Hornsea Project Four: Reports

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B2.2: Report to Inform Appropriate Assessment Part 4: Appendix C: Integrity Matrices

Prepared GoBe Consultants Ltd and APEM Ltd, September 2021
Checked Sarah Randall, Orsted, September 2021
Accepted Francesca De Vita, Orsted, September 2021
Approved Julian Carolan, Orsted, September 2021

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Acronyms

Acronym	Definition
AEoI	Adverse Effect on Integrity
APIS	Air Pollution Information System
CPEMMP	Construction Phase Environmental Management and Monitoring Plan
DCO	Development Consent Order
DML	Deemed Marine Licence
ECC	Export Cable Corridor
ES	Environmental Statement
EU	European Union
FFC SPA	Flamborough and Filey Coast Special Protection Area
HRA	Habitats Regulations Assessment
INNS	Invasive Non-native Species
MMMP	Marine Mammal Mitigation Protocol
MPCP	Marine Pollution Contingency Plan
NN	Nutrient Nitrogen
O&M	Operation and Maintenance
PTS	Permanent Threshold Shift
PVA	Population Viability Analysis
RIAA	Report to Inform Appropriate Assessment
SAC	Special Area of Conservation
SCI	Site of Community Importance
SIP	Site Integrity Plan
SPA	Special Protection Area
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded Ordnance
UXO-MMMP	Marine Mammal Mitigation Protocol relating to Unexploded Ordnance
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust

Units

Unit	Definition
km	Kilometre
cm	Centimetre
m	Metre
ha	Hectare
kg	Kilgogram

Species Glossary

Birds	
Arctic skua	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*
Puffin	*Fratercula arctica*
Bar-tailed godwit	*Limosa lapponica*
Mute swan	*Cygnus olor*
Black-tailed godwit	*Limosa limosa*
Cormorant	*Phalacrocorax carbo*
Common goldeneye	*Bucephala clangula*
Common greenshank	*Tringa nebularia*
Common pochard	*Aythya ferina*
Common redshank	*Tringa totanus*
Purple sandpiper	*Calidris maritima*
Common scoter	*Melanitta nigra*
Common shelduck	*Tadorna tadorna*
Common tern	*Sterna hirundo*
Dark-bellied brent goose	*Branta bernicla*
Dunlin	*Calidris alpinatea*
Eurasian curlew	*Numenius arquata*
Eurasian marsh harrier	*Circus aeruginosus*
Eurasian oystercatcher	*Haematopus ostralegus*
Eurasian teal	*Anas crecca*
Eurasian whimbrel	*Numenius phaeopus*
Eurasian wigeon	*Anas penelope*
European golden plover	*Pluvialis apricaria*
European shag	*Phalacrocorax aristotelis*
European storm petrel	*Hydrobates pelagicus*
Gadwall	*Anas strepera*
Gannet	*Morus bassanus*
Great bittern	*Botaurus stellaris*
Great skua	*Stercorarius skua*
Greater scaup	*Aythya marila*
Grey plover	*Pluvialis squatarola*
Guillemot	*Gavia immer*
Hen harrier	*Gelochelidon nilotica*
Herring gull	*Circus cyaneus*
Kittiwake	*Charadrius alexandrinus*
Leach's storm petrel	*Rissa tridactyla*
Lesser black-backed gull	*Oceanodroma leucorhoa*
Little gull	*Tachybaptus ruficollis*
Little tern	*Hydrocoloeus mintus*
Mallard	*Sternula albifrons*
Northern lapwing	*Circus pygargus*
Northern pintail	*Vanellus vanellus*

Northern shoveler	*Anas acuta*
Red-throated diver	*Pandion haliaetus*
Red knot	*Falco peregrinus*
Ringed plover	*Anser brachyrhynchus*
Roseate tern	*Stercorarius pomarinus*
Ruddy turnstone	*Calidris maritima*
Ruff	*Alca torda*
Sanderling	*Mergus serrator*
Whooper swan	*Xema sabini*
Marine mammals	
Harbour Porpoise	*Podiceps auritus*
Bottlenose dolphin	*Asio flammeus*
Grey seal	*Puffinus griseus*
Harbour seal	*Tringa erythropus*
Fish	
Sea lamprey	*Melanitta fusca*
River lamprey	*Cygnus Cygnus*
Atlantic salmon	*Tringa glareola*
Sea trout	*Halichoerus grypus*
Allis shad	*Phoca vitulina*
Twaite shad	*Petromyzon marinus*
Habitats	
Atlantic salt meadows	*Glauco-Puccinellietalia maritimae*

Matrix Key

✓ = Adverse effect on site integrity cannot be excluded
X = Adverse effect on site integrity can be excluded

Evidence for, or against, adverse effects on European site qualifying feature and site integrity is detailed within the footnotes to the integrity matrices

C = construction
O = operation and maintenance
D = decommissioning

Effect not relevant to feature (no pathway)

Index to Matrices

This appendix presents the integrity matrices for Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four') promoted by Orsted Hornsea Project Four Ltd in accordance with the format specified by the Planning Inspectorate[1].

Matrix	European site included within the assessment
Matrix 1	Southern North Sea (UK) Special Area of Conservation (SAC)
Matrix 2	Flamborough Head (UK) SAC
Matrix 3	Moray Firth (UK) SAC
Matrix 4	The Wash and North Norfolk Coast (UK) SAC
Matrix 5a	Grey seal in the Humber Estuary (UK) SAC
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Matrix 6a	Grey seal in the Humber Estuary (UK) Ramsar
Matrix 6b	Habitats of the Humber Estuary (UK) Ramsar
Matrix 6c	Ornithology of the Humber Estuary (UK) Ramsar
Matrix 7	Berwickshire and North Northumberland Coast (UK) SAC
Matrix 8	Transboundary harbour seal sites: • Doggersbank (Netherlands) SAC; and • Klaverbank (Netherlands) Site of Community Importance (SCI).
Matrix 9	Transboundary grey seal sites: • Doggersbank (Netherlands) SAC; • Klaverbank (Netherlands) SCI; • Bancs des Flandres (France) SAC; • Vlaamse Banken (Belgium) SAC; • SBZ 1 (Belgium) SAC; • SBZ 2 (Belgium) SAC; • SBZ 3 (Belgium) SAC; • Vlakte van de Raan (Belguim/Netherlands) SAC; • Westerschelde & Saeftinghe (Netherlands) SAC; • Voordelta (Netherlands) SAC; and • Waddenzee (Netherlands) SAC.
Matrix 10	Greater Wash (UK) Special Protection Area (SPA)
Matrix 11	Flamborough and Filey Coast (UK) SPA
Matrix 12	Humber (UK) SPA
Matrix 13	Hornsea Mere (UK) SPA
Matrix 14	Northumbria Coast (UK) SPA
Matrix 15	Teesmouth and Cleveland Coast (UK) SPA
Matrix 16	Coquet Island (UK) SPA
Matrix 17	Farne Islands (UK) SPA

[1] Advice Note 10 (November 2017 (version 8).

Matrix	European site included within the assessment
Matrix 18	St Abb's Head and Fast Castle (UK) SPA
Matrix 19	Forth Islands (UK) SPA
Matrix 20	Outer Firth of Forth and St Andrew's Complex (UK) SPA
Matrix 21	Fowlsheugh (UK) SPA
Matrix 22	Buchan Ness to Collieston Coast (UK) SPA
Matrix 23	Troup, Pennan and Lion's Heads (UK) SPA
Matrix 24	East Caithness Cliffs (UK) SPA
Matrix 25	North Caithness Cliffs (UK) SPA
Matrix 26	Copinsay (UK) SPA
Matrix 27	Hoy (UK) SPA
Matrix 28	Marwick Head (UK) SPA
Matrix 29	Rousay (UK) SPA
Matrix 30	Calf of Eday (UK) SPA
Matrix 31	West Westray (UK) SPA
Matrix 32	Fair Isle (UK) SPA
Matrix 33	Sumburgh Head (UK) SPA
Matrix 34	Noss (UK) SPA
Matrix 35	Foula (UK) SPA
Matrix 36	Fetlar (UK) SPA
Matrix 37	Hermaness, Saxa Vord and Valla Field (UK) SPA
Matrix 38	Northumberland Marine SPA

Effects Considered

Potential effects on the European sites considered within the submitted information to support the Report to Inform the Appropriate Assessment (RIAA) for the Habitats Regulation Assessment (HRA) of Hornsea Four are provided in Table 1 below.

Table 1: Potential effects on the European site considered in the matrices.

Designations	Impacts Considered In Matrices
Matrix 1: Southern North Sea SAC	• Increase in underwater noise; • Vessel disturbance; • Vessel collision risk; • Accidental pollution; and • In-combination.
Matrix 2: Flamborough Head (UK) SAC	• Temporary increases in suspended sediments; • (Invasive Non-Native Species - INNS; • Accidental pollution; • Changes to physical processes; and • In-combination.
Matrix 3: Moray Firth (UK) Special Area of Conservation (SAC)	• Increase in underwater noise; • Vessel disturbance; • Vessel collision risk; and • In-combination.
Matrix 4: The Wash and North Norfolk Coast (UK) SAC	• Increase in underwater noise; • Vessel disturbance; and • In-combination.
Matrix 5a: Grey seal in the Humber Estuary (UK) SAC	• Increase in underwater noise; • Vessel disturbance; • Vessel collision risk; and • In-combination.
Matrix 5b: Habitats of the Humber Estuary (UK) SAC	• Increased nitrogen deposition; and • In-combination.
Matrix 6a: Grey seal in the Humber Estuary Ramsar	• Increase in underwater noise; • Vessel disturbance; • Vessel collision risk; and • In-combination.
Matrix 6b: Habitats of the Humber Estuary Ramsar	• Increased nitrogen deposition; and • In-combination.
Matrix 6c: Ornithology of the Humber Estuary Ramsar	• Collision risk; and • In-combination.
Matrix 7: Berwickshire and North Northumberland Coast SAC	• Increase in underwater noise; • Vessel disturbance; • Vessel collision risk; and • In-combination.

Designations	Impacts Considered In Matrices
Matrix 8: Transboundary harbour seal sites (2 sites)	• Increase in underwater noise; • Vessel disturbance; and • In-combination.
Matrix 9: Transboundary Grey seal sites (11 sites)	• Increase in underwater noise; • Vessel disturbance; and • In-combination.
Matrix 10: Greater Wash SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 11: Flamborough and Filey Coast SPA	• Displacement and disturbance; • Collision risk; • Barrier effects; and • In-combination.
Matrix 12: Humber Estuary SPA	• Collision risk; and • In-combination.
Matrix 13: Hornsea Mere SPA	• Collision risk; and • In-combination.
Matrix 14: Northumbria Coast SPA	• Collision risk; and • In-combination.
Matrix 15: Teesmouth and Cleveland Coast SPA	• Collision risk; and • In-combination.
Matrix 16: Coquet Island SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 17: Farne Islands SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 18: St Abb's Head and Fast Castle SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 19: Forth Islands SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 20: Outer Firth of Forth and St Andrew's Complex pSPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 21: Fowlsheugh SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 22: Buchan Ness to Collieston Coast SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 23: Troup, Pennan and Lion's Heads SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 24: East Caithness Cliffs SPA	• Displacement and disturbance;

Designations	Impacts Considered In Matrices
	• Collision risk; and • In-combination.
Matrix 25: North Caithness Cliffs SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 26: Copinsay SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 27: Hoy SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 28: Marwick Head SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 29: Rousay SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 30: Calf of Eday SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 31: West Westray SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 32: Fair Isle SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 33: Sumburgh Head SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 34: Noss SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 35: Foula SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 36: Fetlar SPA	• Collision risk; and • In-combination.
Matrix 37: Hermaness, Saxa Vord and Valla Field SPA	• Displacement and disturbance; • Collision risk; and • In-combination.
Matrix 38: Northumberland Marine SPA	• Displacement and disturbance; • Collision risk; and • In-combination.

HRA Integrity Matrix 1: Southern North Sea (UK) SAC

Name of European site:	Southern North Sea (UK) SAC														
European Union (EU) Code:	UK0030395														
Distance to Project:	0 km to array														
Adverse effect on integrity															
Effects	Increase in underwater noise			Vessel disturbance			Vessel collision risk			Accidental pollution			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Harbour porpoise	Xa	Xb	Xa	Xc	Xd	Xc	Xe	Xe	Xe	Xf	Xf	Xf	Xg	Xg	Xg

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the Habitats Regulations Assessment in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of Permanent Threshold Shift (PTS) would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e. **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML** that provides certainty that risk with respect to disturbance will be managed. Noise impacts to prey would be slightly adverse (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**) with negligible consequences in the wider context of the scale of available habitat. In light of the scale of effects, the mitigation afforded by the SIP, the MMMP and the anticipated requirement for a UXO MMMP, a finding of **no AEoI** is appropriate.

Xb Generally, as noted in **Volume A2, Chapter 4: Marine Mammals**, marine mammals are deemed to be of low vulnerability and have high recoverability to the impact of operational noise. With regards to PTS, the non-impulsive weighted SEL_{cum} PTS and temporary threshold shifts (TTS) thresholds from Southall et al. (2019) resulted in estimated PTS impact ranges of <100 m for Hornsea Four. The animal would need to stay for a 24-hour period for sufficient noise exposure to result in a significant effect. The range of risk of onset of TTS is also <100 m. Further, underwater noise is not considered a risk to harbour porpoise prey. **Volume A4, Annex 4.5: Subsea Noise Technical Report** finds that the risk of TTS (over a period of 12 hours) to harbour porpoise prey (fish) is <50 m. In view of the above and existing evidence that harbour porpoise are not displaced from offshore wind farms following construction, it is concluded there would be **no AEoI** on the harbour porpoise of this site.

