most recent pre-2022 count from SMP database ()			
² From JNCC (https://jncc.gov.uk/our-work/lesser-black-backed-gull-larus-fuscus/#annual-abundance-and-productivity-by-geographical-area-england)			

5.1.10 Puffin

20. A total HPAI mortality of 473 puffins was recorded in England during 2022, with adult mortality representing approximately 0.06% of the England breeding population (**Table 11**). No colonies identified within the mortality data are within the mean maximum foraging range from SEP and DEP (c. 137km; Woodward et al., 2019). An assessment of the effects on this species (as a component of FFC SPA

assemblage) was provided in the **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B)** [APP2-036]; this concluded that there would be no measurable increase in mortality as a result of SEP and DEP. This species was screened out from assessment of disturbance and displacement effects within the ES [APP-097], given the very low numbers recorded. Accordingly, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 11: Puffin recorded HPAI mortality 2022 (England)

	Coquet	Farnes	Totals
Adult	6	40	46
Chick		289	289
Unknown		138	138
Total	6	467	473
Colony adult count ¹	50,058	87,504	-
Adult mortality as percentage of colony population	0.01%	0.05%	-
Estimated England Breeding population ²			73,642
Adult mortality as percentage of England population			0.06%
¹ Most recent pre-2022 count from SMP database ()			
² From data provided by Natural England			

5.1.11 Razorbill

21. A total HPAI mortality of 43 razorbills was recorded in England during 2022, with adult mortality (assuming inclusion of ‘unknown’ age birds, as no specific adult mortality was identified for this species) representing approximately 0.39% of the England breeding population (**Table 12**). The majority of dead birds were recorded from Lindisfarne; this is not a breeding site and it is likely that some of these birds may be from the nearby Farne Islands SPA breeding population. In either case, these are located beyond the mean maximum foraging range of this species (c. 89km Woodward et al., 2019) from SEP and DEP, and therefore there would be no significant breeding season connectivity between SEP and DEP and this site. No HPAI mortality from FFC SPA has been recorded, although RSPB suggest that mortality of this species was likely to have occurred (Clarkson et al., 2022). The ES [APP-097] estimated razorbill mortality of between 23 and 541 birds at SEP and DEP due to displacement, assessed as minor adverse. Any reduction in the wider razorbill population as a result of HPAI would be expected to result in a proportionate reduction in any displacement effects. Given the lack of breeding season connectivity between breeding colonies and SEP and DEP, small predicted effects from SEP and DEP on the wider population, and based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

Table 12: Razorbill recorded HPAI mortality 2022 (England)

	Cornwall beaches	Farnes	Lindisfarne	Total
Chick		1		1
Unknown	1	1	40	42
Total	1	2	40	43
Colony adult count ¹	n/a	637	n/a	
Adult mortality as percentage of colony population	n/a	n/a	n/a	
Estimated England Breeding population ²	11,144			
Adult mortality (including 'unknown') as percentage of England population	0.39%			
¹ Most recent pre-2022 count from SMP database () ² From JNCC (https://jncc.gov.uk/our-work/razorbill-alca-torda/#annual-abundance-and-productivity-by-geographical-area-england)				

5.1.12 Sandwich tern

22. A total HPAI mortality of 6,460 Sandwich terns was recorded in England during 2022, with adult mortality representing approximately 8.7% of the England breeding population (**Table 13**). This includes 4,805 birds (including 805 adults) from Scolt Head, which is part of the North Norfolk Coast SPA, and is located approximately 33km from SEP, within the mean maximum foraging range of Sandwich tern (c. 34km, Woodward et al., 2019). The recorded adult mortality from HPAI at Scolt Head represents approximately 12% of the adult population of the colony, although a summary report from the colony provided by Natural England estimates that during 2022 *'at least 20% of the adult Sandwich Tern population present on Scolt over the breeding season succumbed to Avian Influenza, along with at least 85% of the chicks'*. The report estimates that 600-700 chicks were successfully fledged from the colony. This compares to c.3,800 chicks fledged in 2022 (SMP database).
23. The **RIAA** [APP-059] and **Apportioning and Habitats Regulations Assessment Updates Technical Note (Revision B)** [APP2-036] conclude that an in-combination adverse effect on site integrity for the North Norfolk Coast SPA and Greater Wash SPA Sandwich tern population cannot be ruled out. The predicted annual collision mortality for SEP and DEP alone apportioned to North Norfolk Coast was estimated at between 4.6 and 6.7 birds (depending on input parameters used in the CRM). The Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note (Revision B) [REP3-089] estimated a small number of mortalities (annual mean between 4.7 and 7.0, depending on input parameters used in the CRM) as a result of collisions at SEP and DEP alone, which was assessed as minor adverse. Any reduction in the wider Sandwich tern population as a result of HPAI would be expected to result in a proportionate reduction in any collision effects at SEP and DEP. At this stage, based on the best available evidence relating to HPAI mortality,

it is considered that there would be no change to the conclusions of the EIA and HRA. However, it is recognised that this species is a source of concern, and it is unlikely that the full effects will be known until after the 2023, and subsequent, breeding seasons, and once the rate of recovery is understood.

