Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Appendix 3 - Habitats Regulations Assessment Integrity Matrices

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Glossary of Acronyms

AEoI	Adverse Effects on Integrity
BDMPS	Biologically Defined Minimum Population Scales
CPS	Counterfactual Population Size
CRM	Collision Rate Modelling
DCO	Development Consent Order
DEP	Dudgeon Offshore Wind Farm Extension Project
DOW	Dudgeon Offshore Wind Farm
EDR	Effective Deterrent Radius
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EQS	Environmental Quality Standards
ES	Environmental Statement
FCS	Favourable Conservation Status
GBS	Gravity Base Structure
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
km	Kilometre
MU	Management Unit
MMMP	Marine Mammal Mitigation Protocols
MW	Megawatt
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PTS	Permanent Threshold Shift
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
SAC	Special Area of Conservation
SE	South East
SEP	Sheringham Shoal Offshore Wind Farm Extension Project

SNS	Southern North Sea
SPA	Special Protected Area
SSC	Suspended Sediment Concentration
SOW	Sheringham Shoal Offshore Wind Farm
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded Ordinance

Glossary of Terms

Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP offshore site	The Dudgeon Offshore Wind Farm Extension consisting of the DEP wind farm site, interlink cable corridors and offshore export cable corridor (up to mean high water springs).
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
DEP North array area	The wind farm site area of the DEP offshore site located to the north of the existing Dudgeon Offshore Wind Farm
DEP South array area	The wind farm site area of the DEP offshore site located to the south of the existing Dudgeon Offshore Wind Farm
DEP wind farm site	The offshore area of DEP within which wind turbines, infield cables and offshore substation platform/s will be located and the adjacent Offshore Temporary Works Area. This is also the collective term for the DEP North and South array areas.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation, potential Special Protection Areas, Special Protection Areas, Ramsar sites, proposed Ramsar sites and sites compensating for damage to a European site and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017, although some of the sites listed here are afforded equivalent policy protection under the National Planning Policy Framework (2021) (paragraph 176) and joint Defra/Welsh Government/Natural England/NRW Guidance (February 2021).

Horizontal directional drilling (HDD)	Trenchless technique used to install cables – in this case referring to the installation of the export cables at the landfall.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Infield cables	Cables which link the wind turbine generators to the offshore substation platform(s).
Interlink cables	Cables linking two separate project areas. This can be cables linking: 1) DEP South array area and DEP North array area 2) DEP South array area and SEP 3) DEP North array area and SEP 1 is relevant if DEP is constructed in isolation or first in a phased development. 2 and 3 are relevant where both SEP and DEP are built.
Interlink cable corridor	This is the area which will contain the interlink cables between offshore substation platform/s and the adjacent Offshore Temporary Works Area.
Offshore cable corridors	This is the area which will contain the offshore export cables or interlink cables, including the adjacent Offshore Temporary Works Area.
Offshore export cable corridor	This is the area which will contain the offshore export cables between offshore substation platform/s and landfall, including the adjacent Offshore Temporary Works Area.
Offshore export cables	The cables which would bring electricity from the offshore substation platform(s) to the landfall. 220 – 230kV.
Offshore Temporary Works Area	An Offshore Temporary Works Area within the offshore Order Limits in which vessels are permitted to carry out activities during construction, operation

	and decommissioning encompassing a 200m buffer around the wind farm sites and a 750m buffer around the offshore cable corridors. No permanent infrastructure would be installed within the Offshore Temporary Works Area.
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substation. 220 – 230kV.
Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
SEP offshore site	Sheringham Shoal Offshore Wind Farm Extension consisting of the SEP wind farm site and offshore export cable corridor (up to mean high water springs).
SEP onshore site	The Sheringham Shoal Wind Farm Extension onshore area consisting of the SEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
SEP wind farm site	The offshore area of SEP within which wind turbines, infield cables and offshore substation platform/s will be located and the adjacent Offshore Temporary Works Area.

HABITATS REGULATIONS ASSESSMENT – INTEGRITY MATRICES

1.1 Introduction

1. This document provides the Habitats Regulations Assessment (HRA) integrity matrices for Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and the Dudgeon Offshore Wind Farm Extension Project (DEP). The matrices summarise information provided in the **Report to Inform Appropriate Assessment (RIAA)** (document reference 5.4).

1.2 Integrity Matrices

2. Following screening of potential impacts of SEP and DEP on European sites (as presented in **Appendix 1 HRA Screening** (document reference 5.4.1) and **Appendix 2 Screening Matrices** (document reference 5.4.2) of the **RIAA** (document reference 5.4)), the following features (**Table 1**) of European Sites were assessed in the RIAA to determine if there was a risk of Adverse Effects on Integrity (AEoI) of their qualifying features.

Table 1: European Designated Sites and Qualifying Features Screened In

Site	Qualifying feature
Special Protected Areas (SPAs)	
Greater Wash	Non-breeding red-throated diver, *Gavia stellata* Breeding sandwich tern, *Thalasseus sandvicensis* Breeding common tern, *Sterna hirundo* Non-breeding little gull, *Hydrocoloeus minutus*
North Norfolk Coast SPA and Ramsar	Breeding sandwich tern, *Thalasseus sandvicensis* Breeding common tern, *Sterna hirundo* Non-breeding waterfowl species
Outer Thames Estuary SPA	Non-breeding red-throated diver, *Gavia stellata*
Breydon Water SPA and Ramsar	Non-breeding waterfowl species
The Wash SPA and Ramsar	Non-breeding waterfowl species
Gibraltar Point SPA and Ramsar	Non-breeding waterfowl species
Humber Estuary SPA and Ramsar	Non-breeding waterfowl species
Broadland SPA and Ramsar	Non-breeding waterfowl species
Ouse Washes SPA and Ramsar	Non-breeding waterfowl species
Minsmere-Walberswick SPA and Ramsar	Non-breeding waterfowl species
Nene Washes SPA and Ramsar	Non-breeding waterfowl species
Alde-Ore Estuary SPA and Ramsar	Breeding lesser black-backed gull, *Chroicocephalus ridibundus*
Flamborough and Filey Coast SPA	Breeding gannet, *Morus bassanus* Breeding kittiwake, *Rissa tridactyla* Breeding razorbill, *Alca torda* Breeding guillemot, *Uria aalge*

Site	Qualifying feature
Coquet Island SPA	Breeding Arctic tern, *Sterna paradisaea* Breeding common tern, *Sterna hirundo* Breeding sandwich tern, *Thalasseus sandvicensis*
Farne Islands SPA	Breeding Arctic tern, *Sterna paradisaea* Breeding guillemot, *Uria aalge* Breeding sandwich tern, *Thalasseus sandvicensis* Breeding seabird assemblage
St Abbs Head to Fast Castle SPA	Breeding guillemot, *Uria aalge*
Forth Islands SPA	Breeding gannet, *Morus bassanus* Breeding lesser black-backed gull, *Larus fuscus* Breeding puffin, *Fratercula arctica*
Imperial Dock Lock, Leith SPA	Breeding common tern, *Sterna hirundo*
Fowlsheugh SPA	Breeding guillemot, *Uria aalge* Breeding kittiwake, *Rissa tridactyla*
Ythan Estuary, Sands of Forvie and Meikle Loch SPA (and pSPA extension) and Ramsar	Breeding sandwich tern, *Thalasseus sandvicensis*
Troup, Pennan and Lion's Heads SPA	Breeding guillemot, *Uria aalge* Breeding kittiwake, *Rissa tridactyla*
East Caithness Cliffs SPA	Breeding guillemot, *Uria aalge* Breeding kittiwake, *Rissa tridactyla* Breeding herring gull, *Larus argentatus* Breeding razorbill, *Alca torda*
North Caithness Cliffs SPA	Breeding guillemot, *Uria aalge*
Hoy SPA	Breeding red-throated diver, *Gavia stellata*
Auskerry SPA	Breeding Arctic tern, *Sterna paradisaea*
Marwick Head SPA	Breeding guillemot, *Uria aalge*
West Westray SPA	Breeding guillemot, *Uria aalge*
Fair Isle SPA	Breeding guillemot, *Uria aalge*
Noss SPA	Breeding gannet, *Morus bassanus* Breeding guillemot, *Uria aalge*
East Mainland Coast, Shetland pSPA	Breeding red-throated diver, *Gavia stellata*
Foula SPA	Breeding guillemot, *Uria aalge* Breeding puffin, *Fratercula arctica* Breeding red-throated diver, *Gavia stellata*
Papa Stour SPA	Breeding Arctic tern, *Sterna paradisaea*
Ronas Hill – North Roe and Tingon SPA	Breeding red-throated diver, *Gavia stellata*
Hermaness, Saxa Vord and Valla Field SPA	Breeding gannet, *Morus bassanus* Breeding great skua, *Stercorarius skua*

Site	Qualifying feature
Special Area of Conservation (SACs)	
River Wensum SAC	*Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Desmoulin's whorl snail, *Vertigo moulinsiana* Freshwater crayfish, *Austropotamobius pallipes* Brook lamprey, *Lampetra planeri* Bullhead, *Cottus gobio*
Inner Dowsing, Race Bank and North Ridge SAC	Sandbanks which are slightly covered by sea water all the time. (subtidal sandbanks) Reefs
Southern North Sea SAC	Harbour porpoise, *Phocoena phocoena*
Moray Firth SAC	Bottlenose Dolphin, *Tursiops truncatus*
Humber Estuary SAC	Grey seal, *Halichoerus grypus*
The Wash and North Norfolk SAC	Harbour seal, *Phoca vitulina* Sandbanks which are slightly covered by sea water all the time. (subtidal sandbanks)

3. A summary of the evidence presented in the determination of the risk of AEoI on the relevant qualifying features is detailed within the footnotes to the integrity matrices below.
4. The following abbreviations are used within the integrity matrices:
   - Y – AEoI cannot be ruled out
   - N - AEoI can be ruled out
   - C = construction
   - O = operation
   - D = decommissioning
5. Where effects are not applicable to a particular feature, they are shaded grey.

1.2.1 Greater Wash SPA

Name of European Site: Greater Wash SPA (UK)
Closest distance to SEP / DEP site: 7 / 16.6km

Site Features	Adverse Effect on Integrity due to SEP and DEP																							
	Collision Risk (Project Alone)			Displacement / Barrier Effects (Project Alone)			Combined Displacement and Collision Risk (Project Alone)			Collision Risk (In-Combination)			Displacement / Barrier Effects (In-Combination)			Combined Displacement / Collision Risk (In-Combination)			Displacement / Barrier Effects due to Operation & Maintenance (O&M) Vessel Activity (Project Alone)			Displacement / Barrier Effects due to O&M Vessel Activity (in-Combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich tern, Breeding		N (a)			N (b)			N (c)			Y (d)			N (e)			Y (f)							
Common tern, Breeding		N (g)									N (h)													
Little gull, Non-Breeding		N (i)									N (j)													
Red throated diver, Non-Breeding				N (k)	N (l)								N (n)	N (o)						N (m)			N (p)	

a) **Section 9.3.3.1.4.2** of the **RIAA**: There are various mortality estimates for Sandwich tern depending on the assumed macro-avoidance rate of either 0.250 or 0.500, the mean Sandwich tern collision rates predicted at SEP and DEP using an avoidance rate of 0.980 do not produce impacts of a sufficient magnitude to lead to a detectable impact at the population level (i.e. greater than 1%). The installation of all of DEP's turbines in the DEP North array area (DEP-N), combined with the impacts at SEP, could result in mean mortality rates of just over 1% at macro-avoidance rates of 0.250 (1.04%), but given the highly dynamic nature of Sandwich tern population trends, it seems unlikely that an impact of this magnitude would result in an adverse effect on the integrity of the qualifying feature. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

b) **Section 9.3.3.1.4.1** of the **RIAA**: Based on the mean peak abundances calculated using model-based methods, the annual total of Sandwich terns from the Greater Wash SPA at risk of displacement from SEP and DEP is 304 birds; 202 at DEP and 101at SEP. At displacement rates of 0.000 to 0.500, and a mortality rate of 1% for displaced birds, 0 to 1.0 SPA breeding adults would be predicted to die each year due to displacement from DEP, and 0 to 0.5 birds due to displacement from SEP. The combined mortality of displacement from SEP and DEP would increase annual mortality within this population by 0.03% to 0.16%. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

c) **Section 9.3.3.1.4.3** of the **RIAA**: For combined collision and displacement, there are various mortality estimates for Sandwich tern depending on the assumed macro-avoidance rate as described in the RIAA. Of the scenarios presented, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The conclusionsError! Reference source not found. for collision impacts alone (see 'a)' above) covers this scenario. The conclusions for all other scenarios presented in the RIAA result in very similar, but slightly smaller impacts being predicted. This also applies to any scenario where all the turbines at DEP are all placed in DEP-N. **It is concluded that predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

d) **Section 9.3.3.1.5.2** of the **RIAA**: For in-combination collision risk there are various in-combination mortality estimates based on the assumed offshore wind farm (OWF) designs, macro-avoidance rates and whether design or model based density estimates are used. Using the as-built OWF designs with additional unbuilt capacity built out using as-built design turbines, but with the assumption that the Dudgeon Offshore Wind Farm (DOW) as-built design is legally secured (Scenario E), along with the recommended avoidance rate (0.980), either 97.5 or 99.3 (0.000 macro-avoidance), 73.1 or 74.5 (0.250 macro-avoidance), or 48.7 or 49.6 (0.500 macro-avoidance) breeding adult Greater Wash SPA Sandwich terns per year are predicted to collide with operational OWFs in the wider Wash area. The higher of each of the two values are predicted when model-based density estimates for SEP and DEP are used as Collision Rate Modelling (CRM) inputs. SEP and DEP contribute 1.9% and 7.5% of this total respectively (9.4% together) when CRMs calculated using design-based density estimates are used, or 8.4% and 2.7% of this total respectively (11.1% together) when CRMs calculated using model-based density estimates are used. The collision estimates would represent increases in the existing annual Greater Wash SPA breeding adult Sandwich tern mortality rate of 10.1% or 10.3%, 7.6% or 7.7%, or 5.1% or 5.2% depending on the macro-avoidance correction factor used and the density estimation method at SEP and DEP (higher values were obtained from CRMs using model-based density estimates). Assuming that all of DEP's turbines would be installed at DEP-N increases the overall collision rate slightly, resulting in increases to existing Greater Wash SPA annual Sandwich tern mortality of 10.5%, 7.9% or 5.3% depending on the macro-avoidance rate selected. This situation represents the most realistic scenario for the building out of as yet unbuilt capacity at the existing OWFs of the two presented, in addition to DOW being

Name of European Site: Greater Wash SPA (UK)
Closest distance to SEP / DEP site: 7 / 16.6km

legally secured in its as-built form. It is clear from this assessment that the contribution of SEP and DEP to the overall collision risk of Greater Wash SPA Sandwich tern is relatively modest, and that the bulk of impacts seem to result from the operation of existing OWFs. Based on the increases in annual mortality of the breeding adult Sandwich tern population of the Greater Wash SPA, there is potential for significant effects to occur at the population level due to this impact pathway. **It is concluded that an adverse effect on the integrity of the Greater Wash SPA cannot be ruled out as a result of predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs**

e) **Section 9.3.3.1.5.1** of the **RIAA**: The annual total of Sandwich terns from the Greater Wash SPA at risk of displacement from OWFs in the wider Wash area (including SEP and DEP) is 496 birds when design-based density estimates are used for SEP and DEP, and 527 birds when model-based density estimates are used for SEP and DEP. At displacement rates of 0.000 to 0.500 and a mortality rate of 1% for displaced birds, 0 to 2.48 (using design-based density estimates for SEP and DEP), or 0 to 2.64 (using model-based density estimates for SEP and DEP) SPA breeding adults would be predicted to die each year due to displacement from these OWFs. This would increase annual mortality within this population by 0% to 0.26% (using design-based density estimates for SEP and DEP), or 0% to 0.27% (using model-based density estimates for SEP and DEP). **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP, in-combination with other OWFs, would not adversely affect the integrity of the Greater Wash SPA**

f) **Section 9.3.3.1.5.3** of the **RIAA**: As with the project alone scenarios examined, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). Population Viability Analysis (PVAs) examining the effect of the mortality rates generated by these scenarios at the population level have been produced (see the RIAA). On the basis of the population models produced, the median Counterfactual Population Size (CPS) indicates that after 40 years of operation of SEP and DEP, along with all other OWFs included in the in-combination assessment, the impacted population would be 24.1% to 61.8% smaller than the unimpacted scenario. The contribution of SEP and DEP to Greater Wash SPA Sandwich tern mortality is relatively small in the context of the overall in-combination impact of combined operational phase displacement and collision. Depending on the OWF designs considered, the contribution of DEP amounts to between 5% and 10% of all predicted Greater Wash SPA Sandwich tern mortality due to OWF impacts, and SEP between 2% to 3%. **It is concluded that an adverse effect on the integrity of the Greater Wash SPA cannot be ruled out as a result of predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs**

g) **Section 9.3.3.2.4.1** of the **RIAA**: For DEP, the mean annual collision estimate (0.36) increases the annual baseline mortality by 0.49%. The predicted increase in the annual baseline mortality of Greater Wash SPA Common terns is greater than 1% for the annual upper 95% CI output (1.61 collisions per year; 2.17%). For SEP, the mean annual collision estimate (0.36) increases the annual baseline mortality by 0.49%, and the upper 95% CI output (1.64) increases the baseline mortality by 2.22%. For SEP and DEP, the mean collision rate (0.73) represents a less than 1% increase in the existing mortality of the population (0.98%). The upper 95% CI collision rate (4.39%) results in predicted increases in the annual baseline mortality of Greater Wash SPA common terns of greater than 1%. These values all assume an extremely precautionary 100% of birds present at SEP and DEP belonging to the Greater Wash SPA population. The mean common tern collision rates predicted at SEP and DEP using an avoidance rate of 0.980 do not produce impacts of a sufficient magnitude to lead to an adverse effect on integrity of the Greater Wash SPA. Predicted increases in mortality using the mean collision outputs are close to, but below, the 1% threshold in existing mortality increase, beyond which impacts may be detectable. **It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

h) **Section 9.3.3.2.5.1** of the **RIAA**: Of the other OWFs within the Greater Wash area for which assessments were consulted (i.e. Sheringham Shoal Offshore Wind Farm (SOW), DOW, Race Bank OWF and Triton Knoll), common tern collisions were predicted at SOW only. Three collisions per year were estimated, at an avoidance rate of 0.980. **It is concluded that an adverse effect on the integrity of the Greater Wash SPA can be ruled out as a result of predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other OWFs**.

i) **Section 9.3.3.3.4.1** of the **RIAA**: For SEP and DEP respectively, the mean annual collision estimate for little gull was 0.43 and 1.89. The Greater Wash SPA population at citation represents 1.7% to 13.0% of the number of birds passing through the Greater Wash area of search (i.e. 10,000 to 75,000). On this basis, 0.03 to 0.25 collisions per year at DEP would be attributable to the Greater Wash SPA population of little gull, and 0.01 to 0.06 at SEP, giving a total of 0.04 to 0.30 collisions per year for Greater Wash SPA little gull at SEP and DEP. The increase in existing mortality levels due to these predicted impacts is 0.02% to 0.12%. Applying the same calculations to the 95% upper CI collision rates results in 0.13 to 1.03 collisions per year being attributed to the Greater Wash SPA little gull population, representing a 0.05% to 0.41% increase in existing mortality. **It is concluded that predicted little gull mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

j) **Section 9.3.3.3.5.1** of the **RIAA**: The total predicted annual Collision Risk for little gull from the Greater Wash SPA is 69.6 individuals. Between them, SEP and DEP contribute 2.3 birds to this total, or 3.3%. The predicted in-combination mortality would increase the baseline adult mortality rate of the Greater Wash area of search population of little gull (i.e. 10,000 to 20,000 birds) by 1.7% to 3.5%, and that of the North Sea flyway population by 0.5%. The Greater Wash SPA population at citation represents 1.7% to 13.0% of the number of birds passing through the Greater Wash area of search (i.e. 10,000 to 75,000). On this basis, 1.18 to 9.05 collisions per year would be attributable to the Greater Wash SPA population of little gull. The increase in existing mortality levels due to these predicted impacts is 0.47% to 3.60% (or 1.80% assuming a background population of 20,000 individuals). Accounting for the difference between consented and as-built OWF designs (i.e. 40% reduction in predicted collisions), mortality increases of 0.19% to 1.44% (or 0.72% assuming a background population of 20,000 individuals) within the Greater Wash SPA population are possible. The larger (and probably more realistic) little gull reference populations result in predicted mortality increases of less than 1%. **It is concluded that an adverse effect on the integrity of the Greater Wash SPA can be ruled out as a result of predicted little gull mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs.**

k) **Section 9.3.3.4.4.1** of the **RIAA**: 3.4 red-throated divers would be displaced within 2km of the cable laying vessel if the mean density is assumed (1.5 to 5.4 if the lower and upper 95% CIs are considered) for the section of export cable corridor that crosses the Greater Wash SPA. Assuming a mortality rate of 1% to 10% amongst displaced birds, 0.0 to 0.3 red-throated divers (assuming mean density values) could be expected to be lost to the population as a result of this activity (0.0 to 0.5 birds if the 95% CIs are considered). These impacts would increase the existing annual mortality within the Greater Wash SPA population by 0.0% to 0.1% in the case of the mean modelled red-throated diver within the export cable corridor, or 0.0% to 0.2% if the 95% CIs of density are used. **It is concluded that predicted red-throated diver mortality due to construction phase displacement within the export cable corridor of SEP and DEP would not adversely affect the integrity of the Greater Wash SPA.**

l) **Section 9.3.3.4.4.2** of the **RIAA**: If areas from which red-throated divers may have been displaced by existing OWFs are accounted for, the resulting effective area within which displacement could occur within the Greater Wash SPA due to SEP is 4.69km^2 (**Table 9-40** of the **RIAA**). This represents 0.13% of the Greater Wash SPA. This number is an underestimate, since it does not account for the increased magnitude of impact that could occur in already impacted areas within the Greater Wash SPA. The true potential magnitude of this impact therefore lies between 0.13% and 0.48%.The effective areas over which displacement of red-throated diver could occur within the Greater Wash SPA due to operational phase displacement impacts from SEP are small relative to the overall amount of habitat available (see **Table 9-40** of the **RIAA**) and concerns small areas of habitat at one edge of the SPA. Parts of the potentially impacted areas were included in the SPA citation for species other than red-throated diver. **It is concluded that predicted red-throated diver mortality and changes to distribution due to operational phase displacement of SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Greater Wash SPA.**

m) **Section 9.3.3.4.4.3** of the **RIAA**: Including a 2km buffer, the transit corridor used by the DOW and SOW operation and maintenance vessels occupies 152.48km^2 of the Greater Wash SPA, or approximately 4.3% of the total habitat within the SPA boundary. The mean and 95% CI abundance of birds within the transit corridor (calculated from mean modelled density estimates from Lawson *et al*. (2016) was 91 birds (95% CIs 21 to 231). This represents 6.0% (95% CIs 1.4% to 15.3%) of the red-throated diver population of the Greater Wash SPA at citation. Assuming a mortality rate of 1% of displaced birds within the transit corridor, 0.91 (95% CIs 0.21 to 2.31) birds could be lost annually to the population based on the available survey data, which could represent an increase in existing mortality within the Greater Wash SPA population of 0.26% (95% CIs 0.06% to 0.67%). **It is concluded that predicted red-throated diver mortality due to operational phase displacement within the operation and maintenance vessel transit corridor of SEP and DEP would not adversely affect the integrity of the Greater Wash SPA**.

