

**RWE Renewables UK Dogger Bank
South (West) Limited**

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South (East) Limited**

Dogger Bank South Offshore Wind Farms

**In Principle Monitoring Plan (Revision 6) (Tracked)
Volume 8**

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Revision Change Log			
Rev No.	Page	Section	Description
01	N/A	N/A	Submission for DCO application
02	N/A	N/A	Document updated for Project Change Request 1 – Offshore and Intertidal Works.
02	5	Glossary	Removal of reference to the ESP.
02	12	1.2	Minor text updates.
02	13-15	1.3	Updates to Table 1-1 Key Relevant Parameters
02	19 - 38	1.6	Updates to monitoring proposals based on Project Change Request 1 – Offshore and Intertidal Works and MMO's Relevant Representation [RR-030].
03	15-16	1.4	Addition of reference to Natural England's Offshore Wind Marine Environmental Assessments: Best Practice Advice, the MMO's Standardisation of Offshore Wind Post-Consent Monitoring and the broad set of benthic monitoring objectives produced by Natural England and the Joint Nature Conservation Committee.
03	20-21	1.6.3.1	Amendment to text to clarify the purpose of geophysical surveys.
03	22	1.6.3.4	Added reference to the broad set of benthic monitoring objectives produced by Natural England and the Joint Nature Conservation Committee.
03	23-25	Table 1-2	Minor text amendments to Table 1-2 and addition of Flamborough Front monitoring.
03	27-30	1.6.4.4 Table 1-3	Addition of receptors and explanation of the reasoning for geophysical surveys. Addition of pre-construction DDV / ROV surveys in Table 1-3. Addition of operational DDV / ROV surveys and potential monitoring of drill mounds if required in Table 1-3.
03	35	1.6.6.3	Updates to monitoring proposals to monitor the response of marine mammals to underwater noise
03	41	Table 1-6	Updates include an outline of the factors affecting the frequency of monitoring for the proposed assets based on their associated engineering risks, with an indication of the likely routine frequency of monitoring provided.

Revision Change Log			
04	16-17	1.4	Addition of adaptive management text to clarify the approach that would be taken should monitoring results show impacts worse than those predicted in the ES.
04	23	Table 1-2	Commitment to the monitoring of potential secondary scour effects updated following comments from Natural England.
05	23	Table 1-2	Further detail included regarding monitoring for the marine physical environment.
05	39	1.6.7.3	Further details of the proposed offshore ornithological monitoring plan added following comments received on Schedule 10 DML1; Part 2, 29(4) and Schedule 11 DML2 - Part 2, 29(4) of The ExA's Proposed Schedule of Changes to the Draft DCO.
06	24	1.6.3.4	Monitoring proposals with regards to secondary scour updated following Natural England comments at Deadline 9.
06	31	1.6.4.4	Monitoring proposals with regards to disposal mounds updated following Natural England comments at Deadline 9.

Contents

1	In Principle Monitoring Plan.....	10
1.1	Purpose of the In Principle Monitoring Plan	10
1.2	Background	11
1.3	Key Relevant Parameters	13
1.4	General Guiding Principles for the Proposed Monitoring	15
1.4.1	Consideration of Development Scenarios.....	17
1.5	The Projects Residual Effects.....	18
1.6	In-Principle Proposals for Monitoring	19
1.6.1	Engineering Related Monitoring	19
1.6.2	Strategic Monitoring	20
1.6.3	Marine Physical Environment.....	20
1.6.3.1	Conclusions of the Environmental Statement	20
1.6.3.2	Conclusions of the RIAA.....	21
1.6.3.3	Conclusions of the Marine Conservation Zone Assessment.....	21
1.6.3.4	In-Principle Monitoring.....	21
1.6.4	Benthic and Intertidal Ecology.....	27
1.6.4.1	Conclusions of the Environmental Statement	27
1.6.4.2	Conclusions of the RIAA.....	27
1.6.4.3	Conclusions of the Marine Conservation Zone Assessment.....	27
1.6.4.4	In-Principle Monitoring.....	27
1.6.5	Fish and Shellfish Ecology	32
1.6.5.1	Conclusions of the Environmental Statement	32
1.6.5.2	Conclusions of the RIAA.....	32
1.6.5.3	In-Principle Monitoring.....	32
1.6.6	Marine Mammals.....	34
1.6.6.1	Conclusions of the Environmental Statement	34
1.6.6.2	Conclusions of the RIAA.....	35
1.6.6.3	In-Principle Monitoring.....	36
1.6.7	Offshore Ornithology	37
1.6.7.1	Conclusions of the Environmental Statement	37
1.6.7.2	Conclusions of the RIAA.....	37
1.6.7.3	In-Principle Monitoring.....	38

