RWE Renewables UK Dogger Bank South (West) Limited

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Dogger Bank South Offshore Wind Farms

Report to Inform Appropriate Assessment

Habitats Regulations Assessment

Volume 6

Part 1 of 4 – Introduction and Terrestrial Ecology

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Glossary

Term	Definition
Accommodation Platform	An offshore platform (situated within either the DBS East or DBS West Array Area) that would provide accommodation and mess facilities for staff when carrying out activities for the Projects.
Array Areas	The DBS East and DBS West offshore Array Areas, where the wind turbines, offshore platforms and array cables would be located. The Array Areas do not include the Offshore Export Cable Corridor or the Inter-Platform Cable Corridor within which no wind turbines are proposed. Each area is referred to separately as an Array Area.
Array cables	Offshore cables which link the wind turbines to the Offshore Converter Platform(s).
Collector Platforms (CPs)	Receive the AC power generated by the wind turbines through the array cables, collect it and transform the voltage for onward transmission to the Offshore Converter Platforms (OCPs).
Collision Risk Model (CRM)	Quantitative means to estimate the number of predicted collisions between seabirds recorded in the Array Areas and rotating wind turbines.
Concurrent Scenario	A potential construction scenario for the Projects where DBS East and DBS West are both constructed at the same time.
Construction Buffer Zone	1km zone around the Array Areas and Offshore Export Cable Corridor, and 500m zone around the Inter-Platform Cabling Corridor. Construction vessels may occupy this zone but no permanent infrastructure would be installed within these areas.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Development Scenario	Description of how the DBS East and / or DBS West Projects would be constructed either in isolation, sequentially or concurrently.
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.

Term	Definition
Electrical Switching Platform (ESP)	The Electrical Switching Platform (ESP), if required would be located either within one of the Array Areas (alongside an Offshore Converter Platform (OCP)) or the Export Cable Platform Search Area.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Site	Terminology previously used to refer to sites designated for nature conservation under the Habitats Directive and Birds Directive, prior to the UK's exit from the European Union in 2020. This included candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and was defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Export Cable Platform Search Area	The Export Cable Platform Search Area is located mid-way along the Offshore Export Cable Corridor and is the area of search for the Electrical Switching Platform (ESP).
Habitats Regulations	Conservation of Habitats and Species Regulations 2017 and Conservation of Offshore Marine Habitats and Species Regulations 2017.
Habitats Regulations Assessment (HRA)	The process that determines whether or not a plan or project may have an adverse effect on the integrity of a European Site or European Offshore Marine Site.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.

Term	Definition
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Horizontal Directional Drill (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
Important Bird and Biodiversity Areas	Areas designated by the BirdLife Partnership as being of significance for conservation of birds and associated wildlife upon which the birds rely on.
In Isolation Scenario	A potential construction scenario for one Project which includes either the DBS East or DBS West array, associated offshore and onshore cabling and only the eastern Onshore Converter Station within the Onshore Substation Zone and only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation.
Inter-Platform Cable Corridor	The area where Inter-Platform Cables would route between platforms within the DBS East and DBS West Array Areas, should both Projects be constructed.
Inter-Platform Cables	Buried offshore cables which link offshore platforms.
Intertidal	Area on a shore that lies between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.
Management Unit	Management units provide an indication of the spatial scales at which impacts of plans and projects alone, cumulatively and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK.
Mean High Water Springs (MHWS)	MHWS is the average of the heights of two successive high waters during a 24 hour period.
Mean Low Water Springs (MLWS)	MLWS is the average of the heights of two successive low waters during a 24 hour period.

Term	Definition
Mean Sea Level	The average level of the sea surface over a defined period (usually a year or longer), taking account of all tidal effects and surge events.
National Policy Statement (NPS)	A document setting out national policy against which proposals for NSIPs will be assessed and decided upon.
National Site Network	The National Site Network comprises National Site Network sites (formerly referred to as European) in the UK that already existed (i.e., were established under the Nature Directives) on 31 December 2020 (or proposed to the EC before that date) and any new sites designated under the Habitats Regulations under an amended designation process.
National Site Network sites	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Nearshore	The zone which extends from the swash zone to the position marking the start of the offshore zone (~20m).
Numerical modelling	Refers to the analysis of coastal processes using computational models.
Offshore Converter Platforms (OCPs)	The OCPs are fixed structures located within the Array Areas that collect the AC power generated by the wind turbines and convert the power to DC, before transmission through the Offshore Export Cables to the Project's Onshore Grid Connection Points.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP) between the Offshore Converter Platforms and Transition Joint Bays at the landfall.
Offshore Export Cables	The cables which would bring electricity from the offshore platforms to the Transition Joint Bays (TJBs).

Term	Definition
Preliminary Environmental Information Report (PEIR)	Defined in the EIA Regulations as information referred to in part 1, Schedule 4 (information for inclusion in environmental statements) which has been compiled by the applicants and is reasonably required to assess the environmental effects of the development.
Ramsar Site	Wetlands of international importance, designated under the Ramsar Convention.
Scour protection	Protective materials to avoid sediment erosion from the base of the wind turbine foundations and offshore substation platform foundations due to water flow.
Sediment	Particulate matter derived from rock, minerals or bioclastic matter.
Sediment transport	The movement of a mass of sediment by the forces of currents and waves.
Site of Community Importance (SCI)	Sites that have been adopted by the European Commission in accordance with the Habitats Directive, but not yet formally designated by the government of each country.
Special Area of Conservation (SAC)	Strictly protected sites designated pursuant to Article 3 of the Habitats Directive (via the Habitats Regulations) for habitats listed on Annex I and species listed on Annex II of the Directive
Special Protection Area (SPA)	Strictly protected sites designated pursuant to Article 4 of the Birds Directive (via the Habitats Regulations) for species listed on Annex I of the Directive and for regularly occurring migratory species
Statutory Nature Conservation Bodies (SNCBs)	Comprised of JNCC, Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England and Scottish Natural Heritage, these agencies provide advice in relation to nature conservation to government
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).

Term	Definition
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).
Turbine string	Term referring to a number of cables installed in series on a single cable branch forming a string (or collection) circuit.
Wind turbine	Power generating device that is driven by the kinetic energy of the wind.

Acronyms

Term	Definition
AEoI	Adverse Effect on [Site] Integrity
BDMPS	Biologically Defined Minimum Population Scales
DBS	Dogger Bank South
DIN	Dissolved Inorganic Nitrogen
DO	Dissolved Oxygen
EGL2	Eastern Green Link 2
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESP	Electrical Switching Platform
FLL	Functionally Linked Land
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
MMO	Marine Management Organisation
MU	Management Unit
PVA	Population Viability Analysis
RCP	Reactive Compensation Platform
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCI	Site of Community Importance

Term	Definition
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UXO	Unexploded Ordnance
ZoI	Zone of Influence

Summary

1. **Table 1** below provides a summary of all sites assessed within this Report to Inform Appropriate Assessment.

2. In summary, no adverse effect on site integrity was predicted for the majority of sites, with the exception of the following sites and designated features:

- Dogger Bank SAC - Sandbanks which are slightly covered by sea water all the time
  - Potential adverse effect on site integrity for the Projects together and in-combination with other schemes due to physical change (to another seabed type).
- Flamborough and Filey Coast SPA – Guillemot (breeding) and kittiwake (breeding)
  - Potential adverse effect on site integrity for the Projects in-combination with other schemes due to collision risk (kittiwake only).
  - Potential adverse effect on site integrity for the Projects in-combination with other schemes due to disturbance and displacement (guillemot only).

3. As a result of the above conclusions, project-level compensation plans have been produced and have been submitted alongside this application, see **Volume 6, Habitats Regulations Derogation: Provision of Evidence (application ref: 6.2)** and the associated appendices for further information.

Table 1 Summary of the Potential Effects of the Projects

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
Terrestrial Ecological Sites			
Humber Estuary SPA	**Breeding bird species:** • Great bittern; • Common shelduck; • Hen harrier; • Pied avocet; • European golden plover; • Red knot; • Dunlin; • Ruff; • Black-tailed godwit; • Bar-tailed godwit; and • Common redshank **Non-breeding bird species** • Great bittern; • Eurasian marsh harrier; • Pied avocet; and • Little tern.	Impacts on functionally linked land.	No potential for adverse effect on site integrity.
Annex I Habitats			
Dogger Bank SAC	Sandbanks which are slightly covered by sea water all the time.	Physical change (to another seabed type) Physical change (to another sediment type)	Potential for adverse effect on site integrity for Projects together and in-combination
		Habitat structure changes – removal of substratum (extraction) Abrasion / disturbance of the substrate on the surface of the seabed	No potential for adverse effect on site integrity.

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
		Penetration and / or disturbance of the substratum below the surface of the seabed, including abrasion Changes in suspended solids (water clarity) Smothering and siltation rate changes (Heavy) Smothering and siltation rate changes (Light) Electromagnetic changes Hydrocarbon & Polyaromatic Hydrocarbon (PAH) contamination Introduction or spread of invasive non-indigenous species (INIS) Synthetic compound contaminant (including pesticides, antifoulants, pharmaceuticals) Transition elements & organo-metal (e.g. TBT) contamination	
Flamborough Head SAC	Reefs Submerged or partially submerged sea caves	Smothering and siltation rate changes (Heavy and Light)	No potential for adverse effect on site integrity
Humber Estuary SAC	Mudflats and sandflats not covered by seawater at low tide.	Smothering and siltation rate changes (Heavy and Light) Introduction of other substances (solid, liquid or gas)	No potential for adverse effect on site integrity
Annex II Migratory Fish			
River Derwent SAC	Sea lamprey River lamprey (present as a qualifying feature, but not a primary reason for site selection)	Underwater noise and vibration impacts due to UXO clearance	No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
Humber Estuary SAC	Sea lamprey River lamprey	Underwater noise and vibration impacts due to UXO clearance	No potential for adverse effect on site integrity
Annex II Marine Mammals			
Southern North Sea SAC	Harbour porpoise	Physical or auditory injury resulting from underwater noise Behavioural impacts resulting from underwater noise Disturbance from vessels due to presence and underwater noise Barrier effects from underwater noise Vessel interaction (increase in risk of collision) Barrier effects due to the physical presence of offshore infrastructure Changes to prey availability	No potential for adverse effect on site integrity
Humber Estuary SAC	Grey seal	Physical or auditory injury resulting from underwater noise Behavioural impacts resulting from underwater noise Disturbance from vessels due to presence and underwater noise Barrier effects from underwater noise Vessel interaction (increase in risk of collision) Disturbance at seal haul-out sites Barrier effects due to the physical presence of offshore infrastructure Changes to prey availability	No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
The Wash and North Norfolk Coast SAC	Harbour seal	Physical or auditory injury resulting from underwater noise Behavioural impacts resulting from underwater noise Disturbance from vessels due to presence and underwater noise Barrier effects from underwater noise Vessel interaction (increase in risk of collision) Disturbance at seal haul-out sites Barrier effects due to the physical presence of offshore infrastructure Changes to prey availability	No potential for adverse effect on site integrity
Berwickshire and North Northumberland Coast SAC	Grey seal	Physical or auditory injury resulting from underwater noise Behavioural impacts resulting from underwater noise Disturbance from vessels due to presence and underwater noise Barrier effects from underwater noise Vessel interaction (increase in risk of collision) Disturbance at seal haul-out sites Barrier effects due to the physical presence of offshore infrastructure Changes to prey availability	No potential for adverse effect on site integrity
Moray Firth SAC	Bottlenose dolphin	Physical or auditory injury resulting from underwater noise Behavioural impacts resulting from underwater noise Barrier effects from underwater noise Vessel interaction (increase in risk of collision) Changes to prey availability	No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
Doggersbank SAC	Harbour porpoise Harbour seal Grey seal	Underwater noise from piling Underwater noise from other noisy activities Underwater noise from vessels Underwater noise from operational WTGs Barrier effects from underwater noise Collision risk Prey availability / habitat quality Water quality	No potential for adverse effect on site integrity
Klaverbank SAC	Harbour porpoise Harbour seal Grey seal	Underwater noise from piling Underwater noise from other noisy activities Underwater noise from vessels Underwater noise from operational WTGs Barrier effects from underwater noise Collision risk Prey availability / habitat quality Water quality Disturbance at seal haul-out sites	No potential for adverse effect on site integrity
Marine Ornithological Features			
Greater Wash SPA	Red-throated diver, non-breeding Common scoter, nonbreeding	Disturbance and/or Displacement effects Indirect impacts through effects on habitats and/or prey species Collision Risk Barrier Effects	No potential for adverse effect on site integrity
Flamborough and Filey Coast SPA	Gannet, breeding Razorbill, breeding Puffin, breeding		No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity from Projects together. Potential for adverse effect on site integrity for the Projects in-combination
Coquet Island SPA	Puffin, breeding		No potential for adverse effect on site integrity
Farne Islands SPA	Guillemot, breeding Kittiwake, breeding Puffin, breeding		No potential for adverse effect on site integrity
St Abbs Head to Fast Castle SPA	Kittiwake, breeding Guillemot, breeding Razorbill, breeding		No potential for adverse effect on site integrity
Forth Islands SPA	Kittiwake, breeding Gannet, breeding Guillemot, breeding Razorbill, breeding Puffin, breeding		No potential for adverse effect on site integrity
Fowlsheugh SPA	Kittiwake, breeding Guillemot, breeding Razorbill, breeding		No potential for adverse effect on site integrity
Buchan Ness to Collieston Coast SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
Troup, Pennan and Lion's Heads SPA	Kittiwake, breeding Guillemot, breeding Razorbill, breeding		No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
East Caithness Cliffs SPA	Kittiwake, breeding Guillemot, breeding Razorbill, breeding		No potential for adverse effect on site integrity
North Caithness Cliffs SPA	Guillemot, breeding Kittiwake, breeding Razorbill, breeding Puffin, breeding		No potential for adverse effect on site integrity
Copinsay SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
Hoy SPA	Kittiwake, breeding Guillemot, breeding Puffin, breeding		No potential for adverse effect on site integrity
Rousay SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
Calf of Eday SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
Marwick Head SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
West Westray SPA	Guillemot, breeding Kittiwake, breeding Razorbill, breeding		No potential for adverse effect on site integrity

Site	Qualifying Features	Potential Effects	Potential for adverse effect on site integrity alone / in combination?
Fair Isle SPA	Guillemot, breeding Kittiwake, breeding Razorbill, breeding Puffin, breeding Gannet, breeding		No potential for adverse effect on site integrity
Sumburgh Head SPA	Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity
Noss SPA	Gannet, breeding Guillemot, breeding Kittiwake, breeding Puffin, breeding		No potential for adverse effect on site integrity
Foula SPA	Guillemot, breeding Puffin, breeding Kittiwake, breeding Razorbill, breeding		No potential for adverse effect on site integrity
Hermaness, Saxa Vord and Valla Field SPA	Gannet, breeding Puffin, breeding Kittiwake, breeding Guillemot, breeding		No potential for adverse effect on site integrity

1 Introduction

1.1 Overview

4. In November 2017, The Crown Estate announced a new round of offshore wind leasing. In September 2019, the final bidding areas were announced, and the Offshore Wind Leasing Round 4 was launched. As part of the Round 4 process, developers were able to identify preferred sites within bidding areas defined by The Crown Estate. Applications were then submitted by developers under a competitive bidding process, culminating in an auction held in February 2021. RWE was successful in this auction process, securing preferred bidder status on two adjacent projects, DBS East and DBS West.

5. The Crown Estate carried out a plan-level Habitats Regulation Assessment (HRA) for the Offshore Wind Leasing Round 4, which assessed the potential cumulative impacts of the six offshore wind projects identified through the Round 4 tender process. The Crown Estate gave notice to the United Kingdom (UK) and Welsh Government of its intent to proceed with the Round 4 Plan on the basis of a derogation in April 2022. The Secretary of State for Business, Energy and Industrial Strategy agreed that The Crown Estate could proceed with the Plan. The Applicants have signed an Agreement for Lease with The Crown Estate and this RIAA accompanies the Applicants' application for a DCO to authorise construction and operation of DBS East and DBS West.

6. The Array Areas are located more than 100km offshore on the Dogger Bank in the southern North Sea and each covers approximately 350km^2.

7. Based on an estimated capacity of 3 gigawatts (GW) once fully operational, the Projects could be capable of generating enough electricity to meet the average annual domestic energy needs of around 3 million typical UK homes[1].

[1] Calculation based on 2021 generation, and assuming average (mean) annual household consumption of 3,509 kWh, based on latest statistics from Department of Energy Security and Net Zero (Subnational Electricity and Gas Consumption Statistics Regional and Local Authority, Great Britain, 2021, Mean domestic electricity consumption (kWh per meter) by country/region, Great Britain, 2021

1.2 Habitats Regulations Assessment

8. This document has been produced to inform the HRA process for the Projects. It details the assessment of potential adverse effects on site integrity (AEoI) for each National Site Network site previously screened in for further assessment as part of **Volume 6, Appendix A - Habitats Regulations Assessment Screening (application ref: 6.1.1)**. It should be noted that the Projects have been assessed separately, but included in a single submission. This approach covers the possibility that one or the other of the Projects are developed, as well as both Projects being developed, either concurrently or sequentially. The scope of this document covers all relevant National Site Network sites and relevant qualifying interest features seaward of Mean High Water Springs (MHWS), potential impacts of offshore and intertidal infrastructure seaward of MHWS on onshore sites landward of Mean Low Water Springs (MLWS), and potential impacts of onshore infrastructure on sites landward of MHWS.

9. The Habitats Regulations require that an HRA must be carried out on all plans and projects that are likely to have significant effects on National Site Network sites, which include Special Areas of Conservation (SACs), candidate SACs (cSACs), Sites of Community Importance (SCI), Special Protection Areas (SPAs) and as a matter of policy, possible SACs (pSACs), potential SPAs (pSPAs) and Ramsar Sites (listed under the Ramsar Convention on Wetlands of International Importance – where also designated as a European site).

1.3 This Document

10. The purpose of this 'Report to Inform Appropriate Assessment' (RIAA) is to provide the competent authority with information on the potential for adverse effect on the integrity of National Site Network designated sites as a result of the proposed the Projects. The Habitats Regulation Assessment (HRA) process derives from the requirements of specific European Union Directives and the UK Regulations that implement their requirements in national law which are outlined in section 3 of this report. This report is intended to inform the process of undertaking an Appropriate Assessment and is submitted alongside the Environmental Statement (ES) as part of the Development Consent Order (DCO) application.

1.4 Consultation

11. Consultation responses received from stakeholders with regards to the HRA process for the Projects are detailed in **Table 1-1** below. Where the responses are relevant to specific topics, they are detailed in the following sections through this report:

- Terrestrial Ecology – section 5.1
- Annex I Habitats – section 6.2 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 2 of 4 (application ref: 6.1)**
- Annex II Migratory Fish – section 7.2 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 2 of 4 (application ref: 6.1)**
- Annex II Marine Mammals – section 8.2 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 3 of 4 (application ref: 6.1)**
- Marine Ornithological Features – section 9 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 4 of 4 (application ref: 6.1)**

Table 1-1 Consultation Responses Received Regarding the HRA Process

Comment	Project Response
Responses to Draft HRA Screening Report	
Marine Management Organisation (MMO), 30/01/2023	
The MMO have no comments to make in regards to the Stage 1 screening report at this moment. MMO defer to comments made by Natural England (NE) and Environment Agency (EA) as Lead Competent Authorities on matters related to nature conservation. MMO wish to be included on future HRA discussions/reports so that we can consider whether any subsequent proposed mitigation, which are to be secured in an eventual Deemed Marine Licence (DML) meet the requirements of the MMO Enforcement Team. This means they must be drafted in a way that meets the following 5 criteria: 1) The condition must be necessary. 2) The condition must relate to the activity or development for which a DCO is sought. 3) The condition must be enforceable. 4) The condition must be precise. 5) The condition must be reasonable.	Noted with thanks, the MMO have been included in all HRA consultation and discussions on the Projects to date and will continue to be consulted moving forward.
Natural England, 20/02/2023	
Natural England welcomes the opportunity to review the HRA screening report and provide feedback on it. Additional sites we feel should be screened in can be found below and our detailed comments are provided in Annex I.	Noted with thanks.
Internationally designated sites Natural England can confirm that the proposed works are located within Dogger Bank Special Area of Conservation (SAC), Southern North Sea SAC, the Greater Wash Special Protection Area (SPA) and Flamborough and Filey Coast SPA, all of which have been correctly screened into the HRA assessment. Natural England have reviewed the other adjacent (or within the zone of influence (ZOI)) sites scoped into the assessment and advise the following additional designated sites also have the potential to be impacted and should therefore be screened in: • Humber Estuary SAC • Humber Estuary SPA / Ramsar • Moray Firth SAC • The Wash and North Norfolk Coast SAC • Berwickshire and North Northumberland Coast SAC	Noted with thanks. The additional sites detailed in this comment were screened into the revised HRA Screening report and have been assessed within this report where relevant.