Name of European Site: Greater Wash SPA (UK) **Closest distance to SEP / DEP site: 7 / 16.6km**
n) **Section 9.3.3.4.5.1** of the **RIAA**: The magnitude and duration of these impacts indicates that the likelihood of an in-combination disturbance effect is extremely small. It should also be noted that whilst some displacement of red-throated divers in the export cable corridor crossing the Greater Wash SPA will occur during the construction phase, the relocation of the SOW operations and maintenance base from Wells to Great Yarmouth in 2021 reduced existing levels of vessel activity within the Greater Wash SPA. This means that in practice, increases in vessel activity within the Greater Wash SPA beyond the existing level are not anticipated (compared to pre-2021 levels) as a result of activities during the construction phase of SEP. **No adverse effect on the Greater Wash SPA is predicted due to in-combination displacement effects which the export cable corridor construction of SEP and DEP could contribute to.** o) **Section 9.3.3.4.5.2** of the **RIAA**: In total, the mean modelled densities presented by Lawson *et al*. (2016) indicate that 671.5 red-throated divers use habitats within 12km of operational OWFs within the Greater Wash SPA. This represents 44.4% of the Greater Wash SPA population. Of these birds, 303.8 (or 20.1% of the SPA population) could be displaced due to in-combination operational phase OWF displacement, when displacement rates taken from the "straight line" approach are used (ScottishPower Renewables, 2022). Assuming mortality rates of 1% to 10% of displaced birds, 3.0 to 30.4 birds could die annually due to in-combination operational phase OWF displacement. This would increase the existing annual mortality of the Greater Wash SPA red-throated diver population by 0.9% to 8.8%. In addition to the numbers of red-throated divers that could be displaced and/or die due to operational phase displacement from SEP in-combination with other projects, the effective area over which displacement could occur within the Greater Wash SPA has also been examined. The predicted annual mortality of Greater Wash SPA red-throated divers is 3.0 individuals. This increases the baseline annual mortality of the Greater Wash SPA population by 0.9%. **It is concluded that predicted red-throated diver mortality and changes to distribution due to operational phase displacement of SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Greater Wash SPA** p) **Section 9.3.3.4.5.3** of the **RIAA**: The small impact resulting from the DOW/SOW/DEP/SEP transit corridor is already occurring due to the activities of vessels associated with SOW and DOW (and other vessels active within the transit corridor, which overlaps with a navigational approach to Great Yarmouth). It is therefore the case the potential impact that results from larger numbers of operation and maintenance activities within the transit corridor that overlaps the Outer Thames Estuary SPA due to SEP and DEP is zero. **It is concluded that predicted red-throated diver mortality due to operational phase displacement within the operation and maintenance vessel transit corridor of SEP, DEP, and SEP and DEP, in-combination with similar activities associated with other OWFs, would not adversely affect the integrity of the Greater Wash SPA.**

1.2.2 North Norfolk Coast SPA

Name of European Site: North Norfolk Coast SPA
Closest distance to SEP / DEP site: 17.7 / 33.3km from the wind farm sites respectively and 1.21km from the onshore cable corridor

Site Features	Adverse Effect on Integrity due to SEP and DEP																										
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Combined Displacement and Collision Risk (Project Alone)			Displacement / Barrier Effects (In-Combination)			Collision Risk (In-Combination)			Combined Displacement / Collision Risk (In-Combination)			Direct Effects on Wintering Birds Present in Ex-Situ Habitats			Indirect Effects on Wintering Birds Present in Ex-Situ Habitats			Direct and Indirect Effects on Wintering Birds (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich tern, Breeding (SPA and Ramsar site)		N (a)			N (b)			N (c)			N (d)			Y (e)			Y (f)										
Common tern, Breeding (SPA and Ramsar site)					N (g)									N (h)													
Pink-footed goose, Non-breeding (SPA and Ramsar site)					N (i)									N (j)					N (k)			N (l)			N (m)		
Dark-bellied brent goose, Non-breeding (SPA and Ramsar site)					N (i)									N (j)					N (k)			N (l)			N (m)		
Wigeon, Non-breeding (SPA and Ramsar site)					N (i)									N (j)					N (k)			N (l)			N (m)		
Knot, Non-breeding (SPA and Ramsar site)					N (i)									N (j)					N (k)			N (l)			N (m)		
Waterbird assemblage, Non-breeding (SPA)					N (i)									N (j)													
Avocet; Non-breeding (SPA)																			N (k)			N (l)			N (m)		
Bittern, Non-breeding (SPA)																			N (k)			N (l)			N (m)		
Marsh Harrier, Non-breeding (SPA)																			N (k)			N (l)			N (m)		

Name of European Site: North Norfolk Coast SPA
Closest distance to SEP / DEP site: 17.7 / 33.3km from the wind farm sites respectively and 1.21km from the onshore cable corridor

Montagu's harrier, Non-breeding (SPA)																			N (k)			N (l)			N(m)		

a) **Section 9.4.3.1.4.1** of the **RIAA:** Based on the mean peak abundances calculated using model-based methods, the annual total of Sandwich terns from the North Norfolk Coast SPA at risk of displacement from SEP and DEP combined is 309 birds; 206 at DEP and 103 at SEP. At displacement rates of 0.000 to 0.500, and a mortality rate of 1% for displaced birds, 0 to 1.0 SPA breeding adults would be predicted to die each year due to displacement from DEP, and 0 to 0.5 birds due to displacement from SEP. The combined mortality of displacement from SEP and DEP would increase annual mortality within this population by 0.03% to 0.16%. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Norfolk Coast SPA.**

b) **Section 9.4.3.1.4.2** of the **RIAA**: Collision risk predictions for Sandwich tern vary depending on whether a design or model-based density estimate is used. For SEP and DEP combined, worst-case design based = a mean of 9.23 individuals per annum (upper 95% CI 27.77) and model based = up to a mean of 13.53 individuals per annum (upper 95% CI 23.46). There are various other predictions which vary depending on the assumed rate of macro avoidance (see the RIAA) however **it is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Norfolk Coast SPA.**

c) **Section 9.4.3.1.4.3** of the **RIAA**: For combined collision and displacement, there are various mortality estimates for Sandwich tern depending on the assumed macro-avoidance rate as described in the RIAA. Of the scenarios presented, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The conclusionsError! Reference source not found. for collision impacts alone (see 'b)' above) covers this scenario. The conclusions for all other scenarios presented in the RIAA result in very similar, but slightly smaller impacts being predicted. This also applies to any scenario where all the turbines at DEP are all placed in DEP-N. **It is concluded that predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Norfolk Coast SPA.**

d) **Section 9.4.3.1.5.1** of the **RIAA**: The annual total of Sandwich terns from the North Norfolk Coast SPA at risk of displacement from OWFs in the wider Wash area (including SEP and DEP) is 500 birds when design-based density estimates are used for SEP and DEP, and 532 birds when model-based density estimates are used for SEP and DEP. At displacement rates of 0.000 to 0.500 and a mortality rate of 1% for displaced birds, 0 to 2.51 (using design-based density estimates for SEP and DEP), or 0 to 2.67 (using model-based density estimates for SEP and DEP) SPA breeding adults would be predicted to die each year due to displacement from these OWFs. This would increase annual mortality within this population by 0% to 0.26% (using design-based density estimates for SEP and DEP), or 0% to 0.28% (using model-based density estimates for SEP and DEP). **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together, in-combination with other OWFs, would not adversely affect the integrity of the North Norfolk Coast SPA**.

e) **Section 9.4.3.1.5.2** of the **RIAA**: For in-combination collision risk there are various in-combination mortality estimates based on the assumed OWF designs, macro-avoidance rates and whether design or model-based density estimates are used. Using the **worst-case** consented OWF designs (Scenario A), along with the recommended avoidance rate (0.980), either 173.6 or 175.6 (0.000 macro-avoidance), 130.2 or 131.7 (0.250 macro-avoidance) or 86.8 or 87.8 (0.500 macro-avoidance) breeding adult North Norfolk Coast SPA Sandwich terns per year are predicted to collide with operational OWFs in the wider Wash area. The higher of each of the two values are predicted when model-based density estimates for SEP and DEP are used as CRM inputs. SEP and DEP contribute 1.1% and 4.3% of this total respectively (5.3% together) when CRMs calculated using design-based density estimates are used, or 1.6% and 4.8% of this total respectively (6.4% together) when CRMs calculated using model-based density estimates are used. The collision estimates would represent increases in the existing annual North Norfolk Coast SPA breeding adult Sandwich tern mortality rate of 18.0% or 18.2%, 13.5% or 13.7% or 9.0% or 9.1% depending on the macro-avoidance correction factor used, and the density estimation method at SEP and DEP (higher values were obtained from CRMs using model-based density estimates). Assuming that all of DEP's turbines would be installed at DEP-N increases the overall collision rate slightly, resulting in increases to existing Greater Wash SPA annual Sandwich tern mortality of 18.5%, 13.9% or 9.2% depending on the macro-avoidance rate selected**.** On the basis of the population models produced, the median CPS indicates that after 40 years of operation of SEP and DEP, along with all other OWFs included in the in-combination assessment, the impacted population would be 24.8% to 67.5% smaller than the unimpacted scenario**. It is concluded that an adverse effect on the integrity of the North Norfolk Coast SPA cannot be ruled out as a result of predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs.**

f) **Section 9.4.3.1.5.3** of the **RIAA**: As with the project alone scenarios examined for Sandwich tern, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). PVAs examining the effect of the mortality rates generated by these scenarios at the population level have been produced (see **Table 9-71** of the **RIAA**). On the basis of the population models produced, the median CPS indicates that after 40 years of operation of SEP and DEP, along with all other OWFs included in the in-combination assessment, the impacted population would be population would be 24.3% to 61.9% smaller than the unimpacted scenario. Depending on the OWF designs considered, the contribution of DEP amounts to between 5% and 10% of all predicted North Norfolk Coast SPA Sandwich tern mortality due to OWF impacts, and SEP between 2% to 3%. **It is concluded that an adverse effect on the integrity of the North Norfolk Coast SPA cannot be ruled out as a result of predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs.**

g) **Section 9.4.3.2.4.1** of the **RIAA**: For SEP and DEP combined, the mean collision rate (0.73) of common terns represents slightly more than a 1% increase in the existing mortality of the population (1.08%), along with the upper 95% CI collision rate (4.84%). These values all assume an extremely precautionary 100% of birds present at SEP and DEP belonging to the North Norfolk Coast and Ramsar site SPA population. The mean common tern collision rates predicted at SEP and DEP using an avoidance rate of 0.980 do not produce impacts of a sufficient magnitude to lead to an adverse effect on integrity of the North Norfolk Coast SPA and Ramsar site. Predicted increases in mortality using the mean collision outputs are slightly greater than the 1% threshold in existing mortality increase, beyond which impacts may be detectable. However, it is considered that these increases in mortality are substantially overestimated. Both SEP and DEP lie a considerable distance from the breeding colonies from which the North Norfolk Coast SPA population originates relative to the published mean maximum foraging range. **It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Norfolk Coast SPA and Ramsar site.**

h) **Section 9.4.3.2.5.1** of the **RIAA**: Of the other OWFs within the Greater Wash area for which assessments were consulted (i.e. SOW, DOW, Race Bank OWF and Triton Knoll), common tern collisions were predicted at SOW only. Three collisions per year were estimated, at an avoidance rate of 0.980. The majority of collisions predicted at SOW are likely to involve birds from other colonies on passage, and not breeding adults associated with the Greater Wash SPA. The same arguments apply to the predicted impacts of SEP and DEP. **It is concluded that an adverse effect on the integrity of the North Norfolk Coast SPA can be ruled out as a result of predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs**.

Name of European Site: North Norfolk Coast SPA
Closest distance to SEP / DEP site: 17.7 / 33.3km from the wind farm sites respectively and 1.21km from the onshore cable corridor

i) **Section 9.4.3.3.4.1** of the **RIAA**: Migratory waterbird features - The estimated annual collision risk for each qualifying feature from this designated site for SEP and DEP combined, along with the conclusion of the assessment based on this annual collision rate, is presented in **Table 9-81** of the **RIAA.** The number of annual collisions predicted for all qualifying features is very low (0.006-0.165). It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that the predicted mortality of all qualifying features due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Norfolk Coast SPA and Ramsar site.**

j) **Section 9.4.3.3.5.1** of the **RIAA**: The migration corridors identified by Wright *et al*. (2012) indicate that migration activity of all qualifying features from this designated site is widespread across United Kingdom (UK) waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other OWFs in UK waters. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying migratory waterbird features due to collision at SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the North Norfolk Coast SPA and Ramsar site**

k) **Section 6.4.3** of the **RIAA:** Given the wide ranges of most over-wintering wildfowl and waders, the specific and localised land-take requirements for SEP and DEP and that HDD will be adopted at the landfall, wintering bird species (and in this case specifically pink-footed geese as the only SPA/Ramsar qualifying species as being recorded during the surveys undertaken to date) are considered to be of low sensitivity to any effects arising from SEP and DEP. Nevertheless, mitigation measures in respect to these species (and where required, specifically pink footed geese) are presented (and secured) in the **Outline Ecological Management Plan** (document reference: 9.19). As concluded in **ES Chapter 20 Onshore Ecology and Ornithology** (document reference 6.1.20), through the implementation and adherence to the identified mitigation measures, the impact on over-wintering birds as a result of SEP and DEP is predicted to be of negligible significance. In addition, it is considered that there is an abundant supply of suitable fields for foraging over-wintering birds throughout Norfolk and surrounding counties, which would have capacity and availability to support any displaced foraging demands. As presented (and secured) in the **Outline Ecological Management Plan** (document reference: 9.19), where construction works are undertaken within sugar beet fields or functionally linked habitat between November and January, a pre-construction survey will be undertaken to record the distribution and abundance of pink-footed geese and the distribution of harvested sugar beet likely to be affected during the winter season within which construction works will be undertaken. The findings of these pre-construction surveys will determine whether mitigation measures to reduce disturbance will be required; however, such mitigation measures may comprise pre-work habitat manipulation works to actively discourage bird species from using the fields where works are required and subsequently installing exclusion fencing to deter birds from the area as well as ensuring all lighting (if required) is only directed onto the construction works area. During the construction works and should pink-footed geese be present, the Ecological Clerk of Works (ECoW) will be responsible for advising on the appropriate levels of mitigation, e.g. watching briefs, tool box talks to the construction personnel etc, as presented in the **Outline Ecological Management Plan** (document reference: 9.19). With these measures in place there would be **no adverse effect on the integrity of the North Norfolk Coast SPA in relation to direct impacts to wintering birds present in *ex-situ* habitats**.

l) Watercourses and arable land which might be supporting wintering birds identified as qualifying features of the SPA could be subject to trenching works during the construction phase, and as such there may be effects upon this ex-situ habitat through accidental release of pollutants when crossing watercourses. It is anticipated, however, that through the implementation of appropriate construction techniques and adherence to good environmental practice set out within the **Outline Code of Construction Practice** (document reference: 9.17), risks associated with accidental release of contaminants would be negligible. Onshore construction activities may result in temporary short-term increased noise levels which in-combination with the presence of construction personnel, operating machinery, lighting and ground vibration levels may result in potential wintering grounds to not be used and/or abandoned. Or lead to dust deposition across feeding grounds. Mitigation measures that would be adopted temporary screening around the work area or construction compound so that the noise levels from machinery will be attenuated to an acceptable level. It is generally considered that screening can provided approximately 5dB - 10dB of attenuation but the effectiveness is dependent on the distance to the noise source, and the height and length of the screening. Prior to construction, a Construction Noise Management Plan (CNMP) will be prepared detailing site-specific noise control measures for construction activities will be identified and implemented to reduce potential construction noise. An **Outline Code of Construction** Practice (document reference: 9.17) has been prepared which sets out the management measures for all onshore construction works associated with SEP and DEP. With these measures in place there would be **no adverse effect on the integrity of the North Norfolk Coast SPA in relation to indirect impacts to wintering birds present in *ex-situ* habitats.**

m) Hornsea Project Three will also make landfall and bury cables within *ex-situ* habitats to the North Norfolk Coast SPA. Further details of the projects and plans considered as part of a cumulative assessment is presented in **ES Chapter 20 Onshore Ecology and Ornithology** (document reference 6.1.20) (section 20.7) including a more detailed explanation of the potential in-combination impacts from each of the above projects. Hornsea Project Three commits to a similar suite of measures to minimise potential effects and similarly concludes no adverse effect on integrity. With the implementation of these measures effects from each project would be very localised and it is not expected that these localised effects would combine to be any greater than that for each project individually. As such, there would be **no adverse effect on the integrity of the North Norfolk Coast SPA, in-combination with other plans and projects in relation to wintering birds present in *ex-situ* habitats.**

1.2.3 North Norfolk Coast Ramsar

Name of European Site: North Norfolk Coast Ramsar (UK)

Closest distance to SEP / DEP site: 1.21km from the onshore cable corridor

Site Features	Adverse Effect on Integrity due to SEP and DEP		
	Direct Effects on Wintering Birds Present in Ex-Situ Habitats of the Ramsar Site	Indirect Effects on Wintering Birds Present in Ex-Situ Habitats of the Ramsar Site	Direct and Indirect Effects on Wintering Birds (In-Combination)

Name of European Site: North Norfolk Coast Ramsar (UK) **Closest distance to SEP / DEP site: 1.21km from the onshore cable corridor**									
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Pink-footed goose, Non-breeding (SPA and Ramsar site)	N (a)			N (b)			N (c)		
Dark-bellied brent goose, Non-breeding (SPA and Ramsar site)	N (a)			N (b)			N (c)		
Wigeon, Non-breeding (SPA and Ramsar site)	N (a)			N (b)			N (c)		
Knot, Non-breeding (SPA and Ramsar site)	N (a)			N (b)			N (c)		
Pintail, Non-breeding (Ramsar site)	N (a)			N (b)			N (c)		

a) **Section 6.4.2** of the **RIAA:** Given the wide ranges of most over-wintering wildfowl and waders, the specific and localised land-take requirements for SEP and DEP and that HDD will be adopted at the landfall, wintering bird species (and in this case specifically pink-footed geese as the only Ramsar qualifying species as being recorded during the surveys undertaken to date) are considered to be of low sensitivity to any effects arising from SEP and DEP. Nevertheless, mitigation measures in respect to these species (and where required, specifically pink footed geese) are presented (and secured) in the Outline Ecological Management Plan (document reference: 9.19). As concluded in **ES Chapter 20 Onshore Ecology and Ornithology** (document reference 6.1.20), through the implementation and adherence to the identified mitigation measures, the impact on over-wintering birds as a result of SEP and DEP is predicted to be of negligible significance. In addition, it is considered that there is an abundant supply of suitable fields for foraging over-wintering birds throughout Norfolk and surrounding counties, which would have capacity and availability to support any displaced foraging demands. As presented (and secured) in the **Outline Ecological Management Plan** (document reference: 9.19), where construction works are undertaken within sugar beet fields or functionally linked habitat between November and January, a pre-construction survey will be undertaken to record the distribution and abundance of pink-footed geese and the distribution of harvested sugar beet likely to be affected during the winter season within which construction works will be undertaken. During the construction works and should pink-footed geese be present, the Ecological Clerk of Works (ECoW) will be responsible for advising on the appropriate levels of mitigation, e.g. watching briefs, tool box talks to the construction personnel etc, as presented in the Outline Ecological Management Plan. As presented in the **Outline Ecological Management Plan** (document reference: 9.19), these mitigation measures are considered suitable for minimising the risk to wintering birds. Therefore, there would be **no adverse effect on the integrity of the North Norfolk Coast Ramsar in relation to direct impacts to wintering birds present in *ex-situ* habitats.**

b) **Section 6.4.2** of the **RIAA:** Watercourses and arable land which might be supporting wintering birds identified as qualifying features of the Ramsar site could be subject to trenching works during the construction phase, and as such there may be effects upon this ex-situ habitat through accidental release of pollutants when crossing watercourses. It is anticipated, however, that through the implementation of appropriate construction techniques and adherence to good environmental practice and where required the implementation of control measures, risks associated with accidental release of contaminants would be negligible. Onshore construction activities could result in the temporary loss of foraging territory which in turn may reduce the nesting capacity within certain areas for certain species. Furthermore, the onshore construction activities may result in temporary short-term increased noise levels which in-combination with the presence of construction personnel, operating machinery, lighting and ground vibration levels may result in potential wintering grounds to not be used and/or abandoned. Mitigation measures that would be adopted include temporary screening around the work area or construction compound so that the noise levels from machinery will be attenuated to an acceptable level. It is generally considered that screening can provided approximately 5dB - 10dB of attenuation but the effectiveness is dependent on the distance to the noise source, and the height and length of the screening. Prior to construction a Construction Noise Management Plan (CNMP) will be prepared detailing site specific noise control measures for construction activities will be identified and implemented to reduce potential construction noise. An **Outline Code of Construction Practice** (document reference: 9.17) has been prepared which sets out the management measures for all onshore construction works associated with SEP and DEP. The implementation of these mitigation measures will control and minimise the risk to wintering birds. Therefore, there would be **no adverse effect on the integrity of the North Norfolk Coast Ramsar in relation to indirect impacts to wintering birds present in *ex-situ* habitats.**

c) Hornsea Project Three will also make landfall and bury cables within *ex-situ* habitats to the North Norfolk Coast Ramsar. Further details of the projects and plans considered as part of a cumulative assessment is presented in **ES Chapter 20 Onshore Ecology and Ornithology** (document reference 6.1.20) (section 20.7) including a more detailed explanation of the potential in-combination impacts from each of the above projects. Hornsea Project Three commits to a similar suite of measures to minimise potential effects and similarly concludes no adverse effect on integrity. With the implementation of these measures effects from each project would be very localised and it is not expected that these localised effects would combine to be any greater than that for each project individually. As such, there would be **no adverse effect on the integrity of the North Norfolk Coast Ramsar, in-combination with other plans and projects in relation to wintering birds present in *ex-situ* habitats.**

1.2.4 Outer Thames Estuary SPA

Name of European Site: Outer Thames Estuary SPA **Closest distance to SEP / DEP site: 75km**						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Displacement / Barrier Effects due to O&M vessel activity (Project Alone)			**Displacement / Barrier Effects due to O&M vessel activity (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Red-throated diver, Non-breeding		N (a)			N (b)	

a) **Section 9.5.3.1.4.1** of the **RIAA**: Assuming a mortality rate of 1% of displaced birds, up to 1.11 birds could be lost to the population based on the available survey data, which could represent an increase in existing mortality within the Outer Thames Estuary SPA population of up to 0.05%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. It could also be argued that since this impact might already be occurring due to the activities of vessels associated with SOW and DOW (and impacts are probably smaller than suggested above due to the ongoing effects of other vessels within the transit corridor), the actual impact that results from operation and maintenance activities of vessels associated with SEP and DEP in the Outer Thames Estuary SPA is very low. **It is concluded that predicted red-throated diver mortality due to operational phase displacement within the operation and maintenance vessel transit corridor of SEP, DEP and SEP and DEP would not adversely affect the integrity of the Outer Thames Estuary SPA.**

b) **Section 9.5.3.1.5.1** of the **RIAA**: The small impact resulting from the DOW/SOW/DEP/SEP transit corridor is already occurring due to the activities of vessels associated with SOW and DOW (and other vessels active within the transit corridor, which overlaps with a navigational approach to Great Yarmouth). It is therefore the case the potential impact that results from larger numbers of operation and maintenance activities within the transit corridor that overlaps the Outer Thames Estuary SPA due to SEP and DEP is zero. **It is concluded that predicted red-throated diver mortality due to operational phase displacement within the operation and maintenance vessel transit corridor of SEP and DEP, in-combination with similar activities associated with other OWFs, would not adversely affect the integrity of the Outer Thames Estuary SPA.**

1.2.5 Breydon Water SPA and Ramsar

Name of European Site: Breydon Water SPA **Closest distance to SEP / DEP site: 59.2 / 61.4km**						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Mortality (Project Alone)			**Collision Mortality (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Bewick's swan, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Avocet, Non-breeding (SPA)		N (a)			N (b)	
Golden plover, Non-breeding (SPA)		N (a)			N (b)	
Lapwing, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Ruff, Non-breeding (SPA)		N (a)			N (b)	
Waterbird assemblage, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