1.6.8	Commercial Fisheries	41
1.6.8.1	Conclusions of the Environmental Statement	41
1.6.8.2	In-Principle Monitoring	41
1.6.9	Shipping and Navigation	41
1.6.9.1	Conclusions of the Environmental Statement	41
1.6.9.2	In-Principle Monitoring	41
1.6.10	Offshore Archaeology and Cultural Heritage	44
1.6.10.1	Conclusions of the Environmental Statement	44
1.6.10.2	In-Principle Monitoring	44
References	46

Tables

Table 1-1	Key Relevant Parameters	13
Table 1-2	In-Principle Monitoring Proposed – Marine Physical Environment.....	23
Table 1-3	In-Principle Monitoring Proposed – Benthic and Intertidal Ecology	30
Table 1-4	In-Principle Monitoring Proposed – Fish and Shellfish Ecology	33
Table 1-5	In-Principle Monitoring Proposed – Offshore Ornithology	40
Table 1-6	In-Principle Monitoring Proposed – Shipping and Navigation	42
Table 1-7	In-Principle Monitoring Proposed – Offshore Archaeology and Cultural Heritage	45

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 [that part of] 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).
Collision	The act or process of colliding (crashing) between two moving objects.
Concurrent Scenario	A potential construction scenario for the Projects where DBS East and DBS West are both constructed at the same time.
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.
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).
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) for certain topics.
In Isolation Scenario	A potential construction scenario for one Project which

Term	Definition
	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 Cables	Buried offshore cables which link offshore platforms.
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.
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.
Onshore Export Cable Corridor	This is the area which includes cable trenches, haul roads, spoil storage areas, and limits of deviation for micro-siting. For assessment purposes, the cable corridor does not include the Onshore Converter Stations, Transition Joint Bays or temporary access routes; but includes Temporary Construction Compounds (purely for the cable route).
Project Change Request 1	The changes to the DCO application for the Projects set out in Project Change Request 1 - Offshore & Intertidal Works (document reference 10.49) which was accepted into Examination on 21 st January 2025.
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.
Sequential Scenario	A potential construction scenario for the Projects where DBS East and DBS West are constructed with a lag between the commencement of construction activities. Either Project could be built first.

Term	Definition
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).
Wind turbine	Power generating device that is driven by the kinetic energy of the wind.

Acronyms

Term	Definition
AIS	Automatic Identification System
CSIMP	Cable Burial and Specification, Installation and Monitoring Plan
DBS	Dogger Bank South
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DML	Deemed Marine Licence
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESP	Electrical Switching Platform
HRA	Habitats Risk Regulations Assessment
IPMP	In-Principle Monitoring Plan
KSIMP	Kittiwake Strategic Implementation Monitoring Plan
LAT	Lowest Astronomical Tide
MBES	Multibeam Echosounder
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MCZA	Marine Conservation Zone Assessment
MHWS	Mean High Water Springs
MMMP	Marine Mammal Mitigation Protocol

Term	Definition
MMO	Marine Management Organisation
OCP	Offshore Converter Platforms
OWEAP	Offshore Wind Enabling Actions Programme
SAC	Special Area of Conservation
SIP	Site Integrity Plan
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SSS	Side-scan Sonar
UK	United Kingdom
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation

1 In Principle Monitoring Plan

1.1 Purpose of the In Principle Monitoring Plan

1. This In Principle Monitoring Plan (IPMP) has been produced in order to provide the basis for delivering the monitoring measures as required by the conditions contained within the Deemed Marine Licences (DMLs) for the Dogger Bank South (DBS) East and DBS West Offshore Wind Farms, collectively known as DBS Offshore Wind Farms (herein ‘the Projects’).
2. As the owners of DBS East and West, RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited are ‘the Applicants’ within this IPMP.
3. The IPMP provides a key mechanism through which the relevant regulatory authorities can be assured that required offshore monitoring activities associated with the construction and operation of the offshore infrastructure for the Projects would be formally controlled.
4. The IPMP provides a framework for further discussions post consent with the Marine Management Organisation (MMO), the relevant Statutory Nature Conservation Bodies (SNCB) and advisors (e.g., Maritime and Coastguard Agency (MCA) and The Wildlife Trusts where relevant)) to agree the exact detail (timings, methodologies etc.) of the monitoring that is required. Due to the long lead in time for the development of offshore wind farms it is not desirable or effective to provide final detailed method statements prior to consent being granted. However, agreeing guiding principles reinforces commitments made in the Environmental Statement (ES) and complements Conditions set out in the DMLs and allows refinements to be made based on the best available knowledge and technology. Final detailed plans for monitoring work would be produced closer to the time that the actual work would be undertaken.
5. The relevant topics and / or receptor groups discussed in this plan are as follows:
 - Marine Physical Environment;
 - Benthic and Intertidal Ecology;
 - Fish and Shellfish Ecology;
 - Marine Mammals;
 - Offshore Ornithology;
 - Commercial Fisheries;