Comment	Project Response
Annex I: Detailed Comments	
Consideration of in-combination effects (Section 3.3.1) Natural England note that the Project has adopted a three tier approach to rank other projects in the in-combination assessment. We highlight that NE Best Practice Guidance published in 2022 advises the use of a seven tier approach (Section 11.1, Phase III Best Practice for Data Analysis and Presentation at Examination, March 2022) which we advise is used in this assessment moving forward. We note that for several thematic areas, insufficient information has been provided regarding the approach to in-combination assessment and the Projects to be included for us to meaningfully comment at this time.	In-combination assessments conducted within this report have used the latest available version of Natural England's Phase III Best Practice for Data Analysis and Presentation at Examination guidance to inform the assessment, including the use of the seven-tier approach to defining other relevant schemes.
Responses to Final HRA Screening Report	
MMO, 17/07/2023	
The MMO defers to the statutory advice provided by the relevant Statutory Nature Conservation Body's regarding the potential impacts to the protected features of the identified nature conservation areas that may occur because of the Projects.	Noted with thanks.
Natural England, 17/07/2023	
Natural England considers that both the Holderness Inshore MCZ assessment and Dogger Bank RIAA are fundamental documents required to support the Application, plus any discussion and issues resolution prior to Application submission on In principle Compensation Measures and Measures of Equivalent Environmental Benefit. Natural England advises that these documents are provided in order to progress project discussions prior to submission.	Potential impacts on the Holderness Inshore MCZ and draft findings of the RIAA were discussed with Natural England and the wider Seabed Expert Topic Group prior to the submission of this application (see **ES Volume 7, Consultation (application ref: 7.7)** for further information.
Lincolnshire Wildlife Trust, 17/07/2023	
Derogation and Timescales As DBS will be aware, the Crown Estate, in their Round 4 Plan-Level HRA, concluded that the possibility of an 'Adverse Effect on Site Integrity' (AEOSI) as a result of the Round 4 plan cannot be ruled out for two of the protected sites forming part of the 'national site network'. These are the Flamborough and Filey Coast SPA (due to the potential impact on the kittiwake feature) and the Dogger Bank SAC (due to the likely impact on the sandbank feature of that site). Furthermore, proposed development works are anticipated to impact several other designated areas, including Southern North Sea SAC, Flamborough Head SAC, Greater Wash SPA, Holderness Offshore MCZ and Holderness Inshore MCZ. LWT echoes and strongly supports Natural England's concerns voiced in their response to the DBS Scoping Report: • 'Given the planned submission timescales for this project (PEIR, Q2 2023; DCO Q1, 2024), we are concerned that it will not be possible for robust derogations cases to be developed by the point of application.' We do not feel that the Applicant is allowing for enough time to properly assess the various aspects of these Projects, and their potential harm on receptors.	It should be noted that following amendments to the Projects Offshore Development Area, no direct effects will result from the Projects on the Flamborough Head SAC or Holderness Offshore MCZ. Assessments of potential adverse effects on site integrity are provided in this RIAA for all listed sites, or in **Volume 8, Stage 1 Marine Conservation Zone Assessment (application ref: 8.17)** with regards to the MCZs listed. A detailed derogation case is provided with this application in **Volume 6, Habitats Regulations Derogation: Provision of Evidence (application ref: 6.2)** and its associated appendices that detail the compensation plans for Guillemot and Razorbill, Kittiwake and the Dogger Bank.

2 Project Description

12. This report has been based on a design envelope approach in accordance with National Policy Statement (NPS) EN-3 (paragraph 3.8.87) (DESNEZ, 2023a) which recognises that:

"Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application to the Secretary of State. Such aspects may include:

- the precise location and configuration of turbines and associated development;
- the foundation type and size;
- the installation technique or hammer energy;
- the exact turbine blade tip height and rotor swept area;
- the cable type and precise cable route;
- the exact locations of offshore and/or onshore substations."

13. NPS EN-1 (paragraph 4.2.12) states:

"*Where some details are still to be finalised, the ES should, to the best of the applicant's knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed*" (DESNEZ, 2023b).

14. The design envelope will therefore provide maximum and minimum parameters where appropriate to ensure the worst-case scenario can be quantified and assessed in this report. This approach has been widely used in the consenting of offshore wind farms and is consistent with the Planning Inspectorate Advice Note nine: Rochdale Envelope (Planning Inspectorate, 2018) which states that:

"*The Rochdale Envelope assessment approach is an acknowledged way of assessing a Proposed Development comprising EIA development where uncertainty exists, and necessary flexibility is sought*".

15. The following sections provide an overview of the current understanding of the potential infrastructure required for the Projects, including indicative parameters.

2.1 Development Scenarios

16. As set out in **Volume 7, Chapter 1 Introduction (application ref: 7.1)** of the accompanying ES, whilst the Projects are each Nationally Significant Infrastructure Projects (NSIPs) in their own right, a single application for development consent has been made to address both wind farms, and the associated transmission infrastructure. A single planning process and Development Consent Order (DCO) application provides consistency in the approach to the assessment, consultation and examination. While a single DCO application has been made for both Projects, five separate Deemed Marine Licences are included as schedules to the DCO to cover each Array Area, their associated transmission infrastructure and the inter-project cabling required for the Projects. This approach allows for ease of separate ownership of each of the asset should their ownership change over time.

17. The Applicants have developed DBS East and DBS West transmission infrastructure as co-ordinated projects in accordance with the National Grid Electricity System Operator (ESO) evolving Holistic Network Design (HND), as updated in February 2024 (National Grid ESO, 2024). The HND has confirmed the Projects will have a radial connection to the proposed National Grid Substation at Birkhill Wood.

18. Whilst the Projects are the subject of a single DCO application (with a combined ES and associated submissions), each Project is assessed individually, so that mitigation is Project specific (where appropriate). As such, the assessments cover the following three Development Scenarios:

- DBS East or DBS West are developed In Isolation (the In isolation Scenario);
- Both DBS East and DBS West are developed Concurrent (the Concurrent Scenario), or
- Both DBS East and DBS West are developed Sequentially (the Sequential Scenario).

19. In summary, the following principles set out the framework for how the Projects may be developed, as detailed in **Table 2-1**:

- DBS West and DBS East may be constructed at the same time, or at different times;
- If built In Isolation, either Project could be constructed in five years;
- If built Concurrently, both Projects could be constructed in five years;
- If built Sequentially, construction on either Project could commence first, but with staggered / overlapping construction; or

- If built sequentially, construction of the first Project would be completed within 5 years, with construction of the second Project being completed within 7 years.

20. Therefore, the maximum construction period over which the construction of both Projects could take place is seven years.

Table 2-1 Development Scenarios and Construction Durations

Development scenario	Description	Total Maximum Construction Duration (Years)	Maximum Construction Duration Offshore (Years)	Maximum Construction Duration Onshore (Years)
In Isolation	Either DBS East or DBS West is built In Isolation	Five	Five	Four
Sequential	DBS East and DBS West are both built Sequentially, either Project could commence construction first with staggered / overlapping construction	Seven	A five year period of construction for each project with a lag of up to two years in the start of construction of the second project (excluding landfall duct installation) – reflecting the maximum duration of effects of seven years.	Construction works (i.e. onshore cable civil works, including duct installation) to be completed for both Projects simultaneously in the first four years, with additional works at the landfall, substation zone and cable joint bays in the following two years. Maximum duration of effects of six years.
Concurrent	DBS East and DBS West are both built Concurrent reflecting the maximum peak effects	Five	Five	Four

2.1.1 Offshore Scheme Summary

21. The key offshore components that comprise the Projects include:

- Wind turbines;
- Offshore platforms, including offshore Collector Platforms (CPs) and / or converter platforms (OCPs), an Electrical Switching Platform (ESP) and / or an Accommodation Platform (hereafter collectively referred to as offshore platforms unless specified);
- Foundation structures for wind turbines and offshore platforms;
- Array cables;
- Inter-platform cables;
- Offshore Export Cables from the Array Areas to the landfall; and
- Scour/cable protection (where required).

22. A summary of the key elements of the offshore infrastructure is provided in **Table 2-2**.

Table 2-2 Offshore Scheme Summary

Parameter	**Details**		
	DBS East	**DBS West**	**Combined**
Indicative construction duration (years) (excluding landfall works)	5	5	5 (up to 7 years if sequential build)
Anticipated design life (years)	30	30	30 (32 if sequential build)
Maximum number of wind turbines[2]	57-100	57-100	113-200
Total Array Area agreed in Agreement for Lease (km³)	494.5	494.5	989

[2] In situations where a number does not divide equally between DBS East and DBS West (e.g. 113 turbines), rounded up to higher number (e.g. 57 31.5MW turbines as opposed to 56.5).

Parameter	Details		
	DBS East	DBS West	Combined
Total Array Area assessed for ES (km^2)	349	355	874[3]
Closest point from Array Area to coast (km)	122	100	100
Maximum length of export cable to landfall (per cable) (km)	188	153	N/A
Maximum offshore cable length (km) for all cables	376	306	682
Maximum number of export cables and trenches	2	2	4
Maximum total length of all array cables (km)	325	325	650
Approximate turbine rotor diameter – small turbines (m)	259		
Approximate turbine rotor diameter – large turbines (m)	344.08		
Maximum tip height above MHWS (m)	394.08		
Minimum lower blade tip clearance to MSL (m)	34		
Maximum rotor swept area (small turbines) (km^2)	5.263	5.263	10.526

[3] Total Array Area assessed for ES for the Projects combined includes 170km^2 for Inter Platform Cabling Corridor located between DBS East and DBS West.

Parameter	Details		
	DBS East	DBS West	Combined
Maximum rotor swept area (large turbines) (km^2)	5.299	5.299	10.51
Minimum turbine spacing (centre to centre, in-row or inter-row spacing) (m)	830		
Rotor cut-out wind speed (m/s) (assumed)	>25		
Maximum inter-platform cable length (km)	115	129	342
Wind turbine foundation type options	Steel monopile, piled jacket		
Maximum number of offshore platforms[4]	4 (ESP may be located in the export cable corridor or Array Area)	4 (ESP may be located in the export cable corridor or Array Area)	8 (ESP may be located in the export cable corridor or a single Array Area)
Offshore platform foundation type options (Array Areas)	Steel monopile, piled jacket		
Offshore platform foundation type options (Offshore Export Cable Corridor)	Steel monopile, piled jacket, gravity based foundation		

[4] In some instances the parameters for the Projects in sequence / concurrently are not double those of the Projects in isolation. For example, there is only ever one Accommodation Platform and one ESP under any design scenario. To ensure the WCS has been assessed, however, such platforms are accounted for in each possible scenario.

2.1.2 Wind Turbines

2.1.2.1 Wind Turbine Parameters

23. The project design envelope includes a range of wind turbines in order to accommodate the ongoing rapid development in wind turbine technology. Wind turbine dimensions vary widely, even for wind turbines with similar generating capacities, but for the Projects the 'small' wind turbine indicatively represents wind turbine models on the market today (with capacities of circa 15- 16MW) or evolutions of these models. The 'large' wind turbine reflects models that are predicted to become available in the timeline of the Projects, and which may have generating capacities in excess of 20MW. It is very difficult to predict future wind turbine market developments, but it is possible that wind turbines towards the small or large ends of the project design envelope are eventually selected for construction.

24. Accounting for this range and the assumed total capacity of the Projects there could be between 57 and 100 wind turbines at each of DBS East and DBS West, equating to up to 200 turbines across the two Projects. Wind turbine parameters are summarised in **Table 2-2**. It should be noted the parameters detailed in this table are lower than those estimated in The Crown Estate's Round 4 Plan Level HRA.

2.1.2.2 Wind Turbine Layout

25. The wind turbine layout would not be finalised until much closer to the time of construction, following completion of detailed pre-construction wind resource studies, site investigations and the selection of the preferred wind turbines and their foundations. A layout would be selected from within the consented parameters to optimise energy output and the foundation installation process accounting for ground conditions. The wake downstream of a wind turbine rotor is characterised by decreased wind speed and increased turbulence compared to the flow upstream of the rotor. An optimum layout would ensure that the flow in front of a wind turbine is affected as little as possible by wake effects from other wind turbines.

26. At this time, the layout can therefore only be described in general terms with the minimum separation distance between wind turbines as described in **Table 2-2**. Inter-row spacing is the distance between the main rows of wind turbines and in-row spacing is the distance separating wind turbines in the main rows, which would be orientated to face the prevailing wind, or as close to this as is practical. In-row spacing and inter-row spacing may vary across the Array Areas.

27. The layout would require Maritime and Coastguard Agency (MCA) approval prior to construction to minimise risk to surface vessels, including rescue boats and search and rescue aircraft, as per Marine Guidance Notice (MGN) 654 (MCA, 2021) (see **Volume 7, Chapter 14 Shipping and Navigation (application ref: 7.14)** and **Volume 7, Chapter 15 Aviation and Radar (application ref: 7.15)** of the ES for further details).

2.1.2.3 Wind Turbine Installation

28. The precise detail of the installation process would be confirmed prior to construction. However, it would follow one of the methodologies outlined below (details of the pre-installation works are given in relation to the foundations, section 2.1.3.1):

- Wind turbine components would be loaded on to the installation vessel (typically a jack-up vessel or an anchored floating vessel) at the marshalling base port. The installation vessel would then transit to the Array Area and the components would be lifted by the vessel's crane onto the foundation or transition piece (depending on the foundation type being used). For each wind turbine, the tower would be installed first, followed by the nacelle, then the blades. Technicians would fasten components together as they are lifted into place. Each wind turbine installation is likely to take in the order of one day, assuming no weather delays.
- Alternatively, the wind turbine components may be loaded onto barges or dedicated transport vessels at the marshalling base port and installed by an installation vessel that remains on site throughout the installation campaign.
- It is also possible that complete wind turbines could be pre-assembled and commissioned onshore and transported to site for installation as single units.

29. The total duration of the installation campaigns for the wind turbines is expected to be a maximum of 30 months if the Projects are constructed In Isolation or Concurrently or up to 54 months if the Projects are developed Sequentially.

30. Each installation vessel or barge may be assisted by a range of support vessels. These are typically smaller vessels that may be tugs, guard vessels, anchor handling vessels, or similar. These vessels would make the same general movements to, from and around the Array Areas as the installation vessels that they are supporting. See section 2.1.6.9 for further details of vessel types, numbers, and movements.

2.1.3 Wind Turbine Foundations

31. The following sections describe the monopile and pin pile jacket foundation types under consideration for the wind turbines for the Projects, in addition to details of the pre-installation works. It should be noted that following consultation from PEIR and review of the project design envelope, gravity base foundations and suction bucket jackets have been removed from the design envelope for wind turbine foundations.

32. It is possible that more than one type of wind turbine foundation would be installed on DBS East and DBS West, accounting for the construction programme (i.e. when the Projects are constructed and whether they are constructed at the same time), ground conditions, water depth, wind turbine model and wind resource.

33. The foundations would be manufactured at an onshore facility and most likely delivered to site as fully assembled units with all ancillary structures attached. As with many aspects of the wind farm construction process, different logistical approaches are being explored within the industry as technologies and methodologies continue to evolve.

34. Fabrication and construction methods would depend on the foundation type selected, as described in the sections below

2.1.3.1 Pre-Installation Works

35. Pre-installation works may include:

- Pre-construction surveys to confirm that the seabed is clear of any obstructions prior to installation activities commencing (including unexploded ordnance (UXO)) and to provide information to inform any micro-siting of infrastructure, clearance operations, seabed preparation and for environmental monitoring purposes.

36. UXO clearance requirements would be informed by the results of the pre-constructions surveys. Micrositing would be used to avoid UXO where possible. However, where this is not possible, clearance may be required to safely remove or detonate any UXO that present a hazard to the construction activities or the ongoing operation of the wind farms.

2.1.3.2 Monopiles

2.1.3.1.2 Overview and Materials

37. A monopile is a large tubular structure onto which a cylindrical Transition Piece (TP) may be installed. Alternatively the design may consist of a monopile only (a TP-less design). The pile and/or transition piece may be tapered or change in diameter along their length. The key parameters for monopile foundations are presented in **Table 2-3**.

38. Monopiles and transition pieces are fabricated from steel, with a number of secondary structures on the associated transition pieces such as handrails, ladders and working platforms that may be produced from a range of materials such as steel, concrete, aluminium, other metals and composites

Table 2-3 Monopile Foundation Parameters

Parameter	Small Turbines	Large Turbines
Maximum penetration (piled solution) (m)	40	60
Maximum pile diameter (m)	11	15
Maximum drill arisings per foundation (m^3)	4,524	12,064
Maximum drill arisings across both Projects combined (m^3)	45,239	68,160
Maximum footprint on the seabed per foundation (excl. scour protection) (m^2)	95	177
Maximum outer scour protection diameter at seabed (incl. foundation structure) (m)	63	83
Maximum area of scour protection per foundation (incl. structure footprint area) (m^2)	3,117	5,411
Maximum scour protection volume per foundation (m^3) (rock)	5,278	9,450

2.1.3.2.2 Seabed Preparation

39. Cable installation may require some form of seabed preparation which may include pre-lay grapnel runs and/or pre-lay plough, boulder relocation and / or sandwave clearance. In general, the preparations would be limited to the area directly associated with the array cable or export cable corridor.

2.1.3.3.2 Scour Protection

40. Scour protection material may be required around the base of some or all foundations to protect from current and wave action, thus ensuring structural integrity. Scour protection types may include, but are not limited to, rock filter layers (typically laid before foundation installation) with a rock armour layer, rock/stone filled geotextile bags (typically laid after foundation installation), and/or anti scour mattress solutions.

41. The maximum diameter, area, and volume requirements for scour protection per foundation are provided in **Table 2-3** and **Table 2-5**.

2.1.3.4.2 Installation

42. Monopiles are installed vertically into the seabed by either driving (use of a piledriving hammer), or a combination of driving and drilling techniques where harder ground conditions are present. Other appropriate alternative methods may be used as they become available.

43. Dynamically positioned vessel installation technology to limit the seabed impacts may be utilised for the Projects. However, this may not be possible across the whole site due to the water depths or metocean conditions. At a smaller number of locations an anchor spread may be required during foundation installation. As a worst case, calculations on anchoring are based on anchor deployment occurring at every turbine.

44. Alternatively, or possibly in addition to a dynamic positioning vessel, a jack-up vessel may be deployed for foundations installation.

45. The installation process typically comprises the following stages:

- Lift monopile into the pile gripper on the side of the installation vessel;
- Lift hammer onto monopile and drive monopile into seabed to required embedment depth (anticipated to be up to approximately 60m embedment, dependent upon ground conditions and water depth);
- Lift hammer from monopile and remove pile gripper;
- Lift transition piece onto monopile; and
- Secure transition piece. Transition piece bolted or grouted to the monopile (if required). The grout used is an inert cement mix that is pumped into a specially designed space between the transition piece and the monopile. It is also possible that the transition piece would be integrated with the monopile, in a ‘TP-less’ concept, in which case this installation stage would not be required. Further installation of secondary and tertiary steel works such as access systems and corrosion protection systems may also be required.

46. Where conventional piling is unable to achieve necessary pile penetration, additional methods may be used (e.g. drilling, water jetting, vibro-piling and/or electro-osmosis).

47. Drilling arisings would be disposed of adjacent to installed foundations, as has been performed on existing UK offshore wind farms, including the RWE project at Gwynt y Môr.

48. It is expected that a single monopile foundation installation would take approximately 24 hours on average from vessel arrival to vessel departure, without weather delays. If drilling is required, then the installation duration would be increased.

2.1.3.5.2 Pile Driving

49. For the piling of monopile foundations, larger hammer spreads are more efficient and are likely to reduce the overall installation time and number of blows required to install each pile. However, the actual energy output would be optimised to that required for successful installation. At the time of writing, 5,500kJ spreads are available although the expectation is that larger hammers in the region of 6,000kJ may become available prior to the start of construction of the Projects and may be needed for larger diameter piles. A drivability assessment would be carried out prior to construction when further information is available regarding the ground conditions, to determine the required piling requirements (e.g. hammer energy and blow rate).

50. For this assessment, the maximum hammer energy used for monopile installation is assumed to be 6,000kJ for the largest 15m diameter monopiles. This figure represents a reduction in maximum hammer energy indicated at PEIR. Each piling event would commence with a soft start at a lower hammer energy, followed by a gradual ramp-up for at least 20 minutes to the maximum hammer energy required. The maximum hammer energy is only likely to be required at a few of the piling installation locations.

51. As an alternative to traditional impact piling, the feasibility of alternative installation methods will also be explored pre-construction. Such methods include:

- Vibration piling
  - A method in which the pile is vibrated into the sediment rather than being hammered in. The type and classification of the sound that is generated with vibratory versus impact pile driving is different. The sound generated from vibratory pile driving is classified as more non-impulsive, continuous sound as opposed

to the impulsive and sharp sounds produced from impact pile driving.