Name of European Site: Breydon Water SPA
Closest distance to SEP / DEP site: 59.2 / 61.4km

a) **Section 9.6.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the Strategic Ornithological Support Services Migration Assessment Tool (SOSSMAT) (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-83** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No adverse effect on integrity is predicted for this site due to collision risk at SEP and DEP, as the number of collisions predicted is very low, would be undetectable within the site population within the context of natural variation, and would not result in any measurable effect. **It is concluded that the predicted mortality of all qualifying features due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Breydon Water SPA and Ramsar site.**

b) **Section 9.6.3.1.5.1** of the **RIAA**: Based migration corridors identified by Wright et al. (2012) indicate that migration activity of all qualifying features from this designated site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other OWFs in UK waters. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Breydon Water SPA and Ramsar site.**

1.2.6 The Wash SPA and Ramsar

Name of European Site: The Wash SPA
Closest distance to SEP / DEP site: 43.3 / 61.6km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Collision Risk (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D

Name of European Site: The Wash SPA **Closest distance to SEP / DEP site: 43.3 / 61.6km**						
Bar-tailed godwit, Non-breeding (SPA)		N (a)			N (b)	
Bewick's swan, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Black-tailed godwit, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Common scoter, Non-breeding (SPA)		N (a)			N (b)	
Curlew, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Dark-bellied brent goose, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Dunlin, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Gadwall, Non-breeding (SPA)		N (a)			N (b)	
Goldeneye, Non-breeding (SPA)		N (a)			N (b)	
Grey plover, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Knot, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

Name of European Site: The Wash SPA **Closest distance to SEP / DEP site: 43.3 / 61.6km**						
Lapwing, Non-breeding (Ramsar site)		N (a)			N (b)	
Oystercatcher, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Pink-footed goose, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Pintail, Non-breeding (SPA)		N (a)			N (b)	
Redshank, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Ringed Plover, Non-Breeding (Ramsar site)		N (a)			N (b)	
Sanderling, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Shelduck, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Turnstone, Non-breeding (SPA)		N (a)			N (b)	
Waterbird assemblage, Non-breeding (SPA)		N (a)			N (b)	
Wigeon (*Mareca penelope*), Non-breeding (SPA)		N (a)			N (b)	

Name of European Site: The Wash SPA
Closest distance to SEP / DEP site: 43.3 / 61.6km

a) **Section 9.7.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the SOSSMAT tool (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-84** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. **It is concluded that the predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of The Wash SPA and Ramsar site.**

b) **Section 9.7.3.1.5.1** of the **RIAA**: Based on the migration corridors identified by Wright *et al.* (2012), it is presumed that migration activity of all qualifying species from this site screened into the assessment is widespread across UK waters, and that low numbers of birds, and hence collisions, are therefore expected other UK OWFs. When added together, the small number of birds colliding with turbines at each OWF is still likely to be small, and the number associated with this site smaller still. Therefore, it is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP and DEP, in-combination with other projects, would not adversely affect the integrity of The Wash SPA and Ramsar site.**

1.2.7 Gibraltar Point SPA and Ramsar

Name of European Site: Gibraltar Point
Closest distance to SEP / DEP site: 46.4 / 61.2km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Collision Mortality (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D

Name of European Site: Gibraltar Point **Closest distance to SEP / DEP site: 46.4 / 61.2km**						
Bar-tailed godwit, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Grey plover, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Dark-bellied brent goose, Non-breeding (Ramsar site)		N (a)			N (b)	
Sanderling, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Waterbird assemblage, Non-breeding (Ramsar site)		N (a)			N (b)	

a) **Section 9.8.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and / or DEP using the SOSSMAT tool (Wright and Austin, 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-85** of the **RIAA**. This consists of the site population at designation and national population in 2012 (Wright *et al*., 2012) (the five year peak mean count is unavailable for these species). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. **It is concluded that the predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of Gibraltar Point SPA and Ramsar site.**

b) **Section 9.8.3.1.5.1** of the **RIAA**: Based on the migration corridors identified by Wright *et al* (2012), it is presumed that migration activity of all qualifying species from this site screened into the assessment is widespread across UK waters, and that low numbers of birds, and hence collisions, might be expected at other UK OWFs. When added together, the small number of birds colliding with turbines at each OWF is still likely to be small, and the number associated with this site smaller still. Therefore, it is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of Gibraltar Point SPA and Ramsar site.**

1.2.8 Humber Estuary SPA and Ramsar

Name of European Site: Humber Estuary SPA **Closest distance to SEP / DEP site: 55.3 / 61.2km**						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Risk (Project Alone)			**Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Avocet, Breeding and Non-breeding (SPA)		N (a)			N (b)	
Bittern, Breeding and Non-breeding (SPA)		N (a)			N (b)	
Bar-tailed godwit, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Black-tailed godwit, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Dunlin, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Golden plover, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Knot, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Redshank, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Ruff, Non-breeding (SPA)		N (a)			N (b)	
Shelduck, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

Name of European Site: Humber Estuary SPA **Closest distance to SEP / DEP site: 55.3 / 61.2km**						
Waterbird assemblage, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

a) **Section 9.9.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the SOSSMAT tool (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-86** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of the Humber Estuary SPA and Ramsar site. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of the Humber Estuary SPA and Ramsar site.**

b) **Section 9.9.3.1.5.1** of the **RIAA**: The migration corridors identified by Wright *et al.,* (2012) indicate that migration activity of all qualifying species from this site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other UK OWFs. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP and DEP, in-combination with other projects, would not adversely affect the integrity of Humber Estuary SPA and Ramsar site.**

1.2.9 Broadland SPA and Ramsar

Name of European Site: Broadland SPA and Ramsar (UK)
Closest distance to SEP or DEP site: 37.3 / 41.7km from wind farm site and 8.9km from onshore cable corridor

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Collision Risk (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D
Bewick's swan, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Bittern, Breeding and Non-breeding (SPA)		N (a)			N (b)	
Gadwall, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Ruff, Non-breeding (SPA)		N (a)			N (b)	
Shoveller, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Whooper swan, Non-breeding (SPA)		N (a)			N (b)	
Wigeon, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

a) **Section 9.10.3.1.4.1** of the **RIAA:** The estimated annual collision rate for each qualifying feature of this designated site is presented in **Table 9-87** of the **RIAA** along with the conclusion of the assessment based on this estimated collision rate. The estimated collision rate has been calculated based on operation of both SEP and DEP and assuming an avoidance rate of 0.980 for all features. The number of annual collisions predicted for all qualifying features is very low. It is expected that the increases to existing mortality rates for each qualifying feature due to collisions would be undetectable within the site populations. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted**

Name of European Site: Broadland SPA and Ramsar (UK)
Closest distance to SEP or DEP site: 37.3 / 41.7km from wind farm site and 8.9km from onshore cable corridor

mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of the Broadland SPA and Ramsar site.

b) **Section 9.10.3.1.5.1** of the **RIAA**: The migration corridors identified by Wright *et al.* (2012) indicate that migration activity of all qualifying species from this site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other UK OWFs. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Broadland SPA and Ramsar site.**

1.2.10 Ouse Washes SPA and Ramsar

Name of European Site: Ouse Washes SPA
Closest distance to SEP / DEP site: 85.4 / 101km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Collision Risk (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D
Black-tailed godwit, Breeding (SPA)		N (a)			N (b)	
Gadwall, Breeding (SPA and Ramsar site)		N (a)			N (b)	
Garganey, Breeding (SPA)		N (a)			N (b)	
Pochard, Breeding (SPA)		N (a)			N (b)	

Name of European Site: Ouse Washes SPA **Closest distance to SEP / DEP site: 85.4 / 101km**						
Ruff, Breeding (SPA)		N (a)			N (b)	
Shoveler, Breeding (SPA and Ramsar site)		N (a)			N (b)	
Whooper swan, Breeding and Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Bewick's swan, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Pintail, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Teal, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Wigeon, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Waterbird assemblage, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	

a) **Section 9.11.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the SOSSMAT tool (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-88** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, would not adversely affect the integrity of the Ouse Washes SPA and Ramsar site.**
Section 9.11.3.1.5.1 of the **RIAA**: The migration corridors identified by Wright *et al.* (2012) indicate that migration activity of all qualifying species from this site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other UK OWFs. The total collision risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Ouse Washes SPA and Ramsar site.**

1.2.11 Minsmere-Walberswick SPA and Ramsar

Name of European Site: Minsmere-Walberswick SPA **Closest distance to SEP / DEP site: 86.9 / 91.2km**						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Risk (Project Alone)			**Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Avocet, Breeding (SPA)		N (a)			N (b)	
European white-fronted goose, Non-breeding (SPA)		N (a)			N (b)	
Gadwall, Breeding and Non-breeding (SPA)		N (a)			N (b)	
Shoveler, Breeding and Non-breeding (SPA)		N (a)			N (b)	
Teal, Breeding (SPA)		N (a)			N (b)	

a) **Section 9.12.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the SOSSMAT tool (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-89** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of the Minsmere-Walberswick SPA and Ramsar site.**

b) **Section 9.12.3.1.5.1** of the **RIAA**: The migration corridors identified by Wright *et al.* (2012) indicate that migration activity of all qualifying species from this site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other UK OWFs. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this

Name of European Site: Minsmere-Walberswick SPA **Closest distance to SEP / DEP site: 86.9 / 91.2km**
impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Minsmere-Walberswick SPA and Ramsar site.**

1.2.12 Nene Washes SPA and Ramsar

Name of European Site: Nene Washes SPA
Closest distance to SEP / DEP site: 112 / 92.2km

Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Risk (Project Alone)			**Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Black-tailed godwit, Breeding (SPA and Ramsar site)		N (a)			N (b)	
Gadwall, Breeding and Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Bewick's swan, Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Pintail, Non-breeding (SPA)		N (a)			N (b)	
Shoveler, Breeding and Non-breeding (SPA and Ramsar site)		N (a)			N (b)	
Teal, Non-breeding (SPA)		N (a)			N (b)	

Name of European Site: Nene Washes SPA Closest distance to SEP / DEP site: 112 / 92.2km						
Whooper Swan, Non-breeding (Ramsar site)		N (a)			N (b)	
Wigeon, Non-breeding (SPA)		N (a)			N (b)	

a) **Section 9.13.3.1.4.1** of the **RIAA**: Migrant collision risk modelling was undertaken for all the species with potential for connectivity to SEP and DEP on passage using the SOSSMAT tool (Wright *et al.,* 2012). The status of each qualifying feature screened in for this site is presented in **Table 9-90** of the **RIAA**. This consists of the site population at designation, the five year peak mean count and national population in 2012 (Wright *et al.,* 2012). The estimated annual collision risk for SEP and DEP at an avoidance rate of 0.980 is also presented. No AEoI is predicted for this site due to collision risk at SEP and DEP. Numbers of collisions are so small that effects on population would be extremely small. It would not be possible for impacts of this magnitude to have an effect at the site level given the background populations. **It is concluded that the predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP would not adversely affect the integrity of the Nene Washes SPA and Ramsar site.**

b) **Section 9.13.3.1.5.1** of the **RIAA**: The migration corridors identified by Wright *et al.* (2012) indicate that migration activity of all qualifying species from this designated site is widespread across UK waters. Similarly low numbers of birds, and hence collisions, are therefore expected at other UK OWFs. The total Collision Risk of non-breeding waterbirds at all UK OWFs is still likely to be small in the context of their respective national populations, and the number of collisions associated with this designated site will be smaller still. It is expected that the increases to existing mortality rates for each qualifying feature due to this impact would be undetectable within the site population. Such impacts would consequently not result in any measurable effect. **It is concluded that predicted mortality of all qualifying features due to collision at SEP, DEP and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Nene Washes SPA and Ramsar site.**

1.2.13 Alde-Ore Estuary SPA and Ramsar

Name of European Site: Alde-Ore Estuary SPA and Ramsar (UK) Closest distance to SEP / DEP site: 104 / 110km		
Site Features	**Adverse Effect on Integrity due to SEP and DEP**	
	Collision Risk (Project Alone)	**Collision Risk (In-Combination)**

Name of European Site: Alde-Ore Estuary SPA and Ramsar (UK)
Closest distance to SEP / DEP site: 104 / 110km

	C	O	D	C	O	D
Lesser black-backed gull, Breeding (SPA and Ramsar)		N (a)			N (b)	

a) **Section 9.14.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult lesser black-backed gulls from the Alde-Ore Estuary SPA at risk of collision at DEP is <0.01, and zero at SEP. This gives a combined total annual collision rate for SEP and DEP of <0.01 Alde-Ore Estuary SPA breeding adult lesser black-backed gulls. This would increase the existing mortality of the SPA breeding population by 0.0003%.). **It is concluded that predicted lesser black-backed gull mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Alde-Ore Estuary SPA and Ramsar.**

b) **Section 9.14.3.1.5.1** of the **RIAA**: The predicted annual collision rate of Alde-Ore Estuary SPA lesser black-backed gull at SEP and DEP is 0.001 (mean collision rate), or 0.007 if the 95% upper CI collision rate is considered. This means that time it would take for the impacts to add up to a single bird being lost through this impact would be 1,000 years in the case of the mean collision rate, or 143 years in the case of the upper 95% CI collision rate. Both of these time periods are considerably greater than the 40 year operational period of SEP and DEP. Given the extremely small magnitude of the predicted impact, it is considered that collision impacts at SEP and DEP do not contribute substantially to the in-combination impacts on this qualifying feature, and will not delay, or prevent the achievement of the conservation objectives. **It is concluded that predicted lesser black-backed gull mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Alde-Ore Estuary SPA and Ramsar.**

1.2.14 Flamborough and Filey Coast SPA

Name of European Site: Flamborough and Filey Coast SPA (UK) Closest distance to SEP / DEP site: 122 / 116km																		
Site Features	**Adverse Effect on Integrity due to SEP and DEP**																	
	Displacement / Barrier Effects (Project Alone)			**Collision Risk (Project Alone)**			**Combined Displacement and Collision Risk (Project Alone)**			**Displacement / Barrier Effects (In-Combination)**			**Collision Risk (In-Combination)**			**Combined Displacement / Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Gannet, Breeding		N (a)			N (b)			N (c)			N (d)			N (e)			N (f)	
Kittiwake, Breeding					N (g)									Y (h)				
Guillemot, Breeding		N (i)									N (j)							
Razorbill, Breeding		N (k)									N (l)							

a) **Section 9.15.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of breeding adult gannets from the Flamborough and Filey Coast SPA at risk of displacement from DEP is 337, 32 from SEP, and 369 for SEP and DEP. At displacement rates of 0.600 to 0.800 and a maximum mortality rate of 1% for displaced birds, between two and three SPA breeding adults would be predicted to die each year due to displacement from both OWFs. The combined displacement mortality of SEP and DEP would increase the existing mortality of the SPA breeding population by between 0.10% and 0.14%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

b) **Section 9.15.3.1.4.2** of the **RIAA**: The annual total of breeding adult gannets from the Flamborough and Filey Coast SPA at risk of collision at DEP is 1.55 (95% CIs 0.09 to 4.86), with 0.22 (95% CIs 0.00 to 1.04) collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 1.77 (95% CIs 0.09 to 5.90) Flamborough and Filey Coast SPA breeding adult gannets. This would increase the existing mortality of the SPA

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Closest distance to SEP / DEP site: 122 / 116km

breeding population by 0.08% (0.07% due to DEP, and 0.01% due to SEP). Recently, it has been suggested by Natural England that the application of correction factors to CRM outputs of 0.600 to 0.800 to account for macro-avoidance may be appropriate for this species. If macro-avoidance rates of 0.600 or 0.800 are applied to the predicted collision rates for SEP and DEP, the collision rate becomes 0.35 (95% CIs 0.02 to 1.18) or 0.71 (95% CIs 0.04 to 2.36) respectively. **It is concluded that predicted gannet mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

c) **Section 9.15.3.1.4.3** of the **RIAA**: The annual combined displacement and Collision Risk of breeding adult gannets from the Flamborough and Filey Coast SPA at DEP is 3.91 (95% CIs 1.12 to 8.79), and 0.44 (95% CIs 0.07 to 0.44) at SEP. This gives a combined total annual displacement and Collision Risk rate for SEP and DEP of 4.35 (95% CIs 1.19 to 10.23) Flamborough and Filey Coast SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.20%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates are likely in a typical year of impacts due to SEP and DEP. The use of upper 95% CI outputs would not alter the conclusions of the assessment. **It is concluded that predicted gannet mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

d) **Section 9.15.3.1.5.1** of the **RIAA**: The estimated annual total of breeding adult gannets from Flamborough and Filey Coast SPA at risk of displacement from all OWFs within the UK North Sea Biologically Defined Minimum Population Scales (BDMPS) combined is 10,148 (**Table 9-98** of the **RIAA**). Of this total, SEP and DEP contribute 0.3% and 3.3% respectively. Using displacement rates of 0.600 to 0.800 and a maximum mortality rate of 1% of displaced birds (UK SNCBs, 2017), the number of Flamborough and Filey Coast SPA birds predicted to die each year would be between 61 to 81. The estimated increase in mortality of Flamborough and Filey Coast SPA breeding adult gannets due to in-combination displacement is between 2.81% and 3.74%. Increases in the existing mortality rate of greater than 1% could be detectable against natural variation. **It is concluded that predicted gannet mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together, in-combination with other projects would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

e) **Section 9.15.3.1.5.2** of the **RIAA**: The total predicted annual Collision Risk for breeding adult gannets from the Flamborough and Filey Coast SPA is 339 individuals. Between them, SEP and DEP contribute 1.8 birds to this total, or 0.5%. The predicted in-combination mortality would increase the baseline adult mortality rate of the Flamborough and Filey Coast SPA breeding adult gannet population by 15.5%. This magnitude of increase could result in detectable population level effects. Recently, it has been suggested by Natural England that the application of correction factors to CRM outputs of 0.600 to 0.800 to account for macro-avoidance may be appropriate for this species. If macro-avoidance rates of 0.600 or 0.800 are applied to the predicted collision rates for SEP and DEP, the total in-combination collision rate becomes 67.8 or 135.6 respectively. The predicted in-combination mortality would increase the baseline adult mortality rate of the Flamborough and Filey Coast SPA breeding adult gannet population by 3.1% to 6.3%. This magnitude of increase could still result in detectable population level effects, but is considerably smaller than if no macro-avoidance correction is incorporated. PVAs for a selection of scenarios are presented in the RIAA. The Flamborough and Filey Coast SPA gannet population is believed to be robust enough to allow the conservation objective to maintain the population at (or above) designation levels and sustain the level of additional mortalities presented in **Table 9-100**

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Closest distance to SEP / DEP site: 122 / 116km

of the **RIAA**. At an annual growth rate of 2% or more per annum over the coming decades, the integrity of the site for this feature is high, with high rates for self-repair, and self-renewal under dynamic conditions with minimal external management. In addition, the colony would remain at a size greater than the 8,469 pairs or 16,938 adults required by the population size Conservation Objective. **It is concluded that predicted gannet mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

f) **Section 9.15.3.1.5.3** of the **RIAA**: The predicted annual in-combination breeding adult Flamborough and Filey Coast SPA gannet mortality from collision and displacement of OWFs screened in is shown in **Table 9-101** of the **RIAA**. SEP and DEP contributed approximately 1.1% of the total predicted impact of these scenarios. The predicted mortality would increase the baseline adult mortality rate of the Flamborough and Filey Coast SPA breeding adult gannet population by greater than 1%. This magnitude of increase could result in detectable population level effects. The Flamborough and Filey Coast SPA gannet population is believed to be robust enough to allow the conservation objective to maintain the population at (or above) designation levels and sustain the level of additional mortalities presented in **Table 9-102** of the **RIAA**. At an annual growth rate of 2% or more per annum over the coming decades, the integrity of the site for this feature is high, with high rates for self-repair, and self-renewal under dynamic conditions with minimal external management. In addition, the colony would remain at a size greater than the 8,469 pairs or 16,938 adults required by the population size Conservation Objective. The combined displacement and collision impacts predicted at SEP and DEP, in-combination with other projects, will not prevent all of the other Conservation Objectives from being met. **It is concluded that predicted gannet mortality due to the combined impacts of operational phase displacement and collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

g) **Section 9.15.3.2.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult kittiwakes from the Flamborough and Filey Coast SPA at risk of collision at DEP is 8.09, with 0.78 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 8.86 Flamborough and Filey Coast SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by 0.06% (0.05% due to DEP, and 0.01% due to SEP). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

h) **Section 9.13.3.2.5.1** of the **RIAA**: The total predicted annual in-combination collision risk for breeding adult kittiwakes from the Flamborough and Filey Coast SPA is 487.9 individuals (see **Table 9-105** of the **RIAA** which presents collision rates based largely on consented OWF designs which represents a highly precautionary position, since the majority of OWFs are built with larger numbers of smaller turbines than suggested by their consents). Between them, SEP and DEP contribute 8.9 birds to this total, or 1.8%. The predicted in-combination mortality would increase the baseline adult mortality rate of the Flamborough and Filey Coast SPA breeding adult kittiwake population by 3.2%. This magnitude of increase could result in detectable population level effects. The PVA produced (**Table 9-106** of the **RIAA**) indicates that kittiwake mortality levels due to the impacts from OWFs may already be at, or close to, a level where an adverse effect on the integrity of the Flamborough and Filey Coast SPA might be expected. The contribution of SEP and DEP to

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Closest distance to SEP / DEP site: 122 / 116km

Flamborough and Filey Coast SPA kittiwake mortality is small in the context of the overall in-combination impact of OWF collision; 1.7% of all predicted Flamborough and Filey Coast SPA kittiwake mortality due to OWF impacts are due to DEP, and 0.2% due to SEP. However, despite the impacts being small, they contribute to the current situation, which is that the population is unable to be restored due to existing impacts. This situation is reflected in information presented in recent OWF Examinations, such as Hornsea Project Three, Norfolk Vanguard, and Norfolk Boreas. **It is concluded that an adverse effect on the integrity of the Flamborough and Filey Coast SPA cannot be ruled out as a result of predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other OWFs.**

i) **Section 9.15.3.3.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from the Flamborough and Filey Coast SPA at risk of displacement from SEP and DEP is 703 birds. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.62% due to impacts at DEP, and 0.04% due to impacts at SEP (0.66% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the Flamborough and Filey Coast SPA breeding adult guillemot population would increase by 0.07% due to impacts at DEP (5.4 birds), <0.01% due to impacts at SEP (0.3 birds), and 0.08% due to the impacts of SEP and DEP (5.7 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

j) **Section 9.15.3.3.5.1 of the RIAA**: The estimated annual total of breeding adult guillemots from Flamborough and Filey Coast SPA at risk of displacement from all OWFs within the UK North Sea BDMPS combined is 43,281. Of this total, SEP and DEP contribute 0.1% and 1.5% respectively. Using displacement rates of 0.300 to 0.700 and mortality rates of 1% to 10% of displaced birds (UK SNCBs, 2017), the number of Flamborough and Filey Coast SPA birds predicted to die each year would be between 132 to 3,079 (**Table 9-110** of the **RIAA**). The estimated increase in mortality of Flamborough and Filey Coast SPA breeding adult guillemot due to in-combination displacement impacts is between 1.78% and 41.46%. Increases in the existing mortality rate of greater than 1% could be detectable against natural variation. PVAs examining the effect of the mortality rates generated by the in-combination displacement assessment at the population level have been produced (**Table 9-111** of the **RIAA**). even in scenarios where the growth rate of the Flamborough and Filey Coast SPA guillemot colony is considerably reduced from levels recorded between 1986 and 2017, the application of appropriately precautionary levels of displacement and mortality of displaced birds indicate that a slowing of the population growth rate, rather than a population decline, is likely as a result of in-combination displacement effects. This is particularly true when evidence-based displacement and mortality rates of 50% and 1% are used to predict population level effects. Whilst the CPSs generated from the PVA outputs in **Table 9-111** of the **RIAA** suggest a large change in population at the end of the operational period, this is somewhat inevitable over the length of the operational phase, even when the predicted annual impacts appear smaller. The colony would remain at a size greater than the 41,607 pairs or 83,214 adults required by the population size Conservation Objective. The displacement impacts predicted at SEP and DEP, in-combination with other projects, will not prevent all of the other Conservation Objectives from being met. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