- Shipping and Navigation; and
 - Offshore Archaeology and Cultural Heritage.
6. Monitoring requirements in relation to Habitats Regulations Assessment (HRA) are also considered for Benthic and Intertidal Ecology, Fish and Shellfish Ecology, Marine Mammals and Offshore Ornithology.
 7. Monitoring requirements in relation to HRA are covered within this document but are also addressed in the relevant compensation plan documents:
 - **Volume 6, Appendix 1 - Project Level Kittiwake Compensation Plan (application ref: 6.2.1);**
 - **Volume 6, Appendix 2 - Guillemot [and Razorbill] Compensation Plan (application ref: 6.2.2); and**
 - **Volume 6, Appendix 3 - Project Level Dogger Bank Compensation Plan (application ref: 6.2.3).**
 8. In addition, monitoring requirements in relation to the Marine Conservation Zone Assessment (MCZA) are also considered for Marine Physical Environment, and Benthic and Intertidal Ecology.

1.2 Background

9. The DBS East Array Area would cover an area of approximately 349km² and is located approximately 122km from the coast, whereas DSB West Array Area covers an area of 355km² and is located approximately 100km from the coast. Both Projects make Landfall on the East Riding of Yorkshire coastline near Skipsea to (up to) two newly constructed onshore converter stations before onward onshore cable routeing to the proposed Birkhill Wood National Grid Substation, to the south of Beverley.
10. Between 113 and 200 wind turbines would be installed across both Projects. For assessment purposes, it is assumed that between 57 and 100 wind turbines may be installed for DBS East or DBS West in isolation¹.

¹ In situations where a number does not divide equally between DBS East and DBS West (e.g. 113 large turbines), they are rounded up to higher number (e.g. 57 large turbines as opposed to 56.5) for the purposes of assessing the worst case scenario

11. Depending on the Development Scenario (section 1.4.1), the Array Areas could be connected to one another via Inter-Platform Cables, with a maximum of three offshore platforms combined between the Projects. The Offshore Export Cable Corridor would connect the Array Areas with the Landfall near Skipsea. These would consist of up to four electrical cables along an integrated corridor running from Landfall to a distance of approximately 80km from shore, where the cable corridors serving each Project would diverge into two branches serving the individual Projects. Two electrical cables would be located within each branch. An Onshore Export Cable Corridor would link the Landfall with the newly constructed onshore converter stations before onward onshore cable routing to the proposed Birkhill Wood National Grid Substation.
12. Water depths across DBS East Array Area, DBS West Array Area and the inter-platform cabling area range from approximately 12 - 40m below Lowest Astronomical Tide (LAT). The seabed along the Offshore Export Cable Corridor gently slopes from the Landfall where water depths are shallow, to a maximum of 60m below LAT about 8km offshore. Water depths then shallow to a minimum of 15m below LAT as the Offshore Export Cable Corridor approaches the DBS Array Areas.
13. The key offshore components comprise:
 - Wind turbines;
 - Offshore platforms – Offshore Converter Platforms (OCPs) and 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 High Voltage Direct Current (HVDC) export cables from the Array Areas to the Landfall; and
 - Scour / cable protection (where required).
14. The detailed design of the Projects (e.g. numbers of wind turbines, layout configuration, foundation type and requirement for scour protection) would be determined post-consent. Therefore, the key parameters presented in **Table 1-1** are indicative based on current information and assumptions.
15. Construction of the Projects is anticipated to commence at the earliest in 2026.

1.3 Key Relevant Parameters

Table 1-1 Key Relevant Parameters

Parameter	Details		
	DBS East	DBS West	Combined
Indicative construction duration (years) (excluding Landfall works)	5	5	5 (7 years if sequential build)
Anticipated design life (years)	30	30	30 (32 if sequential build)
Number of wind turbines ²	57-100	57-100	113-200
Total Array Area agreed in Agreement for Lease (km ²)	494.5	494.5	989
Total Array Area assessed for ES (km ²)	349	355	874 ³
Closest point from Array Area to coast (km)	122	100	100
Length of export cable to Landfall (per cable) (km)	188 per cable	153 per cable	N/A
Maximum offshore cable length (km) for all cables	376	306	682
Maximum number of export cables	2	2	4

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).

³ Total Array Area assessed for ES for the Projects combined includes 170km² for Inter Platform Cabling Corridor located between DBS East and DBS West.