- Blue piling
    - A piling solution that uses the deceleration of a large water mass contained in a water vessel to deliver a long-lasting blow to the pile. This technology aims to reduce the noise generated at the source during installation.
- Electro-osmosis
    - A piling technique that utilises electro-osmosis (defined as the movement of water through a porous medium, such as soil, by the application of an externally applied electrical potential) while piling to reduce resistance in the underlying sediment when piling (Rose and Grubbs, 1979).
- Water jetting
    - Either used in conjunction with, or separate from, traditional impact piling, this method utilises a carefully directed and pressurized flow of water to assist in achieving pile penetration. The jetting technique liquefies the soils at the pile tip during pile placement, decreasing the bearing capacity of the soils, causing the pile to descend toward its final tip elevation with much less soil resistance and may lead to a reduced hammer energy being required.

52. It should be noted that these techniques are not yet proven for offshore wind foundations, but are included in the design envelope to allow for future technology developments. Even if feasible, it is likely that such techniques could only be used for part of the installation of each pile, with impact piling being required to complete the installation. As such, the worst case scenario for assessment purposes is reflected by the impact piling parameters.

53. The key impact piling parameters (worst case) are described in **Table 2-4**. Further information describing the detailed piling parameters used to inform the assessment, including the underwater noise modelling are provided in **Volume 7, Chapter 10 Fish and Shellfish Ecology (application ref: 7.10)** and **Volume 7, Chapter 11 Marine Mammals (application ref: 7.11)** of the ES.

Table 2-4 Monopile Piling Parameters for Wind Turbines

Parameter	Value
Maximum Diameter (m)	15
Maximum hammer energy (kJ)	6,000
Maximum pile depth (m)	60
Typical piling time per foundation (mins) (includes soft-start and ramp-up, and providing allowance for issues such as low blow rate, etc.)	320
Maximum piling duration per foundation (hours)	8
Maximum simultaneous piling events	2

2.1.3.6.2 Drilling

54. Whilst pile driving is the most likely installation method, in the event that ground conditions are not suited to piling, monopiles may be drilled, or both drilled and driven, into the seabed. For this purpose, it is estimated that up to an equivalent of 5% of the wind turbine locations could need drilling, i.e. a likely maximum of five for each of DBS East and DBS West. Potential volumes of drill arisings for the Projects are detailed in **Table 2-3**.

55. The drill arisings (spoil) would be disposed of adjacent to the foundation location, above or slightly below the sea surface, from where they would be expected to settle onto the seabed in the immediate vicinity of each foundation (see **Volume 7, Chapter 8 Marine Physical Environment (application ref: 7.8)** of the ES for further details).

2.1.3.3 Pin pile jackets

56. Piled jacket foundations are secured to the seabed by small diameter pin piles (four pin piles per foundation) which are driven into the seabed through pile sleeves at each leg. Alternatively, the pin piles may be pre-installed into the seabed through a template, prior to the arrival of the jacket structure. The pin piles are connected to the jacket legs via a grouted or deformed connection.The installation process typically comprises the following stages:

- Piling template placed on seabed;
- Piles installed;
- Piling template recovered for re-use; and

- Jacket lowered onto piles.

Or:

- Jacket lowered onto seabed; and
- Piles installed.

57. Pin pile installation methodology is similar to that for the monopiles. However, the hammer energy utilised for installation would be up to 3,000kJ due to the smaller size of the piles, with four piles per turbine foundation jacket. Depending on the approach taken it would typically take about 24 hours for the pilling operations and an estimated further 24 hours for the jacket installation and the grouting to be undertaken.

58. The key parameters for jacket foundations (worst case) are presented in **Table 2-5**. Jackets are primarily fabricated from steel. Secondary structures such as handrails, ladders and working platforms may be produced from a range of materials such as steel, concrete, aluminium, other metals and composites

2.1.3.1.3 Drilling

59. Whilst pile driving is the most likely installation method for the jacket pin piles, in the event that ground conditions are not suited to piling, the jacket pin piles may be drilled, or both drilled and driven, into the seabed. For this purpose, it is estimated that up to 5% of the jacket pin pile locations could need drilling.

60. The drill arisings (spoil) would be disposed of adjacent to the foundation location, above or slightly below the sea surface, from where they would be expected to settle onto the seabed in the immediate vicinity of each foundation (see **Volume 7, Chapter 8 Marine Physical Environment (application ref: 7.8)** for further details).

Table 2-5 Jacket Foundation Parameters (Wind Turbines)

Parameter	Small Turbines	Large Turbines
Pin Pile Jacket		
Maximum. number of legs per foundation	4	4
Number of legs across wind farm	800	452
Maximum drill arisings per foundation (m^3)	2,012	4,712
Maximum volume of arisings (m^3)	20,106	26,625

Parameter	Small Turbines	Large Turbines
Maximum height of platform above LAT (m)	20.5	20.5
Maximum separation of adjacent legs at seabed level (m)	20	34
Maximum separation of adjacent legs at LAT (m)	16	24
Maximum leg diameter (m)	2.5	3.5
Maximum pin pile diameter (m)	3	4
Maximum hammer energy (kJ)	up to 3,000	
Total piling time per pin pile (mins) (includes soft-start and ramp-up, and providing allowance for issues such as low blow rate)	190	
Maximum number of simultaneous piling events	3	
Maximum outer scour protection diameter at seabed per leg (including foundation structure) (m)	23	28
Maximum scour protection area per foundation (incl. structure footprint area monopile) (m^2)	1,662	2,463
Maximum scour protection volume per foundation (m^3) (rock)	2,229	3,542

2.1.4 Offshore Platforms

2.1.4.1 Offshore Converter Platforms / Collector Platforms

61. The cables from each string of wind turbines would be brought to a Collector Platform (CP), located appropriately to optimise the array, inter-platform, and export cable lengths. Power would then be sent onto an OCP, where the generated power would be transformed to a higher AC voltage of up to 525kV.

62. There would be up to six CPs / OCPs, as described in section 0. In the case that six CPs / OCPs are constructed there would be three located in in DBS East and three in DBS West. The location of the CPs / OCPs would be confirmed during the detailed design process, accounting for the wind turbine layout, but would be within the Array Area of each wind farm.

63. The basic CP / OCP design would consist of a topside structure configured in a multiple deck arrangement, with the decks either open with modular equipment, or fully clad. Weather sensitive equipment would be housed accordingly. Equipment and facilities may consist of:

- Medium voltage (MV) to high voltage (HV) step-up power transformers;
- HVDC valve hall;
- HV Reactors;
- MV and/or HV switchgear;
- Other electrical power systems;
- Instrumentation, metering equipment and control systems;
- Standby generators;
- Large-scale energy storage systems (batteries etc.), plus associated systems;
- Auxiliary and uninterruptible power supply systems;
- Navigation, aviation and safety marking and lighting;
- Helicopter landing facilities;
- Systems for vessel access and/or retrieval;
- Vessel and helicopter refuelling facilities;
- Potable water;
- Black water separation;
- Storage (including stores, fuel, and spares);
- Offshore accommodation and mess facilities
- Cranes;
- Communication systems and control hub facilities;
- Offshore vessel charging point;
- Indirect seawater cooling system including seawater lift and return caissons;
- HVAC systems;
- Electrolysis and chlorination system;
- System to manage contaminated fluids; and
- Drone landing pad.

64. Maximum parameters for a single CP / OCP topside are provided in **Table 2-6** below.

Table 2-6 Maximum Topside Parameters for a single CP / OCP

Parameter	**Value**
Maximum topside weight (tonnes)	20,000
Maximum topside length (m)	125
Maximum topside width (m)	100
Maximum topside area (m²)	12,500
Maximum topside height (m) (excluding crane and helideck)	105
Maximum topside height (m) (including crane)	195
Height (m) of lightning protection above topside (LAT)	10

2.1.4.2 Other Platforms

65. In addition to the CPs / OCPs, up to two other platforms may be required for the Projects, being:

- ESP; and
- Accommodation Platform.

66. An ESP was required as part of the original HND. A radial connection has now been confirmed by the HND. However, to allow for further evolution of the HND, the ESP is included for assessment. The platform, if required, may be located either within one of the Array Areas (likely alongside a converter station) or mid-way along the Offshore Export Cable Corridor.

67. In addition, a single Accommodation Platform may be required, which would be located within either the DBS East or DBS West Array Area.

2.1.4.3 Platform Foundations

2.1.4.1.3 Parameters and Foundations

68. The foundation types that may be used for the platforms within the Array Areas are monopiles and pin-pile jackets. For the potential ESP within the Offshore Export Cable Corridor, monopiles, pin-pile jackets or gravity based foundations may be used.

69. Scour protection may be required around the base of the foundations to protect against localised erosion of the seabed. The types of scour protection that could be used and installation methods are as described for the wind turbine foundations (section 2.1.3.2).

70. The worst case platform parameters for each foundation type, including details on scour protection, are detailed in **Table 2-7.**

Table 2-7 Worst Case Platform Foundation Parameters, Including Scour Protection

Parameters	Value
Monopile	
Maximum number	8 (Six CPs / OCPs + Two Other Platforms)
Maximum pile diameter (m)	15
Maximum hammer energy (kJ)	6,000
Maximum outer scour protection diameter at seabed (including foundation structure) (m)	83
Maximum scour protection area per offshore platform foundation (including structure footprint area mono-pile) (m^2)	5,411
Maximum scour protection area for all offshore plat-form foundations (including structure footprint area monopile) (m^2)	43,285
Maximum scour protection volume per offshore plat-form monopile foundation (m^3) (rock)	9,450
Maximum offshore platform foundation scour protec-tion volume for project (rock) (m^3)	75,600
Pin-pile jacket	
Maximum number	8 (Six CPs / OCPs + Two Other Platforms)
Number of legs per platform	8
Separation of adjacent legs at seabed level (m)	25

Parameters	Value
Separation of adjacent legs at LAT (m)	25
Indicative leg diameter (m)	2.8
Indicative pin pile diameter (m)	3.8
Maximum hammer energy (kJ)	3,000
Maximum outer scour protection diameter at seabed (including foundation structure) (m)	27
Maximum scour protection area per offshore platform foundation ((including) structure footprint area pin pile (m^2)	4,580
Maximum scour protection area for all foundations (including structure footprint area pin pile) (m^2)	36,644
Maximum scour protection volume per foundation leg (m^3) (rock)	808
Maximum scour protection volume for project (rock) (m^3)	51,712
Gravity-based structure	
Maximum number	1 ESP
Maximum base diameter (OD) (m)	65
Indicative seabed preparation diameter (m)	70
Indicative scour protection width (m)	260
Maximum gravity based height above seabed (m)	10
Maximum outer scour protection diameter at seabed (including foundation structure) (m)	268
Maximum scour protection area per offshore platform foundation (including structure footprint area) (m^2)	56,410
Maximum scour protection volume per offshore platform foundation (m^3) (rock)	102,842

71. The jacket foundation would mainly be comprised of steel. However, it is possible that some secondary structures, such as handrails, gratings and ladders could be produced using other metals, such as aluminium, or composites. Also, concrete could be used to form the working platform.

2.1.5 Underwater Noise

72. A number of activities during the construction, operation and decommissioning of the Projects would create underwater noise. The most significant noise sources are likely to be piling of the foundations and clearance of UXO. An underwater noise modelling study has been undertaken in support of the assessment and is provided in **Volume 7, Appendix 11-3 (application ref: 7.11.11.3).**

2.1.6 Further Electrical Infrastructure – Cables

73. The wind farm electrical array cables connecting the wind turbines to the CPs would collect the HVAC power produced at the wind turbines. This power would then be sent to an OCP via the array cables, where the power is converted to HVDC. This is then exported to the UK electricity transmission network via the export cables. The electrical transmission system, made up of the CPs/OCPs and export cables would be constructed by the Applicants and the ownership would be transferred to an Offshore Transmission Owner (OFTO) in accordance with applicable rules and regulations in a transaction managed by the Office of Gas and Electricity Markets (Ofgem).

74. The electrical cables that make up the offshore electrical infrastructure include:

- Offshore Export Cables (linking the OCPs to the landfall);
- Inter-platform cables (linking CPs and OCP) and
- Array cables (linking the wind turbines to the CPs).

75. These are described in the following sections.

2.1.6.1 Offshore Export Cables

76. Depending on the design scenario chosen, there would be up to four single core HVDC Offshore Export Cables. Fibre optic cables would be bound externally to one of the export cables belonging to each project. The power cable voltage would be up to 525kV with an indicative external cable diameter of 155mm.

77. The total length of the export cables depends on the Development Scenario in question (**Table 2-8**). The maximum offshore cable length would be up to 682km (188km for DBS East and 153km for DBS West per cable, with two power cables required per project, or four power cables in total).

78. For DBS East In Isolation, the maximum length per offshore export cable is 188km, giving a total of 376km as two cables are required.

79. For DBS West In Isolation, the maximum length per offshore export cable is 153km giving a total of 306km as two cables are required.

80. The Offshore Export Cables make landfall near Skipsea, where they would be connected to the onshore cables in TJBs, having been installed by HDD, or similar trenchless technique.

81. Each offshore export cable would be installed in a separate trench with an indicative spacing of 50m between the cables, where two export cables are installed in parallel. For the purpose of the DCO application and environmental assessment, an Offshore Export Cable Corridor has been defined in order to encompass all required cables and the adjacent area of seabed that may be subject for temporary works, such as anchoring, lay-down or the use of jack-up vessels.

82. The Offshore Export Cable Corridor is 1km wide, but funnels out to up to approximately 3km on approach to the landfall and the crossing of the existing Langled pipeline, and approximately 15km on the approach to the DBS West Array Area. The greater width of the corridor at these locations is designed to provide greater flexibility in the detailed routeing of the export cables at the pre-construction stage. The corridor provides space for the installation works and any foreseeable operation and maintenance activities such as cable reburial or repairs.

83. The construction buffer zone measures 500m either side of the Offshore Export Cable Corridor, and provides room for temporary works such as anchoring, jacking up, placement of buoyage and relocation of fishing gear. No permanent infrastructure would be installed within the construction buffer zone. As the burial route for the Projects has not yet been finalised, the construction buffer zone is retained in locations even where the Offshore Export Cable Corridor widens to over 1km to accommodate the necessary construction room in the event any Offshore Export Cables are buried near the perimeter of the Offshore Export Cable Corridor boundary.

84. Due to the length of the Offshore Export Cable Corridor, and the limitations upon cable carousel size/weight on the installation vessel, it is very likely that the export cables would be installed in sections with pre-planned cable joints along the Offshore Export Cable Corridor. At the pre-planned cable jointing locations, the two ends of the cables are laid on the seabed with sufficient slack to allow them to be lifted onto a suitable vessel. The cable jointing is then completed onboard the vessel before the cable is lowered back down to the seabed. The cable is then buried, if possible, or protected using measures as described in section 2.1.6.7. A similar procedure is deployed for cable repairs.

Table 2-8 Offshore Export Cable Parameters

Parameter	DBS East	DBS West	Both Projects
Maximum length of export cable measured from OCPs to landfall (all cables) (km)	376	306	682
Export cable corridor width (km)	Approximately 1km plus a 0.5km temporary construction area buffer on both sides, but widening and varying at a small number of locations		
Export cable corridor width at landfall (approximate) (km)	3		
Maximum number of export power cables	2	2	4
Maximum number of trenches	2*	2*	4*
Typical spacing between cables in trenches (m)	50		
Maximum Offshore Export Cable Corridor temporary disturbance width during installation (per cable) (m)	20		
Export cable operating voltage (kV)	Up to +/-525		

**Trenches would split into three and six trenches on approach to landfall due to the co-located fibre-optic communications cable splitting from the Offshore Export Cables prior to making landfall.*

2.1.6.2 Inter Platform Cables

85. Inter-platform cables would be required to connect CPs to the OCPs, to connect the OCPs between the Projects, and to connect the OCPs to the Accommodation Platform and ESP.

86. The inter-platform cable voltage would be up to 275kV, with an indicative external cable diameter of up to 275mm. They would be integrated with fibre optic cables.

87. Inter-platform cable parameters are set out in **Table 2-9**.

Table 2-9 Inter-Platform Cable Parameters

Parameter	Details
Maximum length of Inter-Platform Cables for DBS East and DBS West combined scenario (km)	342
Maximum length of Inter-Platform Cables for DBS East In Isolation design scenario (km)	115
Maximum length of Inter-Platform Cables for DBS West In Isolation design scenario (km)	129
Maximum inter-platform cable temporary disturbance width during installation (per cable) (m)	20
Indicative external cable diameter (mm)	275

2.1.6.3 Array Cables

88. Array cables link the wind turbines to the CPs. The cable system design would be based on radial strings from the CPs connecting multiple wind turbines per string

89. The array cables would be up to 132kV, with an indicative external cable diameter of up to 220mm. Cable circuits (strings) would be optimised according to the electrical load they are required to carry, with up to three different cable dimensions being used. They would be integrated with fibre optic cables.

90. Each array cable would be installed in its own trench, with the maximum length of array cables being 650km. Array cable parameters are set out in **Table 2-10**.

Table 2-10 Inter Array Cable Parameters

Parameter	DBS East	DBS West	Combined
Maximum length of array cables (km)	325	325	650
Maximum array cable temporary disturbance width during installation (per cable) (m)	20		
Maximum array cable voltage (kV)	Up to 132		

2.1.6.4 Cable Installation Methods

2.1.6.1.4 Removal of Existing Out of Service Cables

91. Where the cable routes cross out-of-service cables, depending on the length of cable and burial depth, these would either be recovered from the seabed by grapple hook or similar method prior to the start of installation or cut at an appropriate distance either side of the cable and the free ends secured to the seabed by clump weights. The agreement of the relevant asset owner would be sought prior to taking such action.

2.1.6.2.4 Boulder clearance

92. Boulders that present an obstacle to the construction activities would be confirmed by the pre-construction surveys. In the instance that a boulder cannot be avoided, it would be relocated to an adjacent area of seabed within the Offshore Development Area where they do not present an obstacle to the works, and where possible to an area of seabed with similar sediment type and avoiding any known sensitive habitats. If required, boulder clearance would be undertaken by sub-sea grab or plough.

2.1.6.3.4 UXO Clearance

93. Specific surveys to identify potential locations of UXO would not be undertaken until after the DCO is granted. This is to allow more detailed engineering work to be carried out on the cable routes and locations of turbines to allow a targeted survey for potential UXO to be undertaken.

94. However, to aid in reporting for the ES Ordtek (2023) has produced a report predicting the number of potential UXO that may be found within the Offshore Development Area. This has been achieved through the examination of data sources including past potential UXO quantities seen on similar projects, geophysical data available for the Projects and historic use of the Offshore Development Area. It is expected that 41 UXO would need to be cleared during the construction phase, as detailed in **Table 2-11** below. It should be noted that the real-world number of UXO may differ from these predicted figures.

Table 2-11 Predictive UXO Numbers Requiring Clearance Within the Offshore Development Area

UXO Type	Nearshore Cable Route (<10m LAT)	Offshore Cable Route (>10m LAT)	DBS East Array Area	DBS West Array Area	Subtotal
German SC-50 Bomb	1	2	0	0	3
British 250lb MC Bomb	1	1	0	0	2
WWI German Mine	0	3	2	2	7
WWI British Mine	0	2	1	1	4
British 500lb MC Bomb	3	3	1	1	8
WWI U-Boat Torpedo (Multiple Variants)	0	1	0	0	1
German SC-250 Bomb	0	1	1	1	3
WWII British Buoyant Mine	0	2	1	1	4
German SC-500 Bomb	0	1	1	1	3
British 1000lb MC Bomb	0	1	1	1	3

UXO Type	Nearshore Cable Route (<10m LAT)	Offshore Cable Route (>10m LAT)	DBS East Array Area	DBS West Array Area	Subtotal
WWII U-Boat Torpedo (Multiple Variants)	0	1	0	0	1
British 2000lb MC Bomb	0	0	0	0	0
German LMB Mine	0	1	0	0	1
German TMB Mine	0	0	0	0	0
German SC-1000 Bomb	0	1	0	0	1
German TMC Mine	0	0	0	0	0
Totals	5	20	8	8	41

95. A Marine Licence application would be applied for post-consent to allow for the investigation and clearance of any UXO to ensure appropriate mitigation is put in place.

2.1.6.4.4 Pre-Lay Grapnel Run

96. Before cable-laying operations commence, it must be ensured that the route is free from obstructions such as discarded fishing gear, anchors or abandoned cables, wires and ropes that may be identified as part of the pre-construction surveys. A survey vessel would be used to undertake a pre-lay grapnel run (PLGR) to clear such identified debris.