×c Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. Construction vessels would add to levels of existing vessel traffic movements (an average of 11 vessels per day passing through the array area in the summer and seven in the winter). As a worst case, eight additional vessels could be present in a given 5 km^2 block. This remains well below the approximately 80 movements per day cited in Heinänen and Skov (2015) as having potential to lead to a negative effect on harbour porpoise increased density. The adoption of a vessel management plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to **Volume A2, Chapter 4: Marine Mammals**, it is determined that the vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in mortality, injury or significant disturbance in marine mammals and a finding that this effect pathway would result in **no AEoI** for the site.

×d Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**). In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

×e **Volume A2, Chapter 4: Marine Mammals** provides an assessment of vessel collision risk with marine mammals. **Volume A2, Chapter 7: Shipping and Navigation** provides existing shipping levels (11 vessels per day passing through the array area in the summer and seven in the winter) and demonstrates that vessel traffic would not be a novel impact. The adoption of a vessel management plan would minimise the risk of mortality from collisions. In the context of existing shipping levels, the increase in those levels proposed during construction at Hornsea Four to (eight vessels per km^2 block) and the relevant project mitigation, the increased vessel traffic associated with construction (and decommissioning) of Hornsea Four has been assessed as insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collisions. This supports a finding that this effect pathway would result in **no AEoI** for the site.

×f A Marine Pollution Contingency Plan (MPCP) will form part of a wider Construction Phase Environmental Management and Monitoring Plan (CPEMMP). The implementation of the CPEMMP, produced in consultation with relevant bodies, and provided for in the Development Consent Order (DCO) as above, enables the conclusion that there is therefore, **no AEoI** to marine mammals in relation to accidental pollution.

×g The plans and projects with the potential to contribute to an in-combination effect (and detailed assessments) are provided in **B2.2: Report to Inform Appropriate Assessment**. In-combination effects are addressed against the conservation objectives with regards to the following effects acting in-combination: underwater noise, vessel disturbance, collision risk, pollution and habitat loss – the latter being assessed in-combination only. A finding of **no AEoI** is made in all cases.

End of Matrix 1

HRA Integrity Matrix 2: Flamborough Head (UK) SAC

Name of European site:	Flamborough Head (UK) SAC														
EU Code:	UK0013036														
Distance to Project:	60.2 km to array														
Adverse effect on integrity															
Effects	Temporary increases in suspended sediments			Introduction of hard substrate (INNS)			Accidental pollution			Changes to physical processes			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Reefs	Xa	Xb	Xa	Xc	Xd	Xc	Xe	Xe	Xe		Xf		Xg	Xg	Xg
Vegetated sea cliffs of the Atlantic and Baltic Coasts															
Submerged or partially submerged sea caves	Xa	Xb	Xa	Xc	Xd	Xc	Xe	Xe	Xe				Xg	Xg	Xg

Evidence supporting conclusions

Xa **Reefs and Submerged or partially submerged sea caves** - Section 10.2.3 of **B2.2: Report to Inform Appropriate Assessment** addresses how temporary, intermittent, and localised increases in suspended sediment concentrations could potentially affect the benthos. Reference is made to the assessments reported in **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Process** and **Volume A5, Annex 1.1: Marine Processes Technical Report** which provide a full description of the physical assessment. It was found likely that effects of deposition from the construction works for Hornsea Four would be limited primarily to the immediate vicinity of the works, or sediment disposal with fine material distributed much more widely. While sediment plumes had the potential to reach the SAC, the conditions at the SAC are highly dispersive for muds and silts, so there is no expectation for material to settle in this location. This, coupled with a determination of "medium sensitivity" for the receptors present, led the RIAA to conclude that the site's conservation objectives would be maintained in the long-term and there is **no potential for an AEoI**.

Xb **Reefs and Submerged or partially submerged sea caves** - Activities with the potential to create short term periods of sediment are considered to be slight compared to those occurring during either the construction or decommissioning phases. Given the small scale and magnitude of possible impact during operation and maintenance compared to the construction phase, it is concluded there is **no potential for an AEoI**.

Xc **Reefs and Submerged or partially submerged sea caves** - Mitigation measures including a CPEMMP with a Marine Biosecurity Plan (see **B2.2: Report to Inform Appropriate Assessment**) would ensure that the risk of potential introduction and spread of INNS would be minimised. The Environmental Statement (ES) concluded this pathway to be of negligible significance. In view of the mitigation

secured and the distance between the array (where the majority of vessel movements would occur) and the SAC boundary (approximately 60 km), there is **no potential for an AEoI**. This conclusion is further supported by the lack of evidence that any adverse effect from INNS has resulted during the construction of offshore wind farms.

Xd **Reefs and Submerged or partially submerged sea caves** - **Volume A2, Chapter 2: Benthic and Intertidal Ecology** reports that up to 5,438,124 m^2 of new hard substrate habitat would be introduced into the Hornsea Four benthic subtidal ecology study area. This could provide new habitat for potential colonisation by marine INNS. Up to 1,433 round trips to port by operational and maintenance vessels per year could contribute to the risk of introduction or spread of INNS. Mitigation measures proposed (i.e., the CPEMMP with a Marine Biosecurity Plan (see **B2.2: Report to Inform Appropriate Assessment**) would ensure that the risk of potential introduction and spread of INNS would be minimised. Based on this mitigation, the distance between the array and the SAC boundary (approximately 60 km), the lack of evidence of any adverse effect resulting from offshore wind, a conclusion of **no AEoI** is made.

Xe **Reefs and Submerged or partially submerged sea caves** - A Marine Pollution Contingency Plan (MPCP) will form part of a wider CPEMMP. These plans are secured by Condition 14(1)(d) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML**. The implementation of the CPEMMP, produced in consultation with relevant bodies, and provided for in the DCO enables the conclusion that there is **no AEoI** in relation to accidental pollution.

Xf **Reefs** - **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Process** assessed the potential for changes to physical processes and the subsequent effect on benthic habitats. Changes to sediment transport, wave climate and tidal flow from Hornsea Four, including from the cable crossings were predicted to be localised. No change in physical processes within the SAC were predicted. On the basis of these assessments, it is concluded that there is **no potential for an AEoI** to the conservation objectives of the reef of the Flamborough Coast SAC.

Xg **Reefs and Submerged or partially submerged sea caves** - The plans and projects identified as part of the in-combination assessment are presented in **B2.2: Report to Inform Appropriate Assessment**. This included the effects of the Bridlington A Dredge Spoil Site and Dogger Bank A and B landfall. Noting the nature of the receiving environment, the short-term, negligible effects resulting from projects alone and the mitigation secured (pollutions and INNS) for Hornsea Four it is considered that in-combination there would be **no potential for an AEoI**.

End of Matrix 2

HRA Integrity Matrix 3: Moray Firth (UK) Special Area of Conservation (SAC)

Name of European site:	Moray Firth (UK) Special Area of Conservation (SAC)											
European Union (EU) Code:	UK0019808											
Distance to Project:	522.5 km to array											
Adverse effect on integrity												
Effects	Increase in underwater noise			Vessel disturbance			Vessel collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D	C	O	D
Bottlenose dolphin	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd	Xe	Xe	Xe

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals**, and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the Habitats Regulations Assessment in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of Permanent Threshold Shift (PTS) would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e. **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML** that provides certainty that risk with respect to disturbance will be managed. Noise impacts to prey would be slightly adverse (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**) with negligible consequences in the wider context of the scale of available habitat. In light of the scale of effects, the mitigation afforded by the SIP, the MMMP and the anticipated requirement for a UXO MMMP, a finding of **no AEoI** is appropriate.

Xb Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. Construction vessels would add to levels of existing vessel traffic movements (an average of 11 vessels per day passing through the array area in the summer and seven in the winter). As a worst case, eight additional vessels could be present in a given 5 km^2 block. The adoption of a vessel management plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to **Volume A2, Chapter 4: Marine Mammals**, it is determined that the vessel traffic associated with construction (and decommissioning) of Hornsea

Four is insufficient to result in mortality, injury or significant disturbance in marine mammals and a finding that this effect pathway would result in **no AEoI** for the site.

Xc Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**. In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

Xd **Volume A2, Chapter 4: Marine Mammals** provides an assessment of vessel collision risk with marine mammals. **Volume A2, Chapter 7: Shipping and Navigation** provides existing shipping levels (11 vessels per day passing through the array area in the summer and seven in the winter) and demonstrates that vessel traffic would not be a novel impact. The adoption of a vessel management plan would minimise the risk of mortality from collisions. In the context of existing shipping levels, the increase in those levels proposed during construction at Hornsea Four to (eight vessels per km^2 block) and the relevant project mitigation, the increased vessel traffic associated with construction (and decommissioning) of Hornsea Four has been assessed as insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collisions. This supports a finding that this effect pathway would result in **no AEoI** for the site.

Xe The plans and projects with the potential to contribute to an in-combination effect (and detailed assessments) are provided in Section 11.3 of **B2.2: Report to Inform Appropriate Assessment**. In-combination effects are addressed against the conservation objectives with regards to the following effects acting in-combination: underwater noise, vessel disturbance, collision risk and pollution. A finding of **no AEoI** is made in all cases.

End of Matrix 3

HRA Integrity Matrix 4: The Wash and North Norfolk Coast (UK) SAC

Name of European site:	The Wash and North Norfolk Coast (UK) SAC								
EU Code:	UK0017075								
Distance to Project:	105 km to array								
Adverse effect on integrity									
Effect	Increase in underwater noise			Vessel disturbance			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Harbour seal	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Atlantic salt meadows									
Coastal lagoons									
Large shallow inlets and bays									
Mediterranean and thermo-Atlantic halophilous scrubs									
Mudflats & sandflats not covered by seawater at low tide									
Reefs									
Salicornia and other annuals colonising mud and sand									
Sandbanks slightly covered by sea water all the time									
Otter									

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e. **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline

SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML** that provides certainty that risk with respect to disturbance will be managed. **Volume A2, Chapter 4: Marine Mammals** considers disturbance impacts. Disturbance displacement is not considered likely to result in a significant reduction in energy intake because the area with noise sufficient to result in disturbance holds a low density of harbour seals and seal densities quickly recover post the disturbance event (high recoverability). Further, noise impacts to prey would be negligible and insignificant (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**. As the number of animals temporarily affected is small in the context of both the overall population and the effects short lived and temporary, underwater noise is not expected to undermine the harbour seal population and distribution and a conclusion of **no AEoI** applies.

Xb Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment.** Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and seven in the winter) and is not therefore, a novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals**, it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in mortality, injury or significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors, there would be **no AEoI** for the site via this effect pathway.

Xc The potential for vessel disturbance (and any associated collision risk) in marine mammals during operation and maintenance is considered in **Volume A2, Chapter 4: Marine Mammals**. Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**). In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

Xd Very low levels of harbour seal are found at Hornsea Four, with **Volume A2, Chapter 4: Marine Mammals** finding the levels so low that no cumulative assessment was required. An assessment of the site within **B2.2: Report to Inform Appropriate Assessment** found there is **no potential** for the short term and temporary disturbance from Hornsea Four to contribute to an in-combination effect on the harbour seal population at the Wash and North Norfolk Coast SAC.

End of Matrix 4

HRA Integrity Matrix 5a: Grey seal - Humber Estuary (UK) SAC

Name of European site:	**Grey seal - Humber Estuary (UK) SAC**											
EU Code:	**UK0030170**											
Distance to Project:	**79.7 km to array and 32.2 km to offshore Export Cable Corridor (ECC)**											
Adverse effect on integrity												
Effect	**Increase in underwater noise**			**Vessel disturbance**			**Vessel collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Grey seal	×a		×b	×c	×d	×b	×e	×f	×b	×g	×g	×g

Evidence supporting conclusions

×a There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e., **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO-MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML**. Noise impacts to prey would be negligible and insignificant (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**). **Volume A2, Chapter 4: Marine Mammals** addresses the potential for behavioural disturbance. As a worst-case, up to 1,489 grey seals (when apportioned to the Humber Estuary, representing up to 2.6% of the SAC population) have the potential to be disturbed by the installation of a monopile at the HVAC, falling to 864 individuals as a worst case in the north west of the array (when apportioned to the Humber, representing up to 1.6% of the SAC population). Hornsea Four could result in short-term, intermittent, and temporary behavioural responses over a period of 12 months. As the number of animals temporarily affected is small in the context of both the overall population and the effects short lived and temporary, underwater noise is not expected to undermine the grey seal population and distribution and **no AEoI** is concluded.

×b Effects during decommissioning are expected to be the same as, or less than effects during construction. Therefore, a finding of **no AEoI** is appropriate.

×c Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**). Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and 7 in the winter) and is not therefore, a novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals**, it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors there would be **no AEoI** for the site via this effect pathway.

×d The potential for vessel disturbance in marine mammals during operation and maintenance is considered in the ES (see **Volume A2, Chapter 4: Marine Mammals**). Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**). In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

×e **Volume A2, Chapter 4: Marine Mammals** provides an assessment of vessel collision risk with marine mammals. The adoption of a Vessel Management Plan would minimise the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** found (in the context of existing shipping levels, the increase in those levels proposed during construction at Hornsea Four and the relevant project mitigation) that the increased vessel traffic associated with construction (and decommissioning) of Hornsea Four (8 vessels per 5km^2 block) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collisions. This applies equally to grey seal that may be connected to the Humber SAC and a conclusion of **no AEoI** applies.

×f It is not expected that the level of vessel activity during operation and maintenance would cause an increase in the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** determined that the projected increase in vessel traffic proposed during operation and maintenance at Hornsea Four (in the context of relevant project mitigation) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collision. This is in the context of existing shipping levels, the increase in vessel traffic proposed during operation and maintenance at Hornsea Four and relevant project mitigation. A finding of **no AEoI** applies

×g The RIAA (**B2.2: Report to Inform Appropriate Assessment**) summarises the projects assessed in-combination for potential temporal and spatial effects in-combination. It was found that disturbance would not be additive, with very little difference in overall disturbance levels when the projects were combined (based on the available information). Given the measure of effects from Hornsea Four alone, it was determined there is no potential for the short term and temporary disturbance from Hornsea Four to contribute to an in-combination effect on the grey seal population at the Humber Estuary SAC.