Parameter	Details		
	DBS East	DBS West	Combined
Maximum number of trenches ⁴	1	1	2
Maximum total length of all array cables (km)	350	350	700
Indicative turbine rotor diameter – small turbines (m)	259		
Indicative turbine rotor diameter – large turbines (m)	344		
Maximum tip height above MHWS (m)	394		
Minimum lower blade tip clearance to MSL (m)	34		
Rotor swept area (km ²)	5.263	5.263	10.526
Minimum turbine spacing (centre to centre) (m)	830		
Rotor cut-out wind speed (m/s) (assumed)	>25		
Maximum Inter-Platform Cable length (km)	23	23	161
Wind turbine foundation type options	Steel monopile, piled jacket		
Maximum number of offshore platforms	2	2	3

⁴ Offshore export cables from DBS East and DBS West respectively will be bundled together in a single trench.

Parameter	Details		
	DBS East	DBS West	Combined
Offshore platform foundation type options (Array Areas)	Steel monopile, piled jacket		
Hammer energies (kilojoules) (kJ)	Maximum hammer energy for monopiles: Up to 6,000kJ Maximum hammer energy for pin-piles: up to 3,000kJ		
Maximum pile diameter (m)	4m for piled jackets 15m for monopiles		

1.4 General Guiding Principles for the Proposed Monitoring

16. Throughout the Environment Impact Assessment (EIA) process, the Applicants have taken steps to avoid or reduce significant effects either through the iterative process of project design ('embedded mitigation' e.g. the removal of gravity base structures from the Array Areas or by 'additional' mitigation measures which would be applied during the construction, operation and maintenance or decommissioning stages of the DBS Offshore Wind Farms.
17. The guiding principles for monitoring and which apply in general to the in-principle monitoring outlined in this document are as follows:
 - All consent conditions, which would include those for monitoring, should be "necessary, relevant to planning, relevant to the development to be consented, enforceable, precise, and reasonable in all other respects" as set out in Paragraph 4.1.16 of the National Policy Statement (NPS) EN-1 (DESNZ, 2023) and Paragraph 56 of the National Planning Policy Framework (Department for Levelling Up, Housing and Communities, 2012).
 - Expectations for monitoring and environmental requirements at the post-consent phase can also be found in Natural England's Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase IV (Parker *et al.*, 2022).

- In line with good practice, monitoring must have a clear purpose in order to provide answers to specific questions where significant environmental impacts have been identified (Cefas, 2012; Glasson *et al.*, 2011; OSPAR 2008). As such, monitoring proposals should have an identified end date and confirmed outputs, which provide statistically robust datasets, as applicable to the hypothesis being tested. The Applicants understand that the MMO is undertaking a project on the Standardisation of Offshore Wind Post-Consent Monitoring (forthcoming). The implications of this document and the guidance it contains will be considered where applicable when published.
- Monitoring should be targeted to address significant evidence gaps or uncertainty (including on the effectiveness of mitigation), which are relevant to the Projects and can be realistically filled, as well as those species or features considered to be the most sensitive to the Projects' effects including those of conservation, ecological and / or economic importance.
- Proposals for monitoring should be based, as a starting point, on the best practice and outcomes of the latest review of environmental data associated with post-consent monitoring of licence conditions of Offshore Wind Farms (MMO, 2014) and applying more recent best practice guidance and lessons learnt (including from the existing Dogger Bank A, B and C and Sofia programmes) where relevant.
- The scope and design of all monitoring work should be finalised and agreed following review of the results of any preceding survey and / or monitoring work (i.e. an adaptive monitoring approach), including those surveys conducted in support of the EIA. This includes the potential for survey requirements to be adapted based on the results of the monitoring outlined in this document, including in the event that unforeseen effects arise, which may in turn give rise to the need for adaptive management measures to be considered. In the event that a review of the construction monitoring results shows a greater impact than that assessed in the ES, the Applicants will use an adaptive management approach. Within the monitoring reports, the Applicants will provide a review of the monitoring results to determine whether results show an impact assessed either within or above those in the ES with justification of this conclusion supported by an interpretation of the monitoring results. Where the Applicants consider that the monitoring results show an impact greater than that assessed in the ES, the monitoring report will include proposals

for solutions and/or additional monitoring that the Applicants will submit to the MMO and SNCBs for further discussion. Where it has been agreed that there are **no significant effects**, monitoring need not be conditioned through the DMLs.

18. The Applicants are supportive of appropriate strategic monitoring studies. Where the Applicants are made aware of new strategic monitoring studies and they are aligned with the Applicants' business goals, they would discuss with the relevant authorities if they are appropriate to discharging specific DBS East and DBS West DML conditions. See section 1.6.2 for further details.