Table 13: Sandwich tern recorded HPAI mortality 2022 (England)

	Breydon Water	Coquet	Dungeness	Farnes	Gibraltar Point	Minsmere	Pagham Harbour	Rye Harbour	Scolt Head	Total
Adult	7	461	1	69	31	25	57	10	805	1,466
Chick		727		207					4,000	4,934
Unknown				60						60
Total	7	1,188	1	336	31	25	57	10	4,805	6,460
Colony adult count ¹	0	3,838	0	834	0	66	486	640	7,820	
Adult mortality as percentage of colony population	n/a	12.01%	n/a	8.27%	n/a	37.88%	11.73%	1.56%	10.29%	
Estimated England Breeding population ²										16,908
Adult mortality as percentage of England population										8.67%
¹ Most recent pre-2022 count from SMP database ()										
² From data provided by Natural England										

5.2 Scotland

24. Colony-specific HPAI data for Scotland has been sought from consultees, but none have been received to date. It is known that mortality was recorded in gannets, kittiwakes, guillemots and puffins from various SPA colonies on the east coast of Scotland (including St Abb’s Head to Fast Castle, Forth Islands and Fowlsheugh). Some of the most detailed investigations, to date, into the effects of HPAI on UK seabird populations have been undertaken on the gannets breeding at the Bass Rock in the Forth Islands SPA (Lane *et al.* 2023). This document can be updated if such data are received before the end of the SEP and DEP Examination.
25. Gannet counts from Bass Rock (Lane *et al.* 2023) in June 2022 identified 5,035 dead birds and 21,227 live birds. Adult mortality was estimated at 3.3% of the breeding population (150,518 adults). Breeding success was estimated at 0.247 fledged chicks/nest, and adult survival between 2021 and 2022 estimated to be 0.455 (95% CI: 0.153 – 0.794) compared with an average annual survival of 0.940 (SD 0.035) between 2011 and 2021.
26. A report on HPAI in wild birds for the period 2020-2023 has been published by NatureScot (2023). The report does not include colony-specific data, but does include a summary of Scotland-wide mortality for 2022. This includes a figure for ‘minimum loss’ (although there is no explanation as to what this represents, or how it has been derived) and positive HPAI tests by species. A summary of these data for species relevant to SEP and DEP is provided in **Table 14**.

Table 14: Scotland 2022 HPAI data (from NatureScot, 2023)

Species Group	Impact assessment	‘Minimum loss’	Species	Tested Positive
Gannet	Highest	11,175	Gannet	113
Guillemot	Highest	1,908	Guillemot	53
Kittiwake	Highest	760	Kittiwake	4
Terns	Highest	677	Common tern	0
	Highest		Sandwich tern	1
Large gulls	Highest	511	Herring gull	16
	Highest		Lesser black-backed gull	0
	Highest		Great black-backed gull	4
Small gulls	Moderate	322	Black-headed gull	2
	Moderate		Common gull	5
Puffin	Moderate	139	Puffin	4
Razorbill	Lowest	38	Razorbill	3

6 Conclusions

27. Available data for England indicate that for the majority of species, HPAI mortality recorded during 2022 is unlikely to affect the conclusions of the assessment for SEP and DEP, in either an EIA or HRA context. However, it is recognised that for many or all species, the estimates available from existing data are likely to underestimate the actual mortality levels. There is also considerable uncertainty as to how HPAI in 2022 (and subsequent years) will impact long-term populations for affected species and colonies. This will be linked to the rate of natural immunity within each species, and other demographic factors that will determine the rate of colony recovery following any loss. Realistically, it may be several years before the full effects of HPAI on seabird populations are known. In relation to SEP and DEP, the highest level of concern is considered to be in relation to Sandwich tern populations from Scolt Head, which is part of the North Norfolk Coast SPA and Greater wash SPA population. This is due to the proximity of SEP and DEP to Scolt Head (and the conclusion of AEoI in relation to the in-combination effects), together with the high mortality at this colony reported during 2022. However, it is also the case that any population reduction at the colony is likely to result in a proportionate reduction in effects (i.e. collision mortality). Therefore, it is unlikely that impacts from SEP and DEP (which in isolation are relatively small) would significantly interact with the effects of HPAI, and, based on the best available evidence relating to HPAI mortality, it is considered that there would be no change to the conclusions of the EIA and HRA.

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