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Closest distance to SEP / DEP site: 122 / 116km

k) **Section 9.15.3.4.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of razorbills from the Flamborough and Filey Coast SPA at risk of displacement from SEP and DEP is 99 birds. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.11% due to impacts at DEP, and 0.06% due to impacts at SEP (0.16% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the Flamborough and Filey Coast SPA breeding adult razorbill population would increase by 0.01% due to impacts at DEP (0.3 birds), <0.01% due to impacts at SEP (0.2 birds), and 0.01% due to the impacts of SEP and DEP (0.5 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of displacement and mortality rates when the mean peak or upper 95% CIs for mean peak abundance estimate assessments are considered. **It is concluded that predicted razorbill mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

l) **Section 9.15.3.4.5.1** of the **RIAA**: The estimated annual total of breeding adult razorbills from Flamborough and Filey Coast SPA at risk of displacement from all OWFs within the UK North Sea BDMPS combined is 7,166. Of this total, SEP and DEP contribute 0.5% and 1.0% respectively. Using displacement rates of 0.300 to 0.700 and mortality rates of 1% to 10% of displaced birds (UK SNCBs, 2017), the number of Flamborough and Filey Coast SPA birds predicted to die each year would be between 21 to 502 (**Table 9-120** of the **RIAA**). The estimated increase in mortality of Flamborough and Filey Coast SPA breeding adult razorbill due to in-combination displacement impacts is between 0.51% and 11.79%. Increases in the existing mortality rate of greater than 1% could be detectable against natural variation. PVAs based on various scenarios have been run and are presented in **Table 9-122** of the **RIAA**. In conclusion, even in scenarios where the growth rate of the Flamborough and Filey Coast SPA guillemot colony is considerably reduced from levels recorded between 1986 and 2017, the application of appropriately precautionary levels of displacement and mortality of displaced birds indicate that a slowing of the population growth rate, rather than a population decline, is likely as a result of in-combination displacement effects. This is particularly true when evidence-based displacement and mortality rates of 50% and 1% are used to predict population level effects. Whilst the CPSs generated from the PVA outputs in **Table 9-122** of the **RIAA** suggest a large change in population at the end of the operational period, this is somewhat inevitable over the length of the operational phase, even when the predicted annual impacts appear smaller. The colony would remain at a size greater than the 41,607 pairs or 83,214 adults required by the population size Conservation Objective. The displacement impacts predicted at SEP and DEP, in-combination with other projects, will not prevent all of the other Conservation Objectives from being met. **It is concluded that predicted razorbill mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Flamborough and Filey Coast SPA.**

1.2.15 Coquet Island SPA

Name of European Site: Coquet Island SPA Closest distance to SEP / DEP site: 289 / 282km																		
Site Features	**Adverse Effect on Integrity due to SEP and DEP**																	
	Collision Risk (Project Alone)			**Displacement / Barrier Effects (Project Alone)**			**Combined Displacement and Collision Risk (Project Alone)**			**Collision Risk (In-Combination)**			**Displacement / Barrier Effects (In-Combination)**			**Combined Displacement / Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Arctic tern, Breeding (SPA)		N (a)									N (b)							
Sandwich tern, Breeding (SPA)		N (c)			N (d)			N (e)			N (f)			N (g)			N (h)	
Common tern, Breeding (SPA)		N (i)									N (j)							

a) **Section 9.16.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult Arctic terns from the Coquet Island SPA at risk of collision at SEP and DEP is <0.01. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA.**

b) **Section 9.16.3.1.5.1** of the **RIAA**: The potential project alone effects on the breeding adult Arctic tern population of the Coquet Island SPA are extremely small. Whilst cumulative effects of collision on Arctic tern during the non-breeding season have not been investigated quantitatively, the low flight heights that are generally used by this species ("Corrigendum," 2014; Johnston *et al.*, 2014), particularly during migration (Hedenström and Åkesson, 2016), indicate that the possibility of a substantial cumulative impact on the species is unlikely. As just 1.5% of total Arctic tern impacts outside the breeding season would be apportioned to this SPA population, the possibility of a substantial impact on this SPA population is considered to be highly remote. It is concluded that in-combination effects on this feature would not adversely affect the integrity of the Coquet Island SPA. **It is concluded that predicted**

Name of European Site: Coquet Island SPA
Closest distance to SEP / DEP site: 289 / 282km

Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Coquet Island SPA.

c) **Section 9.16.3.2.4.2** of the **RIAA**: Under all scenarios, the predicted increase in the annual baseline mortality is considerably less than 1% (**Table 9-130** of the **RIAA**). To be distinguishable from natural variation, increases in mortality would probably need to be larger than 1%. As the predicted increases in baseline mortality of breeding adult Sandwich tern are very small, it is concluded that predicted Collision Risk of Sandwich tern at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA.**

d) **Section 9.16.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total number of Sandwich terns from the Coquet Island SPA at risk of displacement from SEP and DEP is two birds, both of which would occur at DEP. At displacement rates of 0.000 to 0.500, and a mortality rate of 1% for displaced birds, 0 to 0.01 SPA breeding adults would be predicted to die each year due to displacement from DEP. The combined displacement mortality from SEP and DEP would increase annual mortality within this population by <0.01%. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA.**

e) **Section 9.16.3.2.4.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The worse-case scenario for combined operational phase displacement and collision for Coquet Island SPA Sandwich terns is therefore presented in **Table 9-132** of the **RIAA**. The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA.**

f) **Section 9.16.3.2.5.2** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult Sandwich tern population of the Coquet Island SPA are extremely small, with a mean predicted annual mortality rate of <0.01 bird (**Table 9-130** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Coquet Island SPA.**

g) **Section 9.16.3.2.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult Sandwich tern population of the Coquet Island SPA are extremely small, with a mean predicted annual mortality rate of <0.01 bird (**Table 9-132** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination operational phase OWF displacement effect on this qualifying feature. During the breeding season, only a single OWF demonstrator site is within mean maximum foraging range plus one standard deviation of this SPA. Whilst birds were present in small numbers, quantitative displacement assessment was not performed, and potential mortality is anticipated to be very low. As there is no information to enable a quantitative assessment on potential in-combination effects of OWF displacement on breeding Sandwich tern of the Coquet Island SPA, no such assessment has been performed. However, the information presented still provides relatively high confidence that mortality levels due to this impact

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Closest distance to SEP / DEP site: 289 / 282km

are very low. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Coquet Island SPA.**

h) **Section 9.16.3.2.5.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The worse-case scenario for combined operational phase displacement and collision for Coquet Island SPA Sandwich terns is therefore presented in **Table 9-132** of the **RIAA**. The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to combined displacement and collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Coquet Island SPA.**

i) **Section 9.16.3.3.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult common terns from the Coquet Island SPA at risk of collision at SEP and DEP is 0.01. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. **It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Coquet Island SPA.**

j) **Section 9.16.3.3.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult common tern population of the Coquet Island SPA are extremely small, with a mean predicted annual mortality rate of 0.01 bird. Impacts on this qualifying feature are also possible at OWFs during the spring and autumn migration seasons. A review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. However, the low flight heights that are generally used by this species during passage periods ("Corrigendum," 2014; Hedenström and Åkesson, 2016; Johnston *et al*., 2014), indicate that the possibility of a substantial in-combination collision impact on this species during these seasons is unlikely. Furthermore, as just 1.0% of total common tern impacts outside the breeding season would be apportioned to this SPA population (Furness, 2015), the possibility of a substantial impact on this SPA population is considered to be remote. **It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Coquet Island SPA.**

1.2.16 Farne Islands SPA

Name of European Site: Farne Islands SPA
Closest distance to SEP / DEP site: 318 / 310km

Site Features	Adverse Effect on Integrity due to SEP and DEP																	
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Combined Displacement and Collision Risk (Project Alone)			Displacement / Barrier Effects (In-Combination)			Collision Risk (In-Combination)			Combined Displacement / Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Arctic tern, Breeding					N (a)									N (b)				
Sandwich tern, Breeding		N (c)			N (d)			N (e)			N (f)			N (g)			N (h)	
Guillemot, Breeding		N (i)									N (j)							
Kittiwake, Non-breeding					N (k)									N (l)				
Puffin, Non-Breeding		N (m)									N (n)							

a) **Section 9.17.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult Arctic terns from the Farne Islands SPA at risk of collision at SEP and DEP is 0.01. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

b) **Section 9.17.3.1.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult Arctic tern population of the Farne Islands SPA are extremely small (i.e. virtually zero) (**Table 9-134** of the **RIAA**). Potential in-combination effects of OWF collision on Arctic tern have not been investigated quantitatively. During the breeding season, no OWFs are within mean maximum foraging range plus one standard deviation of this SPA, therefore no breeding season impacts on this qualifying feature are predicted. Outside the breeding season, there is potential for other OWFs to impact this qualifying feature during the spring and autumn migration seasons. However, a review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. As approximately just 2.3% of migration season impacts on this species would be apportioned to this SPA population, it is considered unlikely that in-combination effects on this qualifying feature will occur to the level where an adverse effect on the integrity of the site would be possible. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

c) **Section 9.17.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of Sandwich terns from the Farne Islands SPA at risk of displacement from SEP and DEP is two birds, both of which would occur at DEP. At displacement rates of 0.000 to 0.500, and a mortality rate of 1% for displaced birds, 0 to 0.01 SPA breeding adults would be predicted to die each year due to displacement from DEP. The combined displacement mortality from SEP and DEP would increase annual mortality within this population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

d) **Section 9.17.3.2.4.2** of the **RIAA**: For DEP, the mean annual collision estimate increases the annual baseline mortality by 0.01%, and the predicted increase in the annual baseline mortality is 0.07% for the annual upper 95% CI output. For SEP, the mean collision rate increases the annual baseline mortality by 0.00%, and the upper 95% CI collision rate by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. These are very low collision rates which would be further reduced if correction for birds displaced by OWFs were included in the calculations. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

e) **Section 9.17.3.2.4.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The worse-case scenario for combined operational phase displacement and collision for Farne Islands SPA Sandwich terns is therefore as presented for collision risk alone (see 'd)' above. The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

f) **Section 9.17.3.2.5.1** of the **RIAA**: The predicted impact of displacement from of SEP and DEP on the breeding adult Sandwich tern population of the Farne Islands SPA are extremely small, with a mean predicted annual mortality rate of up to 0.01 birds. It is therefore considered that SEP and DEP do not contribute substantially to any in-combination operational phase OWF displacement effect on this qualifying feature. During the breeding season, no OWFs are within mean maximum foraging range plus one standard deviation of this SPA, therefore no breeding season impacts on this qualifying feature are predicted. Impacts on this qualifying feature are also possible at OWFs during the spring and autumn migration seasons. A review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. During passage periods, it is anticipated that displacement impacts will result in very low mortality rates. As just 4.3% of total Sandwich tern impacts outside the breeding season would be apportioned to this SPA population (Furness, 2015), the possibility of a substantial impact on this SPA population is considered to be remote. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

g) **Section 9.17.3.2.5.2** of the **RIAA**: The predicted collision impacts of SEP and DEP on the breeding adult Sandwich tern population of the Farne Islands SPA are extremely small, with a mean predicted annual mortality rate of 0.02 birds). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. During the breeding season, no OWFs are within mean maximum foraging range plus

Name of European Site: Farne Islands SPA
Closest distance to SEP / DEP site: 318 / 310km

one standard deviation of this SPA, therefore no breeding season impacts on this qualifying feature are predicted. Impacts on this qualifying feature are also possible at OWFs during the spring and autumn migration seasons. A review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. However, the low flight heights that are generally used by this species during passage periods ("Corrigendum," 2014; Johnston *et al.*, 2014), indicate that the possibility of a substantial in-combination collision impact on this species during these seasons is unlikely. Furthermore, as just 4.3% of total Sandwich tern impacts outside the breeding season would be apportioned to this SPA population (Furness, 2015), the possibility of a substantial impact on this SPA population is considered to be remote. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

h) **Section 9.17.3.2.5.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The worse-case scenario for combined operational phase displacement and collision for Farne Islands SPA Sandwich terns is therefore presented in **Table 9-132** of the **RIAA**. The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to combined displacement and collision at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

i) **Section 9.17.3.3.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from the Farne Islands SPA at risk of displacement from SEP and DEP is 591 birds. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 0.99% due to impacts at DEP and 0.07% due to impacts at SEP (1.06% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.07% due to impacts at DEP (2.8 birds), 0.01% due to impacts at SEP (0.2 birds) and 0.08% due to the impacts of SEP and DEP (3.0 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under almost any combination of displacement and mortality rates when the mean peak abundance estimate assessments are considered. Mortality rate increases of over 1% are predicted for mean peak abundance estimate assessments only when a displacement rate of 0.700 and a mortality rate of 10% is considered. These displacement and mortality rates are much higher than evidence suggests will actually be the case. Use of the evidence-based displacement (0.500) and mortality rate (1%) would result in a mortality increase of significantly less than 1%. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

j) **Section 9.17.3.3.5.1** of the **RIAA**: Assuming a guillemot displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 749 breeding adult SPA birds would be lost to in-combination displacement annually. This would increase the existing mortality within the SPA population (3,907 breeding adult birds per year) by 19.19%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 54 birds. This would increase the existing mortality within this population by 1.37%. PVAs examining the effect of the mortality rates generated by the in-combination displacement assessment at the population level have been produced (**Table 9-143** of the **RIAA**). The level of mortality predicted in the breeding guillemot population of the Farne Islands SPA due to in-combination OWF displacement is considered to be relatively modest where evidence-based displacement and mortality rates are used. In such a case (50% displacement and 1% mortality of displaced birds), the annual growth rate would change by less than 0.1%. This is considerably less than the average annual growth rate over the medium and short term at the colony. Whilst the use of higher displacement and mortality rates results in population level impacts which would potentially represent an adverse effect on the integrity of the qualifying feature, it is not considered appropriate to rely on these outputs to draw conclusions. This is because the assessment already includes a great deal of precautionary assumptions, and there is no evidence for mortality rates due to OWF displacement being at the higher levels considered by the PVA. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

k) **Section 9.17.3.4.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult kittiwakes from the Farne Islands SPA at risk of collision at DEP is 0.03, with 0.00 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.03 Farne Islands SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by 0.00%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

l) **Section 9.17.3.4.5.1** of the **RIAA**: In total, 15.8 collisions per year are predicted for breeding adults of the Farne Islands SPA due to in-combination collision risk of OWFs in the North Sea. This would increase the existing mortality within this population by 1.2%. The predicted impacts of SEP and DEP on the breeding adult kittiwake population of the Farne Islands SPA are extremely small, with a mean predicted annual mortality rate of 0.03 birds. It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

m) **Section 9.17.3.5.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of puffins from the Farne Islands SPA at risk of displacement from SEP and DEP is 6 birds. At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, less than one (0.02 - 0.39) SPA breeding adult would be predicted to die each year due to displacement from SEP and DEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.00% due to impacts at SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted puffin mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Farne Islands SPA.**

n) **Section 9.17.3.5.5.1** of the **RIAA**: Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality for puffin would be 41 birds. This would increase the mortality within this population by 0.50%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur due to the level of mortality predicted if the evidence-based rates for mortality and displacement are used. **It is concluded that predicted puffin mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Farne Islands SPA.**

1.2.17 St Abbs Head to Fast Castle SPA

Name of European Site: St Abbs Head to Fast Castle SPA
Closest distance to SEP / DEP site: 360 / 360km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement Impacts (Project Alone)			Displacement Impacts (In-Combination)		
	C	O	D	C	O	D
Common guillemot, Breeding		N (a)			N (b)	

a) **Section 9.18.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from the St Abbs Head to Fast Castle SPA at risk of displacement from SEP and DEP is 655 birds. At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 1.8 to 42.7 SPA breeding adults would be predicted to die each year due to displacement from DEP, and 0.1 to 3.1 birds due to displacement from SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 1.63% due to impacts at DEP, and 0.12% due to impacts at SEP (1.75% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the St Abbs Head to Fast Castle SPA breeding adult guillemot population would increase by 0.19% due to impacts at DEP (5.0 birds), 0.01% due to impacts at SEP (0.3 birds), and 0.20% due to the impacts of SEP and DEP (5.3 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the St Abbs Head to Fast Castle SPA.**

b) **Section 9.18.3.1.5.1** of the **RIAA**: Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 919 breeding adult SPA birds would be lost to displacement each year. This would increase the mortality within this population by 35.11%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual season in-combination displacement mortality would be 66 birds. This would increase the mortality within this population by 2.51%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to the level of mortality predicted if the evidence-based rates for mortality and displacement are used. The Scoping Opinion on the assessment approach for the Berwick Bank OWF (late 2021) means that the BDMPS approach for determining potential impacts on guillemot SPAs is not considered applicable by NatureScot, and Marine Scotland. This advice is that since guillemot is a dispersive rather than a fully migratory species, birds do not travel great distances from the breeding colony during the non-breeding season, and that breeding season foraging ranges are applicable year round to determining connectivity with OWFs. On that basis, whilst existing mortality of birds from this SPA may be at a level where effects could be detectable in the context of natural variation due to this impact, SEP and DEP, along with the majority of UK North Sea OWFs, do not contribute to it. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of St Abbs Head to Fast Castle SPA.**

1.2.18 Forth Islands SPA

Name of European Site: Forth Islands SPA
Closest distance to SEP / DEP site: 390 / 390km

Site Features	Adverse Effect on Integrity due to SEP and DEP																	
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Combined Displacement and Collision Risk (Project Alone)			Displacement / Barrier Effects (In-Combination)			Collision Risk (In-Combination)			Combined Displacement / Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Gannet, Breeding (SPA)		N (a)			N (b)			N (c)			N (d)			N (e)			N (f)	
Lesser black-backed gull, Breeding (SPA)					N (g)									N (h)				
Puffin, Breeding (SPA)		N (i)									N (j)							

a) **Section 9.19.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of breeding adult gannets from Forth Islands SPA at risk of displacement from DEP is 92, 70 from SEP, and 162 for SEP and DEP. At displacement rates of 0.600 to 0.800 and a maximum mortality rate of 1% for displaced birds, 0.97 to 1.29 SPA breeding adults would be predicted to die each year due to displacement from both OWFs. The combined displacement mortality of SEP and DEP would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Forth Islands SPA.**

b) **Section 9.19.3.1.4.2** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult gannets from Forth Islands SPA at risk of collision at DEP is 0.71, with 0.15 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.86 Forth Islands SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of

Name of European Site: Forth Islands SPA
Closest distance to SEP / DEP site: 390 / 390km

less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Forth Islands SPA.**

c) **Section 9.19.3.1.4.3** of the **RIAA**: Based on the mean combined displacement and collision rates, the annual mortality of breeding adult gannets from Forth Islands SPA at DEP is 1.35, and 0.64 at SEP. This gives a combined total annual displacement and Collision Risk rate for SEP and DEP of 1.99 Forth Islands SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.02%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Forth Islands SPA.**

d) **Section 9.19.3.1.5.1** of the **RIAA**: Assuming a displacement rate of 0.600 to 0.800, and a mortality rate of 1% of displaced birds, 43 to 58 SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (12,192 breeding adult birds per year) by 0.36% to 0.47%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Forth Islands SPA.**

e) **Section 9.19.3.1.5.2** of the **RIAA**: Of the birds predicted to die annually due to in-combination collision impacts, 307 are estimated to belong to the breeding adult population of Forth Islands SPA. This assumes that 24.3% of birds of the total relevant BDMPS belong to the breeding population of this SPA during the autumn migration season, and 31.3% of birds of the total relevant BDMPS belong to the breeding population of this SPA (Furness, 2015) during the spring migration season. This would increase the existing mortality within the SPA population (12,192 breeding adult birds per year) by 2.52%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to collision risk. The predicted impacts of SEP and DEP on the breeding adult gannet population of Forth Islands SPA are small, with a mean predicted annual mortality rate of 0.86 birds. It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Forth Islands SPA.**

f) **Section 9.19.3.1.5.3** of the **RIAA**: The predicted annual in-combination breeding adult Forth Islands SPA gannet mortality from collision and displacement at OWFs screened in is between 350 and 365 birds, depending on whether a displacement rate of 60% or 80% is used in calculations. This represents an increase in existing annual mortality of 2.87% to 2.99%, assuming an existing mortality of 12,192 breeding adult birds per year. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to collision risk. The predicted impacts of SEP and DEP on the breeding adult gannet population of Forth Islands SPA are small, with a mean predicted annual mortality rate of 1.99 birds. Based on the size of the population, and recent population trends, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to the combined impacts of operational phase displacement and collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Forth Islands SPA.**

g) **Section 9.19.3.2.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult lesser black-backed gulls from the Forth Islands SPA at risk of collision at DEP is 0.01, and zero at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.01 Forth Islands SPA breeding adult lesser black-backed gulls. This would increase the existing mortality of the SPA breeding population by 0.002%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted lesser black-backed gull mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Forth Islands SPA.**

h) **Section 9.19.3.2.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult lesser black-backed gull population of the Forth Islands SPA are extremely small (i.e. virtually zero). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. **It is concluded that predicted lesser black-backed gull mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Forth Islands SPA.**

i) **Section 9.19.3.3.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of puffins from the Forth Islands SPA at risk of displacement from SEP and DEP is 6 birds. At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, less than one (0.03 - 0.60) SPA breeding adult would be predicted to die each year due to displacement from SEP and DEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.01% due to impacts at SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted puffin mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Forth Islands SPA.**

j) **Section 9.19.3.3.5.1** of the **RIAA**: In total, three and six birds from the breeding adult population of the Forth Islands SPA were present at SEP and DEP respectively year round. This brings the number of breeding adult puffins belonging the Forth Islands SPA population at risk of cumulative operational OWF displacement to 19,931 individuals. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 1,395 breeding adult SPA birds would be lost to displacement annually. This would increase the mortality within this population by 11.93%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 100 birds. This would increase the mortality within this population by 0.85%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur due to the level of mortality predicted if the evidence-based rates for mortality and displacement are used. **It is concluded that predicted puffin mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Forth Islands SPA.**

1.2.19 Imperial Dock Lock, Leith SPA

Name of European Site: Imperial Dock Lock SPA Closest distance to SEP / DEP site: 410 / 410km						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Risk (Project Alone)			**Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Common tern, Breeding (SPA)		N (a)			N (b)	

a) **Section 9.20.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult common terns from the Imperial Dock Lock, Leith SPA at risk of collision at SEP and DEP is 0.01. This would increase the existing mortality of the SPA breeding population by 0.02%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Imperial Dock Lock, Leith SPA.**

b) **Section 9.20.3.1.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult common tern population of the Imperial Dock Lock, Leith SPA are extremely small, with 0.01 collisions predicted annually). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. During the breeding season, no OWFs are within mean maximum foraging range of this SPA. Therefore no impacts are predicted. Impacts on this qualifying feature are also possible at OWFs during the spring and autumn migration seasons. A review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. However, the low flight heights that are generally used by this species during passage periods ("Corrigendum," 2014; Hedenström and Åkesson, 2016; Johnston *et al.*, 2014), indicate that the possibility of a substantial in-combination collision impact on this species during these seasons is unlikely. Furthermore, as just 0.8% of total common tern impacts outside the breeding season would be apportioned to this SPA population (Furness, 2015), the possibility of a substantial impact on this SPA population is considered to be remote**. It is concluded that predicted common tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Imperial Dock Lock, Leith SPA.**