1.4.1 Consideration of Development Scenarios

19. The Applicants are seeking to coordinate the development of the Projects as far as possible. The preferred option is a Development Scenario with an integrated transmission system, providing transmission infrastructure which serves both of the wind farms, where both Projects are built concurrently and would co-locate infrastructure to reduce the overall environmental impact and disruption. Therefore, under this scenario post-construction monitoring would be coordinated to begin in an appropriate manner once both Projects had completed construction.
20. However, it is recognised that due to the various Development Scenarios (see section 5.1.1 of **Volume 7, Chapter 5 Project Description (application ref: 7.5)**), there could be a gap of up to two years between the completion of offshore construction works of each Project. As such careful consideration would need to be given to pre and post-construction monitoring timescales.
21. A key consideration is the potential for the effects from construction activities of the Projects to interact since this could potentially influence monitoring results.
22. Since the Development Scenario and construction programme would not be determined until post-consent, the Applicants consider that details of the monitoring programme should be agreed through the development of topic specific monitoring plans that would be produced prior to the start of construction, as conditioned in the DMLs. This would enable those plans to take account of the nature of the impact in question and the monitoring that is proposed in relation to it. Notwithstanding this, where relevant, consideration has been given in the in-principle monitoring proposals included below as to whether the timing of construction activities between Projects is likely to be a relevant concern.

23. The Applicants note that there is precedent for this approach, for example Dogger Bank Creyke Beck A & B (now Dogger Bank A and B) and Dogger Bank Teesside A & B (now Dogger Bank C and Sofia), which at the time that they were consented both featured two wind farms in a single Development Consent Order (DCO) with each having a shared IPMP addressing the possibility of the Projects being constructed concurrently or sequentially. In practice, offshore construction of the first three of these wind farms (collectively termed Dogger Bank Wind Farm) is being undertaken in three stages, although some construction works would overlap. The Sofia offshore wind farm is being progressed by a different developer on its own timeframe although again some offshore construction works would overlap with stages of DBS. In each case, the details of the monitoring programmes have been agreed at the post-consent stage to take account of the actual construction programmes and details of the works to be undertaken, accounting for the timings for the completion of construction on each project.

1.5 The Projects Residual Effects

24. The EIA predicts the residual effect to receptors taking into account:
- Linkages using the source > pathway > receptor model;
 - Embedded / additional mitigation;
 - Receptor sensitivity;
 - Ecological / economic importance / value; and
 - Magnitude of impact.
25. The significance of the residual effect should not in its own right necessarily lead to the requirement for monitoring. Monitoring should be targeted to address significant evidence gaps or uncertainty, which are relevant to the Projects and can be realistically filled.
26. For each receptor, the residual effects and major areas of uncertainty as predicted within the EIA (or HRA), (and any updated assessments as indicated throughout) are detailed. Monitoring has been deemed necessary and required as part of the DML where moderate or major adverse effects are predicted in the EIA, an Adverse Effect on Integrity (AEoI) is predicted in the HRA, or where uncertainty remains at an industry-wide level.

1.6 In-Principle Proposals for Monitoring

27. The following sections set out the in-principle proposals for monitoring in relation to each of the topics and / or receptor groups covered in the EIA and HRA.
28. While accepting that this IPMP represents the best approach to monitoring available at the time of writing, it is recognised that the outcomes of the survey work discussed could influence future monitoring requirements, methodologies, focus and effort for the Projects, as knowledge and understanding develops. For example, where appropriate, and in consultation with the MMO and its advisors, these scopes may be refined to consider other relevant studies carried out by other neighbouring projects in the region. This is a key principle for an adaptive approach to monitoring and would be the subject of ongoing consultation between the Applicants, the MMO and its advisors, as discussed under guiding principles (see section 1.4).
29. This document has been submitted with the DCO application and would be used as a basis for further discussions post-consent.

1.6.1 Engineering Related Monitoring

30. In addition to the environmental survey and monitoring required as conditions of the DMLs within the DCO, additional studies would be undertaken for engineering purposes. Some of these would overlap with the conditioned monitoring and wherever possible the Applicants would look to combine surveys for monitoring purposes with those already being carried out for engineering purposes. These are:
 - Geophysical;
 - Geotechnical;
 - Unexploded Ordnance (UXO) survey;
 - Remotely Operated Vehicle (ROV) survey; and
 - Cable burial survey.
31. Other relevant Plans required under the DML with commitments to monitoring (linked to those listed above) are:
 - An Outline Cable Burial and Specification, Installation and Monitoring Plan (CSIMP) is detailed within **Volume 8, Cable Statement (application ref: 8.20)**;
 - Cable Protection Plans produced in line with the detail outlined in **Volume 8, Cable Statement (application ref: 8.20)**;

- A Scour Protection Plan produced in line with the detail outlined in **Volume 8, Outline Scour Protection Plan (application ref: 8.27)** (monitoring of scour and protection measures); and
- **Volume 8, Outline Offshore Operations and Maintenance Plan (OOMP) (application ref: 8.24).**