97. The width of seabed disturbance along the PLGR is estimated to be up to 6m, which would be encompassed by the maximum 20m footprint of cable installation works – see **Table 2-8, Table 2-9** and **Table 2-10** for further details.

2.1.6.5.4 Sandwave levelling

98. Areas of mobile seabed (typically either in sandwaves or megaripples) may present a risk to the cable burial process either by preventing the cable burial tools from operating efficiently or by resulting in exposure and scouring of the cable once installed. In some cases, this could result over time in the cable being left 'free-spanning' over the seabed. Free spanning cables present a risk to other marine users and result in a large amount of strain being placed on the cables, significantly increasing the chance of their failure and the subsequent need for repair works.

99. In order to prevent this, cables can be placed where possible in the troughs of sandwaves to the reference seabed level, which would minimise the potential for cables becoming exposed. However, where this is not possible, the alternative is to dredge the top of the sandwaves prior to installation down to the seabed reference level. This process is termed sandwave levelling. If this was required, it would be completed before the cable is laid on the seabed.

100. Current worst case sandwave levelling scenarios are detailed in **Table 2-12**.

Table 2-12 Worst Case Sandwave Levelling Scenarios

Parameter	DBS East In Isolation	DBS West In Isolation	DBS West and DBS East Sequentially or Concurrently
Maximum seabed footprint disturbed by sandwave levelling within Array Areas (m^2)	1,100,000	1,134,500	2,478,875
Maximum volume of sandwave material to be dredged/relocated within Array Areas (m^3)	445,500	459.473	1,003,944
Maximum seabed footprint disturbed by sandwave levelling within Offshore Export Cable Corridor (m^2)	12,282,010	10,833,835	23,115,845
Maximum sandwave material to be dredged/relocated within Offshore Export Cable Corridor (m^3)	33,121,800	29,302,899	62,424,700

2.1.6.5 Cable Burial

101. The purpose of cable burial is to ensure that the cables are protected from damage, either from other activities such as fishing and shipping, or from naturally occurring physical processes acting on the seabed.

102. Burial of the cables would be through any combination of ploughing, jetting, or mechanical cutting. The dimensions of the cable trenches and the overall seabed footprint affected by the burial process would depend on the installation method. The installation method and target burial depth will be confirmed post consent based on a cable burial risk assessment considering ground conditions as well as the potential for impacts upon cables such as from trawling and vessel anchors. For the purposes of this assessment, a target burial depth of between 0.5m and 1.5m (relative to the non-mobile seafloor level) has been assumed for all cable burial activities. Information on the potential burial techniques is provided below.

2.1.6.1.5 Ploughing

103. A plough uses a forward blade to cut through the seabed, while burying the cable behind it. Ploughs can be used as a pre-trench tool (i.e. the cables are laid into a trench for later backfilling), a post-lay burial tool (i.e. the cable is first laid in position on the seabed before being ploughed in) or, more commonly, as a simultaneous lay and burial tool. Ploughing tools can be pulled directly by a surface vessel or can be mounted onto self-propelled caterpillar tracked vehicles which run along the seabed taking power from a surface vessel. The plough inserts the cable into the seabed as it moves. The indicative width of disturbance from ploughing is 15m.

104. There are two types of plough: displacement and non-displacement. The difference is important in terms of understanding the effect on the seabed. Displacement ploughs are typically used to pre-cut a trench in hard ground conditions, creating a trench that remains open for subsequent cable installation. A second backfilling pass of the plough is then undertaken to bury the cable.

105. By contrast, a non-displacement plough is designed to trench and bury the cable in a single pass, consequently causing less disturbance on the seabed as part of either a simultaneous or post lay and burial process. The plough may be fitted with additional equipment to help improve performance in certain soils, for example water jets for burying in sand.

2.1.6.2.5 Jetting

106. Jetting uses high powered jets of water to fluidise the seabed sediments and lower the cable to the required depth. Jetting may be undertaken either as a separate operation on a cable that has been pre-laid on the seabed, or by simultaneously laying and jetting. As with a plough, the jetting tool can either be pulled directly by a surface vessel or mounted onto self-propelled caterpillar tracked vehicles. The indicative width of disturbance from jetting is 18m.

2.1.6.3.5 Mechanical Cutting

107. This method involves the excavation of a trench (either by pre-trenching or simultaneously with cable laying), with the excavated material placed alongside. The cable is then laid in the trench and the sediment returned to the trench to complete the burial of the cable, either mechanically or by natural processes. The indicative trench width from mechanical cutting is 18m. An example mechanical cutting tool that could be used is the Global Marine Q1400 Trenching System (Global Marine, 2019).

2.1.6.4.5 Trench Sizes

108. The maximum temporary disturbance width for export, inter-platform and array cable installation would be up to 20m, encompassing the pre-grapnel run and trenching works. The respective indicative trench widths are as follows:

- Pre-lay ploughing 6m;
- Post-lay ploughing 0.5m;
- Jet trenching 1m; and
- Mechanical trenching 0.6m.

2.1.6.6 Array Cable Installation

109. Each section of cable would be laid from the cable lay vessel either from a static coil or a revolving carousel, turntable, or drum. The cable would be pulled into the turbine foundation via a J-tube (or alternative cable entry system) and hung-off inside the foundation structure before being connected to the turbine electrical system.

110. A typical methodology for installing the cable into a J-tube is:

- Mobilisation of a specialist cable installation vessel to site.
- A vessel would take up station adjacent to a wind turbine foundation. The cable end would be connected to a pre-installed messenger wire at the wind turbine foundation. The messenger wire would be recovered by a Remotely Operated Vehicle (ROV). The messenger wire would then

allow the cable to be pulled into the wind turbine foundation from a temporary pre-installed winch arrangement at the wind turbine foundation. An ROV would be used to monitor the cable entering the J-tube or cable entry system.

- When the first cable end is pulled in with required overlength, the cable is secured with a temporary hang-off arrangement and cable installation continue towards the wind turbine foundation for second end pull-in and hang-off. Separate teams would be mobilized for installing permanent hang-off of the cable and terminate the cable cores and fibre optic cables.
- Second end cable pull-in, hang-off and termination would in principle be similar to the first end, except for overboarding of the last end of the cable from the installation vessel that would be by means of a quadrant.
- The same principle for cable installation is applicable for wind turbine foundations without a J-tube. The main differences are the interface between the cable protection system and the foundation entry; without a J-tube the cable is free hanging inside the foundation structure.

2.1.6.7 External Cable Protection

2.1.6.1.7 Need for External Cable Protection

111. There are certain situations where the use of external cable protection may be required. These include:

- At pre-planned cable jointing locations along the Offshore Export Cable Corridor;
- Where an adequate degree of protection has not been achieved from the burial process. This may be as a result of challenging ground conditions, or unforeseen circumstances with the burial process, such as break down of the burial tool/s;
- Where the array cables approach the wind turbines and OCPs, as described above in section 2.1.6.6;
- At cable and pipeline crossings (section 2.1.6.3.7);
- At the trenchless crossing exit pit (offshore only); and
- In the event that cables become unburied as a result of seabed mobility during the operation of the wind farms or (where necessary) in the event of making a cable repair (discussed in section 2.1.6.5.7).

112. In all cases, the amount of external cable protection would be minimised as far as is possible.

113. Since it is not possible to bury the array cables in close proximity to the wind turbines and platforms due to the scour protection that would be installed, the cables would be surface laid with cable protection on the approach to each foundation. An allowance of up to 45km of cable protection (total across both Projects) is included for this purpose. It should be noted however, that this figure would be partly within the footprint of the foundation scour protection.

2.1.6.2.7 Types of External Cable Protection

114. A range of external cable protection systems are available and include:

- Rock placement – the laying of loose rock on top of the cable. Use of rock is often preferred as it is well proven to offer excellent protection in the marine environment, is suitable for application over large areas and is relatively simple and cost effective to deploy;
- Concrete mattresses – prefabricated flexible concrete coverings laid on top of the cable. Deployment is slow and therefore mattresses only tend to be used for short sections of cable;
- Frond mattresses – similar to concrete mattresses but the addition of fronds is used to encourage the settlement of sediment over the mattress and the cable underneath. Only suitable in certain hydrodynamic and sedimentary conditions;
- Protective aprons or coverings – solid structures of varying shapes, typically prefabricated in concrete or similar;
- Bagged solutions – including geotextile sand containers, rock-filled gabion bags or nets, and grout bags, filled with material sourced from the site or elsewhere); and
- Uraduct shell, Tekmar or similar cable protection system – a protective shell fixed around the cable. Generally used for short spans at crossings or near offshore structures where the cable exits the seabed before entering the structure. Such systems alone do not typically provide protection from damage due to fishing trawls or anchor drags.

115. Protection systems may be placed alone or in combination with other types and may be secured to the seabed where necessary.

2.1.6.3.7 Unburied Cables

116. An allowance is made for external cable protection where an adequate degree of protection has not been achieved from the burial process. The cable protection is assumed to have an indicative width on the seabed of up to 15.2m for the Offshore Export Cables and Inter-Platform Cables, and 6m for the array cables. A total allowance for both Projects of up to 117.7km is assumed for the export cables, 35.3km for the Inter-Platform Cables and 103.9km for the array cables.

2.1.6.4.7 Cable and Pipeline Crossings

117. A number of cable and pipeline crossings would be required for the Projects. Potential crossings include:

- Shearwater to Bacton gas pipeline (DBS West only);
- Esmond to Bacton gas pipeline (DBS West only);
- Esmond to Forbes gas pipeline (DBS West only);
- Esmond to Gordon gas pipeline (DBS East and DBS West);
- Cygnus to ETS gas pipeline (DBS East only);
- Cavendish gas pipeline (DBS East only);
- Cavendish methanol pipeline (DBS East only);
- Langeled pipeline (Offshore Export Cable Corridor only);
- Northern Endurance CCS pipeline (Offshore Export Cable Corridor only);
- Hornsea Project Four export cable corridor (Up to six cables, Offshore Export Cable Corridor only);
- Third Eastern Link HVDC cable (referred to as TGDC, Offshore Export Cable Corridor only); and
- Fourth Eastern Link HVDC cable (referred to as E4L5, Offshore Export Cable Corridor only).
- National Grid HND Bootstrap (route not yet finalised, potentially within the Array Areas).

118. Additional new third party infrastructure may be installed ahead of DBS, requiring further crossings.

119. **Table 2-13** Below details the maximum estimated cable and pipeline crossing parameters for the Projects Offshore Export Cables, Inter-Platform Cables or Array Cables. All crossings would be designed to allow over trawling by fishing vessels.

Table 2-13 Maximum Estimated Parameters for Cable and Pipeline Crossings

	Offshore Export Cable Crossings	Inter-Platform Cable Crossings	Array Cable Crossings
Maximum estimated width per crossing	15.2m	15.2m	6m
Maximum estimated length per crossing	400m	400m	400m
Maximum estimated height per crossing	1.4m	1.4m	1m

120. Crossings are designed to protect the obstacle being crossed, as well as the Projects cables once they have been installed. Detailed methodologies for the crossing of cables and pipelines would be determined in consultation with the owners of the infrastructure to be crossed. However, a number of techniques may be utilised, including:

- Pre-lay and post lay concrete mattresses;
- Pre-lay and post lay rock placement; and
- Pre-lay cable with Uraduct (or similar) shell structure protection and post-lay rock placement / rock bags.

2.1.6.5.7 Summary of Potential Cable Protection Requirements

121. A summary of all potential cable protection requirements is provided in **Table 2-14**. As noted previously, these figures are lower than that assumed in The Crown Estate's Round 4 Plan Level HRA. A preliminary Cable Burial Risk Assessment is included within **Volume 8, Cable Statement (application ref: 8.20)**.

Table 2-14 Cable Protection Summary

Cables	Maximum estimated number of cable and pipeline crossings	Maximum estimated area of crossing protection (m²)	Maximum estimated area of cable protection for unburied cables (m²)	Total estimated area of crossing and cable protection (m²)
DBS East In Isolation				
Offshore Export Cable Corridor	24	147,133	1,000,282	1,147,415
Inter-Platform Cable	4	24,460	183,312	207,772
Array Cable	15	36,810	312,900	349,710
Total	41	208,403	1,496,494	1,704,897
DBS West In Isolation				
Offshore Export Cable Corridor	24	147,133	788,941	936,074
Inter-Platform Cable	2	12,230	205,504	217,734
Array Cable	25	61,350	310,500	371,850
Total	49	220,713	1,304,945	1,525,658
DBS West and DBS East Sequentially or Concurrently				
Offshore Export Cable Corridor	48	294,267	1,789,222	2,083,489
Inter-Platform Cable	21	128,411	536,484	664,895
Array Cable	40	98,160	623,400	721,560
Total	105	520,838	2,978,199	3,469,944

2.1.6.8 General Maintenance Activities

122. A programme of monitoring and scheduled maintenance would be undertaken through the lifetime of the wind farms to ensure that all offshore infrastructure is maintained in safe working order and to maximise operational efficiency. Operational control of the wind farms would be through a Supervisory Control and Data Acquisition (SCADA) system, which would connect each turbine to the onshore control room. This system would enable the remote control of individual turbines, as well as remote interrogation, information transfer and data storage.

123. Surveys, including geophysical survey (most typically multibeam echosounder and/or side scan sonar) and through the use of remotely operated vehicles, would be performed at regular intervals throughout the operational lifetime of the wind farms. A typical geophysical survey programme for asset integrity purposes does not require a Marine Licence. The work programme would generally focus on areas of primary interest, for example areas of greatest seabed mobility.

124. Typical general maintenance activities include, but are not limited to:

- Wind turbine inspections and service;
- Oil sampling and/or change;
- Uninterruptible power supply (UPS) battery change;
- Service and inspections of wind turbine safety equipment, nacelle crane, service lift, high voltage system, blades;
- Offshore platform inspection/repair;
- Foundation inspection and repair;
- Cable repair and replacement;
- Cable remedial reburial;
- Cable crossing inspection and repair; and
- Unplanned and planned corrective work.

125. Sub-sea cables are designed for the lifetime of the Projects, however reactive repairs, replacements or remedial cable reburial work may be required, which are addressed in sections 2.1.6.10 and 2.1.6.11 below. Major replacements of wind turbine components such as gearboxes may be required during the lifespan of the Projects. Other large components (e.g., wind turbine blades or OCP transformers) are not expected to need replacement frequently during the operational phase, although failure of these components is possible. In the event of major component replacement, a jack-up vessel may be required to operate continuously for significant periods to carry out major maintenance activities of this type. For this purpose, it is assumed that there could be up to 558 jack-up movements over the operational lifespan of DBS East and DBS West combined, or up to 279 jack-up movements over the operational lifespan of DBS East or DBS West In Isolation.

2.1.6.9 Vessel Operations

126. Vessel visits to the wind farms would be required each year to allow for scheduled and unscheduled maintenance activities. **Table 2-15** provides a breakdown of the maximum number of vessels that may be required at any one time per year during normal operation (i.e. excluding unforeseeable serial defects) and the anticipated maximum number of vessel movements per year during operation.

Table 2-15 Anticipated Trips to the Wind Farms During Operations – Peak Vessel Quantities and Annual Vessel Round-Trips

Vessel Type	Indicative peak numbers of vessels required at any one time (DBS East or DBS West)	Indicative peak numbers of vessels required at any one time (both projects)	Indicative annual vessel round trips (DBS East or DBS West)	Indicative annual vessel round trips (both projects)
Jack-Up vessels	2	3	9	16
Service Operations Vessels (SOVs)	2	2	52	104
Accommodation O&M vessels	2	2	52	104

Vessel Type	Indicative peak numbers of vessels required at any one time (DBS East or DBS West)	Indicative peak numbers of vessels required at any one time (both projects)	Indicative annual vessel round trips (DBS East or DBS West)	Indicative annual vessel round trips (both projects)
Small O&M vessel (CTV)	2	2	52	104
Lift vessels	2	2	9	16
Cable maintenance vessels	2	2	1	1
Auxiliary vessels	8	8	64	128
Helicopter	1	1	0.5/month	1/month
Helicopter – turbine transfers[5]	0	0	6	12

2.1.6.10 Cable Repair or Replacement

127. The basic methodology for carrying out a cable repair would involve removal of the damaged or faulty section of the cable, cutting of that section (unless replacing the whole cable), followed by the insertion of a new cable section to be joined to the existing cable. The seabed footprint of cable repair and replacement works is summarised in **Table 2-16** below.

[5] *Helicopter return trips are for emergency situations only, not for general operations.*

128. The section of cable to be repaired would be exposed using techniques such as jetting or mass flow excavation (if buried) and/or removal of any external cable protection. Once the repair is completed, jetting or other suitable methods of trenching would be used to rebury the cable and/or the external cable protection reinstalled. In addition, cable protection may require inspection and maintenance during the operational phase of the Projects. For the longer inter-platform and export cables, an extended cable loop would typically be surface laid onto the seabed close to and to one side of the original cable, prior to the cable being protected as described above. As the original cable would be recovered from the trench prior to cutting, it's possible that the length of cable to be re-buried, and any external cable protection (if required), would be greater than the length of cable repaired.

129. For array cables, the entire length of a cable (between 0.8km and 6km subject to turbine spacing) could require replacement and therefore 6 km has been assumed as the worst case. The methodology for cable replacement would be identical to cable installation, with the addition of the removal of the cable from the turbine/platform structure and seabed before installation of the replacement.

2.1.6.11 Cable Reburial

130. In the event that cables become exposed due to the natural movement of the seabed over the lifetime of the Projects, it may be necessary to undertake remedial reburial work to ensure that the cables are adequately protected, without the need to resort to the use of external cable protection measures. The need for reburial work would be informed by an ongoing programme of geophysical surveys.

131. The seabed footprint of cable reburial works is summarised in **Table 2-16** below.

132. **Volume 8, In Principle Monitoring Plan (application ref: 8.23)** has been submitted with the DCO application which outlines the proposed monitoring, the details of which would be agreed post consent with the relevant Regulators and SNCBs. Post-construction surveys are a condition of the DMLs in the draft DCO.

Table 2-16 Footprint of Potential Cable Re-Burial and Cable Protection Replacement for Both DBS East and DBS West

Parameter	DBS East In Isolation	DBS West In Isolation	DBS East or DBS West Together
Maximum estimated array cable repairs/replacement - lifetime quantity	9	9	17
Maximum estimated inter platform cable repairs/replacement - lifetime quantity	2	2	6
Maximum estimated array cable repairs/replacement - seabed disturbance per event (m^2)	6,000	6,000	6,000
Maximum estimated area Array Area disturbance over Projects operational lifespan (m^2)	66,000	66,000	138,000
Maximum estimated offshore export cable repairs/replacement - lifetime quantity	7	5	12
Maximum estimated offshore export cable repairs/replacement - seabed disturbance per event (m^2)	6,000	6,000	6,000
Maximum estimated area of offshore export cable disturbance over Projects operational lifespan (m^2)	42,000	30,000	72,000
Maximum estimated export cable protection requiring replacement over the Projects' lifespan	2.5km (dependent on survey results)	2.5km (dependent on survey results)	5km (dependent on survey results)

2.1.6.12 O&M Port

133. The maintenance port and facilities would be located on the East coast of the UK, and it is assumed that all direct labour would be resident within the area. It is likely that the existing facilities at the Grimsby Port would be utilised (and expanded where necessary) as the base for operations management of the Projects, as this would yield synergies and enable effective coordination with the existing operations team at the RWE Grimsby Hub.

2.1.7 Repowering

134. Once any potential life extension opportunities have been exhausted (through those maintenance activities described above and as provided for within the DCO), repowering may be considered at or near the end of the design life of the Projects. Repowering could involve the replacement of turbines and/or foundations with those of a different specification or design, for example to enable the installation of more efficient wind turbines.

135. In this event, if the specifications and designs of the new turbines and/or foundations were outside the existing maximum design scenario, or the impacts of constructing, operating, and decommissioning them were to fall outside those considered in this EIA, repowering would require further consent (and EIA) and is therefore outside of the scope of this document. At this time, it is not expected that repowering would require removal of existing or installation of new offshore (or onshore) cables.

2.1.8 Offshore Decommissioning

136. At the end of the operational lifetime of the Projects, it is anticipated that all structures above the seabed or ground level would be completely removed. The decommissioning sequence would generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment. The decommissioning duration of the offshore infrastructure may take the same amount of time as construction of the Projects, up to five years per Project, although this indicative timing may reduce.

137. The Energy Act 2004 requires that, where the Secretary of State issues a notice under Section 105 of that Act, a decommissioning plan must be submitted to and approved by the Secretary of State, a draft of which would be submitted prior to the construction of the Projects. The decommissioning plan and programme would be updated during the Projects' lifespan in accordance with requirements.

138. To take account of changing best practice and new technologies, the approach and methodologies employed at decommissioning would be cognisant of the legislation and policy requirements at the time of decommissioning.