End of Matrix 5a – **Continued on next page for additional site features**

HRA Integrity Matrix 5b: Habitats - Humber Estuary (UK) SAC

Name of European site:	Habitats - Humber Estuary SAC					
EU Code:	UK0030170					
Distance to Project:	77.9 km to array, 32.2 km to the offshore ECC					
Adverse effect on integrity						
Effects	Increased nitrogen deposition			In-combination		
Stage of Development	C	O	D	C	O	D
Atlantic salt meadows *(Glauco-Puccinellietalia maritimae)*	Xa		Xb	Xc		Xc
Salicornia and other annuals colonising mud and sand	Xc		Xb	Xc		Xc
Mudflats and sandflats not covered by seawater at low tide						
Sandbanks slightly covered by sea water all the time						
Estuaries						
Coastal lagoons* Priority feature						
Dunes with *Hippophae rhamnoides*						
Embryonic shifting dunes						
Fixed dunes with herbaceous vegetation						
Shifting dunes along the shoreline with *Ammophila arenaria*						

Evidence supporting conclusions

Xa **Atlantic salt meadows *(Glauco-Puccinellietalia maritimae)* and Salicornia and other annuals colonising mud and sand** - Air quality modelling reported in **Volume A3, Chapter 9: Air Quality** and summarised in Section 10.2.3 of **B2.2: Report to Inform Appropriate Assessment** predicts that traffic associated with construction beyond the immediate vicinity of the road at 10m would make less than a 1% increment of the relevant long term critical level or critical load alone and are therefore considered inconsequential. That Hornsea Four acting alone does not contribute to more than a 1% change to the APIS Critical Level, is considered sufficient to conclude **no AEoI** with respect to the saltmarsh features of the Humber Estuary SAC.

×b	Effects during decommissioning are expected to be the same as, or less than effects during construction. Therefore, a finding of **no AEoI** is appropriate.
×c	**Atlantic salt meadows *(Glauco-Puccinellietalia maritimae)* and Salicornia and other annuals colonising mud and sand** - Air quality modelling reported in **Volume A3, Chapter 9: Air Quality** as summarised in **B2.2: Report to Inform Appropriate Assessment** found that the upper end of the critical load for NN (the range being 20-30 kg N ha^{-1} $year^{-1}$) is most appropriate, with in-combination contributions (including Hornsea Four) of NN not exceeding this level. Noting the temporary and localised nature of the predicted effect, relative to saltmarsh extent and distribution, it is considered that the temporary elevated levels of NN would have an immeasurable and inconsequential level of impact on saltmarsh condition, or the ecological coherence of the SAC and a conclusion of **no AEoI** applies for effects in combination.

End of Matrix 5b - End of Humber SAC matrices

HRA Integrity Matrix 6a: Grey seal - Humber Estuary Ramsar (UK)

Name of European site:	**Grey seal - Humber Ramsar (UK)**											
EU Code:	**UK11031**											
Distance to Project:	**77.9 km to array and 32.2 km to the offshore ECC**											
Adverse effect on integrity												
Effect	**Increase in underwater noise**			**Vessel disturbance**			**Vessel collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Grey seal (Ramsar Criterion 3)	Xa		Xb	Xc	Xd	Xb	Xe	Xf	Xb	Xg	Xg	Xg

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e., **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO-MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML**. Noise impacts to prey would be negligible and insignificant (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**). **Volume A2, Chapter 4: Marine Mammals** addresses the potential for behavioural disturbance. As a worst-case, up to 1,489 grey seals (when apportioned to the Humber Estuary, representing up to 2.6% of the Ramsar population) have the potential to be disturbed by the installation of a monopile at the HVAC, falling to 864 individuals as a worst case in the north west of the array (when apportioned to the Humber, representing up to 1.6% of the Ramsar population). Hornsea Four could result in short-term, intermittent, and temporary behavioural responses over a period of 12 months. As the number of animals temporarily affected is small in the context of both the overall population and the effects short lived and temporary, underwater noise is not expected to undermine the grey seal population and distribution and a conclusion of **no AEoI** applies.

Xb Effects during decommissioning are expected to be the same as, or less than effects during construction. Therefore, a finding of **no AEoI** is appropriate.

Xc Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**). Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and 7 in the winter) and is not therefore, a novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals** it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors, there would be **no AEoI** for the site via this effect pathway.

Xd The potential for vessel disturbance in marine mammals during operation and maintenance is considered in the ES (see **Volume A2, Chapter 4: Marine Mammals**). Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**). In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works

Xe **Volume A2, Chapter 4: Marine Mammals** provides an assessment of vessel collision risk with marine mammals. The adoption of a Vessel Management Plan would minimise the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** found (in the context of existing shipping levels, the increase in those levels proposed during construction at Hornsea Four and the relevant project mitigation) that the increased vessel traffic associated with construction (and decommissioning) of Hornsea Four (8 vessels per 5km^2 block) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collisions. This applies equally to grey seal that may be connected to the Humber Ramsar and a conclusion of **no AEoI** applies.

Xf It is not expected that the level of vessel activity during operation and maintenance would cause an increase in the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** determined that the projected increase in vessel traffic proposed during operation and maintenance at Hornsea Four (in the context of relevant project mitigation) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collision. This is in the context of existing shipping levels, the increase in vessel traffic proposed during operation and maintenance at Hornsea Four and relevant project mitigation. A finding of **no AEoI** applies.

Xg **B2.2: Report to Inform Appropriate Assessment** summarises the projects assessed in-combination for potential temporal and spatial effects in-combination. It was found that disturbance would not be additive, with very little difference in overall disturbance levels when the projects were combined (based on the available project level information). Given the measure of effects from Hornsea Four alone. it was determined there is no potential for the short term and temporary disturbance from Hornsea Four to contribute to an in-combination effect on the grey seal population at the Humber Estuary Ramsar.

End of Matrix 6a - **Continued on next page for additional features**

HRA Integrity Matrix 6b: Habitats: Humber Estuary Ramsar (UK) (Ramsar Criterion 1)

Name of European site:	Habitats - Humber Estuary Ramsar					
EU Code:	UK11031					
Distance to Project:	77.9 km to array, 32.2 km to the offshore ECC					
Adverse effect on integrity						
Effects	Increased nitrogen deposition			In-combination		
Stage of Development	C	O	D	C	O	D
Saltmarshes (Ramsar Criterion 1)	×a		×b	×c		×c
Estuarine waters (Ramsar Criterion 1)	×c		×b	×c		×c
Intertidal mud and sand flats (Ramsar Criterion 1)						
Coastal brackish/saline lagoons (Ramsar Criterion 1)						
Dune systems and humid dune slacks (Ramsar Criterion 1)						

Evidence supporting conclusions

×a **Saltmarshes and Estuarine waters** - Air quality modelling reported in **Volume A3, Chapter 9: Air Quality** and summarised in Section 10.2.3 of **B2.2: Report to Inform Appropriate Assessment** predicts that traffic associated with construction beyond the immediate vicinity of the road at 10m would make less than a 1% increment of the relevant long term critical level or critical load alone and are therefore considered inconsequential. That Hornsea Four acting alone does not contribute to more than a 1% change to the APIS Critical Level, is considered sufficient to conclude **no AEoI** with respect to the saltmarsh features of the Humber Estuary Ramsar.

×b Effects during decommissioning are expected to be the same as, or less than effects during construction. Therefore, a finding of **no AEoI** is appropriate.

×c **Saltmarshes and Estuarine waters** - Air quality modelling reported in **Volume A3, Chapter 9: Air Quality** as summarised in **B2.2: Report to Inform Appropriate Assessment** found that the upper end of the critical load for NN (the range being 20-30 kg N ha^{-1} $year^{-1}$) is most appropriate, with in-combination contributions (including Hornsea Four) of NN not exceeding this level. Noting the temporary and localised nature of the predicted effect, relative to saltmarsh extent and distribution, it is considered that the

temporary elevated levels of NN would have an immeasurable and inconsequential level of impact on saltmarsh condition, or the ecological coherence of the Ramsar and a conclusion of **no AEoI** applies for effects in combination.

End of Matrix 6b - Continued on next page for additional features

HRA Integrity Matrix 6c: Ornithology: Humber Estuary Ramsar (UK) (Ramsar Criterion 5 and 6)

Name of European site:	Ornithology - Humber Estuary Ramsar					
EU Code:	UK11031					
Distance to Project:	77.9 km to array, 32.2 km to the offshore ECC					
Adverse effect on integrity						
Effects	Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D
Golden plover (Ramsar Criterion 6)		Xa			Xb	
Dunlin (Ramsar Criterion 6)		Xa			Xb	
Black-tailed godwit (Ramsar Criterion 6)		Xa			Xb	
Bar-tailed godwit (Ramsar Criterion 6)		Xa			Xb	
Common redshank (Ramsar Criterion 6)		Xa			Xb	
Common shelduck (Ramsar Criterion 6)		Xa			Xb	
Red knot (Ramsar Criterion 6)		Xa			Xb	
Waterbird assemblage (non-breeding) (Criterion 5)*		Xa			Xb	
*Non-breeding bird assemblage: hen harrier, dark-bellied brent goose, teal, wigeon, goldeneye, avocet, oystercatcher, ringed plover, grey plover, lapwing, sanderling, curlew, whimbrel, and turnstone						

Evidence supporting conclusions

Xa The possible impacts associated with collision risk to all waterbird species and hen harrier from the Humber Estuary Ramsar is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The risk to all waterbirds and hen harrier from Hornsea Four is limited to migratory movements. Estimates (which are supported by collision risk modelling undertaken for this project), indicate extremely low mortality rates per annum. In all cases, the number of collisions (of between zero and 1.11 individuals per annum) was found to lead to no detectable increase in mortality when compared to the natural baseline mortality and the level of effect was found to be trivial and inconsequential for all species. Therefore, it can be concluded that there is **no AEoI** for the Humber Estuary Ramsar in relation to collision mortality during the O&M phase of Hornsea Four alone to any designated features, named or un-named assemblage features or the waterbird assemblage feature.

Xb For the assessment of potential collision risk from the O&M phase alone for all waterbirds and hen harrier at the Humber Estuary Ramsar (see **B2.2: Report to Inform Appropriate Assessment**) the assessment alone concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore **no contribution to any in-combination effect** could occur.

End of Matrix 6c - End of Humber Ramsar matrix

HRA Integrity Matrix 7: Berwickshire and North Northumberland Coast (UK) SAC

Name of European site:	Berwickshire and North Northumberland Coast (UK) SAC											
EU Code:	UK0017072											
Distance to Project:	201.4 km to array											
Adverse effect on integrity												
Effect	Increase in underwater noise			Vessel disturbance			Vessel collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D	C	O	D
Grey seal	Xa		Xa	Xb	Xc	Xb	Xd	Xe	Xd	Xf	Xf	Xf
Mudflats & sandflats not covered by seawater at low tide												
Reefs												
Submerged and partially submerged sea caves												
Large shallow inlets and bays												

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals**, **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e., **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO-MMMP. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML**. Noise impacts to prey would be negligible and insignificant (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**). **Volume A2, Chapter 4: Marine Mammals** addresses the potential for behavioural disturbance. As a worst-case, of the total number of greys seals that may be disturbed being at most 1,489 (from piling monopiles at the HVAC), which represents up to 1.6% of the SAC population. Hornsea Four could result in short-term, intermittent, and temporary behavioural responses over a period of 12 months. As the number of animals temporarily affected is small, in the context of both the overall population and short-lived effects, underwater noise is not expected to undermine the grey seal population and distribution and a conclusion of **no AEoI** applies.

×b Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in Section 10.3.3 of **B2.2: Report to Inform Appropriate Assessment**. Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and 7 in the winter) and is not therefore, a novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals**, it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors, there would be **no AEoI** for the site via this effect pathway.

×c The potential for vessel disturbance in marine mammals during operation and maintenance is considered in **Volume A2, Chapter 4: Marine Mammals** Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**). In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

×d **Volume A2, Chapter 4: Marine Mammals** provides an assessment of vessel collision risk with marine mammals. The adoption of a Vessel Management Plan would minimise the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** found (in the context of existing shipping levels, the increase in those levels proposed during construction at Hornsea Four and the relevant project mitigation) that the increased vessel traffic associated with construction (and decommissioning) of Hornsea Four (8 vessels per 5 km^2 block) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collisions. This applies equally to grey seal that may be connected to the Berwickshire and North Northumberland Coast SAC and a conclusion of no AEoI applies.

×e It is not expected that the level of vessel activity during operation and maintenance would cause an increase in the risk of mortality from collisions. **Volume A2, Chapter 4: Marine Mammals** determined that the projected increase in vessel traffic proposed during operation and maintenance at Hornsea Four (in the context of relevant project mitigation) is insufficient to result in an increase in the risk of mortality or injury in marine mammals as a result of collision. This is in the context of existing shipping levels, the increase in vessel traffic proposed during operation and maintenance at Hornsea Four and relevant project mitigation. A finding of **no AEoI** applies.

×f The SAC is located at a considerable distance from the area of potential disturbance associated with Hornsea Four (171 km) with a number of other foraging grounds apparent for the colony, with uncertainty around the construction window for Marr and Berwick Bank. Given the not significant effect at population level, and the relatively low connectivity at site level, there is no potential for the short term and temporary disturbance from Hornsea Four to contribute to an in-combination effect on the grey seal population at the Berwickshire and North Northumberland SAC.