1.6.2 Strategic Monitoring

32. RWE Renewables is actively involved with the following strategic initiatives:
- The Offshore Wind Strategic Monitoring Research Forum (OWSMRF), which is addressing wider knowledge gaps and industry priorities, focussed on marine birds.
 - ORJIP, of which RWE is a Stage 2 partner.
 - Defra's Offshore Wind Enabling Actions Programme (OWEAP).
33. As noted in section 1.3, where appropriate strategic monitoring studies are available, the Applicants would discuss with the relevant authorities if they are appropriate to enable the discharging of specific DBS East and DBS West DML conditions. This is considered to be particularly relevant to marine mammals and ornithology as reflected in sections 1.6.7 and 1.6.8.
34. RWE Renewables are undertaking the following:
- BMWK JIP: Monitoring soil properties on offshore structures (4D Seismic on Piles) SOP;
 - FEM DP: Monitoring marine megafauna through an integrated approach towards an observatory network (MMERMAID);
 - FEM: Offshore wind farm surveys of marine megafauna: Standardisation of tools and methods for monitoring at farm scales (OWFSOMM); and
 - FEM DP: Effective monitoring strategies to identify and evaluate effects of offshore wind farms on fish communities (FISH-OWF).

1.6.3 Marine Physical Environment

1.6.3.1 Conclusions of the Environmental Statement

35. No residual effects greater than **minor adverse** were predicted within the ES which is not significant in EIA terms and therefore no mitigation in the form of monitoring is proposed.

36. However, a range of geophysical surveys including high resolution bathymetric, multibeam echosounder (MBES), sub-bottom profiler, and side-scan sonar (SSS) will be carried out both before and after construction both for engineering / asset integrity assessment purposes. Data and information arising for this monitoring will feed into the requirements for environmental topics such as benthic ecology (see section 1.6.4) and marine archaeology (see section 1.6.10).

1.6.3.2 Conclusions of the RIAA

37. Although marine physical environment is not assessed within **Volume 6. Report to Inform Appropriate Assessment (RIAA) (application ref: 6.1)**, effects such as the physical change to another seabed / sediment type are assessed upon benthic ecology (see section 1.6.4.2). As such monitoring proposed in **Table 1-2** will be used to fulfil monitoring requirements in relation to benthic habitats.

1.6.3.3 Conclusions of the Marine Conservation Zone Assessment

38. The Marine Conservation Zone Assessment (MCZA) concludes that the conservation objective of maintaining the protected features of the Holderness Inshore and Offshore Marine Conservation Zones (MCZs) in a favourable condition or restoring them to favourable conditions will **not be hindered** by the construction, operation and decommissioning phases of the Projects, or cumulatively with any other plan, project or activity (see **Volume 8, Stage 1 Marine Conservation Zone Assessment (MCZA) (application ref: 8.17)**). Therefore, no monitoring within the MCZs is proposed.

1.6.3.4 In-Principle Monitoring

39. **Table 1-2** provides information on the monitoring requirements for marine physical processes. The proposed monitoring would be discussed and agreed with the MMO in consultation with Natural England post-consent.
40. The assessment of the marine physical environment did not predict any significant effects. However, based on the advice of the MMO and Natural England, the Applicants have committed to undertake monitoring of the Flamborough Front to address evidence gaps in the assessment as outlined in **Review of Flamborough Front (document reference 14.7)**, submitted at Deadline 4.

41. In addition, the Applicants are aware of the set of broad benthic monitoring objectives which Natural England and the Joint Nature Conservation Committee have produced (see Annex B of Appendix J - Natural England's comments on the In-Principle Monitoring Plan [APP-247] and [REP2-044] [REP3-056]). These are detailed in section 1.6.4.4, covering the conservation objectives for the Dogger Bank Special Area of Conservation (SAC) and can be applied to developments across the Dogger Bank Zone. Geophysical surveys (which would capture large scale topographic changes) are incorporated into the surveys (see **Table 1-2**) and meet Objective 1.

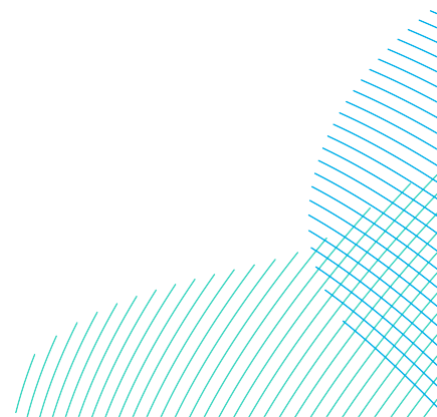


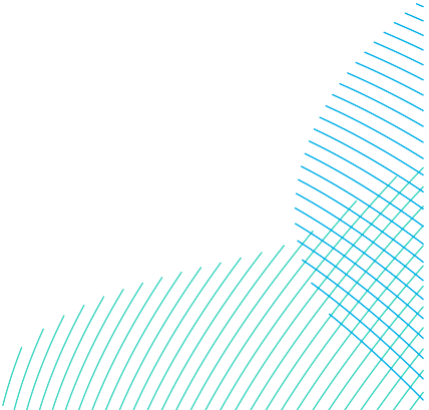
Table 1-2 In-Principle Monitoring Proposed – Marine Physical Environment