2.1.8.1 Wind Turbines and Platforms

139. Wind turbines would be removed by reversing the methods used to install them. Piled foundations would likely be cut approximately 1m below the seabed, with due consideration made of likely changes in seabed level and removed. This could be achieved by inserting a pile cutting device. Once the piles are cut, the foundations could be lifted and removed from the site.

140. At this point in time, it is not thought to be reasonably practicable or environmentally prudent to remove entire piles from the seabed, however, the Applicants would track the development of technology to enable this and would consider such decommissioning methodologies at the time of decommissioning.

141. The offshore platforms would most likely be a reverse installation where the decommissioning would be in two phases, in the first phase the topside would be lifted from the foundation to a transport vessel/barge and sailed to a suitable harbour for decommissioning. In the second phase the foundation would be decommissioned; piled foundations would be decommissioned as described above.

2.1.8.2 Offshore Cables

142. It is expected that most array and export cables (and any associated cable protection) would be left in situ. Exposed sections of cable are more likely to be cut and removed to ensure they don't become hazards to other users of the seabed. At this point in time, it cannot be accurately determined whether and which cables would be exposed at the time of decommissioning.

143. In the event that cables are removed, it is likely that equipment similar to that which is used to install the cables could be used to reverse the burial process and expose them. Therefore, the area of seabed impacted during the removal of the cables could be the same as the area impacted during the installation of the cables. Divers and/or ROVs may be used to support the cable removal vessels.

144. Once the cables are exposed, a grapnel would be used to pull the cables onto the decks of cable removal vessels. The cables would be cut into manageable lengths and returned to shore. Once onshore, it is likely that the cables would be deconstructed to recover and recycle the copper and/or aluminium and steel within them.

3 Habitats Regulations Process

3.1 Legislative Context

145. The Conservation of Habitats and Species Regulations 2017 (2017 No. 1012) and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (2017 No. 1013) are the principal pieces of secondary legislation which transposed the terrestrial and offshore marine aspects of the EU Habitats Directive (Council Directive 92/43/EEC) and certain elements of the EU Wild Birds Directive (Directive 2009/147/EC) into the domestic law. Together, these regulations are collectively known as the "Habitats Regulations". The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019 No. 579) set out the changes that apply now that the UK has left the European Union. These confirmed that:

- All protected sites and species retain the same level of protection.
- Among other things, the requirement for HRA to be undertaken continues to apply.

146. Unless the UK government implements further legislative changes, the obligations, process and terminology of the Habitats Regulations will, for the purposes of this report, remain as set out in existing legislation and regulations. The role of the European Commission is now taken by UK Ministers.

3.1.1 National Site Network Sites (Post EU Exit)

147. The Europe-wide network of nature conservation areas that are the subject of the HRA process was established under the Habitats Directive. The Habitats Directive establishes a network of internationally important sites, designated for their ecological status. For EU member states (and traditionally for the UK), SACs are designated under the Habitats Directive and promote the protection of flora, fauna and habitats. SPAs are designated under the Birds Directive to protect rare, vulnerable and migratory birds. European sites located within an EU Member State combine to create a Europe-wide network of designated sites (the Natura 2000 network) and may be referred to as Natura 2000 Sites.

148. Following the UK's exit from the EU, European sites located within the UK are no longer part of the Natura 2000 network (nor Natura Sites) but instead combine to form the UK's "National Site Network". Hereafter, sites within the UK and the EU are both referred to as National Site Network sites. The National Site Network comprises of European sites in the UK that already existed (i.e., were established under the Nature Directives) on 31 December 2020 (or proposed to the EC before that date) and any new sites designated under the Habitats Regulations under an amended designation process.

149. Note that Ramsar sites are not included within the National Site Network but are still included within the HRA as they remain protected in the same way as SACs and SPAs.

3.2 The HRA Process

150. The HRA process consists of up to three stages that are described in more detail below. For all plans and projects which are not wholly directly connected with, or necessary to the conservation management of a site's qualifying features, this will include formal screening for any LSE either alone or in-combination with other plans or projects. The following is based on the most recent guidance provided by the Department for Environment, Food & Rural Affairs (Defra, 2021).

151. It should be noted that The Crown Estate has conducted a plan-level HRA for all offshore wind sites granted Agreements for Lease in the recent Round 4 leasing round. Within this process two European sites have been assessed as requiring derogation as the effects on their features will lead to an adverse effect on integrity of the sites, these sites are the Dogger Bank SAC and the Flamborough and Filey Coast SPA. This assessment builds upon the plan level HRA, but only considering the Projects and any relevant in-combination schemes.

3.2.1 Stage 1 – Screening

152. For all plans and projects which are not wholly, directly connected with or necessary to the conservation management of a site's qualifying features (such as the proposed Projects), Stage 1 Screening is required, as a minimum.

153. In Stage 1, European sites are screened for LSE (either alone or in combination with other plans or projects). Where it can be determined that there is no potential for LSE to occur to qualifying features of a site, that site is sought to be 'screened out'. It is important to note that the burden of evidence is to show, on the basis of objective information, that there will be no LSE; if the effect may cause LSE, or is not known, this would trigger the need for an Appropriate Assessment (AA).

154. In accordance with the 2018 European Court of Justice ruling in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17), mitigation, including embedded mitigation, has not been taken into account in State 1 Screening.

155. The classes of designations considered within this HRA Screening are:

- SPAs (some of which are also Ramsar sites);
- pSPA - SPAs that are approved by the UK Government but are still in the process of being classified;
- SACs;
- pSACs - A site which has been identified and approved to go out to formal consultation;
- cSACs - Following consultation on the pSAC, the site is submitted to the European Commission (EC) for designation and at this stage it is called a cSAC; and
- SCI - Once the EC approves the site it becomes a SCI, before the national government then designates it as a SAC.

156. Please note that any remaining cSACs and SCIs within the UK are sites that were adopted by the European Commission before the end of the Transition Period following the UK's exit from the EU.

157. Consideration is also given to effects on Ramsar sites. Ramsar sites protect wetland areas and extend only to "*areas of marine water the depth of which at low tide does not exceed six metres*".

158. The HRA Screening Report produced for the Projects (**Volume 6, Appendix - A, application ref: 6.1.1**) is included as an appendix to this report.

3.2.2 Stage 2 – Appropriate Assessment

159. The purpose of the HRA process is to identify where potential LSE may occur and to provide information to the competent authority so that they can determine whether LSE is expected to occur, through an Appropriate Assessment.

160. For those sites where LSE cannot be excluded in Stage 1, further information to inform the assessment is prepared. The assessment will determine whether a project alone or in-combination could adversely affect the integrity of the habitats site in view of its conservation objectives. The assessment and conclusions of this stage will be reported in the form of a RIAA (this report).

161. Where the appropriate assessment identifies the potential for an adverse effect on the integrity of a designated site (or cannot rule one out), the assessment will proceed to Stage 3.

3.2.3 Stage 3 – HRA Derogation

162. In cases where the competent authority concludes in the AA that an adverse effect on the integrity (AEoI) of a European Site cannot be ruled out beyond reasonable scientific doubt, consent should not be granted unless the project satisfies each of the following tests:

- There are no feasible alternative solutions that would be less damaging or avoid damage to the site;
- The proposal needs to be carried out for imperative reasons of overriding public interest; and
- The necessary compensatory measures can be secured.

163. If it is concluded that there are no alternative solutions, then the HRA will proceed to Stage 4.

3.2.4 Stage 4 – Assessment of Imperative Reasons of Overriding Public Interest (IROPI)

164. If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a case will be prepared that the scheme should be carried out for IROPI. The IROPI justification must relate to either:

- human health, public safety or beneficial consequences of primary importance to the environment; or
- having due regard to any opinion from the appropriate authority, any other imperative reasons of overriding public interest.

165. If the conclusion of Stages 3 and 4 is that there is no alternative and that the project has demonstrated IROPI, then the project may proceed subject to a requirement that the appropriate authority must secure that any compensatory measures are taken to ensure that the overall coherence of the National Site Network is protected.

3.2.5 Compensatory Measures

166. If HRA Stage 2 identifies an adverse effect on the integrity of a designated site, an assessment of necessary compensatory measures to ensure that the overall coherence of the National Site Network is secured must also be included in the HRA Report. Compensatory measures should be determined through consultation with the relevant stakeholders, including SNCBs and landowners.

167. The Applicants' RIAA has concluded that, with respect to sandbanks which are slightly covered by sea water all the time (Dogger Bank SAC), breeding guillemot and breeding kittiwake (Flamborough and Filey Coast SPA), an adverse effect on integrity cannot be ruled out when considered in-combination with other offshore wind farms (or for the Projects alone with regards to sandbanks). As such, the Applicants have provided compensatory measures as part of the consent application to compensate for the predicted impacts from the Projects. Further details are provided in **Volume 6, Habitats Regulations Derogation: Provision of Evidence (application ref: 6.2), Volume 6, Project Level Kittiwake Compensation Plan (application ref: 6.2.1), Volume 6, Guillemot and Razorbill Compensation Plan (application ref: 6.2.2)** and **Volume 6, Project Level Dogger Bank Compensation Plan (application ref: 6.2.3).**

168. With regards to breeding razorbill and the Flamborough and Filey Coast SPA, the Applicant's appropriate assessment has concluded that there will be no adverse effect on integrity, either from the Projects alone, or in-combination with other offshore wind farms. In the event that the SoS is unable to reach a conclusion of no adverse effect on integrity with respect to razorbill, the Applicants have developed without prejudice compensatory measures that could be applied to provide compensation for the predicted impacts. See **Volume 6, Habitats Regulations Derogation: Provision of Evidence (application ref: 6.2)** and **Volume 6, Guillemot and Razorbill Compensation Plan (application ref: 6.2.2)** for further information.

4 Stage 1 Screening Conclusions

4.1 Sites Designated for Terrestrial Ecology

169. The HRA screening exercise **(Volume 6, Appendix A (application ref: 6.1.1))** considered sites which met the following criteria:

- A component of the Projects directly overlaps a site whose qualifying features include a habitat; and / or
- The distance between the Projects and the offshore habitat qualifying feature is within the range for which there could be an interaction (i.e. within a ZOI for a physical process change resulting from the Projects).

170. The outcome of the screening exercise (and subsequent consultation) concluded that the following sites should be screened in for further assessment (see **Figure 4-1**):

- Humber Estuary SPA.

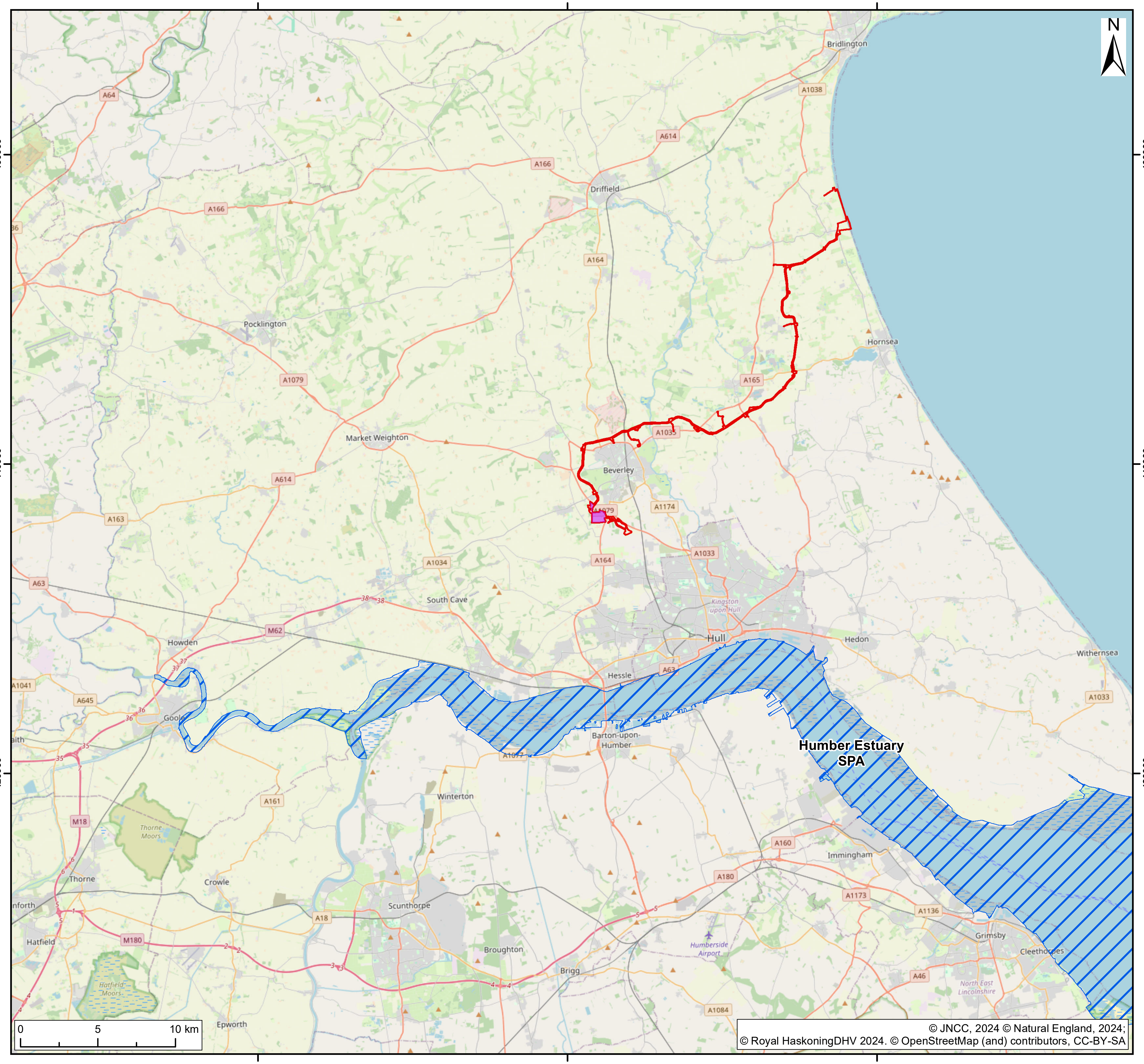
171. Sites screened out of the need for an Appropriate Assessment, due to the conclusion of no LSE, are listed in **Volume 6, Appendix A (application ref: 6.1.1)**.

4.1.1 Potential Effects Screened In

172. The potential effects during the construction, operation and maintenance and decommissioning phases are summarised in **Table 4-1**.

Table 4-1 Summary of Potential Effects to Terrestrial Ecology Sites Screened Into the RIAA

Potential Effect	Construction	Operation & Maintenance	Decommissioning
Permanent and temporary loss of habitats	✓	✓	✓
Temporary habitat fragmentation and species isolation	✓	✓	✓
Impacts on protected species or on their resting or breeding sites	✓	✓	✓
Disturbance of bird populations	✓	✓	✓
Spread of non-native invasive species	✓	✓	✓



Legend:

- Onshore Development Area
- Substation Zone
- Special Protection Areas (SPA)

S3	P01	07/05/2024	Suitable for Review & Comment	JH	SB	CC
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Terrestrial Ecological Sites Screened
In for Further Assessment

Figure: 4-1 | Drawing No: PC2340-RHD-ON-ZZ-DR-Z-0857

Co-ordinate system: British National Grid | Page Size: A3 | Scale: 1:250,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms: HRA Screening

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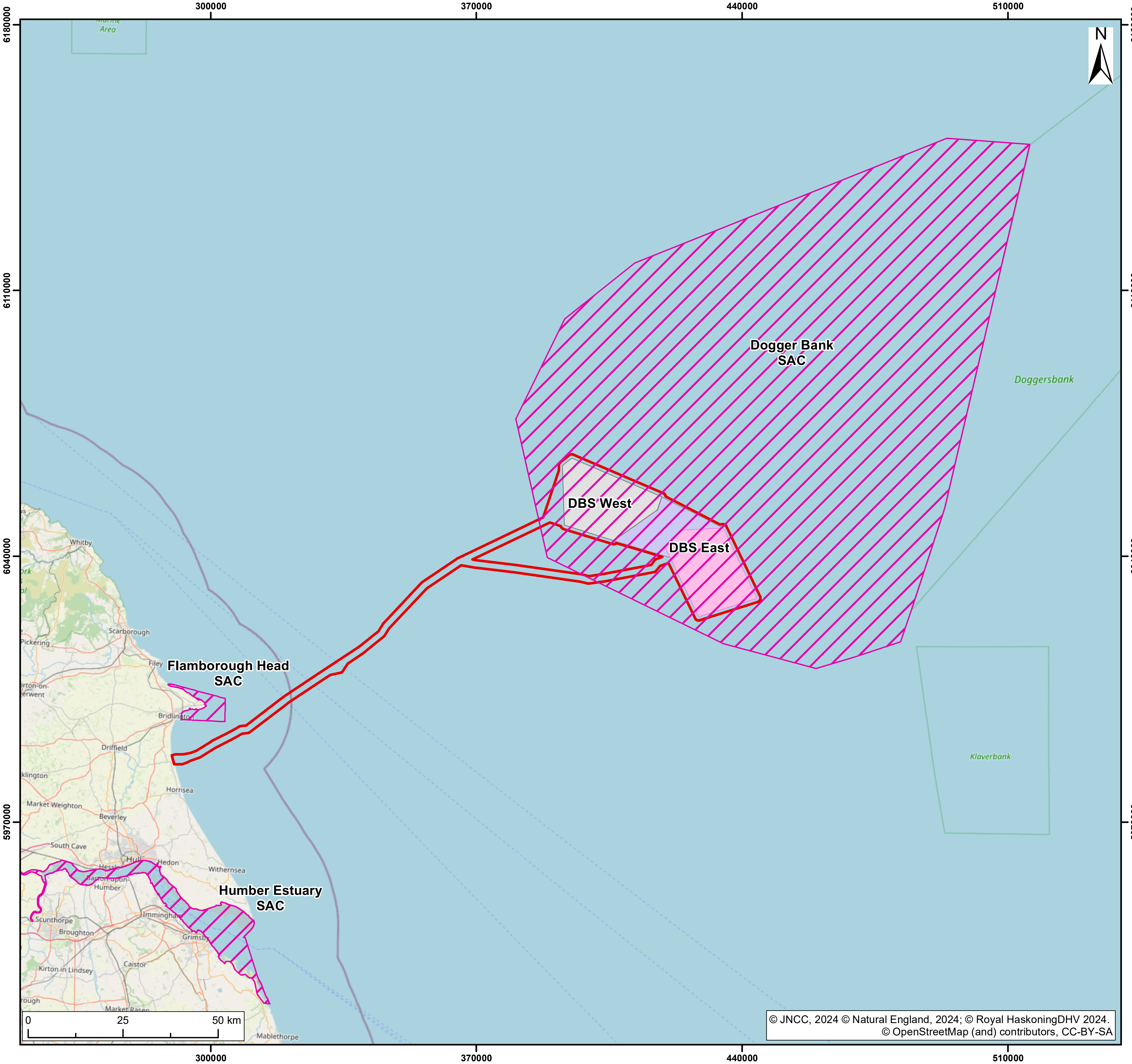

Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Inter-platform Cable Corridor
- Special Area of Conservation (SAC)

S3	P01	07/05/2024	Suitable for Review & Comment	JH	SB	CC
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Offshore Annex I Habitats Screened In for Further Assessment

Figure: 4-2

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0858

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,000,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms: HRA Screening

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4.2 Sites Designated For Offshore Annex I Habitats

173. The HRA screening exercise **(Volume 6, Appendix A (application ref: 6.1.1))** considered sites which met the following criteria:

- A component of the Projects directly overlaps a site whose qualifying features include a habitat; and / or
- The distance between the Projects and the offshore habitat qualifying feature is within the range for which there could be an interaction (i.e. within a ZOI for a physical process change resulting from the Projects).

174. The outcome of the screening exercise (and subsequent consultation) concluded that the following sites should be screened in for further assessment (see **Figure 4-2**):

- Dogger Bank SAC;
- Flamborough Head SAC; and
- Humber Estuary SAC.

175. Sites screened out of the need for an Appropriate Assessment, due to the conclusion of no LSE, are listed in **Volume 6, Appendix A (application ref: 6.1.1)**.

4.2.1 Potential Effects Screened In

176. The potential effects during the construction, operation and maintenance and decommissioning phases are summarised in **Table 4-2**.