End of Matrix 7

HRA Integrity Matrix 8: Transboundary harbour seal sites

Name of European sites:	Doggersbank SAC (NL2008001) and Klaverbank SAC (NL2008002)								
Distance to Project:	89.4 km Doggersbank SAC and 78 km (Klaverbank SCI)								
Adverse effect on integrity									
Effect	Increase in underwater noise			Vessel disturbance			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Doggersbank (Netherlands) SAC (harbour seal)	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Klaverbank SAC (harbour seal)	Xa		Xa	Xb	Xc	Xb	Xe	Xe	Xe

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied to the Habitat Regulations Assessment (HRA) in **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e. **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO-MMMP – see **B2.2: Report to Inform Appropriate Assessment**), or with respect to geophysical surveys, through the **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP). **Volume A2, Chapter 4: Marine Mammals** reports that the area of sea within which noise sufficient to result in disturbance of harbour seal holds a low density of harbour seals - up to 5 harbour seals are predicted to be disturbed during piling. For the Doggersbank and Klaverbank SACIs, there are an estimated 6,000 harbour seal in the Dutch section of the North Sea and Wadden Sea. Any effect is predicted to be temporary and small in the context of the population and no detectable change is predicted with respect to harbour seals associated with transboundary sites. Noise impacts to habitats and prey would be negligible and insignificant (see **Volume A2, Chapter 1: Marine Geology, Oceanography and Physical Processes** and **Volume A2, Chapter 3: Fish and Shellfish Ecology**. In light of the mitigation afforded by the SIP and the MMMP, and the anticipated requirement for a UXO-MMMP and the temporary and small potential for effects, a finding of **no AEoI** is appropriate.

Xb Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in **B2.2: Report to Inform Appropriate Assessment**. Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and seven in the winter) and is not therefore, a

novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals** it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors, there would be **no AEoI** via this effect pathway.

×c The potential for vessel disturbance in marine mammals during operation and maintenance is considered in **Volume A2, Chapter 4: Marine Mammals**. Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**. In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally during the operation & maintenance phase of works.

×d Although the Doggersbank SAC is within screening range of Hornsea Four (with all the Dogger projects being much closer), the at sea usage of harbour seals from the UK do not show significant connectivity (see **Volume A5, Annex 4.1: Marine Mammals Technical Report**, indicating that the location of Hornsea Four does not appear to lie between UK coastal harbour seal sites and the Doggersbank SCI. However, the report similarly does not show significant connectivity to the Dutch coast. In any case, given the very low contribution of Hornsea Four to any In-combination, effects if combined would **not result in an AEoI** on the Doggersbank SAC population.

×e The assessment for the Klaverbank SAC mirrors that for the Doggersbank, above.

End of Matrix 8

HRA Integrity Matrix 9: Transboundary - grey seal sites

Name of European site:	Transboundary grey seal sites								
Distance to Project:	84 km to Doggersbank SAC, 78 km to Klaverbank SAC, 296 km to Bancs des Flandres SAC, 278 km to Vlaamse Banken SAC, 313 km to SBZ 1 SAC, 303 km to SBZ 2 SAC, 307 km to SBZ 3 SAC, 292 km to Vlakte van de Raan SAC, 301 km to Westerschelde & Saeftinghe SAC, 272 km to Voordelta SAC, 229 km to Waddenzee SAC								
Adverse effect on integrity									
Effects	Increase in underwater noise			Vessel disturbance			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Doggersbank (Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Klaverbank (Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Bancs des Flandres (France) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Vlaamse Banken (Belgium) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
SBZ 1 (Belgium) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
SBZ 2 (Belgium) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
SBZ 3 (Belgium) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Vlakte van de Raan (Belguim/Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Westerschelde & Saeftinghe (Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Voordelta (Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd
Waddenzee (Netherlands) SAC	Xa		Xa	Xb	Xc	Xb	Xd	Xd	Xd

Evidence supporting conclusions

Xa There are a number of sources of underwater noise associated with Hornsea Four alone during construction. These are addressed for marine mammals in **Volume A2, Chapter 4: Marine Mammals** and **Volume A4, Annex 4.5: Subsea Noise Technical Report** and applied

to the HRA in **B2.2: Report to Inform Appropriate Assessment**. The risk of onset of PTS would be addressed by appropriate mitigation during percussive piling operations and UXO clearance (i.e., **F2.5: Marine Mammal Mitigation Protocol** (MMMP) and UXO-MMMP – see **B2.2: Report to Inform Appropriate Assessment**. **F2.11: Outline Southern North Sea Special Area of Conservation Site Integrity Plan** (Outline SNS SAC SIP) is provided for in Condition 13(1)(j) of Schedules 11 and 12 of **C1.1: Draft Development Consent Order including Draft DML**. Noise impacts to prey would be negligible and insignificant (see **Volume A2, Chapter 3: Fish and Shellfish Ecology**). **Volume A2, Chapter 4: Marine Mammals** addresses the potential for behavioural disturbance. As a worst-case, of the total number of grey seal that may be disturbed, up to 250.5-431.8 individuals were apportioned to the transboundary sites. Assuming an equal apportionment between the 12 sites that would equate to just 21-36 individual seals. In the context of the European grey seal population (excluding the UK) of 12,400 (SCOS 2018), such a number of seals is inconsequential – whether as a proportion of the total or the total itself. Hornsea Four could result in short-term, intermittent, and temporary behavioural responses over a period of 12 months. As the number of animals temporarily affected is small in the context of both the overall populations and the effects short lived and temporary, underwater noise is not expected to undermine the grey seal population and distribution of any transboundary sites and a conclusion of **no AEoI** applies.

Xb Vessel related disturbance on marine mammals is assessed in **Volume A2, Chapter 4: Marine Mammals** and applied to the HRA in **B2.2: Report to Inform Appropriate Assessment**. Construction vessels would add to levels of existing vessel traffic movements (which average of 11 vessels per day passing through the array area in the summer and seven in the winter) and is not therefore, a novel impact for marine mammals present in the area. As a worst case, eight additional vessels could be present in a given 5 km^2 block. In **Volume A2, Chapter 4: Marine Mammals**, it is determined that the additional vessel traffic associated with construction (and decommissioning) of Hornsea Four is insufficient to result in significant disturbance in marine mammals, with disturbed animals returning to an area once the vessel disturbance has ended. The adoption of a Vessel Management Plan would minimise the potential for any impact (which are predicted to be local, short term duration and intermittent). With reference to these factors, there would be no AEoI via this effect for transboundary sites.

Xc The potential for vessel disturbance in marine mammals during operation and maintenance is considered in **Volume A2, Chapter 4: Marine Mammals**. Operation and maintenance vessel movements are not expected to result in a significant change on existing conditions (see **Volume A2, Chapter 4: Marine Mammals**. In light of the no AEoI conclusion drawn with respect to vessel disturbance during construction (when potential for vessel related disturbance is greater), and the localised, temporary, and intermittent nature of potential effects, it can be concluded that the same conclusion of **no AEoI** applies equally to transboundary sties during the operation & maintenance phase of works.

Xd Consideration of the potential for an in-combination effect on grey seal is provided on a site-by-site basis in **B2.2: Report to Inform Appropriate Assessment**, which was compiled with reference to **Volume A2, Chapter 4: Marine Mammals**. The potential for Hornsea Four to contribute to any in-combination risk of injury (defined as risk of onset of PTS) is considered to be negligible (for example, with the mitigation area in the MMMP exceeding the <100 m range of effect for piling).

End of Matrix 9

HRA Integrity Matrix 10: Greater Wash SPA

Name of European site:	Greater Wash SPA								
EU Code:	UK9020329								
Distance to Project:	63.4 km to array								
Adverse effect on integrity									
Effect	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Red-throated diver	Xa	Xb	Xc				Xd	Xe	Xc
Common scoter	Xa	Xb	Xc				Xd	Xe	Xc
Little gull					Xf			Xg	
Sandwich tern									
Common tern									
Little tern									

Evidence supporting conclusions

Xa **Red throated diver and common scoter** - The possible impacts associated with construction phase disturbance and displacement to red-throated diver and common scoter from the Greater Wash SPA is assessed in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to the low densities of red-throated divers and common scoters present in the Hornsea Four offshore ECC (neither are present in array area) in the non-breeding seasons, the number of individual red-throated divers and common scoters that may potentially be subject to displacement consequent mortality, which can be attributed to the Greater Wash, is well under one breeding adult per annum. The conclusion drawn is a *de minimis* contribution to any increase in baseline mortality. There is, therefore, **no potential for an AEoI** to the conservation objectives of the red-throated diver or common scoter features of Greater Wash SPA in relation to disturbance and displacement effects in the construction phase from Hornsea Four alone and subject to natural change, red-throated diver and common scoter will be maintained as features in the long-term.

Xb **Red throated diver and common scoter** - The possible impacts associated with O&M phase disturbance and displacement to red-throated diver and common scoter from the Greater Wash SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. It was determined that the small level of vessel activities associated with the operational and maintenance activities for Hornsea Four would not lead to any consequent displacement related mortality for either red-throated diver or common scoter, as it would not significantly alter the background vessel activities already present from the Humber Estuary shipping channel into the North Sea. It was also determined that any disturbance and displacement in relation to any ad-hoc maintenance of export cables during the O&M phase of Hornsea Four would be less the construction phase cable laying activities and as such no significant adverse impacts or effects would occur through this very limited and unlikely occurrence during the O&M phase of Hornsea Four. There is, therefore, **no potential for an AEoI** to the conservation objectives of the red-throated diver or common scoter features of Greater Wash SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, both red-throated diver and common scoter will be maintained as a feature in the long-term.

Xc **Red throated diver and common scoter** - The impacts during the decommissioning phase are considered to be similar and potentially less than those outlined in the construction phase.

Xd **Red throated diver and common scoter** - For the assessment of potential disturbance and displacement effects from the construction phase alone for red-throated diver and common scoter at the Greater Wash SPA (see **B2.2: Report to Inform Appropriate Assessment**) concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore **no potential for any contribution for an in-combination effect**.

Xe **Red throated diver and common scoter** For the assessment of potential disturbance and displacement effects from the O&M phase alone for red-throated diver and common scoter at the Greater Wash SPA (see **B2.2: Report to Inform Appropriate Assessment**) assessment alone concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore **no potential for any contribution for an in-combination effect**..

Xf **Little gull** - The possible impacts associated with collision risk to little gulls from the Greater Wash SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Due to risk to little gull from Hornsea Four being limited to migratory movements and being estimated from collision risk modelling at under one breeding adult per annum this level of effect was found to be trivial and inconsequential. The conclusion drawn was that there is **no potential for an AEoI** to the conservation objectives of the little gull feature of the Greater Wash SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, little gull will be maintained as a feature in the long-term.

Xg **Little gull** - For the assessment of potential collision risk from the O&M phase alone for little gull at the Greater Wash SPA (see **B2.2: Report to Inform Appropriate Assessment**), limited risk of collision was estimated of three individuals (2.7 birds per annum). Therefore, the risk of an adverse effect on the population is extremely low and hence a prediction that Hornsea Four in-combination with all other OWFs will not affect the achievement of the conservation objectives for the Greater Wash SPA. There is, therefore, **no potential for an AEoI** to the conservation objectives of the little gull feature of the Greater Wash SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination with all other offshore wind farms and subject to natural change, little gull will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision mortality.

End of Matrix 10

HRA Integrity Matrix 11: Flamborough and Filey Coast SPA

Name of European site:	**Flamborough and Filey Coast SPA**														
EU Code:	**UK9006101**														
Distance to Project:	**63 km to array and 2.5 to offshore ECC**														
Adverse effect on integrity															
Effects	**Displacement and disturbance**			**Collision risk**			**Combined Disturbance and Collision risk**			**Barrier Effects**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Gannet	Xa	Xb	Xc		Xd			Xe					Xf	Xg	Xf
Kittiwake					Xh									Xi	
Herring gull (component of seabird assemblage)					Xj									Xk	
Guillemot	Xl	Xm	Xc								Xn		Xf	Xo	Xf
Razorbill	Xl	Xm	Xc								Xn		Xf	Xp	Xf
Puffin (component of seabird assemblage)	Xq	Xr	Xc								Xs		Xf	Xt	Xf
Seabird assemblage (excluding named components above															

Evidence supporting conclusions

Xa **Gannet** - Species assessed to show minor sensitivity to construction activities within the Hornsea Four array area, with potential effects associated with disturbance and displacement of gannets summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited across all seasons and any effect being reduced when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the Flamborough and Filey Coast (FFC) SPA was found to be a maximum of two breeding adults per annum. This level of impact would be indistinguishable from natural fluctuations in the population, especially considering the impacts from construction are both temporally and spatially limited. Therefore, **no AEoI** would result to the conservation objectives of the gannet feature of FFC SPA in relation to potential adverse disturbance and displacement effects from the construction phase of Hornsea Four alone and subject to natural change, gannet would be maintained as a feature in the long-term.

Xb **Gannet** - Species assessed to show limited sensitivity to O&M activities, but known to avoid active wind turbine generators (WTGs) within array areas, with potential effects associated with disturbance and displacement of gannets summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Disturbance and displacement during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was found to be between three and four breeding adults per annum. The addition of between three and four possible additional breeding adult mortalities per annum equates to between 0.15% to 0.20% increase in mortality relative to baseline mortality at most, when considering either the latest 2017 colony counts or 0.24% to 0.3% for the historic citation population level. This level of impact would be indistinguishable from natural fluctuations in the population. Therefore, **there is no potential for an AEoI to the conservation objective to maintain the population of the gannet feature of FFC SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone** and subject to natural change, gannet will be maintained as a feature in the long-term.

Xc **Gannet, guillemot, razorbill and puffin** - The impacts during the decommissioning phase would be the same or less than for the construction phase. Therefore, a finding of **no AEoI** is appropriate.

Xd **Gannet** - Species assessed to show sensitivity to collision risk during the O&M phase of Hornsea Four, with potential effects associated with collision risk to gannets summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Collision consequent mortality levels during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was found to be nine breeding adults per annum. The addition of nine possible additional breeding adult mortalities per annum equates to a 0.62% or 0.39% increase in mortality relative to baseline mortality at most, when considering either the citation or the latest 2017 colony counts, respectively. This level of impact would be indistinguishable from natural fluctuations in the population. Therefore, **there is no potential for an AEoI to the conservation objective to maintain the population size of the gannet feature of FFC SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone** and subject to natural change, gannet will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Xe **Gannet** - Species assessed to show sensitivity to combined displacement and collision risk during the O&M phase of Hornsea Four, with potential effects associated summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Combined displacement and collision risk predicted consequent mortality levels during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was found to be between 12 to 13 breeding adults per annum. The addition of between 12 and 13 possible

additional breeding adult mortalities per annum equates to between 0.54% to 0.59% increase in mortality relative to baseline mortality at most, when considering either the latest 2017 colony counts or 0.86% to 0.94% for the historic citation population level. This level of impact would be indistinguishable from natural fluctuations in the population. Therefore, **there is no potential for an AEoI to the conservation objective to maintain the population of the gannet feature of FFC SPA in relation to combined displacement and collision risk effects in the O&M phase from Hornsea Four alone** and subject to natural change, gannet will be maintained as a feature in the long-term.