1.2.20 Fowlsheugh SPA

Name of European Site: Fowlsheugh SPA Closest distance to SEP / DEP site: 460 / 450km												
Site Features	**Adverse Effect on Integrity due to SEP and DEP**											
	Collision Risk (Project Alone)			**Displacement / Barrier Effects (Project Alone)**			**Collision Risk (In-Combination)**			**Displacement / Barrier Effects (In-Combination**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**			
Kittiwake, Breeding		N (a)						N (b)				
Common guillemot, Breeding					N (c)						N (d)	

a) **Section 9.21.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult kittiwakes from the Fowlsheugh SPA at risk of collision at DEP is 0.07, with 0.01 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.09 Fowlsheugh SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Fowlsheugh SPA.**

b) **Section 9.21.3.1.5.1** of the **RIAA**: In total, 91.7 collisions per year are predicted for breeding adults of the Fowlsheugh SPA due to in-combination collision risk of OWFs in the North Sea. This would increase the existing mortality within this population by approximately 2.2%. Since increases in mortality of more than 1% could potentially be detectable, an adverse effect due to this in-combination impact is possible. The predicted impacts of SEP and DEP on the breeding adult kittiwake population of the Fowlsheugh SPA are extremely small, with 0.09 collisions predicted annually. It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. An impact of this magnitude is not considered to prevent the conservation objectives of the SPA from being met. **It is concluded that predicted kittiwake mortality due to of collision impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Fowlsheugh SPA.**

c) **Section 9.21.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from the Fowlsheugh SPA at risk of displacement from SEP and DEP is 479 birds. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding population would increase by 0.83% due to impacts at DEP, and 0.06% due to impacts at SEP (0.90% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.06% due to impacts at DEP (2.2 birds), less than 0.01% due to impacts at SEP (0.2 birds), and 0.06% due to the impacts of SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would

	Name of European Site: Fowlsheugh SPA Closest distance to SEP / DEP site: 460 / 450km

occur under any combination of displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Fowlsheugh SPA.**

d) **Section 9.21.3.2.5.1** of the **RIAA**: Of the birds at risk of displacement, 7,692 are estimated to belong to Fowlsheugh SPA, assuming 3.0% of birds of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). In total therefore, 15,372 birds from the Fowlsheugh SPA are at risk of in-combination OWF displacement throughout the year. Annual displacement and mortality of breeding adult birds belonging to the Fowlsheugh SPA are presented in **Table 9-174** of the **RIAA**. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 1,076 breeding adult SPA birds would be lost to displacement each year. This would increase the existing mortality within the SPA population (3,746 breeding adult birds per year) by 28.72%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 77 birds. This would increase the existing mortality within this population by 2.05%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to the level of mortality predicted if the evidence-based rates for mortality and displacement are used. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Fowlsheugh SPA.**

1.2.21 Ythan Estuary, Sands of Forvie and Meikle Lock SPA

Name of European Site: Ythan Estuary, Sands of Forvie and Meikle Loch SPA
Closest distance to SEP / DEP site: 480 / 480km

Site Features	Adverse Effect on Integrity due to SEP and DEP																	
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Combined Displacement and Collision Risk (Project Alone)			Displacement / Barrier Effects (In-Combination)			Collision Risk (In-Combination)			Combined Displacement / Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Sandwich tern, Breeding		N (a)			N (b)			N (c)			N (d)			N (e)			N (f)	

a) **Section 9.22.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of Sandwich terns at risk of displacement is one bird, which would occur at DEP. The displacement mortality from SEP and DEP would increase annual mortality within this population by <0.01% (**Table 9-175** of the **RIAA**). 980. It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. **It is concluded that predicted Sandwich tern mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

b) **Section 9.22.3.1.4.2** of the **RIAA**: For DEP, the mean annual collision estimate increases the annual baseline mortality by 0.00%, and the predicted increase in the annual baseline mortality is 0.04% for the annual upper 95% CI output. For SEP, the mean and upper 95% CI collision rates increases the annual baseline mortality by 0.00. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. Collision risk predictions in-combination are shown in **Table 9-178** of the **RIAA**, avoidance rates of 0.980. It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

c) **Section 9.22.3.1.4.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The worst-case scenario for combined operational phase displacement and collision for Ythan Estuary, Sands of Forvie and Meikle Loch SPA Sandwich terns is therefore presented in **Table 9-177** of the **RIAA**. The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

d) **Section 9.22.3.1.5.1** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult Sandwich tern population of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA are extremely small, with a mean predicted annual mortality rate of up to 0.01 birds (**Table 9-177** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination operational phase OWF displacement effect on this qualifying feature. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

e) **Section 9.22.3.1.5.2** of the **RIAA**: The predicted impacts of SEP and DEP on the breeding adult Sandwich tern population of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA are extremely small, with a mean predicted annual mortality rate of 0.01 birds (**Table 9-69** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. **It is concluded that predicted Sandwich tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

f) **Section 9.22.3.1.5.3** of the **RIAA**: It was demonstrated for Sandwich terns of the North Norfolk Coast SPA that when considering combined displacement and Collision Risk, the highest mortality rates are obtained when macro-avoidance is 0% (i.e. displacement is not predicted to occur). The annual mortality predicted and consequent increase in baseline annual mortality of the population is very small, far less than the 1% level at which effects may be detectable. **It is concluded that predicted Sandwich tern mortality due to combined displacement and collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA.**

1.2.22 Troup, Pennan and Lion's Heads SPA

Name of European Site: Troup, Pennan and Lion's Heads SPA
Closest distance to SEP / DEP site: 540 / 530km

Site Features	Adverse Effect on Integrity due to SEP and DEP											
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)			Collision Risk (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D
Guillemot, Breeding		N (c)			N (d)							
Kittiwake, Breeding								N (a)			N (b)	

a) **Section 9.23.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult kittiwakes from the Troup, Pennan and Lion's Heads SPA at risk of collision at DEP is 0.12, with 0.02 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.14 Troup, Pennan and Lion's Heads SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by 0.01%. The maximum predicted mortality increase that could occur in the population is 0.01% due to the collision impacts of SEP and DEP. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Troup, Pennan and Lion's Heads SPA.**

b) **Section 9.23.3.1.5.1** of the **RIAA**: In total, 68.6 collisions per year are predicted for breeding adults of the Troup, Pennan and Lions Heads SPA due to in-combination collision risk of OWFs in the North Sea. This would increase the existing mortality within this population by 2.2%. These collision rates are based largely on consented OWF designs. The predicted impacts of SEP and DEP on the breeding adult kittiwake population of Troup, Pennan and Lions Heads SPA are small, with a mean predicted annual mortality rate of 0.14 birds. It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted kittiwake mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Troup, Pennan and Lions Heads SPA.**

c) **Section 9.23.3.2.4.1** of the **RIAA**: At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 0.4 to 9.4 SPA breeding adults would be predicted to die each year due to displacement from DEP, and 0.0 to 0.7 birds due to displacement at SEP. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.05% due to impacts at DEP (0.7 birds), 0.00% due to impacts at SEP (0.0 birds) and 0.05% due to the impacts of SEP and DEP (0.7 birds). **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Troup, Pennan and Lion's Head SPA.**

d) **Section 9.23.3.2.5.1** of the **RIAA**: In total, 2,927 birds from the Troup, Pennan and Lion's Head SPA are at risk of in-combination OWF displacement throughout the year. Whilst existing mortality of birds from this SPA may be at a level where effects could be detectable in the context of natural variation due to this impact, SEP and DEP, along with the majority of UK North Sea OWFs, do not contribute to it. It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of Troup, Pennan and Lion's Head SPA. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Troup, Pennan and Lion's Head SPA.**

1.2.23 East Caithness Cliffs SPA

Name of European Site: East Caithness Cliffs SPA
Closest distance to SEP / DEP site: 620 / 610km

Site Features	Adverse Effect on Integrity due to SEP and DEP											
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Collision Risk (In-Combination)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D
Kittiwake, Breeding					N (a)			N (b)				
Guillemot, Breeding		N (c)									N (d)	
Razorbill, Breeding		N (e)									N (f)	

Name of European Site: East Caithness Cliffs SPA
Closest distance to SEP / DEP site: 620 / 610km

a) **Section 9.24.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult kittiwakes from the East Caithness Cliffs SPA at risk of collision at DEP is 0.06, with 0.00 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.06 East Caithness Cliffs SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. The maximum predicted mortality increase that could occur in the population is 0.01% due to the collision impacts of SEP and DEP. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of East Caithness Cliffs SPA.**

b) **Section 9.24.3.1.5.1** of the **RIAA**: In total, 275.7 collisions per year are predicted for breeding adults of the East Caithness Cliffs SPA due to in-combination collision risk of OWFs in the North Sea. This would increase the existing mortality within this population by 3.9%. The predicted impacts of SEP and DEP on the breeding adult kittiwake population of the East Caithness Cliffs SPA are extremely small relative to the overall annual in-combination impact predicted, with a mean predicted annual mortality rate of 0.37 birds (**Table 9-186** of the **RIAA**). It is therefore considered that the predicted impacts SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature, and will not prevent, or delay, the conservation objectives for this SPA from being met. **It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the East Caithness Cliffs SPA.**

c) **Section 9.24.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from East Caithness Cliffs SPA at risk of displacement from SEP and DEP is 1,469 birds (**Table 9-188** of the **RIAA**); 1,370 at DEP (**Table 9-186** of the **RIAA**) and 100 at SEP (**Table 9-188** of the **RIAA**). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 4.1 to 95.9 SPA breeding adults would be predicted to die each year due to displacement from DEP, and 0.3 to 7.0 birds due to displacement at SEP. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.08% due to impacts at DEP (6.8 birds), 0.01% due to impacts at SEP (0.5 birds) and 0.08% due to the impacts of SEP and DEP (7.3 birds). It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of East Caithness Cliffs SPA. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of East Caithness Cliffs SPA.**

d) **Section 9.24.3.2.5.1** of the **RIAA**: In total, 43,359 birds from the East Caithness Cliffs SPA are at risk of in-combination OWF displacement throughout the year. 1083. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 3,035 breeding adult SPA birds would be lost to displacement each year. This would increase the existing mortality within the SPA population (9,103 breeding adult birds per year) by 33.34%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 217 birds. This would increase the existing mortality within this population by 2.38%. In addition, the predicted impacts of SEP and DEP on the breeding adult guillemot population of the East Caithness Cliffs SPA are small relative to the overall impact (**Table 9-189** of the **RIAA**). It is considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP, in-combination with other projects, would not adversely affect the integrity of East Caithness Cliffs SPA.**

e) **Section 9.24.3.3.4.1** of the **RIAA**: The predicted annual mortality increase for breeding adults from this SPA due to this impact is between 0.00% to 0.18% for DEP, 0.00% to 0.10% for SEP, and 0.01% to 0.28% for SEP and DEP when displacement and mortality rates of 0.300 to 0.700 and 1% to 10% are considered alongside mean peak abundance estimates for SEP and DEP. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the East Caithness Cliffs SPA breeding adult razorbill population would increase by 0.01% due to impacts at DEP (0.4 birds), 0.01% due to impacts at SEP (0.2 birds), and 0.02% due to the impacts of SEP and DEP (0.6 birds). It is concluded that predicted razorbill mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the East Caithness Cliffs SPA. **It is concluded that predicted razorbill mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the East Caithness Cliffs SPA.**

f) **Section 9.24.3.3.5.1** of the **RIAA**: In total, 6,894 birds from the East Caithness Cliffs SPA are at risk of in-combination OWF displacement throughout the year. The predicted impacts of SEP and DEP on the breeding adult razorbill population of the East Caithness Cliffs SPA are small relative to the overall impact (**Table 9-193** of the **RIAA**). It is considered that SEP and DEP do not contribute substantially to any in-combination displacement impacts on this qualifying feature, and the magnitude of the contribution is unlikely to prevent, or delay, the conservation objectives of the SPA being met. **It is concluded that predicted razorbill mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of East Caithness Cliffs SPA.**

1.2.24 North Caithness Cliffs SPA

Name of European Site: North Caithness Cliffs SPA
Closest distance to SEP / DEP site: 650 / 640km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Guillemot, Breeding		N (a)			N (b)	

Name of European Site: North Caithness Cliffs SPA
Closest distance to SEP / DEP site: 650 / 640km

a) **Section 9.25.3.1.4.1** of the **RIAA**: When added to the existing baseline mortality and assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 1.80% due to impacts at DEP and 0.13% due to impacts at SEP (1.93% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.13% due to impacts at DEP (3.1 birds), 0.01% due to impacts at SEP (0.2 birds) and 0.14% due to the impacts of SEP and DEP (3.3 birds). As predicted increases in baseline mortality of breeding adult guillemot of less than 1% are predicted, and are likely to be undetectable against natural variation, **it is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the North Caithness Cliffs SPA.**

b) **Section 9.25.3.1.5.1** of the **RIAA**: In total, 12,512 birds from the North Caithness Cliffs SPA are at risk of in-combination OWF displacement throughout the year. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 876 breeding adult SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (2,371 breeding adult birds per year) by 36.95%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 63 birds. This would increase the existing mortality within this population by 2.64%. Whilst existing mortality of birds from this SPA may be at a level where effects could be detectable in the context of natural variation due to this impact, SEP and DEP, along with the majority of UK North Sea OWFs, do not contribute to it. It is considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of North Caithness Cliffs SPA.**

1.2.25 Hoy SPA

Name of European Site: Hoy SPA
Closest distance to SEP / DEP site: 670 / 660km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Red-throated diver, Breeding		N (a)			N (b)	

a) **Section 9.26.3.1.4.1** of the **RIAA**: The available evidence regarding red-throated diver displacement by operational OWFs suggests that the most likely result of displacement is that there will be little or no impact on adult survival, and that any impact would probably be undetectable at the population level. There is very little evidence to support the upper range of mortality effects for displaced birds currently advised by Natural England (i.e. up to 10%), and a review of the available evidence indicates that a mortality rate of 1% is considered precautionary (Macarthur Green, 2019). Using this evidence-based precautionary value for mortality, predicted mortality increases of this SPA population are considerably below 1% of the existing mortality level, which is considered the limit below which a population-level impact would be undetectable and within the expected levels of natural variation. **It is concluded on this basis that predicted mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Hoy SPA.**

b) **Section 9.26.3.1.5.1** of the **RIAA**: Of the birds at risk of displacement, 23 are estimated to belong to the Hoy SPA, assuming up to 0.9% of birds of the total BDMPS belong to the breeding population of this SPA during passage seasons, and 0.2% of birds of the total BDMPS belong to the breeding population of this SPA during the winter. Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, two breeding adult SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (19 breeding adult birds per year) by 12.27%. Using a displacement rate of 1.000, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 0.23 birds. This would increase the existing mortality within this population by 1.23%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that detectable changes in mortality rates could occur due to the level or mortality predicted if the more realistic worst-case rates for mortality are used. However, the numbers of birds predicted to be displacement is small (i.e. less than a single bird annually). It is also anticipated that displacement and mortality rates may be considerably lower than those considered by this assessment. Finally, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted red-throated diver mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Hoy SPA.**

1.2.26 Auskerry SPA

Name of European Site: Auskerry SPA Closest distance to SEP / DEP site: 680 / 670km						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Collision Risk (Project Alone)			**Collision Risk (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Arctic tern, Breeding		N (a)			N (b)	

a) **Section 9.27.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult Arctic terns from the Auskerry SPA at risk of collision at SEP and DEP is <0.01. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur on this population whether the mean monthly density estimates for SEP and DEP or the upper 95% CIs of these density estimates are used as an input into the CRM. The maximum predicted mortality increase that could occur in the population is <0.01% due to the collision impacts of SEP and DEP. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Auskerry SPA.**

b) **Section 9.27.3.1.5.1** of the **RIAA**: The potential project alone effects on the breeding adult Arctic tern population of the Auskerry SPA are extremely small. The predicted impacts of SEP and DEP on the breeding adult Arctic tern population of the Auskerry SPA are extremely small (i.e. virtually zero) (**Table 9-203** of the **RIAA**). Potential in-combination effects of OWF collision on Arctic tern have not been investigated quantitatively. A review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. As approximately just 0.8% of migration season impacts on this species would be apportioned to this SPA population (Furness, 2015), it is considered unlikely that in-combination effects on this qualifying feature will occur to the level where an adverse effect on the integrity of the site would be possible. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Auskerry SPA.**

1.2.27 Marwick Head SPA

Name of European Site: Marwick Head SPA Closest distance to SEP / DEP site: 710 / 700km						
Site Features	**Adverse Effect on Integrity due to SEP and DEP**					
	Displacement / Barrier Effects (Project Alone)			**Displacement / Barrier Effects (In-Combination)**		
	C	**O**	**D**	**C**	**O**	**D**
Guillemot, Breeding		N (a)			N (b)	

a) **Section 9.28.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from Marwick Head SPA at risk of displacement from SEP and DEP is 160 birds (**Table 9-206** of the **RIAA**); 149 at DEP (**Table 9-204** of the **RIAA**) and 11 at SEP (**Table 9-206** of the **RIAA**). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 0.4 to 10.4 SPA breeding adults would be predicted to die each year due to displacement from DEP and 0.0 to 0.8 birds due to displacement at SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 1.43% due to impacts at DEP and 0.10% due to impacts at SEP (1.53% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.10% due to impacts at DEP (0.7 birds), 0.01% due to impacts at SEP (0.1 birds) and 0.11% due to the impacts of SEP and DEP (0.8 birds). **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Marwick Head SPA.**

b) **Section 9.28.3.1.5.1** of the **RIAA**: Of birds at risk of displacement, 2,564 are estimated to belong to Marwick Head SPA, by assuming 1.0% of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 179 breeding adult SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (731 breeding adult birds per year) by 24.55%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 13 birds. This would increase the existing mortality within this population by 1.75%. It is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Marwick Head SPA.**

1.2.28 West Westray SPA

Name of European Site: West Westray SPA
Closest distance to SEP / DEP site: 720 / 710km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Guillemot, Breeding		N (a)			N (b)	

a) Section 9.29.3.1.4.1 of the RIAA: Based on the mean peak abundances, the annual total of guillemots from West Westray SPA at risk of displacement from SEP and DEP is 463 birds (Table 9-210 of the RIAA); 432 at DEP (Table 9-207 of the RIAA) and 31 at SEP (Table 9-209 of the RIAA). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 1.3 to 30.2 SPA breeding adults would be predicted to die each year due to displacement from DEP and 0.1 to 2.2 birds due to displacement at SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 1.73% due to impacts at DEP and 0.13% due to impacts at SEP (1.85% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.12% due to impacts at DEP (2.2 birds), 0.01% due to impacts at SEP (0.2 birds) and 0.13% due to the impacts of SEP and DEP (2.3 birds). The use of evidence-based displacement (0.500) and mortality rates (1%) would result in a mortality increase of substantially less than 1% and increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of West Westray SPA.**

b) Section 9.29.3.1.5.1 of the RIAA: Of the birds at risk of displacement, 7,436 are estimated to belong to West Westray SPA, assuming 2.9% of birds of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 521 breeding adult SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (1,751 breeding adult birds per year) by 29.74%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 37 birds. This would increase the existing mortality within this population by 2.12%. The predicted impacts of SEP and DEP on the breeding adult guillemot population of the West Westray SPA are small relative to the overall impact (Table 9-210 of the RIAA). It is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of West Westray SPA.**

1.2.29 Fair Isle SPA

Name of European Site: Fair Isle SPA
Closest distance to SEP / DEP site: 720 / 710km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Guillemot, Breeding		N (a)			N (b)	

a) Section 9.30.3.1.4.1 of the RIAA: Based on the mean peak abundances, the annual total of guillemots from Fair Isle SPA at risk of displacement from SEP and DEP is 176 birds (Table 9-214 of the RIAA); 164 at DEP (Table 9-215 of the RIAA) and 12 at SEP (Table 9-213 of the RIAA). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 0.5 to 11.5 SPA breeding adults would be predicted to die each year due to displacement from DEP and 0.0 to 0.8 birds due to displacement at SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 0.90% due to impacts at DEP and 0.07% due to impacts at SEP (0.96% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.06% due to impacts at DEP (0.8 birds), less than 0.01% due to impacts at SEP (0.1 birds) and 0.07% due to the impacts of SEP and DEP (0.9 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of recommended displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Foula SPA.**

Name of European Site: Fair Isle SPA
Closest distance to SEP / DEP site: 720 / 710km

b) **Section 9.30.3.1.5.1** of the **RIAA**: Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 197 breeding adult SPA birds would be lost to displacement each non-breeding season. This would increase the existing mortality within the SPA population (1,276 breeding adult birds per year) by 15.47%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 14 birds. This would increase the existing mortality within this population by 1.10%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to the level of mortality predicted if the evidence-based rates for mortality and displacement are used. Therefore, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Fair Isle SPA.**

1.2.30 Noss SPA

Name of European Site: Noss SPA
Closest distance to SEP / DEP site: 780 / 765km

Site Features	Adverse Effect on Integrity due to SEP and DEP																	
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Collision Risk (In-Combination)			Displacement / Barrier Effects (In-Combination)			Combined Displacement and Collision Risk (Project Alone)			Combined Displacement and Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Gannet, Breeding		N (a)			N (b)			N (e)			N (d)			N (c)			N (f)	
Guillemot, Breeding		N (g)									N (h)							

a) **Section 9.31.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of breeding adult gannets from Noss SPA at risk of displacement from DEP is 13, 10 from SEP, and 23 for SEP and DEP. At displacement rates of 0.600 to 0.800 and a maximum mortality rate of 1% for displaced birds, 0.14 to 0.19 SPA breeding adults would be predicted to die each year due to displacement from both OWFs (**Table 9-218** of the **RIAA**). The combined displacement mortality of SEP and DEP would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Noss SPA.**

b) **Section 9.31.3.1.4.2** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult gannets from Noss SPA at risk of collision at DEP is 0.10, with 0.02 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.12 Noss SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Noss SPA.**

c) **Section 9.31.3.1.4.3** of the **RIAA**: Based on the mean combined displacement and collision rates, the annual mortality of breeding adult gannets from Noss SPA at DEP is 0.20, and 0.09 at SEP. This gives a combined total annual displacement and Collision Risk rate for SEP and DEP of 0.29 Noss SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates are likely in a typical year of impacts due to SEP and DEP. **It is concluded that predicted gannet mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Noss SPA.**

d) **Section 9.31.3.1.5.1** of the **RIAA**: Assuming a displacement rate of 0.600 to 0.800, and a mortality rate of 1% of displaced birds, 6 to 9 SPA birds would be lost to displacement each year. This would increase the existing mortality within the SPA population (2,230 breeding adult birds per year) by 0.29% to 0.39%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable change in mortality rate is predicted due to operational phase OWF displacement impacts. The predicted impacts of SEP and DEP on the breeding adult gannet population of Noss SPA due to this impact are small, with a mean predicted annual mortality rate of 0.16 birds (**Table 9-220** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Noss SPA.**

e) **Section 9.31.3.1.5.2** of the **RIAA**: During the autumn and spring migration seasons respectively, 836 and 333 birds belonging to the UK North Sea and Channel BDMPS are predicted to die due to collision with OWFs in the North Sea. Of these birds, 47 are estimated to belong to the breeding adult population of Noss SPA, assuming 3.4% of birds of the total relevant BDMPS belong to the breeding population of this SPA during the autumn migration season, and 5.5% of birds of the total relevant BDMPS belong to the breeding population of this SPA (Furness, 2015) during the spring migration season. This would increase the existing mortality within the SPA population (2,230 breeding adult birds per year) by 2.10%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to collision risk. The predicted impacts of SEP and DEP on the breeding adult gannet population of Noss SPA are small, with a mean predicted annual mortality rate of 0.12 birds (**Table 9-220** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Noss SPA.**