Table 4-2 Summary of Potential Effects to Offshore Annex I Habitats Screened Into the RIAA

Potential Effect	Construction	Operation and Maintenance	Decommissioning
Abrasion / disturbance of the substrate on the surface of the seabed	✓	✓	✓
Penetration and / or disturbance of the substratum below the surface of the seabed, including abrasion	✓	x	✓
Habitat structure changes – removal of substratum (extraction)	✓	x	x

Potential Effect	Construction	Operation and Maintenance	Decommissioning
Changes in suspended solids (water clarity)	✓	✓	✓
Smothering and siltation rate changes (Heavy)	✓	✓	✓
Smothering and siltation rate changes (Light)	✓	✓	✓
Electromagnetic changes	×	✓	×
Hydrocarbon & Polyaromatic Hydrocarbon (PAH) contamination	✓	✓	✓
Introduction or spread of invasive non-indigenous species (INIS)	✓	✓	✓
Physical change (to another seabed type)	✓	✓	✓
Physical change (to another sediment type)	✓	✓	✓
Synthetic compound contaminant (including pesticides, antifoulants, pharmaceuticals)	x	✓	x
Transition elements & organo-metal (e.g. TBT) contamination	✓	✓	✓

4.3 Sites Designated For Annex II Migratory Fish

177. The HRA screening exercise **(Volume 6, Appendix A (application ref: 6.1.1))** considered sites which met the following criteria:

- A component of the Projects directly overlaps a site whose qualifying features include a habitat; and / or
- The distance between the Projects and the offshore habitat qualifying feature is within the range for which there could be an interaction (i.e. within a ZOI for a physical process change resulting from the Projects).

178. The outcome of the screening exercise (and subsequent consultation) concluded that the following sites should be screened in for further assessment (see **Figure 4-3**):

- River Derwent SAC; and
- Humber Estuary SAC.

179. Sites screened out of the need for an Appropriate Assessment, due to the conclusion of no LSE, are listed in **Volume 6, Appendix A (application ref: 6.1.1)**.

4.3.1 Potential Effects Screened In

180. The potential effects during the construction, operation and maintenance and decommissioning phases are summarised in **Table 4-3**.

Table 4-3 Summary of Potential Effects to Annex II Migratory Fish Screened Into the RIAA

Potential Effect	Construction	Operation and Maintenance	Decommissioning
Underwater noise and vibration impacts due to UXO clearance	✓	x	x

4.4 Sites Designated For Annex II Marine Mammals

181. For marine mammals, the approach to the RIAA primarily focuses on the potential for connectivity between individual marine mammals from designated populations and the Projects (i.e. demonstration of a clear source-pathway-receptor relationship). This is based on the distance of the Offshore Development Area from a European site, the range of each effect and the potential for animals from a European site to be within range of that effect. Therefore, the following is determined:

- The distance between the potential effect of the Array Areas, Offshore Development Area, and European sites with marine mammals as a qualifying feature within the range for which there could be an interaction (e.g. the pathway is not too long for significant noise propagation and therefore the site is within the area of effect for underwater noise effects).
- The distance between the Offshore Development Area and resources on which the qualifying marine mammal feature depends, such as key habitats or areas of prey species is within the potential area of effect.

There is the potential for an indirect effect acting through prey or access to habitat.

- The likelihood that a foraging area or a migratory route occurs within any area of effect of the Offshore Development Area. This applies to mobile qualifying features when outside of a European site.

182. The approach to screening for seal species was undertaken based on the identified connectivity with SACs through tagging studies, and those SACs that are within the Management Units (MUs) with identified connectivity for seal species.

183. **Table 4-4** and **Figure 4-4** show the European sites and qualifying features that have been screened for likely significant effects (LSE). All other European sites designated for Annex I marine mammal species are screened out on the basis of no potential for LSE/ For further information on rationale, see **Volume 6, Appendix A (application ref: 6.1.1)**.

Table 4-4 Summary of marine mammal SAC's and features screened in

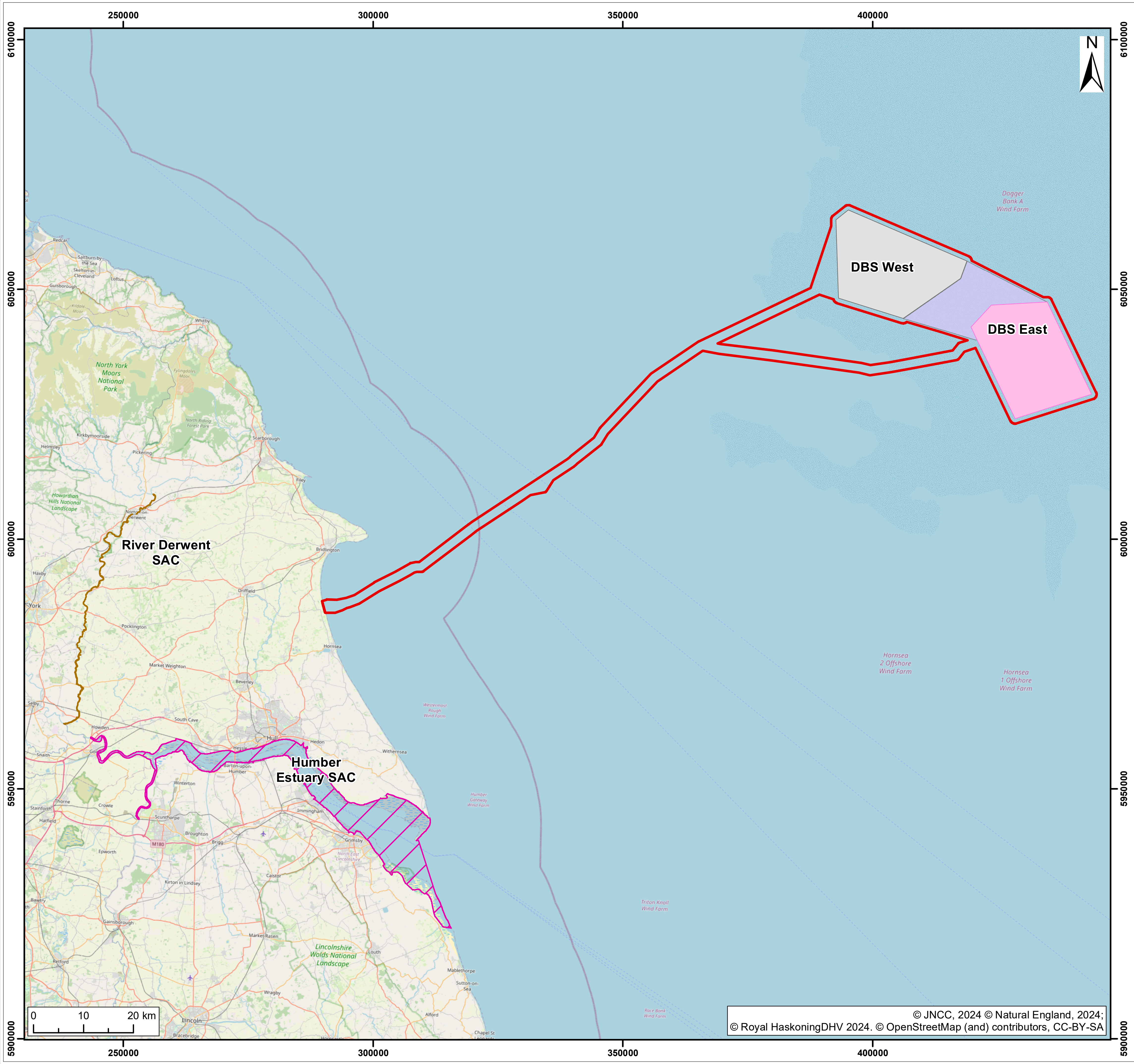
Site	Qualifying features screened in
Southern North Sea SAC	Harbour porpoise, *Phocoena phocoena*
Humber Estuary SAC	Grey seal, *Halichoerus grypus*
The Wash and North Norfolk Coast SAC	Harbour seal, *Phoca vitulina*
Berwickshire and North Northumberland Coast SAC	Grey seal
Moray Firth SAC	Bottlenose dolphin, *Tursiops truncatus*
Doggersbank SAC	Harbour porpoise Grey seal Harbour seal
Klaverbank SAC	Harbour porpoise Harbour seal

4.4.1 Potential Effects Screened In

184. The potential effects during the construction, operation and maintenance and decommissioning phases are outlined below, and summarised in **Table 4-5**.

Table 4-5 Summary of Potential Effects to Marine Mammals Screened Into the RIAA

Potential Effects	Construction	Operation & Maintenance	Decommissioning
Physical or auditory injury resulting from underwater noise	✓	✓	✓
Behavioural impacts resulting from underwater noise	✓	✓	✓
Disturbance from vessels due to presence and underwater noise	✓	✓	✓
Barrier effects from underwater noise	✓	✓	✓
Vessel interaction (increase in risk of collision)	✓	✓	✓
Disturbance at seal haul-out sites	✓	✓	✓
Disturbance to seals foraging at sea	✓	✓	✓
Barrier effects due to the physical presence of offshore infrastructure	x	✓	x
Changes in water quality	x	x	x
Changes to prey availability	✓	✓	✓
EMF (direct effects)	x	x	x



Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Inter-platform Cable Corridor
- Humber Estuary Special Area of Conservation (SAC)
- River Derwent Special Area of Conservation (SAC)

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S3	P01	16/04/2024	Suitable for Review & Comment	JH	SB	CC

Title:

Sites Designated for Annex II Migratory Fish Screened In for Further Assessment

Figure: 4-3 | Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0859

Co-ordinate system: WGS 1984 UTM Zone 31N | Page Size: A3 | Scale: 1:750,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms: HRA Screening

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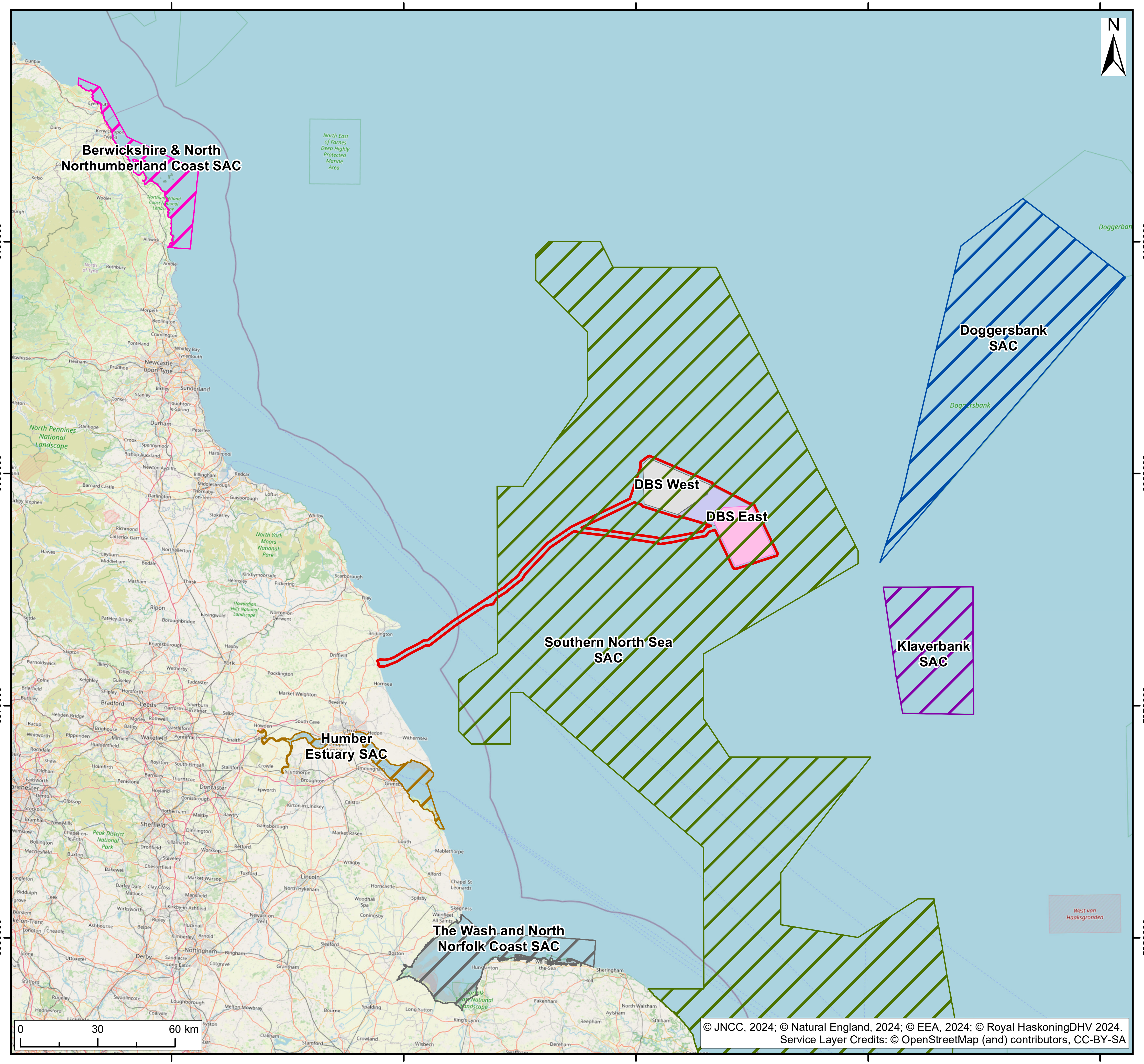

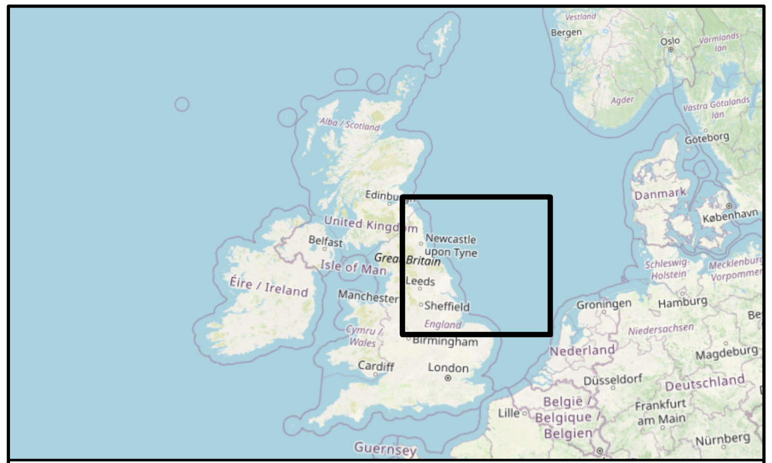

Legend:

- Offshore Development Area
- DBS East Array Area
- DBS West Array Area
- Inter-platform Cable Corridor
- Humber Estuary Special Area of Conservation (SAC)
- Southern North Sea Special Area of Conservation (SAC)
- Doggersbank Special Area of Conservation (SAC)
- Klaverbank Special Area of Conservation (SAC)
- Berwickshire and North Northumberland Coast SAC
- The Wash and North Norfolk Coast SAC

S3	P01	22/04/2024	Suitable for Review & Comment	JH	SB	CC
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:

Marine Mammal Designated Sites
In Relation to the Projects

Figure: 4-4a | Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0860

Co-ordinate system: WGS 1984 UTM Zone 31N | Page Size: A3 | Scale: 1:1,500,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms: HRA Screening

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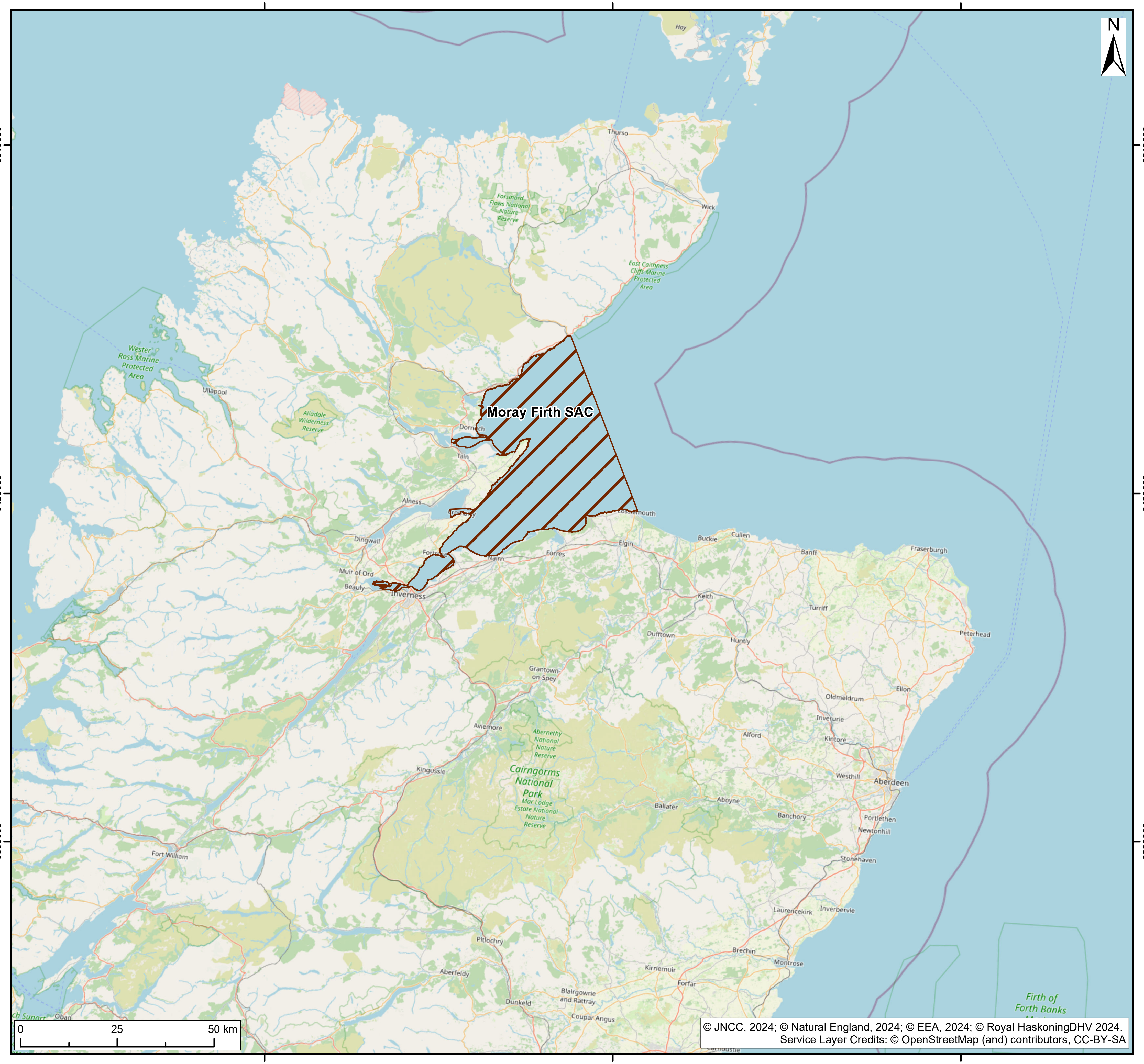

Legend:

Moray Firth SAC

SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR
S3	P01	22/04/2024	Suitable for Review & Comment	JH	SB	CC

Title:

Marine Mammal Designated Sites
In Relation to the Projects

Figure: 4-4b

Drawing No: PC2340-RHD-OF-ZZ-DR-Z-0860

Co-ordinate system: WGS 1984 UTM Zone 31N

Page Size: A3

Scale: 1:1,000,000

Project: Dogger Bank South Offshore Wind Farms

Report: Dogger Bank South Offshore Wind Farms: HRA Screening

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4.5 Sites Designated for Marine Ornithological Features

185. Stage 1 of the HRA LSE screening assessment initially identified a long list of SPAs and Ramsar sites with relevant offshore ornithological features based on potential theoretical connectivity to the Projects (**Volume 6, Appendix A (application ref: 6.1.1**)). However, since the initial HRA screening exercise was provided to stakeholders in November 2022, the Stage 2 screening outcomes have been revised to reflect comments from Natural England (**Table 9-1**), alterations to the Offshore Development Area and also to take into account the completion of the baseline aerial survey dataset (March 2021 to February 2023). This has resulted in a number of changes to the original screening conclusions (refer to section 4.5.4).

186. Sites which either overlap with the Projects' elements, or are within range of relevant species' foraging ranges during the breeding season or for which there is a reasonable likelihood of non-breeding season connectivity have been screened in.

187. No SPA or Ramsar sites designated for bird features physically overlap the array areas of the Projects. The offshore export cable corridor has a very small amount of overlap with the northern most end of the Greater Wash SPA.

188. A summary of the screening criteria utilised to identify theoretical connectivity between SPAs and Ramsar Sites with relevant ornithology features and the offshore Project is outlined below.

4.5.1 Features screened in for assessment

189. Birds present in offshore waters and potentially affected by the Projects are predominantly seabirds (defined for this report as auks, gulls, and gannets). These species have the potential to be present during the breeding season, non-breeding season and the spring / autumn migration/passage periods. Other bird species that may be affected by the Projects include waterfowl (divers, swans, geese, ducks and waders) and other bird species which may fly through the Array Areas during spring and/or autumn migration/passage periods.

190. Ornithology features with potential connectivity with the Projects were categorised as:

- Breeding seabirds;
- Non-breeding seabirds (including non-breeding seabirds that are qualifying features of SPAs in their own right, as well as those which are features of breeding seabird colony SPAs, but potentially present during the non-breeding season); and

- Migratory terrestrial birds (including non-breeding water birds).