Xf **Gannet, guillemot, razorbill and puffin -** no proposed overlap during construction and decommissioning phases with other projects within a reasonable distance based on expert judgement and species foraging range (Woodward et al. 2019) that would result in a possible in-combination impact, occurring at the same time on the same features of designated sites reviewed for this RIAA.

Xg **Gannet (In-combination Disturbance and Displacement)** - Gannet assessed to show limited sensitivity to O&M activities but is known to avoid active WTGs within array areas. Gannet is therefore considered for potential effects associated with disturbance and displacement from Hornsea Four in-combination with other plans and projects in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment.** Disturbance and displacement during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA and other populations was found to be between 51 and 68 breeding adults per annum. The addition of between 51 and 68 possible additional breeding adult mortalities per annum equates to an increase in baseline mortality of the citation population of between 3.70% and 4.93% across all bio-seasons per annum (Hornsea Four alone contributes an increase of 0.24% to 0.31% in baseline mortality per annum across all bio-seasons). The predicted consequent baseline mortality increase of the more recent 2017 colony count is estimated at between 2.34% and 3.12% across all bio-seasons per annum (Hornsea Four alone contributes an increase of 0.15% to 0.20% in baseline mortality per annum across all bio-seasons). The increase in mortality relative to baseline exceeded 1% and so Population Viability Analysis (PVA) modelling was provided (see **B2.2: Report to Inform Appropriate Assessment**). When considering the growth rate scenarios suggested by Natural England and the in-combination displacement reduction in growth rates, the colony growth rate would still remain positive under any scenario and continue to increase over the 35 years Hornsea Four would be operating. Therefore, **the potential for an AEoI** to the conservation objective to maintain the population size of the gannet feature of FFC SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination can be ruled out.

Gannet (In-combination Collision Risk) – Gannet assessed to show sensitivity to collision risk from Hornsea Four and other plans and projects, with potential effects summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Collision consequent mortality levels from Hornsea Four in-combination across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was estimated to be 298 breeding adults per annum. The predicted consequent baseline mortality increase of the citation population is estimated at 21.72% across all bio-seasons per annum, of which Hornsea Four alone contributes an increase of nine predicted breeding adult mortalities equating to an increase of 0.62% in baseline mortality per annum across all bio-seasons. The predicted consequent baseline mortality increase of the more recent 2017 colony count is estimated at 13.74% across all bio-seasons per annum, of which Hornsea Four alone contributes an increase of nine predicted breeding adult mortalities equating to an increase of 0.39% in baseline mortality per annum across all bio-seasons. The results from the PVA when applying an adult mortality rate of 298 estimated a maximum reduction in the population growth rate of 1.36% may occur using the density independent model. Following this evidence led approach to consider an in-combination adult mortality rate of 298 against the most appropriate FFC SPA gannet colony short and long-term growth rates the maximum reduction in the population growth rate of 1.36% (using the

density independent model) would not result in the growth rate becoming negative. The gannet feature of the FFC SPA would therefore remain in a favourable condition and continue to increase in population after 35 years and would mean the conservation objective to maintain the population of the gannet feature of the FFC SPA would still be met over the operational lifespan of Hornsea Four and **no AEoI** from in-combination collision mortality impacts would result.

Gannet (in-combination Displacement and Collision Risk) – Gannet also assessed to show sensitivity to combined displacement and collision risk from Hornsea Four and other plans and projects, with potential effects summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Combined displacement and collision risk predicted consequent mortality levels from Hornsea Four in-combination across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was estimated to be between 349 and 366 breeding adults per annum. The results from the PVA when applying an adult mortality rate of between 349 and 366 estimated a maximum reduction in the population growth rate of 1.54% to 1.61% may occur using the density independent model. Following this evidence led approach to consider an in-combination adult mortality rate of between 349 and 366 against the most appropriate FFC SPA gannet colony short and long-term growth rates the maximum reduction in the population growth rate of 1.54% to 1.61% (using the density independent model) would not result in the growth rate becoming negative. The gannet feature of the FFC SPA would therefore remain in a favourable condition and continue to increase in population after 35 years and would mean the conservation objective to maintain the population of the gannet feature of the FFC SPA would still be met over the operational lifespan of Hornsea Four and **no AEoI** from in-combination combined displacement and collision mortality impacts would result.

Xh **Kittiwake** - Species assessed to show sensitivity to collision risk during the O&M phase of Hornsea Four, with potential effects associated with collision risk to kittiwakes summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Collision consequent mortality levels during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was found to be 21 breeding adults per annum. The addition of 21 possible additional breeding adult mortalities per annum equates to a 0.09% or 0.14% increase in mortality relative to baseline mortality at most, when considering either the citation or the latest 2017 colony counts, respectively. This level of impact would be indistinguishable from natural fluctuations in the baseline mortality rate, which is estimated to be the loss of 15,048 breeding adults per annum from this population. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of the FFC SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone. Therefore, subject to natural change, the kittiwake population at the FFC SPA will continue to be restored to the size at the point or designation whilst avoiding deterioration from its current level and be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Xi **Kittiwake** - Kittiwake assessed to show sensitivity to collision risk from Hornsea Four and other plans and projects, with potential effects summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Collision consequent mortality levels from Hornsea Four in-combination across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was estimated to be 397 breeding adults per annum. The predicted consequent baseline mortality increase of the citation population is estimated at 1.62% across all bio-seasons per annum, of which Hornsea Four alone contributes an increase of 21 predicted breeding adult mortalities equating to an increase of 0.09% in baseline mortality per annum across all bio-seasons. The predicted consequent baseline mortality increase of the more recent 2017 colony count is estimated at 2.64% across all bio-seasons per annum, of which Hornsea Four alone contributes an increase of 21 predicted breeding adult mortalities equating to an increase of 0.14% in baseline mortality per annum across all bio-seasons.. Due to the increase in mortality relative to baseline mortality from collision impacts in-combination exceeding a 1%

increase further consideration was provided through PVA modelling. The PVA modelling for this project differs from other OWF Development Application assessments in that it used the most recent model developed by Natural England for the purpose of improving previous PVAs and enabling a more consistent approach, with all parameters considered and agreed ahead of running the models to determine the potential levels of effect for the FFC SPA kittiwake feature. The results from the PVA when applying an adult mortality rate of 397 estimated a maximum reduction in the population growth rate of 0.48% may occur using the density independent model, which was the model version Natural England advocated the use of. Following this evidence led approach to consider an in-combination adult mortality rate of 397 against the most appropriate FFC SPA kittiwake colony, when reviewing both the short-term and long-term growth rates the maximum reduction in the population growth rate of 0.48% (using the density independent model) would remain at a level that would not be detrimental to the population and would result in the growth rate remaining positive. The kittiwake feature of the FFC SPA would, therefore, remain in a favourable condition and continue to increase in population after 35 years allowing for the conservation objective to restore the population of the kittiwake feature of the FFC SPA to still be met over a longer period of time and therefore, **an AEoI from in-combination collision mortality impacts can be ruled out**.

Xj **Herring gull** - Herring gull was screened into the assessment of the O&M phase in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment** on a precautionary basis as a result of the proximity of the FFC SPA and its flight behaviour that places it at risk of collision with the turning blades of the WTGs, though only very low densities were recorded in site-specific data within the array area. Collision consequent mortality levels during the O&M phase across all seasons was estimated to be very low and when considering the wider mixing of North Sea populations in the non-breeding bio-season, following apportionment of any effects to breeding adults from the FFC SPA was found to be less than one breeding adult per annum. The possible loss of less than one breeding adult per annum would be indistinguishable from natural fluctuations in the population or when considering relative to the baseline mortality rate. There is, therefore, **no potential for an AEoI** to the conservation objectives of the seabird assemblage feature, of which herring gull is a named component, of the FFC SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, herring gull will be maintained as a feature of the seabird assemblage in the long-term.

Xk **Herring gull** - Herring gull was screened into the assessment of the O&M phase in-combination in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment** on a precautionary basis as a result of the proximity of the FFC SPA and its flight behaviour that places it at risk of collision with the turning blades of the WTGs, though only very low densities were recorded in site-specific data within the array area. Assessment alone concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore **no potential for any contribution for an in-combination effect**.

Xl **Guillemot and razorbill** - Guillemot and razorbill were assessed to show sensitivity to construction activities within the Hornsea Four array area, with potential effects associated with disturbance and displacement of auks summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited across all seasons and when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be 18 breeding adult guillemots per annum and less than one breeding adult razorbill per annum. The addition of this level of displacement consequent mortalities of breeding adult guillemot and razorbill per annum equates to a 0.24% (0.35%) and 0.02% (0.03%) increase in mortality relative to baseline mortality at most, when considering either the latest 2017 colony counts (or citation population levels), respectively. This level of effect would be indistinguishable from natural fluctuations in the population of each species. Therefore, **the potential for an AEoI** to the conservation to maintain the population size of the guillemot and razorbill feature of FFC SPA in

relation to disturbance and displacement effects in the construction phase from Hornsea Four alone can be ruled out, subject to natural change, guillemot and razorbill will be maintained as features of the SPA in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Xm **Guillemot and razorbill** - Guillemot and razorbill were assessed to show sensitivity to O&M activities within the Hornsea Four array area, with potential effects associated with disturbance and displacement of auks summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Disturbance and displacement across all seasons, when the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be 35 breeding adult guillemots per annum and less than two breeding adult razorbill per annum. The addition of this level of displacement consequent mortalities of breeding adult guillemot and razorbill per annum equates to a 0.47% (0.69%) and 0.04% (0.07%) increase in mortality relative to baseline mortality at most, when considering either the latest 2017 colony counts (or citation population levels), respectively. This level of effect would be indistinguishable from natural fluctuations in the population of each species. Therefore, **the potential for an AEoI to the conservation objective to maintain the population size of the guillemot and razorbill feature of FFC SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone can be ruled out**, and subject to natural change, both guillemot and razorbill will be maintained as features of the SPA in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Xn **Guillemot and razorbill** - To create a barrier effect, Hornsea Four would need to be sited between where birds breed at FFC SPA cliffs to regular known foraging areas. For an effect to occur flights for both species would need to be in an almost due east-west alignment from the SPA to encounter Hornsea Four. However, as the distance between the array and the SPA (63 km) is at the outer limits of the known mean-max foraging range for razorbill (88.7 km) and guillemot (73.2 km) (Woodward et al. 2019), Hornsea Four would not cause a barrier effect on a regular basis. These foraging ranges indicate that few breeding auks would forage in the waters east of Hornsea Four. This is supported by models based on tracking studies that also confirm very few guillemots or razorbills are likely to forage regularly in waters to the east of Hornsea Four (Wakefield et al, 2017). There is, therefore, **no potential for an AEoI to the conservation objectives of these two auks species in relation to a barrier effect**.

Xo **Guillemot** - Guillemot were assessed to show sensitivity to O&M activities within the Hornsea Four array area in-combination with other plans and projects, with potential effects associated with disturbance and displacement of guillemots summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. In-combination disturbance and displacement across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be 204 breeding adult guillemots per annum. The addition of 204 predicted mortalities increases the baseline mortality of the citation population or the 2017 colony count by 4.03% or 2.75% across all bio-seasons per annum, respectively (Hornsea Four alone contributes an increase of 35 predicted breeding adult mortalities equating to an increase of 0.69% or 0.47% in baseline mortality across all bio-seasons per annum, respectively). Following PVA modelling of guillemot at the FFC SPA in-combination to consider the potential change at the population level (an adult mortality rate of 204), a maximum reduction in the population growth rate of 0.19% may occur using the density independent model. As the guillemot colony is predicted to maintain a colony growth rate of between 3% to 5% then the effect of a reduction in growth rate of 0.14% would not affect the overall population levels into the future from Hornsea Four in-combination with other plans and projects. When considering the growth rate scenario suggested by Natural England and the in-combination displacement reduction in growth rate, the colony growth rate would still remain positive under the highly precautionary scenario and continue to increase over the 35 years Hornsea Four would be operating. Therefore, **the potential for an AEoI to the conservation objective to maintain the**

population size of the guillemot feature of FFC SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination can be ruled out.

Xp **Razorbill** - Razorbill were assessed to show sensitivity to O&M activities within the Hornsea Four array area in-combination with other plans and projects, with potential effects associated with disturbance and displacement of razorbills summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. In-combination disturbance and displacement across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be 36 breeding adult razorbills per annum. The predicted increase in baseline mortality of the citation population or 2017 colony count equates to 1.63% or 0.85% across all bio-seasons per annum respectively (Hornsea Four alone contributes an increase of less than two predicted breeding adult mortalities equating to an increase of 0.07% or 0.04% in baseline mortality across all bio-seasons per annum, respectively). Following PVA modelling of razorbill at the FFC SPA in-combination to consider the potential change at the population level (an adult mortality rate of 36), a maximum reduction in the population growth rate of 0.11% may occur using the density independent model. As the razorbill colony is predicted to maintain a colony growth rate of between 6% to 7% then the effect of a reduction in growth rate of 0.14% would not affect the overall population levels into the future from Hornsea Four in-combination with other plans and projects. When considering the growth rate scenario suggested by Natural England and the in-combination displacement reduction in growth rate, the colony growth rate would still remain positive under the highly precautionary scenario and continue to increase over the 35 years Hornsea Four would be operating. Therefore, **the potential for an AEoI to the conservation objective to maintain the population size of the razorbill feature of FFC SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination can be ruled out**.