Name of European Site: Noss SPA
Closest distance to SEP / DEP site: 780 / 765km

f) **Section 9.31.3.1.5.3** of the **RIAA**: The predicted annual in-combination breeding adult Noss SPA gannet mortality from collision and displacement of OWFs screened in is between 53 and 56 birds, depending on whether a displacement rate of 60% or 80% is used in calculations. This represents an increase in existing annual mortality of 2.38% to 2.51%, assuming an existing mortality of 2,230 breeding adult birds per year. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to collision risk. The predicted impacts of SEP and DEP on the breeding adult gannet population of Noss SPA are small, with a mean predicted annual mortality rate of 0.29 birds (**Table 9-220** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay, the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to the combined impacts of operational phase displacement and collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Noss SPA.**

g) **Section 9.31.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from Noss SPA at risk of displacement from SEP and DEP is 208 birds (**Table 9-224** of the **RIAA**); 194 at DEP (**Table 9-222** of the **RIAA**) and 14 at SEP (**Table 9-223** of the **RIAA**). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 0.6 to 13.5 SPA breeding adults would be predicted to die each year due to displacement from DEP and 0.0 to 1.0 birds due to displacement at SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 0.91% due to impacts at DEP and 0.07% due to impacts at SEP (0.97% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.06% due to impacts at DEP (1.0 birds), less than 0.01% due to impacts at SEP (0.1 birds) and 0.07% due to the impacts of SEP and DEP (1.0 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of recommended displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Noss SPA.**

h) **Section 9.31.3.2.5.1** of the **RIAA**: Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of recommended displacement and mortality rates when the mean peak abundance estimate assessments are considered. Of the birds at risk of displacement, 3,333 are estimated to belong to Noss SPA, assuming 1.3% of birds of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 233 breeding adult SPA birds would be lost to displacement each year. This would increase the existing mortality within the SPA population (1,492 breeding adult birds per year) by 15.64%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 17 birds. This would increase the existing mortality within this population by 1.12%. The predicted impacts of SEP and DEP on the breeding adult guillemot population of the Noss SPA are small relative to the overall impact (**Table 9-224** of the **RIAA**). It is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature, even if it is assumed that the species is fully migratory. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Noss SPA.**

1.2.31 East Mainland Coast, Shetland SPA

Name of European Site: East Mainland Coast, Shetland SPA
Closest distance to SEP / DEP site: 780 / 770km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Red-throated diver, Breeding		N (a)			N (b)	

a) **Section 9.32.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of red-throated divers from the East Mainland Coast Shetland SPA at risk of displacement from SEP and DEP is 11 birds (**Table 9-228** of the **RIAA**); three at DEP (**Table 9-226** of the **RIAA**) and eight at SEP (**Table 9-227** of the **RIAA**). At a displacement rate of 1.000, and mortality rates of 1% to 10% for displaced birds, zero to 0.3 SPA breeding adults would be predicted to die each year due to displacement from DEP, and zero to 0.8 birds due to displacement from SEP. Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.42% due to impacts at DEP, and 1.24% due to impacts at SEP (1.66% due to SEP and DEP). Using what is thought to be a more reasonable worst-case scenario of 1% mortality, annual mortality in the East Mainland Coast Shetland SPA breeding adult red-throated diver population would increase by 0.04% due to impacts at DEP, 0.12% due to impacts at SEP, and 0.17% due to the impacts of SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted red-throated diver mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the East Mainland Coast Shetland SPA.**

Name of European Site: East Mainland Coast, Shetland SPA
Closest distance to SEP / DEP site: 780 / 770km

b) **Section 9.32.3.1.5.1** of the **RIAA**: Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, 10 breeding adult SPA birds would be lost to displacement annually. This would increase the existing mortality within the SPA population (66 breeding adult birds per year) by 15.69%. Using a realistic worse-case displacement rate of 1.000, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be one bird. This would increase the existing mortality within this population by 1.57%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. Therefore, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay the conservation objectives for the SPA being met. **It is concluded that predicted red-throated diver mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of East Mainland Coast Shetland SPA.**

1.2.32 Foula SPA

Name of European Site: Foula SPA
Closest distance to SEP / DEP site: 785 / 775km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Guillemot, Breeding		N (a)			N (b)	
Puffin, Breeding		N (c)			N (d)	
Red-throated diver, Breeding		N (e)			N (f)	

a) **Section 9.33.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of guillemots from Foula SPA at risk of displacement from SEP and DEP is 224 birds (**Table 9-232** of the **RIAA**); 208 at DEP (**Table 9-230** of the **RIAA**) and 15 at SEP (**Table 9-231** of the **RIAA**). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, 0.6 to 14.6 SPA breeding adults would be predicted to die each year due to displacement from DEP and 0.0 to 1.1 birds due to displacement at SEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within the SPA breeding adult population would increase by 0.72% due to impacts at DEP and 0.05% due to impacts at SEP (0.77% due to SEP and DEP). Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, annual mortality in the population would instead increase by 0.05% due to impacts at DEP (1.0 birds), less than 0.01% due to impacts at SEP (0.1 birds) and 0.06% due to the impacts of SEP and DEP (1.1 birds). Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates would occur under any combination of recommended displacement and mortality rates when the mean peak abundance estimate assessments are considered. **It is concluded that predicted guillemot mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of Foula SPA.**

b) **Section 9.33.3.1.5.1** of the **RIAA**: Of the birds at risk of displacement, 3,590 are estimated to belong to Foula SPA, assuming 1.4% of birds of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 251 breeding adult SPA birds would be lost to displacement each non-breeding season (and therefore annually). This would increase the existing mortality within the SPA population (2,027 breeding adult birds per year) by 12.40%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 18 birds. This would increase the existing mortality within this population by 0.89%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. Therefore, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted guillemot mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Foula SPA.**

c) **Section 9.33.3.2.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of puffins from the Foula SPA at risk of displacement from SEP and DEP is 1 birds (**Table 9-236** of the **RIAA**); 1 at DEP (**Table 9-234** of the **RIAA**) and 0 at SEP (**Table 9-235** of the **RIAA**). At displacement rates of 0.300 to 0.700, and mortality rates of 1% to 10% for displaced birds, less than one (0.00 - 0.06) SPA breeding adult would be predicted to die each year due to displacement from SEP and DEP. Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.00% due to impacts at SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted puffin mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Foula SPA.**

Name of European Site: Foula SPA
Closest distance to SEP / DEP site: 785 / 775km

d) **Section 9.33.3.2.5.1** of the **RIAA**: During the non-breeding season, 45,017 birds belonging to the UK North Sea and Channel BDMPS are at risk of displacement from OWFs in the North Sea. Of the birds at risk of displacement, 1,310 are estimated to belong to the Foula SPA, assuming 2.9% of birds of the total BDMPS belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 0.700 and a mortality rate of 10% of displaced birds, 92 breeding adult SPA birds would be lost to displacement each non-breeding season (and therefore annually). This would increase the mortality within this population by 15.37%. Using an evidence-based displacement rate of 0.500, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 7 birds. This would increase the mortality within this population by 1.10%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. Therefore, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted puffin mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Foula SPA.**

e) **Section 9.33.3.3.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of red-throated divers from the Foula SPA at risk of displacement from SEP and DEP is less than one bird (**Table 9-240** of the **RIAA**). At a displacement rate of 1.000, and mortality rates of 1% to 10% for displaced birds, zero to 0.01 SPA breeding adults would be predicted to die each year due to displacement from DEP, and zero to 0.05 birds due to displacement from SEP. Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.39% due to impacts at DEP, and 1.21% due to impacts at SEP (1.60% due to SEP and DEP). Using what is thought to be a more reasonable worst-case scenario of 1% mortality, annual mortality in the Foula SPA breeding adult red-throated diver population would increase by 0.04% due to impacts at DEP, 0.12% due to impacts at SEP, and 0.16% due to the impacts of SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted red-throated diver mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Foula SPA.**

f) **Section 9.33.3.3.5.1** of the **RIAA**: Less than one (0.46) breeding adult SPA birds would be lost to displacement annually. This would increase the existing mortality within the SPA population (16 breeding adult birds per year) by 11.95%. Using a displacement rate of 1.000, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be 0.05 birds. This would increase the existing mortality within this population by 1.20%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. Therefore, it is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay the conservation objectives for the SPA being met. **It is concluded that predicted red-throated diver mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Foula SPA.**

1.2.33 Papa Stour SPA

Name of European Site: Papa Stour SPA
Closest distance to SEP / DEP site: 810 / 795km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Collision Risk (Project Alone)			Collision Risk (In-Combination)		
	C	O	D	C	O	D
Arctic tern, Breeding		N (a)			N (b)	

a) **Section 9.34.3.1.4.1** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult Arctic terns from the Papa Stour SPA at risk of collision at SEP and DEP is <0.01. This would increase the existing mortality of the SPA breeding population by <0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Papa Stour SPA.**

b) **Section 9.34.3.1.5.1** of the **RIAA**: Potential in-combination effects of OWF collision on Arctic tern have not been investigated quantitatively. During the breeding season, no OWFs are within mean maximum foraging range plus one standard deviation of this SPA, therefore no breeding season impacts on this qualifying feature are predicted. Outside the breeding season, there is potential for other OWFs to impact this qualifying feature during the spring and autumn migration seasons. However, a review of other OWF assessments has not revealed any OWFs where substantial impacts on this species are predicted during these seasons. As approximately just 1.3% of migration season impacts on this species would be apportioned to this SPA population (Furness, 2015), it is considered unlikely that in-combination effects on this qualifying feature will occur to the level where an adverse effect on the integrity of the site would be possible. **It is concluded that predicted Arctic tern mortality due to collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Papa Stour SPA.**

1.2.34 Ronas Hill – North Roe and Tingon SPA

Name of European Site: Ronas Hill – North Roe and Tingon SPA
Closest distance to SEP / DEP site: 825 / 810km

Site Features	Adverse Effect on Integrity due to SEP and DEP					
	Displacement / Barrier Effects (Project Alone)			Displacement / Barrier Effects (In-Combination)		
	C	O	D	C	O	D
Red-throated diver, Breeding		N (a)			N (b)	

a) **Section 9.35.3.1.4.1** of the **RIAA**: At a displacement rate of 1.000, and mortality rates of 1% to 10% for displaced birds, zero to 0.1 SPA breeding adults would be predicted to die each year due to displacement from DEP, and zero to 0.2 birds due to displacement from SEP. Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, annual mortality within this population would increase by 0.38% due to impacts at DEP, and 1.17% due to impacts at SEP (1.55% due to SEP and DEP). Using what is thought to be a more reasonable worst-case scenario of 1% mortality, annual mortality in the Ronas Hill - North Roe and Tingon SPA breeding adult red-throated diver population would increase by 0.04% due to impacts at DEP, 0.12% due to impacts at SEP, and 0.15% due to the impacts of SEP and DEP. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted red-throated diver mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Ronas Hill - North Roe and Tingon SPA.**

b) **Section 9.35.3.1.5.1** of the **RIAA**: Of the birds at risk of displacement, 18 are estimated to belong to the Ronas Hill - North Roe and Tingon SPA, assuming up to 0.7% of birds of the total BDMPS during the spring and autumn migration seasons belong to the breeding population of this SPA, and 0.2% of birds of the total BDMPS during the winter belong to the breeding population of this SPA (Furness, 2015). Assuming a displacement rate of 1.000 and a mortality rate of 10% of displaced birds, two breeding adult SPA birds would be lost to displacement annually. This would increase the existing mortality within the SPA population (16 breeding adult birds per year) by 11.25%. Using a realistic worse-case displacement rate of 1.000, and a mortality rate for displaced birds of 1%, the annual in-combination displacement mortality would be <1 bird. This would increase the existing mortality within this population by 1.13%. It is considered that SEP and DEP do not contribute substantially to any in-combination impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted red-throated diver mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Ronas Hill - North Roe and Tingon SPA.**

1.2.35 Hermaness, Saxa Vord and Valla Field SPA

Name of European Site: Hermaness, Saxa Vord and Valla Field SPA
Closest distance to SEP / DEP site: 840 / 830km

Site Features	Adverse Effect on Integrity due to SEP and DEP																	
	Displacement / Barrier Effects (Project Alone)			Collision Risk (Project Alone)			Collision Risk (In-Combination)			Displacement / Barrier Effects (In-Combination)			Combined Displacement and Collision Risk (Project Alone)			Combined Displacement and Collision Risk (In-Combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Gannet, Breeding		N (a)			N (b)			N (e)			N (d)			N (c)			N (f)	

a) **Section 9.36.3.1.4.1** of the **RIAA**: Based on the mean peak abundances, the annual total of breeding adult gannets from the Hermaness, Saxa Vord and Valla Field SPA at risk of displacement from DEP is 33, 25 from SEP, and 58 for SEP and DEP. At displacement rates of 0.600 to 0.800 and a maximum mortality rate of 1% for displaced birds, 0.35 to 0.46 SPA breeding adults would be predicted to die each year due to displacement from both OWFs (**Table 9-250** of the **RIAA**). The combined displacement mortality of SEP and DEP would increase the existing mortality of the SPA breeding population by 0.01%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. **It is concluded that predicted gannet mortality due to operational phase displacement at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Hermaness, Saxa Vord and Valla Field SPA.**

b) **Section 9.36.3.1.4.2** of the **RIAA**: Based on the mean collision rates, the annual total of breeding adult gannets from the Hermaness, Saxa Vord and Valla Field SPA at risk of collision at DEP is 0.25, with 0.05 collisions annually predicted at SEP. This gives a combined total annual collision rate for SEP and DEP of 0.30 Hermaness, Saxa Vord and Valla Field SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.01%. **It is concluded that predicted gannet mortality due to collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Hermaness, Saxa Vord and Valla Field SPA.**

Name of European Site: Hermaness, Saxa Vord and Valla Field SPA
Closest distance to SEP / DEP site: 840 / 830km

c) **Section 9.36.3.1.4.3** of the **RIAA**: Based on the mean combined displacement and collision rates, the annual mortality of breeding adult gannets from the Hermaness, Saxa Vord and Valla Field SPA at DEP is 0.49, and 0.23 at SEP. This gives a combined total annual displacement and Collision Risk rate for SEP and DEP of 0.71 Hermaness, Saxa Vord and Valla Field SPA breeding adult gannets. This would increase the existing mortality of the SPA breeding population by 0.02%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable changes in mortality rates are likely in a typical year of impacts due to SEP and DEP. **It is concluded that predicted gannet mortality due to the combined effects of operational phase displacement and collision at SEP, DEP, and SEP and DEP together would not adversely affect the integrity of the Hermaness, Saxa Vord and Valla Field SPA.**

d) **Section 9.36.3.1.5.1** of the **RIAA**: Of the birds at risk of displacement, 2,687 are estimated to belong to the breeding adult population of the Hermaness, Saxa Vord and Valla Field SPA, assuming 8.5% of birds of the total relevant BDMPS belong to the breeding population of this SPA during the autumn migration season, and 13.7% of birds of the total relevant BDMPS belong to the breeding population of this SPA during the spring migration season (Furness, 2015). Assuming a displacement rate of 0.600 or 0.800, and a mortality rate of 1% of displaced birds, 16 to 21 SPA birds would be lost to displacement each non-breeding season (and therefore annually). This would increase the existing mortality within the SPA population (4,144 breeding adult birds per year) by 0.39% to 0.52%. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that no detectable change in mortality rate is predicted due to operational phase OWF displacement impacts. The predicted impacts of SEP and DEP on the breeding adult gannet population of the Hermaness, Saxa Vord and Valla Field SPA due to this impact are small, with a mean predicted annual mortality rate of 0.40 birds (**Table 9-249** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Hermaness, Saxa Vord and Valla Field SPA.**

e) **Section 9.36.3.1.5.2** of the **RIAA**: During the autumn and spring migration seasons respectively, 836 and 333 birds are preficted to die due to collision with OWFs in the North Sea. Of these birds, 117 are estimated to belong to the breeding adult population of Hermaness, Saxa Vord and Valla Field SPA. This would increase the existing mortality within the SPA population (4,144 breeding adult birds per year) by 2.82%. The predicted impacts of SEP and DEP on the breeding adult gannet population of the Hermaness, Saxa Vord and Valla Field SPA are small, with a mean predicted annual mortality rate of 0.30 birds (**Table 249** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent or delay the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to of operational phase displacement impacts at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of Hermaness, Saxa Vord and Valla Field SPA.**

f) **Section 9.36.3.1.5.3** of the **RIAA**: The predicted annual in-combination breeding adult Hermaness, Saxa Vord and Valla Field SPA gannet mortality from collision and displacement of OWFs screened into the Appropriate Assessment is between 133 and 138 birds, depending on whether a displacement rate of 0.600 to 0.800 is used in calculations. This represents an increase in existing annual mortality of 3.21% to 3.34%, assuming an existing mortality of 4,144 breeding adult birds per year. Increases in the existing mortality rate of less than 1% are likely to be undetectable against natural variation. This means that a detectable change in mortality rate is predicted due to collision risk. The predicted impacts of SEP and DEP in isolation and together on the breeding adult gannet population of the Hermaness, Saxa Vord and Valla Field SPA are small, with a mean predicted annual mortality rate of 0.70 birds (**Table 9-251** of the **RIAA**). It is therefore considered that SEP and DEP do not contribute substantially to any in-combination collision impacts on this qualifying feature. Mortality rates of this size will not prevent, or delay the conservation objectives for the SPA being met. **It is concluded that predicted gannet mortality due to the combined impacts of operational phase displacement and collision at SEP, DEP, and SEP and DEP together, in-combination with other projects, would not adversely affect the integrity of the Hermaness, Saxa Vord and Valla Field SPA.**

1.2.36 River Wensum SAC

Name of European Site: River Wensum SAC
Closest distance to SEP / DEP site: 0km. The site overlaps with the DCO Order Limits however Horizontal Directional Drilling will be used to go underneath it and therefore avoid direct impacts on the SAC.

Site Features	Adverse Effect on Integrity due to SEP and DEP											
	Direct effects on qualifying features present within ex-situ habitats of the SAC			Indirect effects on qualifying features present within the SAC boundary arising from geology / contamination and groundwater / hydrology effects.			Indirect effects on qualifying features present within ex-situ habitats of the SAC arising from geology / contamination and groundwater / hydrology effects during the construction phase.			In-Combination Effects		
	C	O	D	C	O	D				C	O	D
Watercourses of plain to montane levels with *Ranunculus fluitantis*	N (a)			N (a)			N (a)			N (c)		

Name of European Site: River Wensum SAC Closest distance to SEP / DEP site: 0km. The site overlaps with the DCO Order Limits however Horizontal Directional Drilling will be used to go underneath it and therefore avoid direct impacts on the SAC.												
Desmoulin's whorl snail	N (b)			N (b)			N (b)			N (c)		

a) **Section 6.4.1.1.1** of the **RIAA**: The introduction of cable ducts is not anticipated to have any effect upon groundwater flows for the River Wensum (see **ES Chapter 18 Water Resources and Flood Risk** (document reference 6.1.18)). Furthermore, for a river crossing, HDD ducts would be installed 5m to 15m below the floodplain, and at least 2m below the river bed. As a result, the buried ducts will have no effect upon surface water flows. The potential exists for the accidental release of lubricants, fuels, oils and drilling fluid from construction machinery working in and adjacent to surface watercourses, through spillage, leakage and in-wash from vehicle storage areas after rainfall / sediment runoff due the proposed works in these locations. Furthermore, these activities have the potential to increase the potential for the erosion of soil particulates, resulting in an increase in the supply of fine sediment to surface watercourses through surface runoff and the erosion of exposed soils if unmitigated. The proposed works will entail vehicle tracking and earthworks associated with trenchless crossing techniques at the River Wensum. Plant, including a drilling rig, haulage vehicles earth-moving equipment will be operating within the floodplain adjacent to the watercourse for approximately 2 months. The land would be levelled, topsoil removed and stored within the mobilisation areaThe mitigation measures described in this section of the RIAA and secured in the **Outline Ecological Management Plan** (document reference: 9.19) and **Outline Code of Construction Practice** (document reference 9.17) are considered suitable for minimising the risk of sediment / pollutant release into watercourses functionally connected with the River Wensum down to a negligible level. In light of the negligible risk of the proposed works affecting local groundwater and hydrology following implementation of the mitigation measures outlined above, and the commitment to cross the River Wensum using trenchless techniques, there will be **no adverse effect on the integrity of the River Wensum SAC in relation to the conservation objectives for *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.**

b) **Section 6.4.1.1.2** of the **RIAA**: The potential for SEP and DEP to change local groundwater and hydrological conditions, during its construction phase is covered for indirect effects on *Ranunculion fluitantis* and *Callitricho-Batrachion*. The conclusions and mitigation for potential effects are the same for Desmoulin's whorl snail. The mitigation measures described in **Section 6.4.1.1.1** of the RIAA and secured in the **Outline Ecological Management Plan** (document reference: 9.19) and **Outline Code of Construction Practice** (document reference 9.17) would also mitigate potential effects on Desmoulin's whorl snail and therefore **no adverse effect on the integrity of the River Wensum SAC in relation to the conservation objectives for Desmoulin's whorl snail is anticipated**.

c) **Section 6.4.1.4** of the **RIAA**: Hornsea Project Three, Norfolk Vanguard, Norfolk Boreas and the Norwich Western Link Road projects also propose to cross the River Wensum. Further details of the projects and plans considered as part of a cumulative assessment is presented in **ES Chapter 20 Onshore Ecology and Ornithology** (document reference 6.1.20) (section 20.7) including a more detailed explanation of the potential in-combination impacts from each of the above projects. All of these projects have also committed to avoid direct impacts by either using trenchless techniques or, in the case of the Norwich Western Link, by bridging over the river. All of these projects commit to a similar suite of measures to minimise potential effects to no greater than negligible. With the implementation of this suite of measures indirect effects from each project would be very localised and it is not expected that these localised effects would combine to be any greater than that for each project individually. As such, there would be **no adverse effect on the integrity of the River Wensum SAC, in-combination with other plans and projects.**

1.2.37 Inner Dowsing, Race Bank and North Ridge SAC

Name of European Site: Inner Dowsing, Race Bank and North Ridge SAC Closest distance to SEP / DEP site: 10.3 / 2.2km									
Site Features	**Adverse Effect on Integrity due to SEP and DEP**								
	Increased Suspended Sediment Concentration (SSC) and deposition (project alone)			**Changes in physical processes (effecting sediment supply)**			**Increased SSC and deposition (in-combination)**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Sandbanks which are slightly covered by sea water all the time	N (a)	N (a)	N (a)		N (b)		N (c)	N(c)	N(c)

a) **Section 7.4.2.1.1** of the **RIAA**: The potential for increases in SSC is considered greatest during the construction phase and therefore whilst increases in SSC could occur during operation and decommissioning, given the much reduced volumes of sediment that would be disturbed, any effects would be less than those assessed for construction. For the total volume released during the construction phase, the worst-case scenario is associated with the maximum number of 18MW Gravity Base Structure (GBS) foundations (19 at SEP, 24 at DEP) dredged to 5m, with a maximum preparation volume of 322,327m^3 (SEP) and 407,150m^3 (DEP). Mobilised sediment from gravity base foundation installation may be transported by wave and tidal action in suspension in the water column. During construction, the disturbance effects at each wind turbine location are likely to last for no more than a few days, within an overall foundation installation programme of approximately 6 months. Based on the assessment provided in **ES Chapter 6 Marine Geology, Oceanography and Physical Processes** (document reference 6.1.6), the impact of increased SSC entering the Inner Dowsing, Race Bank and North Ridge SAC and subsequent deposition is expected to be negligible with all subtidal sand biotopes determined to be low or not sensitive, the conservation objectives of the subtidal sandbanks qualifying feature will not be affected and there will be **no adverse effect on the integrity of the Inner Dowsing, Race Bank and North Ridge SAC.**

b) **Section 7.4.2.1.2** of the **RIAA**: Offshore of the North Norfolk coast, sediment transport is tidally driven, with tidal currents moving sediments in a net direction of transport to the south-east. Therefore, net sediment transport is moving away from the Inner Dowsing, Race Bank and North Ridge SAC, and across the SEP and DEP wind farm sites, meaning there will be no interruption of sediment supply to the Annex I sandbanks of the Inner Dowsing, Race Bank and