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
Changes in seabed level and the sediment transport regime, including scour processes	Physical environment and linked receptor groups e.g., marine ecology	Pre- construction	<p>Engineering and design purposes</p> <p>Input to benthic and other related ecological surveys and monitoring requirements as agreed with the MMO.</p> <p>Sand wave / bank characterisation</p> <p>Inform scour modelling</p>	<p>Surveys within the agreed Array Areas and Offshore Export Cable Corridor (note, the Array Areas and part of the Offshore Export Cable Corridor fall within the Dogger Bank SAC) using full seabed coverage Multibeam Echo Sounder (MBES) bathymetry and Side Scan Sonar (SSS) surveys of the area(s) within the Offshore Development Area in which it is proposed to carry out construction works, including a 500m buffer area around the site of each works (the “site of each works” being the area within the Offshore Development Area which is actually taken forwards to construction noting that it is possible that certain areas within the Offshore Development Area may not be developed).</p> <p>Where possible, alignment with the post-construction monitoring would be undertaken.</p> <p>The results of the pre-construction survey will be combined with existing survey data and other relevant information to define a pre-construction baseline of sediment transport regimes considering morphodynamic processes, seabed sediment composition and thickness, seabed mobility, and wave and tide regime.</p>	<p>A construction programme and monitoring plan would be submitted at least six months prior to commencement of licensed activities and would include details of proposed pre-construction surveys, baseline report format and content, construction monitoring, post-construction surveys and monitoring and related reporting.</p> <p>Detail of the pre-construction surveys and an outline of all proposed pre-construction monitoring shall be submitted to the MMO for written approval at least six months prior to the first survey.</p> <p>Detail of post-construction and operational monitoring is to be submitted at least six months prior to commissioning. Surveys carried out post- construction, with provision of the agreed reports in the agreed format in accordance with the agreed timetable, unless otherwise agreed in writing with the MMO in consultation with the relevant SNCBs.</p>
		Post- construction	<p>Structural integrity / engineering (scour)</p> <p>Sand wave / bank recovery rates and re-exposure of buried cables.</p> <p>Nearshore cable protection in water depth less than 10m</p> <p>Trenchless crossing exit pits</p>	<p>Surveys within the Array Areas and Offshore Export Cable Corridor (note, the Array Areas and part of the Offshore Export Cable Corridor fall within the Dogger Bank SAC) using full seabed coverage MBES and SSS. For this purpose the undertaker would, prior to the first such survey, submit a desk based assessment (based on detailed pre-construction survey data and which takes account of all factors which influence scour) to identify the representative sample of adjacent wind turbines / offshore platforms with greatest potential for scour. Selection of the representative sample will also consider the potential difference in conditions for foundations located on the top of the Dogger Bank to those located on the Dogger Banks margins. The survey would be used to validate the desk-based assessment: further surveys may be required if there are significant differences between the modelled scour (to be undertaken pre-construction) and recorded scour. The quantity of turbines /</p>	

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
				<p>offshore platforms subject to monitoring would be confirmed following the completion of detailed design studies and in consultation with the MMO. This would also include monitoring of secondary scour <u>at a sub-set of locations where scour/cable protection measures are installed in agreement with the MMO;</u> i.e. scour around the perimeter of installed scour protection, where relevant.</p> <p>Geophysical surveys would be carried out both before and after construction both for engineering / asset integrity purposes and to feed into the requirements for other environmental topics such as benthic ecology and archaeology.</p> <p>If nearshore external cable protection is installed it will be monitored, along with associated sediment accretion and scour.</p> <p>Post-construction monitoring will confirm recovery and backfilling of the seabed at the trenchless crossing exit pits.</p>	
Changes to water circulation due to the presence of infrastructure (wind turbines and offshore platforms)	Flamborough Front	Pre-construction	Establish the duration and frequency of occurrence of the Flamborough Front within the Array Areas to inform the design of post-construction monitoring requirements	<p>Consider the data published from The Crown Estate FRONTWARD Project, and any new research or data that has become available since DCO submission, to inform the pre-construction baseline. If required, analyse satellite imagery (e.g. Sentinel 3 sea surface temperature and chlorophyll concentrations) to determine the timing of occurrence and the location and duration of the Flamborough Front in the southern North Sea, filling in any data gaps in the FRONTWARD data. To establish the pre-construction baseline, it is proposed five years of historical imagery is reviewed. The pre-construction baseline will cover the post-consent period through to the start of construction. Depending on data availability, monthly, seasonal and annual changes in sea surface temperature and chlorophyll will be monitored post-construction for a period of five years with a review period at five year intervals. This assessment can be coordinated with other projects in the Dogger Bank region (e.g. Hornsea Project Four and Dogger Bank D) to fill the evidence gap in baseline understanding of the location of the Flamborough Front. A technical report outlining the findings will be published publicly (e.g. a technical publication) to improve understanding of the natural variability in front location and strength.</p>	<p>A Flamborough Front Pre-Construction Monitoring Plan would be submitted for review and agreement at least six months prior to the start of construction which would include details on the assessment methodology, data types includes, data resolution and temporal resolution of the monitoring.</p> <p>A technical report showing the results of the pre-construction monitoring would be submitted for review to inform the scope of the post-construction monitoring if required. This would include details on thresholds and trigger points for intervention.</p>