Xq **Puffin** - Puffin were assessed to show sensitivity to construction activities within the Hornsea Four array area, with potential effects associated with disturbance and displacement of auks summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited across all seasons and when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be under one breeding adult puffin. The addition of this level of displacement consequent mortalities of breeding adult puffin per annum equates to a 0.10% increase in mortality relative to baseline mortality at most, when considering either the latest 2017 and 2018 colony counts, which represent the most accurate counts of this species. This level of effect would be indistinguishable from natural fluctuations in the population of puffin. Therefore, **the potential for an AEoI to the conservation objective to maintain the population size of this named feature of the seabird assemblage or the seabird assemblage feature of FFC SPA, in relation to disturbance and displacement effects in the Operation and Maintenance (O&M) phase from Hornsea Four alone can be ruled out**.

Xr **Puffin** - Puffin were assessed to show sensitivity to O&M activities within the Hornsea Four array area, with potential effects associated with disturbance and displacement of auks summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Disturbance and displacement during the O&M phase across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be under one breeding adult puffin. The addition of this level of displacement consequent mortalities of breeding adult puffin per annum equates to a 0.21% increase in mortality relative to baseline mortality at most, when considering the latest 2017 & 2018 colony counts, which represent the most accurate counts of this species. This level of effect would be indistinguishable from natural fluctuations in the population of puffin. Therefore, **the potential for an AEoI to the conservation objective to maintain the population size of this named feature of the seabird assemblage or the seabird assemblage feature of FFC SPA, in relation to**

disturbance and displacement effects in the O&M phase from Hornsea Four alone can be ruled out. Therefore, subject to natural change, the named species of puffin within the seabird assemblage will be maintained in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Xs **Puffin** - The distance to the Hornsea Four array area to the FFC SPA (63 km at its closest point). As this is further than the mean foraging range of puffin (62.4 km) (Woodward et al. 2019), the presence of WTGs would not be the cause of a barrier effect on a regular basis. Evidence also indicates that only a few breeding auks would forage in the waters to the east of the Hornsea Four array area. The conservation objectives for puffin would not be undermined and subject to natural change, puffin would be maintained as a feature in the long-term. Therefore, **it can be concluded that No AEoI** will result due to potential barrier effects.

Xt **Puffin** - Puffin were assessed to show sensitivity to O&M activities within the Hornsea Four array area in-combination with other plans and projects, with potential effects associated with disturbance and displacement of puffins summarised in Section 11.4.3 of **B2.2: Report to Inform Appropriate Assessment**. In-combination disturbance and displacement across all seasons, when considering the wider mixing of North Sea populations in the non-breeding bio-season, the proportion of any impacts apportioned to breeding adults from the FFC SPA was found to be five breeding adult puffins per annum. The addition of this level of displacement consequent mortalities of breeding adult puffin per annum equates to a 1.54% increase in mortality relative to baseline mortality at most, when considering the latest 2017 / 2018 mean colony count. As this is over a 1% increase in mortality relative to baseline mortality, but despite Hornsea Four alone contributing only an increase of 0.11% in baseline mortality across all bio-seasons per annum, PVA modelling was undertaken as a precaution for in-combination. Following PVA modelling of puffin at the FFC SPA in-combination to consider the potential change at the population level (an adult mortality rate of five), a maximum reduction in the population growth rate of 0.18% may occur using the density independent model, which would not result in a decline in the population of puffin at the FFC SPA. When considering a maximum reduction of five breeding adult puffins or a reduction in the growth rate of 0.17% from the FFC SPA colony this would be considered *de minimis* overall. Therefore, following this assessment of puffin, as a named species within the seabird assemblage, evidence is provided that the conservation objective of the seabird assemblage feature of the FFC SPA would not be significantly adversely affected due to displacement of puffins as a consequence of Hornsea Four in-combination with other plans or projects. The conservation objective to which is to maintain an overall seabird assemblage population level of all species at the FFC SPA of 216,730 individuals, therefore the loss of five birds is not considered to make any consequential difference this being maintained, as the assemblage population is greater than this currently. Therefore, the conservation objective will still be met over the operational lifespan of Hornsea Four and **an AEoI from in-combination displacement impacts can be ruled out** on the seabird assemblage when considering puffin and other species.

End of Matrix 11

HRA Integrity Matrix 12: Humber Estuary SPA

Name of European site:	Humber Estuary SPA					
EU Code:	UK9006111					
Distance to Project:	77.9km to array and 32.2km to offshore ECC					
Adverse effect on integrity						
Effects (B) – Breeding (NB) – Non-breeding		Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D
Shelduck (NB)		Xa			Xb	
Marsh harrier (B)						
Hen harrier (NB)		Xa			Xb	
Avocet (B + NB)		Xa			Xb	
Golden plover (NB)		Xa			Xb	
Knot (NB)		Xa			Xb	
Dunlin (NB)		Xa			Xb	
Ruff (NB)		Xa			Xb	
Black-tailed godwit (NB)		Xa			Xb	
Bar-tailed godwit (NB)		Xa			Xb	
Redshank (NB)		Xa			Xb	
Little tern (B)						
Bittern (B+ NB)						
Waterbird assemblage (excluding named components above)		Xa			Xb	

Evidence supporting conclusions

Xa	Collision risk for waterbird species and hen harrier from this SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment.** The risk to all waterbirds and hen harrier from Hornsea Four is limited to migratory movements. Estimates (which are supported by collision risk modelling undertaken for this project), indicate extremely low mortality rates per annum. In all cases, the number of collisions (of between zero and 1.11 individuals per annum) was found to lead to no detectable increase in mortality when compared to the natural baseline mortality and the level of effect was found to be trivial and inconsequential for all species. Therefore, **it can be concluded that there is no AEoI** for the Humber Estuary SPA in relation to collision mortality during the O&M phase of Hornsea Four alone to any designated features, named or un-named assemblage features or the waterbird assemblage feature.
Xb	In-combination collision risk for waterbird species and hen harrier from this SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**, where the assessment alone concluded potential for a trivial and inconsequential level of effect, that would be well within the error margins of the assessment, and therefore no material contribution or very minor contributions to baseline mortality as a result of Hornsea Four would result and therefore **no contribution to any in-combination effect could occur**.
Note	An assessment of air-quality impacts to saltmarsh as supporting habitat of the SPA is undertaken in **Matrix 4b**. **No AEoI** is concluded.

End of Matrix 12

HRA Integrity Matrix 13: Hornsea Mere SPA

Name of European site:	Hornsea Mere SPA					
EU Code:	UK9006171					
Distance to Project:	12.9 km to offshore ECC					
Adverse effect on integrity						
Effects	Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D
Gadwall		Xa			Xb	
Mute swan						

Evidence supporting conclusions

Xa **Gadwall** - The possible impacts associated with collision risk to gadwall from the Hornsea Mere SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment.** Due to risk to gadwall from Hornsea Four being limited to migratory movements and being estimated from collision risk modelling at under one individual per annum, which equates to an increase in baseline mortality of 0.17%, a level of effect which was found to be trivial and inconsequential. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gadwall feature of the Hornsea Mere SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, gadwalls will be maintained as features in the long-term.

Xb **Gadwall** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gadwall feature of Hornsea Mere SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

End of Matrix 13

HRA Integrity Matrix 14: Northumbria Coast SPA

Name of European site:	Northumbria Coast SPA					
EU Code:	UK9006131					
Distance to Project:	144 km to array					
Adverse effect on integrity						
Effects	Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D
Arctic tern		Xa			Xb	
Little tern						
Turnstone						
Purple sandpiper						

Evidence supporting conclusions

Xa **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by Wildfowl and Wetlands Trust (WWT) and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the English tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of the Northumbria Coast SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic terns will be maintained as a feature in the long-term.

Xb It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from any English SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation

objectives of the Arctic tern feature of Northumbria Coast SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 14

HRA Integrity Matrix 15: Teesmouth and Cleveland Coast SPA (as extended in January 2020)

Name of European site:	Teesmouth & Cleveland Coast SPA					
EU Code:	UK9006131					
Distance to Project:	144 km to array					
Adverse effect on integrity						
Effects		Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D
Sandwich tern		Xa			Xb	
Common tern		Xa			Xb	
Avocet						
Ruff						
Knot						
Redshank						
Little tern						
Waterbird assemblage						

Evidence supporting conclusions

Xa **Sandwich and common tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the English tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the common or Sandwich tern features of the Teesmouth and

Cleveland Coast SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, both tern species will be maintained as features in the long-term.

Xb **Sandwich and common tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from any English SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the common and Sandwich tern features of Teesmouth and Cleveland Coast SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 15

HRA Integrity Matrix 16: Coquet Island SPA

Name of European site:	Coquet Island SPA								
EU Code:	UK9006031								
Distance to Project:	167 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Kittiwake (unnamed component of the seabird assemblage)					Xa			Xb	
Sandwich tern					Xc			Xd	
Common tern					Xc			Xd	
Arctic tern					Xc			Xd	
Roseate tern					Xc			Xd	
Puffin (component of the seabird assemblage)	Xe	Xf	Xg				Xh	Xh	Xh
Seabird assemblage (excluding named components above)									

Evidence supporting conclusions

Xa **Kittiwake** - The possible impacts associated with collision risk to kittiwake from the Coquet Island SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Due to wider mixing of North Sea populations and migration out of the UK North Sea in the non-breeding bio-seasons, the proportion of impacts apportioned to individuals from the Coquet Island SPA was found to be trivial and inconsequential. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Coquet Island

SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

- Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Coquet Island SPA in relation to collision in the O&M phase from Hornsea Four in-combination.
- Xc **Common, Sandwich Arctic and roseate terns -** A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the English tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the common, Sandwich, Arctic or roseate tern features of Coquet Island SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, all tern species will be maintained as features in the long-term.
- Xd **Common, Sandwich, Arctic and roseate terns -** It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report** based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from any English SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the common , Sandwich, Arctic , roseate tern or sandwich tern features of Coquet Island SPA during O&M from effects in-combination and subject to natural change, all tern species will be maintained as features in the long-term.
- Xe **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Coquet Islands SPA within the North Sea during the construction phase is summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited and low densities of puffin within the Hornsea Four array area, the proportion of impacts apportioned to individuals from Coquet Island SPA was found to be less than one breeding adult per annum, equating to an increase in baseline mortality of 0.01%. This level of impact would be indistinguishable from natural fluctuations in the population, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Coquet Island SPA in relation to disturbance and displacement during the construction phase for Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.
- Xf **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Coquet Island SPA within the North Sea is summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned displacement mortality for this SPA was estimated at well under a single breeding adult bird per annum and an increase in baseline mortality of less than 0.01% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of

the puffin feature of Coquet Island SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xg **Puffin** - The impacts during the decommissioning phase are considered to be similar and potentially less than those outlined in the construction phase. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Coquet Island SPA in relation to disturbance and displacement effects in the decommissioning phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xh **Puffin** - Connectivity to Hornsea Four limited due to low densities of puffin within the Hornsea Four array area and the distance from the SPA to Hornsea Four being on the limit of puffin foraging range, the effect from disturbance and displacement was found to be trivial and inconsequential, as summarised in Section 10.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Coquet Island SPA in relation to disturbance and displacement during construction, O&M and decommissioning phases for Hornsea Four in-combination and subject to natural change, puffins will be maintained as a feature in the long-term.

End of Matrix 16

HRA Integrity Matrix 17: Farne Islands SPA

Name of European site:	Farne Islands SPA								
EU Code:	UK9006021								
Distance to Project:	198 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Sandwich tern					Xc			Xd	
Common tern					Xc			Xd	
Arctic tern					Xc			Xd	
Roseate tern									
Guillemot	Xe	Xf	Xg				Xh	Xh	Xh
Puffin (component of the seabird assemblage)	Xi	Xj	Xg				Xk	Xk	Xk
Seabird assemblage (excluding named components aobve)									

Evidence supporting conclusions

Xa **Kittiwake** - The possible impacts associated with collision risk to kittiwake from the Farne Islands SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Due to wider mixing of North Sea populations and migration out of the UK North Sea in the non-breeding bio-seasons, the proportion of impacts apportioned to individuals from the Farne Islands SPA was found to be trivial and inconsequential. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material

contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Farne Islands SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Farne Islands SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Common, Sandwich and Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the English tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the common, Sandwich and Arctic tern features of the Farne Islands SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, all tern species will be maintained as a feature in the long-term.

Xd **Common, Sandwich and Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from any English SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the common tern, Sandwich and Arctic tern features of the Farne Islands SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination and subject to natural change, all tern species will be maintained as a feature in the long-term

Xe **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from the Farne Islands SPAs within the North Sea during the construction phase is summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited and wider mixing of North Sea populations in the non-breeding bio-season, the proportion of impacts apportioned to individuals from the Farne Islands SPA was found to be up to two breeding adults per annum, equating to an increase in baseline mortality of well under 0.1%. This level of impact would be indistinguishable from natural fluctuations in the population, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Farne Islands SPA in relation to disturbance and displacement during the construction phase for Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xf **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from the Farne Islands SPA within the North Sea is summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned displacement mortality for this SPA was estimated at three breeding adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality,

which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Farne Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xg **Guillemot and puffin** - The impacts during the decommissioning phase are considered to be similar and potentially less than those outlined in the construction phase. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot and puffin feature of Farne Islands SPA in relation to disturbance and displacement effects in the decommissioning phase from Hornsea Four alone and subject to natural change, guillemots and puffins will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Farne Islands SPA in relation to disturbance and displacement effects in the construction, O&M and decommissioning phases from Hornsea Four in-combination.