Name of European Site: Inner Dowsing, Race Bank and North Ridge SAC
Closest distance to SEP / DEP site: 10.3 / 2.2km

North Ridge SAC, which will be supplied by sediment further up the coast from the north-west. Therefore, there will be no impact from changes to physical processes due to cable protection, and the conservation objectives of the subtidal sandbanks qualifying feature will not be affected and there will be **no adverse effect on the integrity of the Inner Dowsing, Race Bank and North Ridge SAC.**

c) **Section 7.4.2.2** of the **RIAA**: Given that Hornsea Project Three is approximately 80km from SEP and DEP and outside the ZOI it is considered there is no pathway for in-combination impacts in relation to wind turbine foundation installation or infield cable installation. In relation to the export cable installation, based on an assumed Hornsea Project Three construction start in 2023 and offshore export cable corridor construction in years 3 and 4 (2026-2026), and possibly also years 7 and 8 in a two-phase development (2030-2031), temporal overlap of export cable construction between SEP and DEP and Hornsea Project Three could potentially occur. However, given that export cable installation is anticipated to be completed in 50 days for a SEP in isolation scenario, 60 days for a DEP in isolation scenario or 100 days for a SEP and DEP scenario, a temporal overlap in export cable construction activities is considered to be unlikely. Moreover, the SEP and DEP export cable corridor is over 14km from the Inner Dowsing, Race Bank and North Ridge SAC and is therefore outside the ZOI for SSCs and so it is determined there is no impact pathway for in-combination effects in relation to export cable installation. Given that construction impacts in relation to increases in SSC and deposition are greatest during construction and there is **no impact pathway for in-combination effects during construction, it is considered there is also no impact pathway for in-combination effects during operation or decommissioning.**

1.2.38 Southern North Sea SAC

Name of European Site: Southern North Sea SAC
Closest distance to SEP / DEP site: 25.6 / 13.9km

Site Features	Adverse Effect on Integrity due to SEP and DEP																								
	Underwater noise – piling (project alone)			Underwater noise during non-piling activities			Underwater noise and disturbance from vessels			Underwater noise – barrier effects			Collision risk with vessels			Changes to water quality			Changes to prey availability			Underwater noise from operational turbines			In-combination (disturbance from underwater noise)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	N (a)			N (b)	N(i)	N(o)	N (c)	N(j)	N(o)	N (d)	N(k)	N(o)	N (e)	N(l)	N(o)	N (f)	N (m)	N(o)	N (g)	N (n)	N(o)		N(h)		N(p)		

a) **Section 8.4.1.1.1** of the **RIAA**: The maximum area of PTS from cumulative exposure during simultaneous piling at SEP and DEP is up to 260km^2 (**Table 8-22** of the **RIAA**). The number of harbour porpoise that could be at risk of PTS, without mitigation, could be up to 380 in the summer period (0.11% of the NS MU), or up to 169 in the winter period (0.05% of the NS MU) (**Table 8-23** of the **RIAA**). The potential impact area of 260km^2 for simultaneous piling at SEP and DEP would not directly overlap with the SNS SAC winter or summer areas. The effective implementation of the MMMP will reduce the risk of PTS to harbour porpoise during piling at SEP and DEP, therefore, there would be **no adverse effect on the integrity of the Southern North Sea SAC in relation to the conservation objectives for harbour porpoise, due to PTS from piling during construction, for SEP and DEP**. See the RIAA for further conclusions in relation to disturbance from underwater noise during piling. For all assessments and scenarios there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction.**

b) **Section 8.4.1.1.2** of the **RIAA**: As a worst-case, the maximum number of harbour porpoise that could be impacted if SEP and DEP are both developed has been assessed (**Table 8-29** of the **RIAA**). The maximum duration of offshore construction, including piling and export cable installation, is up to two years for each Project, therefore four years for SEP and DEP. However, construction activities would not be underway constantly throughout this period. The duration of offshore export cable installation and trenching activities is expected to take approximately 100 days for SEP and DEP. There is no potential for any direct overlap with the SNS SAC for underwater noise from other construction activities at SEP and DEP. There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to auditory injury (PTS or TTS) during construction (activities other than piling), for SEP and DEP**.

c) **Section 8.4.1.1.3** of the **RIAA**: As a worst-case, the maximum number of harbour porpoise has been assessed to indicate the maximum number that could be impacted by vessels from SEP and DEP, if they are developed concurrently (**Table 8-32** of the **RIAA**). The assessment is based on up to 25 vessels on both sites at the same time (an area of 0.75km^2). There is no potential for any direct overlap with the SNS SAC for underwater noise and the presence of vessels. If the behavioural response is displacement from the area, it is predicted that harbour porpoise will return once the activity has been completed and therefore any impacts from underwater noise as a result of construction vessels will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant disturbance of harbour porpoise. There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to auditory injury (PTS or TTS) during construction (disturbance from construction vessels), for SEP and DEP.**

d) **Section 8.4.1.1.4** of the **RIAA**: At the closest point, the DEP wind farm site is 13.9km from the SNS SAC summer area (26km Effective Deterrent Radius (EDR) has a maximum overlap of 356km^2 (1.32%)) and is 18.9km from the SNS SAC winter area (26km EDR has a maximum overlap of 32.7km^2 (0.26%)). The SEP wind farm site is 25.6km from the SNS SAC winter area (26km EDR has a maximum overlap of 0.15km^2 (0.0012%)) and is 31.1km from the SNS SAC summer area (no overlap). The export cable corridors are 21.2km from the summer area and 18.4km from the winter area. Therefore, there is no potential for any direct barrier effects from underwater noise in the SNS SAC and therefore there would be no significant barrier effects to harbour porpoise during construction of SEP and DEP and **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to potential barrier effects from underwater noise during construction for SEP and DEP.**

Name of European Site: Southern North Sea SAC
Closest distance to SEP / DEP site: 25.6 / 13.9km

e) **Section 8.4.1.1.5** of the **RIAA**: As a worst-case, up to 0.008% of the North Sea MU reference population could be at increased collision risk with vessels (**Table 8-33** of the **RIAA**). Therefore, this is not predicted to result in any significant population effects or any changes to the conservation status of harbour porpoise. Taking into account the limited potential for increased collision risk with vessels during construction, there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to increased collision risk with construction vessels for SEP and DEP.**

f) **Section 8.4.1.1.6** of the **RIAA**: The potential changes in water quality have been assessed as negligible in **ES Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Sediment contamination levels in the surveyed area are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment. Due to the limited range and short duration of the potential effects, the effect on harbour porpoise would be negligible. Due to the potential changes in water quality having a negligible effect on harbour porpoise there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to changes in water quality during construction for SEP and / or DEP.**

g) **Section 8.4.1.1.7** of the **RIAA**:[1] As a worst-case, the maximum number of harbour porpoise from each Project has been assessed to indicate the impact as a result of potential changes in prey availability from underwater noise during piling if SEP and DEP are developed concurrently (**Table 8-35** of the **RIAA**). Up to 0.27% of the North Sea MU population could be temporarily displaced due to changes in prey availability during construction of SEP and DEP. This level of impact would not result in any significant population effects or any changes to the conservation status of harbour porpoise. Taking into account the distances of SEP and DEP from the SNS SAC and the number of harbour porpoise potentially affected by changes in prey availability assessed as a result of underwater noise during piling at SEP and DEP, there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise for SEP and DEP.**

h) **Section 8.4.1.3.1** of the **RIAA**: Up to 0.00076% of the North Sea MU reference population could be affected due to underwater noise from operational turbines at SEP and DEP, based on worst-case for TTS SEL_{cum}. The indicative separation distance between wind turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.05km (maximum of 3.3km) and therefore there would be no overlap in the potential impact range of less than 100m (<0.1km) around each turbine Therefore, any potential effects would not result in any significant population effects or any changes to the FCS of harbour porpoise. There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to underwater noise effects from operational turbines for SEP and / or DEP.**

i) **Section 8.4.1.3.2** of the **RIAA**: The underwater noise from maintenance activities are considered to be the same or less than those assessed for underwater noise from other construction activities (including rock placement, trenching and cable laying). Therefore, there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to underwater noise and disturbance effects from operation and maintenance activities for SEP and / or DEP.**

j) **Section 8.4.1.3.3** of the **RIAA**: The underwater noise from maintenance vessels are considered to be the same or less than those assessed for underwater noise from construction vessels. Therefore, there would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to underwater noise and disturbance effects from operation and maintenance vessels for SEP and / or DEP.**

k) **Section 8.4.1.3.4** of the **RIAA**: The indicative separation distance between turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.05km (maximum of 3.3km) therefore there would be no overlap in the potential impact range of less than 100m (<0.1km) around each turbine and there would be adequate room for marine mammals to move through the wind farm sites. There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to barrier effects from increased underwater noise during operation and maintenance for SEP and / or DEP.**

l) **Section 8.4.1.3.5** of the **RIAA**: The assessment of collision risk, as presented for the construction phase (**Section 8.4.1.1.5** of the **RIAA**), is based on the total project area, within which additional vessels may be present, and is not based on the number of vessels present within that area. Therefore, the assessment of the potential for increased collision risk with vessels during operation would be the same as the assessment as for construction, as the area of potential effect is the same. There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to increased collision risk from operations and maintenance vessels for SEP and / or DEP.**

m) **Section 8.4.1.3.6** of the **RIAA**: Changes in water quality are considered to have negligible effect on marine mammals. As assessed in **ES Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7), any potential changes in water quality at SEP and / or DEP during operation and maintenance would be negligible. Therefore, **there would be no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise as a result of any changes to water quality during operation and maintenance for SEP and / or DEP.**

n) **Section 8.4.1.3.7** of the **RIAA**: There would be **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise due to changes in prey availability (as a result of temporary / permanent habitat loss / disturbance; introduction of wind turbine foundations, scour protection and hard substrate; increased suspended sediment concentrations; underwater noise and EMF effects) during operation and maintenance for SEP and / or DEP.**

o) **Section 8.4.1.5** of the **RIAA**: Potential effects on harbour porpoise associated with decommissioning have not been assessed in detail, as further assessments will be carried out ahead of any decommissioning works to be undertaken taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the foundations (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, it is expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur). Therefore, the potential effects on harbour porpoise during decommissioning would be the same or less than those assessed for construction due to the processes of decommissioning potentially being the reverse of the installation, without the need for piling.

[1] Note that as the worst-case with regard to effects on prey availability is primarily dictated by underwater noise effects on prey species, this conclusions has been presented in these matrices. For conclusions with respect to physical disturbance, suspended sediment and contaminated sediment see **Section 8.4.1.1.7** of the RIAA.

Name of European Site: Southern North Sea SAC
Closest distance to SEP / DEP site: 25.6 / 13.9km

p) **Section 8.4.1.6.3** of the **RIAA**:[2] Based on the worst-case scenarios and very precautionary approach, there is the potential for up to 34.5% of the summer area, with a seasonal average of 6.21%, or up to 69.6% of the winter area, with a seasonal average of 12.0%, to be affected. With up to 18,181 harbour porpoise (5.25% of the NS MU reference population) potentially disturbed (**Table 8-53** of the **RIAA**). With the development of SIPs to deliver the appropriate mitigation and management measures across projects and management by the MMO, there could be no significant disturbance and **no adverse effect on the integrity of the SNS SAC in relation to the conservation objectives for harbour porpoise as a result of disturbance effects from all noise sources for SEP and DEP in-combination with other plans and projects.**

1.2.39 Moray Firth SAC

Name of European Site: Moray Firth SAC
Closest distance to SEP / DEP site: more than 600km

Site Features	Adverse Effect on Integrity due to SEP and DEP																									
	Underwater noise – piling (project alone)			Underwater noise during non-piling activities			Underwater noise and disturbance from vessels			Underwater noise – barrier effects			Collision risk with vessels			Changes to water quality			Changes to prey availability			Underwater noise from operational turbines			In-combination (disturbance from underwater noise)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Bottlenose dolphin	N (a)			N (b)	N(i)	N(o)	N (c)	N(j)	N(o)	N(d)	N(k)	N(o)	N(e)	N(l)	N(o)	N(f)	N (m)	N(o)	N(g)	N(n)	N(o)		N(h)		N(p)		

a) **Section 8.4.2.1.1** of the **RIAA**: As a worst-case the maximum number of bottlenose dolphin that could be affected during piling at SEP and DEP, is up to 0.5 individuals (which represents 0.23% of the latest east coast of Scotland count of 224 bottlenose dolphin) (**Table 8-56** of the **RIAA**). The effective implementation of the MMMP for piling will reduce the risk of PTS or TTS for bottlenose dolphin during piling at SEP and DEP, therefore, there would be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) as a result of underwater noise during piling at SEP and/or DEP**.

b) **Section 8.4.2.1.2** of the **RIAA:** The maximum potential impact area for PTS or TTS for each activity (cable laying, trenching, rock placement, drilling and dredging) is less than 0.03km^2. There is the potential that more than one of these activities could be underway at either site or the export cable corridor area at the same time. As a worst-case and unlikely scenario, an assessment for all five activities (0.15km^2) has been undertaken. Up to 0.009 individuals (0.004% of east coast of Scotland population) could be affected (**Table 8-58** of the **RIAA**). The potential effects that could result from underwater noise during other construction activities, including cable laying and protection would be temporary in nature, not consistent throughout the offshore construction periods for SEP and DEP and would be limited to only part of the overall construction period and area at any one time. The assessment indicates (**Table 8-58** of the **RIAA**) that there would be no significant effects on bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) as a result of underwater noise during construction activities, other than piling, for SEP and DEP.**

c) **Section 8.4.2.1.3** of the **RIAA:** As a worst-case the maximum number of bottlenose dolphin from each Project has been assessed to indicate the maximum number that could be impacted from SEP and DEP, if they are developed concurrently, based on up to 25 vessels at the two sites (**Table 8-60** of the **RIAA**). Up to 0.022 individuals (0.01% of east coast of Scotland population) could be affected. The assessment indicates that there would be no significant disturbance of bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) as a result of underwater noise from construction vessels for SEP and DEP.**

d) **Section 8.4.2.1.4** of the **RIAA:** The worst-case scenario in relation to barrier effects as a result of underwater noise is based on the maximum spatial and temporal (i.e. largest area and longest duration) scenarios. For bottlenose dolphin this would be the maximum predicted impact area for TTS from cumulative SEL during sequential piling at SEP and DEP in the same 24-hour period of up to 17km^2 (**Table 8-56** of the **RIAA**). As previously assessed, the maximum number of bottlenose dolphin that could be affected during piling at SEP and DEP, is up to 0.5 (which represents 0.23% of the of the latest east coast of Scotland count of 224 bottlenose dolphin) (**Table 8-56** of the **RIAA**). Therefore, there would be no significant disturbance of bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to potential barrier effects as a result of underwater noise during construction activities for SEP and / or DEP**.

e) **Section 8.4.2.1.5** of the **RIAA:** Although the risk of collision is likely to be low, as a precautionary worse-case scenario, the number of bottlenose dolphin that could be at increased collision risk with vessels during construction has been assessed based on 5% of the number of animals that could be present in the SEP and DEP wind farm sites and export cable corridors potentially being at increased collision risk (**Table 8-61** of the **RIAA**). This has been based on the percentage of harbour porpoise post mortem examinations with evidence of interaction with vessels, as there is currently no information on the potential collision risk for bottlenose dolphin. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Draft MMMP** (document reference 9.4)). Therefore, there would

[2] Note that due to the complexity that would be involved with including each in-combination assessment conclusion from each noise source assessment, only the conclusion for the worst-case potential overall in-combination effects for disturbance from all noise sources is presented in these matrices.

Name of European Site: Moray Firth SAC
Closest distance to SEP / DEP site: more than 600km

be no increased collision risk of bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to potential collision risk with construction vessels for SEP and / or DEP.**

f) **Section 8.4.2.1.6** of the **RIAA:** Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any potential changes to water quality during construction of SEP and DEP would be negligible. Therefore, there would be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to changes in water quality as a result of all construction activities for SEP and /or DEP**.

g) **Section 8.4.2.1.7** of the **RIAA:** The number of bottlenose dolphin that could potentially be affected by any changes in prey availability is up to 16 individuals (7.2% of east coast of Scotland population; **Table 8-62** of the **RIAA**) for SEP and DEP. This means that, under the precautionary assumptions of this assessment, up to 16 bottlenose dolphin could be at risk of a reduced (or removed) potential to forage within that area. More realistically, however, the loss of prey (fish) species availability would not be for all fish within that area, and bottlenose dolphin would be able to forage within that area still, or, would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species. Therefore, there will be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin as a result of any changes to prey availability due to underwater noise during piling for SEP and DEP.**

h) **Section 8.4.2.2.1** of the **RIAA:** The indicative separation distance between wind turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.05km (maximum of 3.3km) and therefore there would be no overlap in the potential impact range of less than 100m (<0.1km) around each operational turbine. Taking into account the number of bottlenose dolphin potentially affected as a result of underwater noise from operational turbines (**Table 8-63** of the **RIAA**) there would be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) from increased underwater noise from operational turbines at SEP and / or DEP.**

i) **Section 8.4.2.2.2** of the **RIAA:** Underwater noise from maintenance activities is considered to be the same or less than that assessed from other construction activities. Therefore, there would be no significant effects on bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) from increased underwater noise during operation and maintenance activities for SEP and / or DEP**.

j) **Section 8.4.2.2.3** of the **RIAA:** The underwater noise from operation and maintenance activities are considered to be the same or less than that assessed from construction vessels. Therefore, there would be no significant effects on bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to auditory injury (PTS and TTS) from increased underwater noise from operation and maintenance vessels for SEP and / or DEP.**

k) **Section 8.4.2.2.4** of the **RIAA:** No barrier effects as a result of underwater noise during operation and maintenance are anticipated. Any potential barrier effects from underwater noise during operation and maintenance would be less than those assessed for barrier effects from underwater noise during construction. Therefore, there would be no significant effects on bottlenose dolphin and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to barrier effects from underwater noise during operation and maintenance for SEP and / or DEP.**

l) **Section 8.4.2.2.5** of the **RIAA:** The assessment of collision risk, as presented for the construction phase (**Section 8.4.2.1.5** of the **RIAA**), is based on the total project area, within which additional vessels may be present, and is not based on the number of vessels present within that area. Therefore, the assessment of the potential for increased collision risk with vessels during operation would be the same as the assessment as for construction, as the area of potential effect is the same. In line with the construction assessment, there would be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to increased collision risk from operation and maintenance vessels for SEP and / or DEP.**

m) **Section 8.4.2.2.6** of the **RIAA:** Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any potential changes to water quality during construction of SEP and DEP would therefore be negligible and any changes in water quality during operation and maintenance would be less than during construction. Therefore, there would be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphins due to any changes in water quality during the operation and maintenance phase for SEP and / or DEP.**

n) **Section 8.4.2.2.7** of the **RIAA:** The potential impacts of permanent loss or change of habitat, physical disturbance, temporary habitat loss, EMF, increased SSC, re-mobilisation of contaminated sediment and underwater noise on changes in prey availability are localised and in some cases, short in duration. **ES Chapter 9 Fish and Shellfish Ecology** (document reference 6.1.9), provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Therefore, there will be **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to changes in prey availability during the operation and maintenance phase for SEP and / or DEP.**

o) **Section 8.4.2.3** of the **RIAA**: Potential effects on bottlenose dolphin associated with decommissioning have not been assessed in detail as further assessments will be carried out ahead of any decommissioning works to be undertaken taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the foundations (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, is it expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur). The potential effects on bottlenose dolphin during decommissioning would be the same or less than those assessed for construction, meaning no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin.

p) **Section 8.4.2.4** of the **RIAA**: The potential in-combination effects from all possible noise sources during piling at SEP and DEP is summarised in **Table 8-64** of the **RIAA.** Based on the worst-case scenarios and precautionary approach, there is the potential for up 23.2 bottlenose dolphin (10.3% of the east coast of Scotland count; 1.15% of GNS MU) to be disturbed **(Table 8-64** of the **RIAA).** However, it should be noted that it is considered highly unlikely that all activity, and all bottlenose dolphin potentially affected, would be from the Moray Firth SAC, as the potential for effect would most likely occur offshore, where the Moray Firth bottlenose dolphin population are unlikely to be (given their preference of the nearshore area). In addition, a number of the in-combination projects included within the assessment are in locations with no known connectivity with the Moray Firth bottlenose dolphin population.