4.5.1.1 Breeding seabird features

191. To determine which SPA or Ramsar sites with breeding qualifying features have theoretical connectivity with the Projects during the breeding season, the mean of the maximum foraging range (km) + one standard deviation of the mean (1SD hereafter) was used to assess overlap with the Projects. Foraging range data for each species was taken from Woodward et al. (2019).

4.5.1.2 Non-breeding and migratory seabird features

192. Outside the breeding season, seabirds breeding at SPAs located beyond the breeding season foraging range of the Projects may spend part or all of the nonbreeding season in the vicinity of the Projects, either wintering or migrating through on spring and/or autumn passage between their colony and wintering areas.

193. To determine which SPA or Ramsar sites have theoretical connectivity with the Projects during the non-breeding season, the Biologically Defined Minimum Population Scales (BDMPS) Report (Furness, 2015) was used to assess seabird dispersal or migration patterns during the non-breeding season.

4.5.1.3 Migratory terrestrial birds (including non-breeding waterbirds):

194. To determine which SPA or Ramsar sites with terrestrial bird qualifying bird features (including non-breeding water birds) have theoretical connectivity with the offshore Projects during the non-breeding season, information on migration routes, principally Wright et al. (2012), but also Wernham et al. (2002), Brown and Grice (2005) and Furness (2015) was used to inform the assessment. A limit of 100km was considered to represent a reasonable cut off point. The probability that individuals from a particular SPA or Ramsar site located in excess of 100km from the Projects could be present in sufficient numbers to result in an LSE is considered to be highly remote.

195. Beyond 100km, only SPAs on the east coast of Britain which are classified for breeding seabirds were considered for migratory birds during the non-breeding season. This is because seabirds are the key species which may be subject to effects from OWFs. This approach was informed by the HRA screening reports for OWFs most recently submitted to PINS for DCO (e.g. Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions (Equinor, 2022)).

4.5.2 Pathways for LSE screened in

196. For all sites identified as having theoretical connectivity with the Projects, the second step of the screening exercise was to determine whether there may be a potential pathway for LSE, and hence a requirement for Appropriate Assessment. Assessment for LSE was informed by species impact pathways, results of site characterisation surveys and species sensitivity to impacts.

197. The impact pathways that could not be ruled out for SPA and Ramsar site qualifying features with theoretical connectivity to the Projects are presented in **Table 4-6**. These pathways may occur during the construction, operation and maintenance, and decommissioning phases of the Projects.

Table 4-6 Impact pathways screened into the RIAA for offshore ornithology.

Potential Pathway	Construction	Operation & Maintenance	Decommissioning
Disturbance and/or Displacement effects	✓	✓	✓
Indirect impacts through effects on habitats and/or prey species	✓	✓	✓
Collision Risk	x	✓	x
Barrier Effects	x	✓	x

4.5.2.1 Construction and decommissioning: disturbance / displacement

198. During the construction phase of the Projects there is the potential to affect bird populations in the marine environment through disturbance due to construction activity itself, resulting in the risk of displacement of birds from construction sites. This would effectively result in temporary habitat loss through reduction in the area available for feeding, loafing and moulting. In addition, a small amount of habitat may be disturbed, however this will be extremely limited in scale compared to the wide areas in which seabirds are able to forage. Disturbance during construction may also occur due to underwater noise propagation and increased vessel activity. These activities have the potential to disturb and displace birds from within and around the offshore elements of the Projects, including the array areas and the subsea cables. The level of potential disturbance at each work location will vary depending on the activities taking place.

199. Bird species most likely to be vulnerable to underwater noise are those that forage by diving after fish or shellfish, and include auks, divers and seaduck. Gull and tern species feed at the surface only and are considered the least vulnerable, with no apparent responses to piling activity recorded at Egmond aan Zee (Leopold and Camphuysen 2007).

200. Sites designated for wildfowl and waders that are more than 100km beyond the boundary of the Projects are not considered vulnerable to disturbance during construction.

4.5.2.2 Construction and decommissioning: indirect effects

201. Indirect disturbance and displacement of birds may occur during the construction phase if there are effects on prey species and/or the habitats of prey species. These indirect effects include those resulting from the production of underwater noise (e.g. during piling) and the generation of suspended sediments (e.g. during preparation of the seabed for foundations) that may alter the behaviour or availability of bird prey species. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms result in less prey being available within the construction area to foraging seabirds.

202. During the non-breeding season seabirds typically have much wider areas available for foraging and therefore the potential consequences of displacement are likely to be much lower. Seabirds which feed on widely occurring fish species will also be able to relocate to other suitable foraging areas within their normal range of distribution at this time.

203. Sites designated for wildfowl and waders that are more than 100km beyond the boundary of the Projects are not considered vulnerable to indirect effects during construction.

4.5.2.3 Operation: disturbance / displacement

204. The presence of wind turbines has the potential to directly disturb and displace birds from within and around the array areas. This is assessed as an indirect habitat loss, as it has the potential to reduce the area available to birds for feeding, loafing and moulting. Vessel activity and the lighting of wind turbines and associated ancillary structures could also attract (or repel) certain species of birds and affect migratory behaviour on a local scale. As offshore wind farms are a relatively new feature in the marine environment, there is limited evidence as to the disturbance and displacement effects of the operational infrastructure on birds in the long term.

205. Seabird species vary in their reactions to the presence of operational infrastructure (e.g. wind turbines, and offshore substation platforms) and to the maintenance activities that are associated with it (particularly ship and helicopter traffic), with Garthe and Hüppop (2004) presenting a scoring system for such disturbance factors, which is used widely in offshore wind farm EIAs. Some species avoid offshore wind farms immediately post-construction and return to the area after a period of time and other species show little or no evidence of returning to the wind farm area post-construction. The likely scale of displacement effects varies by species, therefore, depending on their sensitivity (Langston, 2010) and the density within the offshore wind farm (and adjoining) areas.

206. The implications for birds displaced from wind farms will also vary depending on the availability of other habitats which can support those birds. Quantifying the risk to birds requires, therefore, predictions based on modelling which takes into account these variables. Typically, this involves estimating the proportion of birds present that are likely to be displaced and then the proportion of those birds that are displaced that will be unable to successfully relocate (leading to death or emigration). It also requires separating out the risk to birds that are associated with those populations that form SPA qualifying features from other populations that are not SPA qualifying features (as the birds recorded at a wind farm site are likely a mixture of both).

207. Seabirds are considered to be most at risk from operational disturbance and displacement effects when they are resident (e.g. during the breeding season or non-breeding season). The small risk of effect to migrating birds is better considered in terms of barrier effects.

208. Sites designated for wildfowl and waders that are more than 100km beyond the boundary of the Projects are not considered vulnerable to disturbance during operation.

4.5.2.4 Operation: collision risk

209. There is a potential risk of collision with the wind turbine rotors and associated infrastructure resulting in injury or fatality to birds which fly through the array areas whilst foraging for food and commuting between breeding sites and foraging areas.

210. The risk of collision with wind turbine generators depends on a number of variables, such as species-specific avoidance rates, flight heights, speed of flight, frequency of movements in or near to the turbines as well as the size and location of the turbines themselves. Quantifying the collision risk to birds is based on modelling which takes into account these variables. It also requires separating out the risk to birds that are associated with those populations that form SPA qualifying features from other populations that are not SPA features (as the birds recorded at a wind farm site are likely a mixture of both).

211. Seabirds are considered to be at risk of collisions during the breeding and non-breeding seasons. For sites designated for wildfowl and waders that are outside of the boundary of the Projects' Offshore Development Area, the risk of collision refers to biannual migratory movements only.

212. Species for which there were predicted to be fewer than 5 collisions per year before apportioning among candidate SPAs have been screened out on the basis that an LSE can be ruled out. For this reason, lesser black-back gull (1.2 annual collisions) and herring gull (2.2 annual collisions) have been screened out of the assessment (**Table 9-1**).

4.5.2.5 Operation: barrier effects

213. The presence of the Projects could potentially create a barrier to bird migration and foraging routes, and as a consequence, the Projects have the potential to result in long-term changes to bird movements. It has been shown that some species (divers and scoters) avoid wind farms by making detours around wind turbine arrays which potentially increases their energy expenditure (Petersen et al., 2006; Petersen and Fox, 2007), which under some circumstances could potentially decrease survival rates. Such effects may have a greater effect on birds that regularly commute around a wind farm (e.g. birds heading to / from foraging grounds and roosting / nesting sites) than on migrants that would only have to negotiate around a wind farm once per migratory period, or twice per annum, if flying the same return route (Speakman et al., 2009).

214. During the spring and autumn migration periods, the route taken by migrating individuals may change due to the barrier effect created by the wind turbines. Although migrating birds may have to increase their energy expenditure to circumvent the array areas at a time when their energy budgets are typically restricted, this effect is likely to be small for one-off avoidances. Masden et al. (2010, 2012) and Speakman et al. (2009) calculated that the costs of such avoidance during migration were small, accounting for less than 2% of available fat reserves.

215. Several species of seabirds could be susceptible to a barrier effect, outside of passage movements, if the presence of wind turbines prevented access to foraging grounds or made the journey to or from foraging grounds more energetically expensive, particularly during the breeding season. d

216. Barrier effects are not considered relevant to features affected by the offshore export cable corridor only.

4.5.3 Transboundary sites

4.5.3.1 Breeding seabirds

217. The potential for connectivity between the Projects and transboundary sites (non-UK SPAs in the North Sea) was considered in the HRA screening assessment **(Volume 6, Appendix A (application ref: 6.1.1)).**

218. Impacts on breeding seabird populations in The Netherlands, Germany, Belgium and France can be screened out due to the distance of colonies in those countries from the Projects, which, with two exceptions discussed in the next paragraph for gannet, exceeds the screening foraging ranges (mean max. +1 s.d., Woodward et al., 2019) of key breeding seabirds assessed in this RIAA.

219. There are two gannet colonies, Seevogelschutzgebiet Helgoland SPA (Germany) and Littoral Seino-Marin SPA (France), located within the reported maximum connectivity range for gannet (315±194km, Woodward et al., 2019) from the Projects. However, tracking studies of breeding adults at each of these colonies show that birds from those colonies do not travel as far as the Dogger Bank but forage relatively close to their breeding colonies (Stefan Garthe, pers. comm., Wakefield et al. 2013). Therefore, no trans-boundary issues for breeding seabirds are screened into this assessment.

4.5.3.2 Non-breeding seabirds

220. Recent offshore wind farm applications (e.g. Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions (Equinor, 2022) and Hornsea Project Four offshore wind farm (Orsted, 2022) have considered a number of non-UK SPAs in the North Sea during HRA screening for impacts on non-breeding and migrating seabirds including: Littoral Seino-Marin SPA (France), Baie de Seine Occidentale SPA (France), Baie de Seine Occidentale SPA (France) and Seevogelschutzgebiet Helgoland SPA (Germany). However, in these previous assessments no transboundary SPAs were screened in for LSE either for the project alone or in-combination effects.

221. Given that the proportions of seabirds from non-UK SPAs which could migrate through the Projects outside the breeding season are expected to be small, particularly when considered within the wider BDMPS populations (Furness, 2015), and that the wind farms highlighted above (Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions) are located closer to these non-UK SPAs than the Projects, it is considered appropriate to screen out these transboundary sites from the RIAA.

222. The Netherlands Ministry of Infrastructure and the Environment has previously raised concerns that offshore wind farms proposed in the southern North Sea could have effects on the seabirds of Bruine Bank (Brown Ridge) pSPA. The non-breeding seabirds that are the interest feature of the Bruine Bank pSPA are primarily auks. Outside the breeding season these species are not constrained to undertake foraging trips and therefore there is no basis for assuming connectivity between the Bruine Bank pSPA and the Projects. Accordingly, no LSE on the Bruine Bank (Brown Ridge) pSPA is predicted and this site is screened out.

4.5.4 Changes to original screening conclusions

223. The sites originally screened in which have been retained were:

- Greater Wash SPA;

- Flamborough and Filey Coast SPA;
- Coquet Island SPA;
- Farne Islands SPA;
- St Abbs Head to Fastcastle SPA; and
- Forth Islands SPA.

224. The following two sites were included originally but have subsequently been screened out:

- Outer Firth of Forth and St Andrews Bay complex pSPA was screened out because this SPA protects the foraging habitat rather than breeding colonies; and,
- Northumberland Marine SPA was screened out as this SPA protects the foraging habitat of several breeding seabird SPAs (Farne Islands SPA, Coquet Island SPA and Northumbria Coast SPA) and potential impacts on designated species are considered within their respective breeding colony SPAs.

225. In addition, the following features of the original SPAs were also screened out (on a species by species basis):

- Breeding shag and cormorant, part of the seabird assemblage at Flamborough and Filey Coast SPA and designated features of the Forth Islands SPA were screened out as these species were not recorded within the offshore ornithology survey area during baseline aerial surveys;
- Breeding guillemot, razorbill and puffin, designated features of the Forth Islands SPA, were screened out as these species are beyond the mean maximum + 1SD foraging range to the Projects from this SPA;
- Breeding guillemot, a designated feature of the St Abbs Head to Fast Castle SPA was screened out as this species is beyond the mean maximum + 1SD foraging range to the Projects from these sites;
- Breeding lesser black-backed gull, a designated feature of Forth Islands SPA was screened out as non-breeding season collision risk within the Projects was fewer than 0.5 birds per annum (refer to section 9.1.1 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 4 of 4 (application ref: 6.1)**);
- Breeding herring gull, designated feature of the St Abbs Head to Fast Castle SPA, Forth Islands SPA, Fowlsheugh SPA and East Caithness Cliffs SPA was screened out as non-breeding season collision risk within the

Projects was fewer than 2 birds per annum (refer to section 9.1.1 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 4 of 4 (application ref: 6.1)**); and,

- Breeding great black-backed gull, a designated feature of East Caithness Cliffs SPA was screened out as non-breeding season collision risk within the Projects was fewer than 3.9 birds (refer to section 9.1.1 of **Volume 6, Report to Inform Appropriate Assessment Habitats Regulations Assessment Part 4 of 4 (application ref: 6.1)**);
- Breeding fulmar, designated feature of Coquet Island SPA was screened out as this species is not considered sensitive to disturbance / displacement and the collision risk within the offshore ornithology survey area was low (refer to the ES **Volume 7, Chapter 12 Offshore Ornithology (application ref: 7.12)**).

226. The following additional SPAs, designated for breeding seabird species, have been screened in to assess impacts on non-breeding and migratory seabirds. This includes SPAs that are potentially connected with the Projects during the non-breeding season (Furness, 2015), but are beyond mean maximum + 1SD foraging range for designated seabirds to the Projects (refer to section 4.5.1.2):

- Fowlsheugh SPA;
- Buchan Ness to Collieston Coast SPA;
- Troup, Pennan and Lion's Heads SPA;
- East Caithness Cliffs SPA;
- North Caithness Cliffs SPA;
- Copinsay SPA;
- Hoy SPA;
- Rousay SPA;
- Calf of Eday SPA;
- Marwick Head SPA;
- West Westray SPA;
- Fair Isle SPA;
- Sumburgh Head SPA;
- Noss SPA;
- Foula SPA; and
- Hermaness, Saxa Vord and Valla Field SPA.

227. Other SPAs and features given consideration but screened out were:

- Pentland Firth proposed SPA (pSPA) was screened out as it was withdrawn as a pSPA following NatureScot's and JNCC's final advice and recommendations to Scottish Ministers on the proposals to classify a network of marine pSPAs (NatureScot, 2019);
- Breeding Manx shearwater, a designated feature of Outer Firth of Forth and St Andrews Bay Complex SPA, was screened out as this species was not recorded within the offshore ornithology survey area during baseline aerial surveys; and,
- Non-breeding little gull, a designated feature of the Greater Wash SPA, was screened out as this species was not considered to be at risk of displacement or collision as a result of development of the Projects in the ES **Volume 7, Chapter 12 Offshore Ornithology (application ref: 7.12**)).

228. Non-breeding waterbirds (ducks and waders) as well as breeding terns and cormorants, designated features of the Northumbria Coast SPA and Ramsar site, are screened out as the export cable corridor does not pass through this SPA and Ramsar site.

4.5.5 SPAs and Ramsar sites considered in the RIAA

229. **Table 4-7** presents the SPAs and Ramsar sites that have been taken forward for assessment within this RIAA (i.e. those species for which it was not possible to conclude no LSE).

Table 4-7 Summary of Designated Sites and Features Screened In

SPA / Ramsar site	Features	Rationale
Greater Wash SPA	Red-throated diver, non-breeding	Potential risk of displacement effects within the Offshore Export Cable Corridor during the non-breeding (autumn migration, winter and spring migration) season.
	Common scoter, nonbreeding	Potential risk of displacement effects within the Offshore Export Cable Corridor during the non-breeding (autumn migration, winter and spring migration) season.

SPA / Ramsar site	Features	Rationale
Flamborough and Filey Coast SPA	Kittiwake, breeding	Potential risk of collision during the breeding and non-breeding (autumn migration and spring migration) seasons.
	Gannet, breeding	Potential risk of collision and displacement/barrier effects during the breeding and non-breeding (autumn migration and spring migration) seasons.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the breeding and non-breeding seasons.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the breeding and non-breeding (autumn migration, winter and spring migration) seasons.
	Puffin, breeding	Potential risk of displacement/barrier effects during the breeding and non-breeding (autumn migration, winter and spring migration) seasons.
Coquet Island SPA	Puffin, breeding	Potential risk of displacement/barrier effects during the breeding and non-breeding (autumn migration, winter and spring migration) seasons.
Farne Islands SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the breeding and non-breeding (autumn migration and spring migration) seasons.
	Puffin, breeding	Potential risk of displacement/barrier effects during the breeding and non-breeding (autumn migration, winter and spring migration) seasons.
St Abbs Head to Fast Castle SPA	Kittiwake, breeding	Potential risk of collision during the breeding and non-breeding (autumn migration and spring migration) seasons.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.

SPA / Ramsar site	**Features**	**Rationale**
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Forth Islands SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) seasons.
	Gannet, breeding	Potential risk of collision and displacement/barrier effects during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
Fowlsheugh SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
Buchan Ness to Collieston Coast SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Troup, Pennan and	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.

SPA / Ramsar site	Features	Rationale
Lion's Heads SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
East Caithness Cliffs SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
North Caithness Cliffs SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
Copinsay SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Hoy SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.

SPA / Ramsar site	Features	Rationale
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
Rousay SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Calf of Eday SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Marwick Head SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
West Westray SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
Fair Isle SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.

SPA / Ramsar site	Features	Rationale
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
	Gannet, breeding	Potential risk of collision and displacement/barrier effects during the non-breeding (autumn migration and spring migration) season.
Sumburgh Head SPA	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
Noss SPA	Gannet, breeding	Potential risk of collision and displacement/barrier effects during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
Foula SPA	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.

SPA / Ramsar site	Features	Rationale
	Razorbill, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) season.
Hermaness, Saxa Vord and Valla Field SPA	Gannet, breeding	Potential risk of collision and displacement/barrier effects during the non-breeding (autumn migration and spring migration) season.
	Puffin, breeding	Potential risk of displacement/barrier effects during the non-breeding (autumn migration, winter and spring migration) seasons.
	Kittiwake, breeding	Potential risk of collision during the non-breeding (autumn migration and spring migration) season.
	Guillemot, breeding	Potential risk of displacement/barrier effects during the non-breeding season.

5 Sites Designated for Terrestrial Ecology

5.1 Approach to Assessment

230. This section provides information to allow the determination of the potential for the Projects to have an adverse effect on the integrity of sites designated for terrestrial ecological features.

231. For each site designated for terrestrial ecology screened in for further assessment, the following have been provided:

- A summary of the terrestrial ecology considered for assessment for each National Site Network site;
- An assessment of potential effects during the construction, operation, maintenance and decommissioning phases of the Projects; and
- An assessment of the potential for in-combination effects alongside other relevant developments and projects

5.2 Consultation

232. **Table 5-1** provides a summary of how the consultation responses relevant to Annex I Habitats received to date have influenced the approach that has been taken.