Xi **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Farne Islands SPA within the North Sea during the construction phase is summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited and low densities of puffin within the Hornsea Four array area, the proportion of impacts apportioned to individuals from Farne Islands SPA was found to be less than one breeding adult per annum, equating to an increase in baseline mortality of under 0.01%. This level of impact would be indistinguishable from natural fluctuations in the population, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Farne Islands SPA in relation to disturbance and displacement during the construction phase for Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xj **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Farne Islands SPA within the North Sea is summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned displacement mortality for this SPA was estimated at well under a single breeding adult bird per annum and an increase in baseline mortality of less than 0.01% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Farne Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xk **Puffin** - Connectivity to Hornsea Four limited due to low densities of puffin within the Hornsea Four array area and the distance from the SPA to Hornsea Four being outside of puffins foraging range, the effect from disturbance and displacement was found to be trivial and inconsequential, as summarised in Section 10.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Farne Islands SPA in relation to disturbance and displacement during

construction, O&M and decommissioning phases for Hornsea Four in-combination and subject to natural change, puffins will be maintained as a feature in the long-term.

End of Matrix 17

HRA Integrity Matrix 18: St Abb's Head and Fast Castle (UK) SPA

Name of European site:	St Abb's Head and Fast Castle (UK) SPA								
EU Code:	UK9004271								
Distance to Project:	269 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Guillemot (component of the seabird assemblage)		Xc						Xd	
Razorbill (component of the seabird assemblage)		Xe						Xf	
Herring gull (component of the seabird assemblage)									
Seabird assemblage (excluding named components above)									

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of St Abb's Head and Fast Castle SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very

small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of St Abb's Head and Fast Castle SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×c **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at 2.10 adult birds per annum and an increase in baseline mortality under 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of St Abb's Head and Fast Castle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×d **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of St Abb's Head and Fast Castle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×e **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of St Abb's Head and Fast Castle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

×f **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of St Abb's Head and Fast Castle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 18

HRA Integrity Matrix 19: Forth Islands SPA

Name of European site:	Forth Islands (UK) SPA								
EU Code:	UK9004171								
Distance to Project:	272 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Gannet					Xa			Xb	
Kittiwake (component of the seabird assemblage)					Xc			Xd	
Lesser black-backed gull									
Herring gull (component of the seabird assemblage)									
Common tern					Xe			Xf	
Arctic tern					Xe			Xf	
Roseate tern									
Sandwich tern					Xe			Xf	
Guillemot (component of the seabird assemblage)		Xg						Xh	
Razorbill (component of the seabird assemblage)		Xi						Xj	
Puffin		Xk						Xl	
Shag									
Seabird assemblage (excluding named components above)									

Evidence supporting conclusions

Xa **Gannet** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at 1.8 breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the gannet feature of Forth Islands SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, gannets will be maintained as a feature in the long-term.

Xb **Gannet** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gannet feature of Forth Islands SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Forth Islands SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Forth Islands SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Common, Arctic and Sandwich tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the common, Arctic and Sandwich tern features of the Forth islands SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, all three tern species will be maintained as a feature in the long-term.

Xf **Common, Arctic and Sandwich tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the common tern, Arctic tern or sandwich tern features of the Forth Islands SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xi **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned

displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of St Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

Xj **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xk **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xl **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Forth Islands SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 19

HRA Integrity Matrix 20: Outer Firth of Forth and St Andrew's Complex pSPA

Name of European site:	Outer Firth of Forth and St Andrew's Complex pSPA								
EU Code:	UK9004411								
Distance to Project:	241 km to array								
Adverse effect on integrity									
Effect	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Eider									
Slavonian grebe									
Gannet					Xa			Xb	
Kittiwake (component of the seabird assemblage)					Xc			Xd	
Little gull									
Herring gull (component of the seabird assemblage)									
Common tern									
Arctic tern									
Guillemot (component of the seabird assemblage)		Xe						Xf	
Puffin (component of the seabird assemblage)		Xg						Xh	
Red-throated diver									
Shag									
Seabird assemblage (excluding named components above)									
Waterbird assemblage									

Evidence supporting conclusions

Xa **Gannet** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the gannet feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, gannets will be maintained as a feature in the long-term.

Xb **Gannet -** Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gannet feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned

displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality under 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xf **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Outer Firth of Forth and St Andrew's Complex pSPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xg **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Outer Firth of Forth and St Andrew's pSPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xh **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Outer Firth and Forth SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 20

HRA Integrity Matrix 21: Fowlsheugh SPA

Name of European site:	**Fowlsheugh SPA**								
EU Code:	**UK9002271**								
Distance to Project:	**341 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of the seabird assemblage)									
Kittiwake					X a			X b	
Herring gull (component of the seabird assemblage)									
Guillemot		X c						X d	
Razorbill (component of the seabird assemblage)		X e						X f	

Evidence supporting conclusions

X a **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Foulsheugh SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

X b **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very

small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Fowlsheugh SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×c **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at 2.54 adult birds per annum and an increase in baseline mortality under 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Fowlsheugh SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×d **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Fowlsheugh SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×e **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Fowlsheugh SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

×f **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Fowlsheugh SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 21

HRA Integrity Matrix 22: Buchan Ness to Collieston Coast SPA

Name of European site:	**Buchan Ness to Collieston Coast SPA**								
EU Code:	**UK9002491**								
Distance to Project:	**381 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of the seabird assemblage)									
Kittiwake (component of the seabird assemblage)					X a			X b	
Herring gull (component of the seabird assemblage)									
Guillemot (component of the seabird assemblage)		X c						X d	
Shag (component of the seabird assemblage)									

Evidence supporting conclusions

X a **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at 1.4 breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Buchan Ness to Collieston Coast SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

X b **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can

	be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Buchan Ness to Collieston Coast SPA in relation to collision in the O&M phase from Hornsea Four in-combination.
Xc	**Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality under 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Buchan Ness to Collieston Coast SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.
Xd	**Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Buchan Ness to Collieston Coast SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 22

HRA Integrity Matrix 23: Troup, Pennan and Lion's Heads SPA

Name of European site:	**Troup, Pennan and Lion's Heads SPA**								
EU Code:	**UK9002471**								
Distance to Project:	**423 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of the seabird assemblage)									
Kittiwake					X a			X b	
Herring gull (component of the seabird assemblage)									
Guillemot		X c						X d	
Razorbill (component of the seabird assemblage)		X e						X f	

Evidence supporting conclusions

X a **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at 1.7 breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Troup, Pennan and Lion's Heads SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

X b **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to

any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Troup, Pennan and Lion's Head SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Troup, Pennan and Lion's Heads SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xd **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Troup, Pennan and Lion's Heads SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xe **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Troup, Pennan and Lion's Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

Xf **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Troup, Pennan and Lion's Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 24

HRA Integrity Matrix 24: East Caithness Cliffs SPA

Name of European site:	**East Caithness Cliffs SPA**								
EU Code:	**UK9001182**								
Distance to Project:	**500 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of the seabird assemblage)									
Kittiwake					X a			X b	
Herring gull									
Great black-backed gull (component of seabird assemblage)									
Guillemot		X c						X d	
Razorbill		X e						X f	
Shag									
Cormorant (component of seabird assemblage)									
Peregrine									

Evidence supporting conclusions

X a **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at 4.5 breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in

baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of East Caithness Cliffs SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of East Caithness Cliffs SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at 7.86 adult birds per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of East Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xd **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of East Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xe **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 10.9 and Table 10.10 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of East Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

Xf **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the

conservation objectives of the razorbill feature of East Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 25

HRA Integrity Matrix 25: North Caithness Cliffs SPA

Name of European site:	North Caithness Cliffs SPA								
EU Code:	UK9001181								
Distance to Project:	534 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Guillemot		Xc						Xd	
Razorbill (component of the seabird assemblage)		Xe						Xf	
Puffin (component of the seabird assemblage)		Xg						Xh	
Peregrine									

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of North Caithness Cliffs SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

×b **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of North Caithness Cliffs SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×c **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at 3.47 adult birds per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×d **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of North Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×e **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 10.9 and Table 1010 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of North Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

×f **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of North Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×g **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of

this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of North Caithness Cliffs SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xh **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement found to be trivial and inconsequential, as summarised in Table 10.9 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no AEoI** to the conservation objectives of the puffin feature of any Scottish SPAs in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 26

HRA Integrity Matrix 26: Copinsay SPA

Name of European site:	Copinsay SPA								
EU Code:	UK9002151								
Distance to Project:	558 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Great black-backed gull (component of the seabird assemblage)									
Guillemot (component of the seabird assemblage)		Xc						Xd	

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Copinsay SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to

any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Copinsay SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of 0.15% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Copinsay SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xd **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Copinsay SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 27

HRA Integrity Matrix 27: Hoy SPA

Name of European site:	Hoy SPA								
EU Code:	UK9002141								
Distance to Project:	558 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of seabird assemblage)									
Great skua					Xa			Xb	
Arctic skua (component of seabird assemblage)					Xa			Xb	
Kittiwake (component of seabird assemblage)					Xc			Xd	
Great black-backed gull (component of seabird assemblage)									
Guillemot (component of seabird assemblage)		Xe						Xf	
Puffin (component of seabird assemblage)		Xg						Xh	
Red throated diver									
Peregrine									

Evidence supporting conclusions

Xa **Great and Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua

features of Hoy SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic and great skuas will be maintained as a feature in the long-term.

Xb **Great and Arctic skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Hoy SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Hoy SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake -** Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no AEoI** to the conservation objectives of the kittiwake feature of Hoy SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Hoy SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xf **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Hoy SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xg **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Hoy SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xh **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement found to be trivial and inconsequential, as summarised in Table 10.9 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no AEoI** to the conservation objectives of the puffin feature of any Scottish SPAs in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 28

HRA Integrity Matrix 28: Marwick Head SPA

Name of European site:	Marwick Head SPA								
EU Code:	UK9002121								
Distance to Project:	595 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Kittiwake (component of seabird assemblage)					Xa			Xb	
Guillemot		Xc						Xd	

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Marwick Head SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Marwick Head SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×c **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Marwick Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×d **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Marwick Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 29

HRA Integrity Matrix 29: Rousay SPA

Name of European site:	**Rousay SPA**								
EU Code:	**UK9002371**								
Distance to Project:	**595 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of seabird assemblage)									
Arctic skua (component of seabird assemblage)					X a			X b	
Kittiwake (component of seabird assemblage)					X c			X d	
Arctic tern					X e			X f	
Guillemot (component of seabird assemblage)		X g						X h	

Evidence supporting conclusions

X a **Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Chapter 5, Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic skua feature of Rousay SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic skuas will be maintained as a feature in the long-term.

Xb **Arctic skua** - It was concluded in the assessment presented in **Volume A5, Chapter 5,: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic skua feature of Rousay SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Rousay SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Rousay SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Chapter 5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of the Rousay SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic terns will be maintained as a feature in the long-term.

Xf **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Rousay SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution

	to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Rousay SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.
×h	**Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Rousay SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 30

HRA Integrity Matrix 30: Calf of Eday SPA

Name of European site:	Calf of Eday SPA								
EU Code:	UK9002431								
Distance to Project:	595 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Great black-backed gull (component of the seabird					Xc			Xd	
Guillemot (component of the seabird assemblage)		Xe						Xf	
Cormorant (component of the seabird assemblage)									

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Calf of Eday SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as

summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Calf of Eday SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×c **Great black-backed gull** - The possible impacts associated with collision risk to great black-backed gulls from this SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Due to the low densities of great black-backed gulls present in the Hornsea Four array area and wider mixing of North Sea populations in the non-breeding seasons, the number of individual great black-backed gulls that may potentially be subject to collision risk mortality attributed to the Calf of Eday SPA is well under one breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This is considered a *de minimis* contribution to any increase in baseline mortality. There is, therefore, **no potential for an AEoI** to the conservation objectives of the great black-backed gull feature of Calf of Eday SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, great black-backed gulls will be maintained as a feature in the long-term.

×d **Great black-backed gull** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the great black-backed gull feature of Calf of Eday SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

×e **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Calf of Eday SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×f **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Calf of Eday SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 31

HRA Integrity Matrix 31: West Westray SPA

Name of European site:	**West Westray SPA**								
EU Code:	**UK9002101**								
Distance to Project:	**605 km to array**								
Adverse effect on integrity									
Effects	**Displacement & disturbance**			**Collision risk**			**In-combination**		
Stage of Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Fulmar (component of seabird assemblage)									
Arctic skua (component of seabird assemblage)					X a			X b	
Kittiwake (component of seabird assemblage)					X c			X d	
Arctic tern					X e			X f	
Guillemot		X g						X h	
Razorbill (component of seabird assemblage)		X i						X j	

Evidence supporting conclusions

X a **Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic skua feature of the West Westray SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic skua will be maintained as a feature in the long-term.

X b **Arctic skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. Based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea

Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic skua feature of West Westray SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at 1.3 breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of West Westray SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of West Westray SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of the West Westray SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic tern will be maintained as a feature in the long-term.

Xf **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of West Westray SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at 2.50 adult birds per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase

in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of West Westray SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of West Westray SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xi **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of West Westray SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

Xj **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of West Westray SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 32

HRA Integrity Matrix 32: Fair Isle SPA

Name of European site:	Fair Isle SPA								
EU Code:	UK9002091								
Distance to Project:	607 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Gannet (component of the seabird assemblage)					Xa			Xb	
Great skua (component of the seabird assemblage)					Xc			Xd	
Arctic skua (component of the seabird assemblage)					Xc			Xd	
Kittiwake (component of the seabird assemblage)					Xe			Xf	
Arctic tern (component of the seabird assemblage)					Xg			Xh	
Guillemot		Xi						Xj	
Razorbill (component of the seabird assemblage)		Xk						Xl	
Puffin (component of the seabird assemblage)		Xm						Xn	
Shag (component of the seabird assemblage)									
Fair Isle wren									

Evidence supporting conclusions

Xa **Gannet** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was less than a single breeding adult per annum and an

increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the gannet feature of Fair Isle SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, gannets will be maintained as a feature in the long-term.

Xb **Gannet** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gannet feature of Fair Isle SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Great and Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic and great skua features of Fair Isle SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic and great skuas will be maintained as a feature in the long-term.