Name of European Site: Moray Firth SAC
Closest distance to SEP / DEP site: more than 600km

Therefore, the assessment against the GNS MU is considered more appropriate for in-combination effects. On this basis, there would be no significant disturbance and **no adverse effect on the integrity of the Moray Firth SAC in relation to the conservation objectives for bottlenose dolphin due to any potential effects mentioned in Section 8.4.2.1 and 8.4.2.2 (of the RIAA) for SEP and DEP in-combination with other plans and projects.**

1.2.40 Humber Estuary SAC

Name of European Site: Humber Estuary SAC (UK)
Closest distance to SEP / DEP site: 59.7 / 62.2km

Site Features	Adverse Effect on Integrity due to SEP and DEP																																
	Underwater noise – piling (project alone)			Underwater noise during non-piling activities			Underwater noise and disturbance from vessels			Underwater noise – barrier effects			Collision risk with vessels			Disturbance at haul-out sites			Disturbance of foraging seals			Changes in water quality			Changes in prey availability			Underwater noise from operational turbines			In-combination (disturbance from underwater noise)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	N (a)			N (b)	N (k)	N (s)	N (c)	N (l)	N (s)	N (d)	N (m)	N (s)	N (e)	N (n)	N (s)	N (f)	N (o)	N (s)	N (g)	N (p)	N (s)	N (h)	N (q)	N (s)	N (i)	N (r)	N (s)		N (j)		N (t)		

a) **Section 8.4.3.1.1** of the **RIAA**: The maximum predicted impact area for PTS or TTS from cumulative SEL during sequential piling (see **Section 8.3.2** of the **RIAA**) at SEP and DEP in the same 24 hour period is up to 18km^2 or 370km^2, respectively (**Table 8-67** of the **RIAA**). The maximum predicted impact area for PTS or TTS from cumulative SEL during simultaneous piling at SEP and DEP in the same 24 hour period is up to 33km^2 or 520km^2, respectively (**Table 8-67** of the **RIAA**). As a worst-case, the maximum number of grey seal that could be affected during piling at SEP and DEP, is up to 382 individuals (9.8% of SAC count; 4.4% of South East (SE) Management Unit (MU)). The effective implementation of the MMMP for piling will reduce the risk of PTS and TTS for grey seal during piling at SEP and DEP, therefore, there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to auditory injury (PTS and TTS) from increased underwater noise during construction (piling) for SEP and DEP.**

b) **Section 8.4.3.1.2** of the **RIAA**: As a worst-case the maximum number of grey seal from each Project has been assessed to indicate the maximum number that could be impacted from SEP and DEP, if they are developed concurrently (**Table 8-69** of the **RIAA**). Up to 0.22 individuals (0.006% of SAC count; 0.003% of SE MU) could be affected. The assessment indicates that there would be no significant disturbance of grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to auditory injury (PTS and TTS) from increased underwater noise from other construction activities, other than piling, for SEP and DEP.**

c) **Section 8.4.3.1.3** of the **RIAA**: As a worst-case the maximum number of grey seal from each Project has been assessed to indicate the maximum number that could be impacted from SEP and DEP, if they are developed concurrently, based on up to 25 vessels (**Table 8-71** of the **RIAA**). Up to 0.55 individuals (0. 014% of SAC count; 0.0064% of SE MU) could be affected. The assessment indicates that there would be no significant disturbance of grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to auditory injury (PTS and TTS) and disturbance from increased underwater noise from construction vessels for SEP and / or DEP.**

d) **Section 8.4.3.1.4** of the **RIAA**: The worst-case scenario in relation to barrier effects as a result of underwater noise is based on the maximum spatial and temporal (i.e. largest area and longest duration) scenarios. For grey seal, this would be the maximum predicted impact area for TTS from cumulative SEL during simultaneous piling at SEP and DEP in the same 24 hour period of up to 520km^2 (**Table 8-67** of the **RIAA**). Disturbance and any barrier effects during piling would be temporary and for a relatively short duration (i.e. during active piling). It is unlikely that all grey seal potentially affected would be from the Humber Estuary SAC, which is located over 59km from SEP and DEP (at closest point). Therefore, there would be no significant disturbance of grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential barrier effects from increased underwater noise during construction for SEP and DEP.**

e) **Section 8.4.3.1.5** of the **RIAA**: Although the risk of collision is likely to be low, as a precautionary worse-case scenario, the number of grey seal that could be at increased collision risk with vessels during construction has been assessed based on 5% of the number of animals that could be present in the SEP wind farm site, DEP wind farm site and export cable corridor potentially being at increased collision risk (**Table 8-72** of the **RIAA** which shows that up to 14.7 individuals (0.38% of SAC count; 0.17% of SE MU) could be affected). This has been based on the percentage of harbour porpoise post mortem examinations with evidence of interaction with vessels, as there is currently no information on the potential collision risk for grey seal. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Draft MMMP** (document reference 9.4)). Therefore, there would be no increased collision risk of grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential vessel collision risk during construction for SEP and / or DEP.**

f) **Section 8.4.3.1.6** of the **RIAA**: Vessel movements to and from any port will be incorporated within existing vessel routes, and would therefore be considerably further from the Donna Nook haul-out site than the 300m that is noted as being the distance at which grey seal will react to vessel presence. Taking into account the proximity of shipping channels to and from existing ports, it is likely that seals hauled-out along these routes and in the area of the ports

Name of European Site: Humber Estuary SAC (UK)
Closest distance to SEP / DEP site: 59.7 / 62.2km

would be habituated to the noise, movements and presence of vessels, and the additional construction vessels using these existing vessel routes while transiting to port would not make a significant increase in the potential for disturbance at grey seal haul-out sites. Therefore, there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to disturbance at seal-haul out sites during construction for SEP and / or DEP.**

g) **Section 8.4.3.1.7** of the **RIAA**: If it is assumed, as an unlikely and worst-case scenario, that all grey seal within the total area would be disturbed, and that any disturbance could result in the cessation of foraging within that area, then a total of 382 grey seal could potentially be disturbed from foraging during simultaneous piling at SEP and DEP. This effect could occur for up to 33 days, taking into account the duration of piling activities occurring at the same time. For activities not including piling, which have the potential to take place over a longer time frame, of up to four years, less than one (0.22) harbour seal could be restricted from foraging throughout the entire construction period. Therefore, between one and 382 grey seal (0.006-9.8% of SAC count; 0.003-4.4% of SE MU), could be temporarily disturbed from foraging at SEP and DEP, due to construction. It is however unlikely that there would be the potential for any significant disturbance of foraging grey seal from the Humber Estuary SAC, given the distance of 59.7km from the closest point of SEP and DEP to the SAC, and that grey seal are generalist feeders with wide foraging ranges. Any disturbance of foraging grey seals would be restricted to the area and duration of the activity, and there are other suitable habitats and prey available in the surrounding area. Therefore, there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to disturbance of foraging grey seals during construction for SEP and DEP.**

h) **Section 8.4.3.1.8** of the **RIAA**: Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any potential changes to water quality during construction of SEP and DEP would be negligible. Therefore, there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to any changes in water quality during construction for SEP and DEP.**

i) **Section 8.4.3.1.9** of the **RIAA**: Any changes in prey availability during piling as a result of underwater noise, based on the worst-case for TTS SELcum for fish species with a swim bladder involved in hearing, using the fleeing response model is 330km^2 at DEP and 210km^2 at SEP. This is the largest potential impact range for prey (fish) species, and has therefore been used to inform the below worst-case and precautionary assessment. This assessment assumes that all grey seal within the largest impact area for fish (as noted above) would be at risk of a reduction in prey availability, due to the prey (fish) species themselves being potentially affected within that area. As a worst-case, the number of grey seal that could potentially be affected by any changes in prey availability is up to 423 individuals (10.85% of SAC count; 4.88% of SE MU) for SEP and DEP. This means that, under the precautionary assumptions of this assessment, up to 423 grey seal could be at risk of a reduced (or removed) potential to forage within that area. More realistically, however, the loss of prey (fish) species availability would not be for all fish within that area, and grey seal would be able to forage within that area still, or, would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites, and the potential areas for habitat loss. The temporary habitat disturbance footprint is up to 7.87km^2 for SEP and DEP, and the permanent footprint is 1.159km^2, which represents a very small proportion of the area available for grey seal foraging from the Humber Estuary SAC. As noted above, grey seal typically forage up to 100km from their haul-out sites, which equates to a significantly large total foraging area for the individuals associated with the site. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species. Furthermore, it is unlikely that all individuals potentially impacted would be from the Humber Estuary SAC. It is therefore predicted that there will be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal as a result of any changes to prey availability during construction for SEP and DEP.**

j) **Section 8.4.3.2.1** of the **RIAA**: Up to 1.25 individuals (0.032% of SAC count; 0.015% of SE MU) could be affected by underwater noise from operational turbines at SEP and DEP (**Table 8-73** of the **RIAA**). The indicative separation distance between wind turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.05km (maximum of 3.3km) and therefore there would be no overlap in the potential impact range of less than 100m (<0.1km) around each turbine. Taking into account the number of grey seal potentially affected as a result of underwater noise from operational turbines (**Table 8-73** of the **RIAA**) there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to operational underwater noise from turbines for SEP and / or DEP**.

k) **Section 8.4.3.2.2** of the **RIAA**: The underwater noise from maintenance activities are considered to be the same or less than those assessed for underwater noise from for other construction activities. Therefore, there would be **no significant effects on grey seal and no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal from increased underwater noise during operation and maintenance activities for SEP and / or DEP.**

l) **Section 8.4.3.2.3** of the **RIAA**: The underwater noise from operation and maintenance vessels are considered to be the same or less than those assessed for underwater noise from construction vessels. Therefore, there would be no significant effects on grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to increased underwater noise from operation and maintenance vessels for SEP and / or DEP.**

m) **Section 8.4.3.2.4** of the **RIAA**: No barrier effects as a result of underwater noise during operation and maintenance are anticipated. Therefore, there would be no significant effects on grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential barrier effects from underwater noise during operation and maintenance activities for SEP and / or DEP.**

n) **Section 8.4.3.2.5** of the **RIAA**: The assessment of collision risk, as presented for the construction phase (**Section 8.4.3.1.5** of the **RIAA**), is based on the total project area, within which additional vessels may be present, and is not based on the number of vessels present within that area. Therefore, the assessment of the potential for increased collision risk with vessels during operation would be the same as the assessment as for construction, as the area of potential effect is the same. In line with the construction assessment, there would be **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to increased collision risk from operation and maintenance vessels for SEP and / or DEP**.

o) **Section 8.4.3.2.6** of the **RIAA**: Any potential disturbance at grey seal haul-out sites during operation and maintenance would be less than those assessed for during construction, as there are fewer vessels. Therefore, there would be no significant effects on grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential disturbance at haul-out sites from operation and maintenance vessels for SEP and / or DEP.**

p) **Section 8.4.3.2.7** of the **RIAA**: Any potential disturbance of foraging grey seal during operation and maintenance would be less than those assessed for during construction. Therefore, there would be **no significant effects on grey seal and no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential disturbance of foraging seals during operation and maintenance for SEP and /or DEP.**

Name of European Site: Humber Estuary SAC (UK)
Closest distance to SEP / DEP site: 59.7 / 62.2km

q) **Section 8.4.3.2.8** of the **RIAA**: Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any potential changes to water quality during construction of SEP and DEP would be negligible. Furthermore, any changes in water quality during operation and maintenance would be less than during construction. Therefore, there would be no significant effects on grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to any changes in water quality during operation and maintenance for SEP and / or DEP.**

r) **Section 8.4.3.2.9** of the **RIAA**: The potential impacts of permanent loss or change of habitat, physical disturbance, temporary habitat loss, EMF, increased SSC, re-mobilisation of contaminated sediment and underwater noise on changes in prey availability are localised and, in some cases, short in duration. **ES Chapter 9 Fish and Shellfish Ecology** (document reference 6.1.9), provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Therefore, there would be no significant effects on grey seal and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal due to potential changes in prey availability from operation and maintenance vessels for SEP and / or DEP.**

s) **Section 8.4.3.3** of the **RIAA**: Potential effects on grey seal associated with decommissioning have not been assessed in detail, as further assessments will be carried out ahead of any decommissioning works to be undertaken, taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the foundations (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, is it expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur). The potential effects on grey seal during decommissioning would be the same or less than those assessed for construction meaning there would be no significant effects on grey seal and no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal at SEP and DEP.

t) **Section 8.4.3.4** of the **RIAA**: The potential in-combination effects from all possible noise sources during piling at SEP and DEP are summarised in **Table 8-74** of the **RIAA**. Based on the worst-case scenarios and precautionary approach, there is the potential for up to 1,611 grey seal (up to 6.68% of the reference population) to be disturbed. However, this should be considered a highly precautionary (and unrealistic) assessment, with actual in-combination effects likely to be lower, due to not all activities and projects taking place at the same time, and due to assessed disturbance ranges likely being smaller than those presented here, on an absolute worst-case basis only. Taking into account mitigation for UXO and the SIP to reduce the significant disturbance of harbour porpoise from underwater noise in-combination effects, there would be no significant disturbance and **no adverse effect on the integrity of the Humber Estuary SAC in relation to the conservation objectives for grey seal for SEP and DEP in-combination with other projects and activities.**

1.2.41 The Wash and North Norfolk Coast SAC

Name of European Site: The Wash and North Norfolk Coast SAC (UK)
Closest distance to SEP / DEP site: 8.3 / 24.3km

Site Features	Adverse Effect on Integrity due to SEP and DEP																																				
	Underwater noise – piling (project alone)			Underwater noise during non-piling activities			Underwater noise and disturbance from vessels			Underwater noise – barrier effects			Collision risk with vessels			Disturbance at haul-out sites			Disturbance of foraging seals			Changes in water quality			Changes in prey availability			Underwater noise from operational turbines			In-combination (disturbance from underwater noise)			Changes to tidal currents affecting sediment transport (project alone)			Changes to tidal currents affecting sediment transport (in-combination)		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	N (a)			N (b)	N (k)	N (s)	N (c)	N (l)	N (s)	N (d)	N (m)	N (s)	N (e)	N (n)	N (s)	N (f)	N (o)	N (s)	N (g)	N (p)	N (s)	N (h)	N (q)	N (s)	N (i)	N (r)	N (s)		N (j)		N (t)								
Sandbanks which are slightly covered by sea water all the time																																N (u)			N (v)		

a) **Section 8.4.4.1.1** of the **RIAA**: The maximum predicted impact area for PTS or TTS from cumulative SEL during simultaneous piling at SEP and DEP in the same 24 hour period is up to 33km^2 or 520km^2, respectively (**Table 8-77** of the **RIAA**). The maximum number of harbour seal that could be affected during piling at SEP and DEP, is up to 98 individuals (3.45% of SAC count; 2.62% of SE MU). The effective implementation of the MMMP for piling will reduce the risk of PTS and TTS for harbour seal during piling at SEP and DEP and therefore there would be **no adverse effect on the integrity of The Wash and North Norfolk SAC in relation to the conservation objectives for harbour seal due to auditory injury (PTS and TTS) from increased underwater noise during construction (piling) for SEP and DEP.**

b) **Section 8.4.4.1.2** of the **RIAA**: Up to 0.06 individuals (0.002% of SAC count; 0.0015% of SE MU) could be affected by underwater noise associated with all non-piling construction activities for SEP and DEP (**Table 8-79** of the **RIAA**). The maximum duration for the offshore construction period, including piling and export cable installation, is up to two years for each Project, therefore four years for SEP and DEP. However, construction activities would not be underway constantly throughout this period. The duration of offshore export cable installation and trenching activities is expected to take approximately 100 days for SEP and DEP. The assessment indicates that there would be no significant disturbance of harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk SAC in relation to the conservation objectives for harbour seal due to auditory injury (PTS and TTS) from increased underwater noise during other non-piling construction activities for SEP and DEP.**

c) **Section 8.4.4.1.3** of the **RIAA**: Up to 0.14 individuals (0.005% of SAC count; 0.004% of SE MU) could be affected (**Table 8-81** of the **RIAA**). The assessment indicates that there would be no significant disturbance of harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk SAC in relation to the conservation objectives for harbour seal due to auditory injury (PTS and TTS) and disturbance from increased underwater noise from construction vessels for SEP and DEP.**

d) **Section 8.4.4.1.4** of the **RIAA**: The worst-case scenario in relation to barrier effects as a result of underwater noise is based on the maximum spatial and temporal (i.e. largest area longest duration) scenarios. For harbour seal, this would be the maximum predicted impact area for TTS from cumulative SEL during simultaneous piling at SEP and DEP in same 24 hour period of up to 520km^2 (**Table 8-77** of the **RIAA**). Disturbance and any barrier effects during piling would be temporary and for a relatively short duration (i.e. during active piling). Therefore, there would be no significant disturbance of harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk SAC in relation to the conservation objectives for harbour seal due to potential barrier effects from increased underwater noise during construction (piling) for SEP and DEP.**

e) **Section 8.4.4.1.5** of the **RIAA**: Up to 3.1 individuals (0.11% of SAC count; 0.0.08% of SE MU) could be affected (**Table 8-82** of the **RIAA**). Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Draft MMMP** (document reference 9.4)). Therefore, there would be no increased collision risk of harbour seal and no adverse **effect on the integrity of The Wash and North Norfolk SAC in relation to the conservation objectives for harbour seal due to increased collision risk from construction vessels for SEP and DEP.**

f) **Section 8.4.4.1.6** of the **RIAA**: Vessel movements to and from any port will be incorporated within existing vessel routes, which would be considerably further from either The Wash or Blakeney Point harbour seal haul-out sites than the 600m that is noted as being the distance at which harbour seal will react to vessel presence. Taking into account the proximity of shipping channels to and from existing ports, it is likely that seals hauled-out along these routes and in the area of the ports would be habituated to the noise, movements and presence of vessels, and the additional construction vessels using these existing vessel routes while transiting to port would not cause a significant increase in the potential for disturbance and / or interaction at harbour seal haul-out sites. Therefore, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to disturbance at seal-haul out sites during construction for SEP and / or DEP.**

g) **Section 8.4.4.1.7** of the **RIAA**: There is potential for SEP and DEP to effect between one and 104 harbour seal (2.7% of the SAC count; or 2.1% of the SE MU), however, it is unlikely that harbour seal would be disturbed from the entire area during construction. Therefore, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to disturbance of foraging harbour seals at sea during construction for SEP and / or DEP.**

Name of European Site: The Wash and North Norfolk Coast SAC (UK)
Closest distance to SEP / DEP site: 8.3 / 24.3km

h) **Section 8.4.4.1.8** of the **RIAA**: Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any potential changes to water quality during construction of SEP and DEP would be negligible. Therefore, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to any changes to water quality during construction for SEP and / or DEP.**

i) **Section 8.4.4.1.9** of the **RIAA**: As a worst-case, the number of harbour seal that could potentially be affected by any changes in prey availability is up to 84 individuals (2.95% of SAC count; 2.24% of SE MU) for SEP and DEP. This means that, under the precautionary assumptions of this assessment, up to 84 harbour seal could be at risk of a reduced (or removed) potential to forage within that area. More realistically, however, the loss of prey (fish) species availability would not be for all fish within that area, and harbour seal would be able to forage within that area still, or, would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites, and the potential areas for habitat loss. The temporary habitat disturbance footprint is up to 7.87km^2 for SEP and DEP, and the permanent footprint is 1.159km^2, which represents a very small proportion of the area available for harbour seal forgaging from The Wash and North Norfolk Coast SAC; as noted above, harbour seal typically forage up to 80km from their haul-out sites, which equates to a significantly large total foraging area for the individuals associated with the site. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species. Therefore, there will be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to potential changes in prey availability during construction for SEP and / or DEP.**

j) **Section 8.4.4.2.1** of the **RIAA**: The potential effect for any TTS as a result of underwater noise from all operational wind turbines at each site (23 at SEP and 30 at DEP) has been assessed and indicates that up to 0.26 individuals (0.009% of SAC count; 0.0097% of SE MU) could be affected (**Table 8-83** of the **RIAA**). The indicative separation distance between turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.05km (maximum of 3.3km) therefore there would be no overlap in the potential impact range of less than 100m (<0.1km) around each turbine. Taking into account the number of harbour seal potentially affected as a result of underwater noise from operational turbines (**Table 8-83** of the **RIAA**) there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to auditory injury (PTS and TTS) from increased underwater noise from operational turbines for SEP and / or DEP.**

k) **Section 8.4.4.2.2** of the **RIAA**: The underwater noise from maintenance activities are considered to be the same or less than those assessed for underwater noise from other construction activities. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to auditory injury (PTS and TTS) from increased underwater noise during operation and maintenance activities for SEP and / or DEP.**

l) **Section 8.4.4.2.3** of the **RIAA**: The underwater noise from operation and maintenance vessels are considered to be less than those assessed for underwater noise from construction vessels. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal from underwater noise from operation and maintenance vessels for SEP and / or DEP**

m) **Section 8.4.4.2.4** of the **RIAA**: No barrier effects as a result of underwater noise during operation and maintenance are anticipated. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal from barrier effects from underwater noise during operation and maintenance for SEP and / or DEP.**

n) **Section 8.4.4.2.5** of the **RIAA**: The assessment of collision risk, as presented for the construction phase (**Section 8.4.4.1.5** of the **RIAA**), is based on the total project area, within which additional vessels may be present, and is not based on the number of vessels present within that area. Therefore, the assessment of the potential for increased collision risk with vessels during operation would be the same as the assessment as for construction, as the area of potential effect is the same. In line with the construction assessment, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to increased collision risk from operation and maintenance vessels for SEP and / or DEP**

o) **Section 8.4.4.2.6** of the **RIAA**: Any potential disturbance at harbour seal haul-out sites during operation and maintenance would be less than those assessed for construction, as there are fewer vessels. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to potential disturbance at seal-haul out sites for SEP and / or DEP**

p) **Section 8.4.4.2.7** of the **RIAA**: Any potential disturbance of foraging harbour seal during operation and maintenance would be less than that assessed during construction. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to potential disturbance of foraging harbour seals at sea during the operation phase for SEP and / or DEP.**

q) **Section 8.4.4.2.8** of the **RIAA**: Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 7 Marine Water and Sediment Quality** (document reference 6.1.7). Any changes in water quality during operation and maintenance would be negligible and less than during construction. Therefore, there would be no significant effects on harbour seal and **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to changes in water quality during the operation phase for SEP and / or DEP.**

r) **Section 8.4.4.2.9** of the **RIAA**: The potential impacts of permanent loss or change of habitat, physical disturbance, temporary habitat loss, EMF, increased SSC, re-mobilisation of contaminated sediment and underwater noise on changes in prey availability are localised and, in some cases, short in duration. **ES Chapter 9 Fish and Shellfish Ecology** (document reference 6.1.9), provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Therefore, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal due to changes in prey availability during the operation phase for SEP and / or DEP.**

s) **Section 8.4.4.3** of the **RIAA**: Potential effects on harbour seal associated with decommissioning have not been assessed in detail, as further assessments will be carried out ahead of any decommissioning works to be undertaken, taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the foundations (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and

Name of European Site: The Wash and North Norfolk Coast SAC (UK)
Closest distance to SEP / DEP site: 8.3 / 24.3km

foundations may be cut to an appropriate level. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, is it expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur). The potential effects on harbour seal during decommissioning would be the same or less than those assessed for construction for all the effects.

t) **Section 8.4.4.4** of the **RIAA**: Based on the worst-case scenarios and precautionary approach, there is the potential for up to 224.3 harbour seal (0.73% of the reference population) to be disturbed by in-combination underwater noise effects during construction of SEP and DEP(**Table 8-84** of the **RIAA**). Taking into account mitigation for UXO and the SIP to reduce the significant disturbance of harbour porpoise, there would be **no adverse effect on the integrity of The Wash and North Norfolk Coast SAC in relation to the conservation objectives for harbour seal for SEP and DEP in-combination with other plans and projects.**

u) **Section 7.4.1.1** of the **RIAA**: Mean spring tide current velocities of about 1m/s occur at the wind farm sites, although velocities are lower closer to the coast across the export cable corridor. Impacts on bedload sediment transport are likely to be localised to the areas immediately surrounding the cable protection in the form of sea bed scour where the sediment is soft enough to be mobilised. Where the export cables are buried there would be no effect on bedload sediment transport. However, if cable protection is required there is potential for it to create an obstacle that interrupts bedload sediment transport. Firstly, it should be noted that the potential magnitude of the effect will depend on the local sediment transport rates; a lower rate would reduce the potential effect on sediment supply to wider areas. There would be a range of sediment transport potentials across the export cables. If chalk or Pleistocene geological units are exposed at the sea bed or covered by a thin lag, then they are static and have zero transport potential (i.e. no mobile sediment). If the cable protection is laid in these areas, then sediment transport is not an issue as no sediment is being transported. Where the sea bed is composed of mobile sand, it can be transported under existing tidal conditions. Net alongshore sediment transport is directed to the west around the Weybourne landfall. Mobile sediment would first accumulate on one side or both sides of the obstacle (depending on the gross and net transport) to the height of the protrusion. Theoretically, and with continued build-up, it would then form a 'ramp' over which sediment transport would eventually continue by bedload processes, thereby eventually bypassing the protection. Therefore, in the unlikely event that there were interruptions to sediment supply to the Wash and North Norfolk Coast SAC Annex I sandbanks, they would be small scale, localised and temporary. With respect to the HDD exit point, this is located approximately 1,000m offshore and there will be no cable protection inshore of this point. Although the net sediment transport is to the west inshore which is wave driven along the coastline, wave driven sediment transport ceases at the 'closure depth' which marks the effective boundary of wave-driven sediment transport. Offshore of the closure depth, sediment transport is tidally driven. Tidal currents are the main driving force of sediment transport and off the North Norfolk coast move sediments in a net direction of transport to the south-east. The closure depth is inshore of the HDD exit point, therefore where the net direction of sediment transport is wave driven and to the west there is no cable protection and therefore there will be no interruption to sediment supply inshore to the sandbank features of the Wash and Norfolk Coast SAC. Further offshore of the HDD exit point where there may be cable protection, the net sediment transport is tidally driven and to the south-east, and is travelling away from the Wash and North Norfolk Coast SAC. Consequently, there will be no interruption of sediment supply to the Annex I sandbanks of the Wash and North Norfolk Coast, which will be supplied by sediment further up the coast from the north west. Therefore, there will be no impact and **no adverse effect on integrity of the subtidal sandbanks feature of the Wash and North Norfolk Coast SAC from changes to physical processes due to cable protection.**

v) **Section 7.4.1.2** of the **RIAA**: As there will be no impact to the subtidal sandbanks of the Wash and North Norfolk Coast SAC from potential changes to physical processes due to external export cable protection, **there is no impact pathway for in-combination effects with other projects and plans.**

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