Table 5-1 Consultation Responses Relevant to Onshore Annex I Habitats

<table>
<tr><th>Comment</th><th>Project Response</th></tr>
<tr><td colspan="2">Responses to Draft HRA Screening Report</td></tr>
<tr><td colspan="2">MMO, 30/01/2023</td></tr>
<tr><td colspan="2">Natural England, 20/02/2023</td></tr>
<tr><td><u>Humber Estuary SPA / Ramsar</u>
Natural England considers that potential impacts on birds using functionally linked land associated with the Humber Estuary SPA/Ramsar from the proposed development cannot be ruled out at this time. The substation and onshore cabling area passes within 10km of the Humber estuary SPA and falls within the Impact Risk Zone (IRZ) for this site. This means there is potential for the land to be used by wintering waders and geese as part of their foraging ranges. We therefore advise that Humber Estuary SPA is screened into the HRA and evidence is collected and/or provided to demonstrate if the number of birds using the site is significant. Further details are provided on this in Annex 1</td><td>The Humber Estuary SPA / Ramsar has been screened in for further assessment in section 5.4.</td></tr>
<tr><td><u>Sites designated for Terrestrial Ecology (Section 4.5)</u>
Natural England welcome the inclusion of Hornsea Mere in this screening document following our advice on the scoping paper in August 2022, and agree that it is outside any ZOI for the construction, operation/maintenance and decommissioning of the Project and can be screened out of further HRA stages. We also agree that Lower Derwent Valley is sufficiently far away from the project to not be impacted.
Regarding the Humber Estuary SPA, we acknowledge the rational within the screening document that the built-up nature of the land between the Humber Estuary SPA and the export cable corridor makes it unlikely to be used by protected features. However, no evidence has been provided to support this statement. We therefore recommend that Humber Estuary SPA / RAMSAR remains screened into the HRA assessment and the Project obtain the following information to help undertake a Habitats Regulations Assessment (HRA):
• A data search from the local Ecological Data Centre;
• Consultation with the Council's Ecologist;
• Consultation with local bird groups and other organisations that may hold relevant information; and
• A desk-based assessment - using aerial photography, mapping, habitat maps and relevant ecological literature – of the suitability for SPA birds of the habitats present on the proposed site and adjacent fields.
If the above desk study identifies that the site or adjacent areas are used by bird features of the Humber Estuary designated sites, we recommend that passage/wintering bird surveys may be required to assess the use of the site as functionally linked land to the estuary. Natural England has generally advised that if ≥1% of a Humber Estuary bird species population could be affected by a proposal, alone or in combination with other plans or projects, then further consideration is required. However, where species are particularly vulnerable due to declines in the Humber population, then it may not be appropriate to rely on the 1% of the estuary population as the critical threshold</td><td>Noted regarding the screening out of the Hornsea Mere SPA and Lower Derwent Valley SAC and SPA.
The Humber Estuary SPA / Ramsar has been screened in for further assessment in section 5.4.</td></tr>
<tr><td colspan="2">Responses to Final HRA Screening Report</td></tr>
<tr><td colspan="2">Natural England</td></tr>
</table>

Comment	Project Response
The report states that it is not fully understood if the land within / in the vicinity of the onshore cable route and substation zone(s) is functionally linked with the Humber Estuary SPA. As advised, evidence should be provided to provide certainty to the HRA conclusions.	See section 5.3 and 5.4 for detail regarding the functionally linked land assessment conducted for the Projects.
Natural England welcomes that potential impacts to SPA/Ramsar birds have been screened into the HRA for further assessment. However, we advise there are two separate potential impact pathways: • Loss of functionally linked land; • Construction phase disturbance to SPA / Ramsar birds using functionally linked land. Include two separate impact pathways for functionally linked land.	See section 5.3 and 5.4 for detail regarding the functionally linked land assessment conducted for the Projects.
There are no assessment of in-combination impacts with other relevant plans or projects for the Humber Estuary SPA/SAC. We advise the following impacts pathways are considered: • loss of functionally linked land; • disturbance to SPA / Ramsar bird species using functionally linked land; • lamprey migration routes; • water quality; and • air quality. As a minimum we advise considering site allocations in relevant Local Plans as well as relevant planning applications from East Riding of Yorkshire Council and Hull City Council. This should include: existing completed projects; • approved but uncompleted projects; • ongoing activities; • plans or projects for which an application has been made and which are under consideration by the consenting authorities; and • plans and projects which are foreseeable, i.e., projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects.	See section 5.3 and 5.4 for detail regarding the functionally linked land assessment conducted for the Projects. Information regarding the other impact pathways mentioned in this response are provided in section 6 and section 7 of this report.

5.3 Assessment of Potential Effects

233. The HRA Screening report (**Volume 6, Appendix A (application ref: 6.1.1)**) identified the following potential effects to be taken forward for further assessment in relation to the construction, operation and maintenance and decommissioning phases of the Projects for terrestrial ecology:

- Permanent and temporary loss of habitats;
- Temporary habitat fragmentation and species isolation;
- Impacts on protected species or on their resting or breeding sites;
- Disturbance of bird populations; and
- Spread of non-native invasive species.

5.3.1 Embedded Mitigation

234. **Table 5-2** outlines the embedded and standard mitigation measures incorporated into the design of the Projects relevant to the assessment for terrestrial ecology designated sites.

Table 5-2 Embedded Mitigation Measures Relevant for Terrestrial Ecology Designated Sites

Parameter	Mitigation measures embedded into the design of the Project
Ecology Management Plan	An Ecological Management Plan (EMP) will be developed in accordance with the **Outline Ecological Management Plan (OEMP) (Volume 8, application ref: 8.10).** The OEMP includes but is not limited to pre-construction, construction, and post-mitigation measures relating to habitats, hedgerows, birds, bats, badgers, otters, water voles, reptiles, GCN, and other protected or notable species where relevant. The EMP will include details of any long-term mitigation and management measures relevant to terrestrial ecology and ornithology and nature conservation. The EMP will be developed in consultation with the relevant stakeholders.

5.4 Humber Estuary SPA

5.4.1 Site Description

235. The Humber Estuary is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. The range of habitats on the Estuary (detailed in the feature descriptions) support a variety of wintering, passage and breeding birds, including internationally important populations of a number of species. Birds are widely distributed throughout the site, the distribution of individual species reflecting habitat distribution and species ecology. At high tide essential roost sites are at a premium due to the combined effects of extensive historical land claim, coastal squeeze and the acute lack of grazing marsh and grassland. A number of developing managed realignment sites are contributing to the variety of habitats available to the birds (Natural England, 2024a).

236. Adjacent inland terrestrial sites areas are used extensively as high tide roosts and also provide important supporting habitats for some SPA bird species.

5.4.1.1 Qualifying Features

237. The Humber Estuary SPA is designated for the following non-breeding bird species:

- Great bittern Botaurus stellaris;
- Common shelduck *Tadorna tadorna*;
- Hen harrier Circus cyaneus;
- Pied avocet Recurvirostra avosetta;
- European golden plover *Pluvialis apricaria*;
- Red knot Calidris canutus;
- Dunlin Calidris alpina;
- Ruff Philomachus pugnax;
- Black-tailed godwit Limosa limosa islandica;
- Bar-tailed godwit *Limosa lapponica*;
- Common redshank *Tringa tetanus*;

238. The SPA is also designated for the following breeding bird species:

- Great bittern;
- Eurasian marsh harrier *Circus aeruginosus*;

- Pied avocet; and
- Little tern Sterna albifrons

239. The site is also designated for a waterbird assemblage.

5.4.1.2 Conservation Objectives

240. With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change (Natural England, 2019):

241. Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

5.4.1.3 Condition Assessment

242. While no condition assessment has been conducted for the Humber Estuary SPA specifically, the condition status of each ornithological feature has been assessed for the overlapping Humber Estuary SSSI, most recently in 2022 (Natural England, 2024b):

- Favourable
    - Great bittern;
    - Common shelduck;
    - Hen harrier;
    - Pied avocet;
    - Eurasian marsh harrier;
    - European golden plover; and
    - Black-tailed godwit.
- Unfavourable, no change
    - Dunlin; and
    - Ruff.
- Unfavourable, declining
    - Bar-tailed godwit; and

   - Common redshank.
- Not recorded
   - Red knot; and
   - Little tern.

5.4.2 Assessment

5.4.2.1 Functionally Linked Land

243. Statutory Consultation for the Projects, under Section 42 of the Planning Act 2008 and Regulation 13 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, ran from 6th June 2023 to 17th July 2023. During this consultation, NE requested further information regarding potential impact on birds by loss of Functionally Linked Land (FLL) associated with the Humber Estuary SPA/Ramsar.

244. FLL is a term often used to describe areas of land or sea occurring outside a designated site which is considered to be critical to, or necessary for, the ecological or behavioural functions in a relevant season of a qualifying feature for which a SAC/ SPA/ Ramsar site has been designated. These habitats are frequently used by SPA species and supports the functionality and integrity of the designated sites for these features.

245. In their response to the consultation, NE noted that no assessment has been provided of potential loss of FLL associated with the Humber Estuary SPA/Ramsar. NE welcomed that potential impacts to birds using FLL was screened into the HRA for further assessment and suggested a desk-based assessment to determine if further surveys were required.

246. At the end of the survey season in 2023, all ecological surveys were completed, and the following reports were used to address NE's comments:

- Peak Ecology (2022) Dogger Bank South Offshore Windfarm. Desk Study Report.
- Peak Ecology (2023ab) Dogger Bank South Offshore Wind Farms. Habitat Survey Report.
- Peak Ecology (2023b) Dogger Bank South Offshore Wind Farms. Overwintering Bird Survey Report.
- Peak Ecology (2023c) Dogger Bank South Offshore Wind Farms. Breeding Bird Survey Report.

247. The onshore site selection process has sought to avoid settlements, sensitive habitats and taken into account other technical and environmental constraints. As a result, the boundaries of the Onshore Development Area were revised, amended and finalised in October 2023 (see **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref 7.4)** for further information). Based on the Onshore Development Area taken forward to DCO application, it was established that a relatively small area at the southern part of the Onshore Development Area could be considered as potential functionally linked land, being the part of the scheme footprint that falls within the 10km of the Humber Estuary SPA/Ramsar.

248. The desktop surveys for the Onshore Development Area indicated that the potential FLL lies outside Important Bird and Biodiversity Areas, statutory or non-statutory designated sites and that there are no habitats of principal importance within or adjacent to the area (Peak Ecology, 2022).

249. Habitat surveys carried out during 2023 identified the potential FLL to be within a working farm (Peak Ecology 2023a), with the area comprising of mostly arable land with occasional pockets of modified grassland and native species hedgerows. This area is bisected by a high voltage power line that runs in a NW-SE direction adjacent to the nearby A1079 road.

250. A desktop survey comprising the review of online websites of the Royal Society for Protection of Birds (RSPB), National Biodiversity Network, MAGIC and British Trust for Ornithology (BTO) was undertaken to gather exiting background information based on species records and existing habitats to identify potential important areas for birds within the onshore development area surroundings. Species and protected sites data for the Onshore Development Area from the past 15 years, including a 2km buffer, were purchased from the North and East Yorkshire Ecological Data Centre. The results of the desktop survey did not identify any records of any bird species designated for the Humber Estuary SPA within the potential FLL or in the immediate vicinity (Peak Ecology 2022).

251. Overwintering and breeding bird surveys were carried out along the whole of the Onshore Development Area (including the potential FLL) between Oct 2022 and August 2023. The overwintering bird surveys undertaken between October 2022 and March 2023 did not identify any bird species associated with the Humber Estuary SPA within the potential FLL (Peak Ecology 2023b). However, two species classed as qualifying features of the SPA were recorded in the vicinity of the Onshore Development Area: mallard and teal. Four mallards were recorded near the pond next to the Poplar Farm farmhouse in November 2022 and eight teal were recorded in a field several hundred metres to the west of the potential FLL.

252. The breeding bird surveys carried out between March and end of August 2023 did not identify any birds associated with the Humber Estuary SPA within the potential FLL, but it did identify a farmland bird assemblage typical for the site and similar to adjacent farmland. In this area, much of the bird interest was concentrated within woodland or buildings whilst most central field records pertained to skylark or foraging hirundines or gulls (Peak Ecology 2023c).

253. Based on the assessment of the data collected associated with the DBS proposal so far, as well as consultation with the professional ornithologists that carried out the field work, it can be established with considerable amount of confidence that the area of the Onshore Development Area that falls within 10km of the Humber Estuary Ramsar/SPA does not form part of land functionally linked to the designated site.

254. NE agreed with the findings outlined in the FLL Assessment and responded by email on 11th January 2024, included in **Annex A** of this report. In summary, this email stated that:

"*We have reviewed the Overwintering Bird Report (dated 30/09/2023) and Functionally Linked Land Assessment (dated 30/10/2023) and based on the information provided, NE is satisfied that the survey effort is sufficient to rule out impacts to functionally linked land in this case because:*

- The desktop survey did not identify any records of any SPA bird species within the 'potential FLL' or in the immediate vicinity.
- The surveys did not identify any SPA bird species in significant numbers.
- The distance from the Humber Estuary SPA is circa 10km.
- The proposed development within 10km of the Humber Estuary SPA are temporary works only."

255. There is, therefore, no potential for an AEoI to the Humber Estuary SPA from impacts to functionally linked land from the Projects alone or in combination with other plans and projects and therefore, subject to natural change, the qualifying features of the Humber Estuary SPA/Ramsar will be maintained in the long term.

5.4.2.2 Summary

256. It was determined that the area of the Onshore Development Area that falls within 10km of the Humber Estuary SPA/Ramsar does not form part of land functionally linked to the designated site. There is, therefore, no potential for an AEoI to the Humber Estuary SPA from impacts to functionally linked land from the Projects alone or in combination with other plans and projects and therefore, subject to natural change, the qualifying features of the Humber Estuary SPA/Ramsar will be maintained in the long term.

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Annex A – Natural England Response to Functionally Linked Land Memo

From: [redacted]
Sent: Thursday, January 11, 2024 2:28 PM
To: [redacted]
Cc: [redacted]
Subject: [EXT] RE: DBS Overwintering Bird Survey Report

Hi [redacted]

I hope you are well.

Please find our responses to the questions posed to us late in 2023:

- **HRA and Ch 18: Terrestrial Ecology and Ornithology**
    - Confirmation you agree with the Functional Linked land report and that there is no requirement for further overwintering bird surveys in 2023/2024

    - Confirmation you agree with the baseline Survey Reports issued for your comment on the 03/11/2023:
        - Desk Study
        - Breeding Bird Survey Report
        - Habitat Survey Report
        - Overwintering Survey Report

- *We have reviewed the Overwintering Bird Report (dated 30/09/2023) and Functionally Linked Land Assessment (dated 30/10/2023).*

- *We note that bird surveys have been undertaken once per between October and March using a walked transect survey methodology. As stated in our PIER consultation response (dated 17/07/2023), Natural England typically advises two surveys per month during the wintering and passage periods. Furthermore, Natural England recommends that observations from vantage points are used. Vantage point surveys are considered preferable to transect or walkover surveys for observing behaviour of birds on the ground and to minimise the risk of flushing birds due to movement of a surveyor during a walkover survey.*

- *However, based on the information provided, Natural England is satisfied that the survey effort is sufficient to rule out impacts to functionally linked land in this case because:*
    - *The desktop survey did not identify any records of any SPA bird species within the 'potential FLL' or in the immediate vicinity.*
    - *The surveys did not identify any SPA bird species in significant numbers.*
    - *The distance from the Humber Estuary SPA is circa 10km.*
    - *The proposed development within 10km of the Humber Estuary SPA are temporary works only*

    - Confirmation you agree we will identify ancient woodland, wood, pasture parkland, or ancient and veteran trees in the ES. In addition, we wanted to update you today that further survey work to identify veteran trees is expected to commence in the new year.
    - Agreed

- Confirmation you are happy watercourses and hydrological connection to the SPA will be assessed in the ES, outcomes can be shared when available.
- Agreed

- **Chapter 5: Project Description**
  - You requested further information on proposed Intertidal works and beach access, I can present this detail at the Terrestrial Ecology ETG (see below).

- **Ch 19: Geology and Land Quality**
  - Confirmation you agree there will be no impacts on Withow Gap SSI (now avoided)
  - Following the choice of the northern landfall point outlined in the DBS Flood Risk and Geology ETG on 7th December 2023, Natural England is satisfied that the proposed works are unlikely to impact Withow Gap SSSI due to their distance from the site. We consider comments G5, 6, 8 and 9 to be resolved. Comment G2 still stands but is no longer a material concern. We will therefore opt out of attendance at further meetings on this topic area. Should your proposal change such that works occur closer to Withow Gap SSSI, or works that involve earthworks on the coastal cliffs or intertidal zone, we would require reassessment of these impacts.

- **Ch 21: Land Use**
  - Confirmation you agree with the position on ALC surveys, that we will make a commitment to complete them ahead construction, the outputs would inform the Soil Management Plan
  - Please confirm if you would like us to set up a meeting to discuss this chapter and the initial outputs in more detail with you as we have not prosed a specific ETG for this topic.

  - We are advising all areas undergoing temporary disturbance, including cable trenching to have a detailed ALC survey to inform micrositing, EIA and restoration criteria at the application stage. However, we've accepted similar survey approach on other projects for cable connections elsewhere but it is not acceptable for permanent development.

  - It is worthwhile adding that there is much to consider regarding the timing of soil surveys but we would refer to NPS EN-1.

  - There is a legal obligation to consider and assess reasonable alternatives even without all environmental under The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (legislation.gov.uk). To consider alternatives without all the environmental information (ie ALC survey) a worst case scenario would need to be applied. Natural England are required to consider BMV soils where permanent loss for a development is over 20ha and therefore the approach adopted by the Project of WCS (Worst Case Scenario) assumptions is not viable assessing potential soil quality impacts.

    - The potential impact on soils and agricultural land could be substantial due to the extent of soil disturbance and the need for appropriate restoration along the cable route and the permanent land take for any permanent infrastructure (e.g converter station / access roads etc). It is important that detailed soil and ALC surveys are undertaken at the earliest stages of project planning to inform routing, soil handling and soil restoration criteria.

    - To be clear though an outline Soil Management Plan should be prepared to accompany the ES as per the 2009 Defra Construction Code.

    - [redacted] would be willing to attend any ALC meeting.

- A detailed ALC survey needs to be undertaken to inform the EIA of all areas of permanent development (e.g. converter station, substation extension, access etc)
-
    - Please confirm your availability to attend the PRoW and Access ETG, being organised by [redacted] and [redacted] (dated proposed first week of December). Would you h[redacted] shapefile for the Proposed King Charles the II coastal path which intersects with our landfall?
    - For **open stretches**, where the rights have commenced, Natural England only needs to know about developments that will change the alignment of the trail itself (not the coastal margin). Where Natural England is consulted on planning applications for other reasons that overlap with the alignment of the England Coast Path, the Consultations Hub will respond using the standard wording:
        - The development proposal affects the England Coast Path, which should be protected and enhanced in line with paragraphs 100, 172 and 174 of the National Planning Policy Framework. Natural England has a duty to prepare a Variation Report for the Secretary of State where the alignment (but not the margin) of the England Coast Path changes and local planning authorities are advised to notify Natural England of any development or other change that impedes or obstructs people's ability to undertake a continuous journey on foot on the National Trail.

    - For **stretches in development**, it is important that the England Coast Path teams know about all planning applications that could affect proposals for the alignment. Planning applications that trigger an IRZ are forwarded by the Consultations Hub to the Area Teams for further assessment. If these applications also affect the England Coast Path, the England Coast Path hub in the Area Team will be copied in. The Area Team will then liaise with their local England Coast Path hub before responding.

    - The stretch where the project meets landfall is currently **in development**.

- **Ch 26: Air Quality**
    - Road Traffic Emissions on Ecological Sites (Comment H13): We kindly request NE confirmation of agreement with our response, particularly in considering JNCC guidance for the assessment of road traffic emissions on ecological sites.

- Emissions from NRMM and Backup Generators (Comments H2, H5, H12): We seek NE confirmation on our response to comments regarding the qualitative assessment of emissions from Non-Road Mobile Machinery (NRMM) and backup generators during the construction phase.
- We are currently unable to provide comment on terrestrial air quality at this moment.

- Assessment of Vessel Emissions (Comments H1, H10, H11): We would appreciate NE confirmation of agreement with our response, specifically in scoping out the assessment of vessel emissions during both the operation and construction phases of the project. This also includes the evaluation of onshore traffic emissions.
- The average fleet mix may not represent the actual situation in terms of vehicle movements. However we note that further information about the suitability of the methodology is to be provided at a later stage, so we will review the reasoning when this is submitted.

- **Landscape and Visual**
  - We are also arranging a separate LVIA ETG, please confirm your attendance at this through response to [redacted] and [redacted] who have issued requests for your availability. Impacts have been scoped out offshore and there are no AONB impacts. –

  - Relevant Natural England representatives have been informed about potential LVIA ETG meetings.

- **BNG**
  - Confirmation you agree to use of Metric Version = V4.0 (confirmation of any prosed revisions and likely timeframes?)
  - Confirmation habitats to MLWS should be included in our BNG assessment Assessing baseline & impacts to MLWS
    - Agreement on use of 'Beach (EUNIS littoral mixed sediments and infralittoral fine sand) = Littoral Sand within Metric 4.0'

    - Natural England is unable to provide specific advice on BNG currently.

If you have any further questions please do not hesitate to contact me.

Kind regards

[redacted]

Natural England

[redacted]

RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire, SN5 6PB