Xd **Great and Arctic skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Fair Isle SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xe **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Fair Isle SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xf **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect.

Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Fair Isle SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xg **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Fair Isle SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic terns will be maintained as a feature in the long-term.

Xh **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Fair Isle SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xi **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xj **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xk **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

×l **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×m **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

×n **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Fair Isle SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 33

HRA Integrity Matrix 33: Sumburgh Head SPA

Name of European site:	Sumburgh Head SPA								
EU Code:	UK9002511								
Distance to Project:	639 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Arctic tern					Xc			Xd	
Guillemot (component of the seabird assemblage)		Xe						Xf	

Evidence supporting conclusions

Xa **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Sumburgh Head SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any

in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Sumburgh Head SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Sumburgh Head SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic tern will be maintained as a feature in the long-term.

Xd **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Sumburgh Head SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xe **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Sumburgh Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xf **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Sumburgh Head SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 34

HRA Integrity Matrix 34: Noss SPA

Name of European site:	Noss SPA								
EU Code:	UK9002081								
Distance to Project:	667 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Gannet					Xa			Xb	
Great skua					Xc			Xd	
Kittiwake (component of the seabird assemblage)					Xe			Xf	
Guillemot		Xg						Xh	
Puffin (component of the seabird assemblage)		Xi						Xj	

Evidence supporting conclusions

Xa **Gannet** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was less than a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the gannet feature of Noss SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, gannets will be maintained as a feature in the long-term.

Xb **Gannet** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised

in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gannet feature of Noss SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Great skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the great skua feature of Noss SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, great skua will be maintained as a feature in the long-term.

Xd **Great skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the great skua feature of Noss SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xe **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Noss SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xf **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Noss SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline

mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Noss SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Noss SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xi **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Noss SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xj **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Noss SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 35

HRA Integrity Matrix 35: Foula SPA

Name of European site:	Foula SPA								
EU Code:	UK9002061								
Distance to Project:	678 km to array								
Adverse effect on integrity									
Effects		Displacement & disturbance			Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Great skua					Xa			Xb	
Arctic skua (component of the seabird assemblage)					Xa			Xb	
Kittiwake (component of the seabird assemblage)					Xc			Xd	
Arctic tern					Xe			Xf	
Guillemot		Xg						Xh	
Razorbill (component of the seabird assemblage)		Xi						Xj	
Puffin		Xk						Xl	
Leach's storm petrel									
Red throated diver									
Shag									

Evidence supporting conclusions

Xa **Great and Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of skuas

migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Foula SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic and great skua will be maintained as a feature in the long-term.

Xb **Great and Arctic skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Foula SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xc **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Foula SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xd **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Foula SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xe **Arctic tern** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of the Foula SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic terns will be maintained as a feature in the long-term.

Xf **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the

conservation objectives of the Arctic tern feature of Foula SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Foula SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Foula SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xi **Razorbill** - The possible impacts associated with disturbance and displacement of razorbills from Scottish SPAs within the North Sea is summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-seasons was estimated at well under a single adult birds per annum and an increase in baseline mortality under 0.1% across the entire non-breeding seasons. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Foula SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone.

Xj **Razorbill** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 20 and 21 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the razorbill feature of Foula SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

Xk **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality,

which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Foula SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

xl **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement found to be trivial and inconsequential, as summarised in Table 10.9 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no AEoI** to the conservation objectives of the puffin feature of any Scottish SPAs in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 36

HRA Integrity Matrix 36: Fetlar SPA

Name of European site:	Fetlar SPA					
EU Code:	UK9002031					
Distance to Project:	712 km to array					
Adverse effect on integrity						
Effects		Collision risk			In-combination	
Stage of Development	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)						
Great skua		Xa			Xb	
Arctic skua (component of the seabird assemblage)		Xa			Xb	
Arctic tern		Xc			Xd	
Red-necked phalarope						
Dunlin						
Whimbrel						

Evidence supporting conclusions

Xa **Great and Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in the **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Fetlar SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic and great skuas will be maintained as a feature in the long-term.

Xb **Great and Arctic skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic or great skua features of Fetlar SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xc **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to Arctic terns from Scottish SPAs. There is, therefore, **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of the Fetlar SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, Arctic terns will be maintained as a feature in the long-term.

Xd **Arctic tern** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the Arctic tern feature of Fetlar SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 37

HRA Integrity Matrix 37: Hermaness, Saxa Vord and Valla Field SPA

Name of European site:	Hermaness, Saxa Vord and Valla Field SPA								
EU Code:	UK9002011								
Distance to Project:	733 km to array								
Adverse effect on integrity									
Effects	Displacement & disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Fulmar (component of the seabird assemblage)									
Gannet					Xa			Xb	
Great skua					Xc			Xd	
Kittiwake (component of the seabird assemblage)					Xe			Xf	
Guillemot (component of the seabird assemblage)		Xg						Xh	
Puffin		Xi						Xj	
Red throated diver									
Shag (component of the seabird assemblage)									

Evidence supporting conclusions

Xa **Gannet** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was less than a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the gannet feature of Hermaness, Saxa Vord and Valla Field SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, gannets will be maintained as a feature in the long-term.

Xb **Gannet** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in

Table 25 and 26 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the gannet feature of Hermaness, Saxa Vord and Valla Field SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Great skua** - A review of skua migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of skua migration undertaken by WWT and MacArthur Green (2014) concluded that the majority of skuas migrate within 20 km from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the Scottish skua populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the great skua features of Hermaness, Saxa Vord and Valla Field SPA in relation to collision mortality effects in the O&M phase from Hornsea Four alone and subject to natural change, great skuas will be maintained as a feature in the long-term.

Xd **Great skua** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**, based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to skuas from Scottish SPAs. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the great skua feature of Hermaness, Saxa Vord and Valla Field SPA in relation to collision mortality effects in the O&M phase from Hornsea Four in-combination.

Xe **Kittiwake** - During the non-breeding bio-season, this SPA population mixes with other populations in the wider North Sea. This mixing limits the strength of the pathway to Hornsea Four. After the apportionment of individuals to this SPA, impacts were found to be trivial and inconsequential (as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at less than a single breeding adults per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Hermaness, Saxa Vord and Valla Field SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xf **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 27 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Hermaness, Saxa Vord and Valla Field SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xg **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from Scottish SPAs within the North Sea is summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality

for this SPA during non-breeding bio-season was estimated at less than a single adult bird per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the guillemot feature of Hermaness, Saxa Vord and Valla Field SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

×h **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 19 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Hermaness, Saxa Vord and Valla Field SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

×i **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Scottish SPAs within the North Sea is summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The proportioned displacement mortality for this SPA during non-breeding bio-season was estimated at a single adult bird per annum and an increase in baseline mortality of 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the puffin feature of Hermaness, Saxa Vord and Valla Field SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

×j **Puffin** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Table 22 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the puffin feature of Hermaness, Saxa Vord and Valla Field SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four in-combination.

End of Matrix 38

HRA Integrity Matrix 38: Northumberland Marine SPA

Name of European site:	Northumberland Marine SPA								
EU Code:	UK9020325								
Distance to Project:	187 km to array and 144 km to offshore ECC								
Adverse effect on integrity									
Effects	Displacement and disturbance			Collision risk			In-combination		
Stage of Development	C	O	D	C	O	D	C	O	D
Kittiwake (component of the seabird assemblage)					Xa			Xb	
Common tern					Xc			Xd	
Arctic tern					Xc			Xd	
Roseate tern					Xc			Xd	
Sandwich tern					Xc			Xd	
Little tern									
Guillemot	Xe	Xf	Xg				Xh	Xh	Xh
Puffin	Xi	Xj	Xg				Xk	Xk	Xk
Seabird Assemblage (excluding named components above)									

Evidence supporting conclusions

Xa **Kittiwake** - The possible impacts associated with collision risk to kittiwake from the Northumberland Marine SPA is assessed in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Due to wider mixing of North Sea populations and migration out of the UK North Sea in the non-breeding bio-seasons, the proportion of impacts apportioned to individuals from the Northumberland Marine SPA was found to be trivial and inconsequential. The proportioned collision mortality for this SPA during the entire non-breeding bio-season was estimated at well under a single breeding adult per annum and an increase in baseline mortality was predicted to be well under 0.1%. This effect is so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, **no potential for an AEoI** to the conservation objectives of the kittiwake feature of Northumberland Marine SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, kittiwakes will be maintained as a feature in the long-term.

Xb **Kittiwake** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations and effect from collision risk from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is no potential for an AEoI to the conservation objectives of the kittiwake feature of Northumberland Marine SPA in relation to collision in the O&M phase from Hornsea Four in-combination.

Xc **Common, Arctic, roseate and Sandwich terns** - A review of tern migratory pathways and potential collision risk during such passage movements was undertaken, the results of which are presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report**. The most recent assessment of tern migration undertaken by WWT and MacArthur Green (2014), concluded that the majority of terns migrate within 20 km at most from the UK coastline. Following the same migratory apportioning methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), it can be concluded that none of the English tern populations are at risk of collision from Hornsea Four due to evidence supporting their migratory flights being closer to the coast (Hornsea Four is located 69 km from the coast). There is, therefore, no potential for an AEoI to the conservation objectives of the common, Arctic, roseate and Sandwich tern features of Northumberland Marine SPA in relation to collision risk effects in the O&M phase from Hornsea Four alone and subject to natural change, all tern species will be maintained as features in the long-term.

Xd **Common, Arctic, roseate and Sandwich terns** - It was concluded in the assessment presented in **Volume A5, Annex 5.5: Offshore Ornithology Migratory Birds Report** based on the apportionment methodology used by Norfolk Boreas (Norfolk Boreas Ltd 2019), no collision effects from Hornsea Four could be attributed to terns from any English SPAs. Therefore, it can be concluded that there is no potential for an AEoI to the conservation objectives of the common, Arctic, roseate and Sandwich tern features of Northumberland Marine SPA during O&M from effects in-combination and subject to natural change, all tern species will be maintained as features in the long-term.

Xe **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from the Northumberland Marine SPAs within the North Sea during the construction phase is summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited and wider mixing of North Sea populations in the non-breeding bio-season, the proportion of impacts apportioned to individuals from the Northumberland Marine SPA was found to be up to two breeding adults per annum, equating to an increase in baseline mortality of well under 0.1%. This level of impact would be indistinguishable from natural fluctuations in the population, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material

contribution. Therefore, it can be concluded that there is **no potential for an AEoI** to the conservation objectives of the guillemot feature of Northumberland Marine SPA in relation to disturbance and displacement during the construction phase for Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xf **Guillemot** - The possible impacts associated with disturbance and displacement of guillemots from the Northumberland Marine SPA within the North Sea is summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned displacement mortality for this SPA was estimated at three breeding adult birds per annum and an increase in baseline mortality of less than 0.1% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, no potential for an AEoI to the conservation objectives of the guillemot feature of Northumberland Marine SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, guillemots will be maintained as a feature in the long-term.

Xg **Guillemot and puffin** - The impacts during the decommissioning phase are considered to be similar and potentially less than those outlined in the construction phase. There is, therefore, no potential for an AEoI to the conservation objectives of the guillemot and puffin feature of Northumberland Marine SPA in relation to disturbance and displacement effects in the decommissioning phase from Hornsea Four alone and subject to natural change, guillemots and puffins will be maintained as a feature in the long-term.

Xh **Guillemot** - Connectivity to Hornsea Four limited due to mixing of this population during the non-breeding season with the wider North Sea populations. The effect from disturbance and displacement from Hornsea Four alone was found to be trivial and inconsequential, as summarised in Section 10.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is no potential for an AEoI to the conservation objectives of the guillemot feature of Northumberland Marine SPA in relation to disturbance and displacement effects in the construction, O&M and decommissioning phases from Hornsea Four in-combination.

Xi **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Northumberland Marine SPA within the North Sea during the construction phase is summarised in Section 10.4.3 of **B2.2: Report to Inform Appropriate Assessment**. Due to disturbance and displacement during the construction phase being temporally and spatially limited and low densities of puffin within the Hornsea Four array area, the proportion of impacts apportioned to individuals from Northumberland Marine SPA was found to be less than one breeding adult per annum, equating to an increase in baseline mortality of under 0.01%. This level of impact would be indistinguishable from natural fluctuations in the population, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. Therefore, it can be concluded that there is no potential for an AEoI to the conservation objectives of the puffin feature of Northumberland Marine SPA in relation to disturbance and displacement during the construction phase for Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xj **Puffin** - The possible impacts associated with disturbance and displacement of puffins from Northumberland Marine SPA within the North Sea is summarised in Section 10.4.4 of **B2.2: Report to Inform Appropriate Assessment**. The proportioned displacement mortality for this SPA was estimated at well under a single breeding adult bird per annum and an increase in baseline mortality of less than 0.01% across the non-breeding season. This was deemed so low as to be considered no material contribution to the natural baseline mortality rate. The conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution. There is, therefore, no potential for an AEoI to the conservation

objectives of the puffin feature of Northumberland Marine SPA in relation to disturbance and displacement effects in the O&M phase from Hornsea Four alone and subject to natural change, puffins will be maintained as a feature in the long-term.

Xk **Puffin** - Connectivity to Hornsea Four limited due to low densities of puffin within the Hornsea Four array area and the distance from the SPA to Hornsea Four being outside of puffins foraging range, the effect from disturbance and displacement was found to be trivial and inconsequential, as summarised in Section 10.4 of **B2.2: Report to Inform Appropriate Assessment**. Therefore, the conclusion drawn is of at most a very small and *de minimis* contribution to any increase in baseline mortality, which is insufficient to result in a material contribution to any in-combination effect. Therefore, it can be concluded that there is no potential for an AEoI to the conservation objectives of the puffin feature of Northumberland Marine SPA in relation to disturbance and displacement during construction, O&M and decommissioning phases for Hornsea Four in-combination and subject to natural change, puffins will be maintained as a feature in the long-term.

End of Matrix 39

END OF INTEGRITY MATRICES

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