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
		Post-construction	Determine the scale of near-field wake related effects from foundations	<p>If the Flamborough Front is present within the Array Areas (or located to the south of the Array Areas which would indicate the stratified water body is potentially present in the Array Areas as the front is the boundary between well mixed water to the south and stratified water to the north), near-field monitoring will be undertaken in the lee of up to three foundation installations. The location of the monitoring will aim to target the largest foundation type (with the maximum wake effect) in areas where the Flamborough Front is present (determined through near real-time satellite observations).</p> <p>It is proposed the survey will include a towed thermistor chain (to measure temperature at different water depths within the water column) and an Acoustic Doppler Current Profiler (ADCP) (to measure current speed and direction). Other technologies may be available, and these will be considered as part of the survey design. The spatial, vertical and temporal resolution of the survey will be determined in the Flamborough Front Post-Construction Monitoring Plan and will depend on the final foundation design and array layout.</p>	<p>Post construction monitoring will only be undertaken if the Flamborough Front is proven to be present, or located to the south of the Array Areas during the pre-construction monitoring outlined above. If it is present to the north of the Array Areas, monitoring will not be required as this is an indicator that the water column is not stratified within the Array Areas.</p> <p>A Flamborough Front Post-Construction Monitoring Plan would be submitted for review and agreement at least six months prior to the start of monitoring. This will outline the detailed survey design, including equipment, number of deployments, timing of deployment, monitoring intervals (spatially, vertically and temporally). The monitoring plan will be agreed with the MMO and Natural England before any survey commences).</p>
		Post-construction	Determine the scale of far-field wake related effects from foundations	<p>Monitoring of far-field wake effect will rely on satellite imagery (e.g. Sentinel 3 sea surface temperature and chlorophyll concentration). Far-field monitoring will be undertaken within the array areas and if wake effects are detected beyond the array, the monitoring area will be increased to cover the extent of the far-field wake effect, or to the nearest adjacent offshore wind farm (where the effects of the Projects will be indistinguishable from the effects caused by another offshore wind farm). This will allow the evidence gap in understanding the effects of clusters of wind farms to be addressed.</p> <p>It is proposed monitoring of satellite imagery will be undertaken at one year and five years post construction to define the scale of effects from foundations. The assessment will be compared to the pre-construction monitoring to define thresholds of change. A technical report outlining the findings will be</p>	

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
				published publicly (e.g. a technical publication) to improve understanding of the effect of foundations on water circulation.	



1.6.4 Benthic and Intertidal Ecology

1.6.4.1 Conclusions of the Environmental Statement

- 42. No residual effect was greater than **minor adverse** for DBS East or DBS West in insolation or the Projects together.
- 43. Although no significant effects are predicted with regards to benthic and intertidal communities, pre-construction surveys are included in order to determine if sensitive species / habitats are present and to ensure that those habitats and environments identified in the ES continue to be representative of the benthic environment in the Dogger Bank area.

1.6.4.2 Conclusions of the RIAA

- 44. The assessment concludes AEol on the Dogger Bank SAC sandbank feature in relation to both Projects alone and in-combination effects (see **Volume 6, RIAA (application ref: 6.1)**). Therefore, monitoring within the Dogger Back SAC is proposed (see section 1.6.4.4).

1.6.4.3 Conclusions of the Marine Conservation Zone Assessment

- 45. The MCZA concludes that the conservation objective of maintaining the protected features of the Holderness Inshore and Offshore MCZs in a favourable condition or restoring them to favourable conditions will **not be hindered** by the construction, operation and decommissioning phases of the Projects, or cumulatively with any other plan, project or activity (see **Volume 8, Stage 1 MCZA (application ref: 8.17)**).
- 46. In addition, following consideration of the MMO's Relevant Representation [RR-030:4.15.1], the Applicants have amended Condition 13 (3) of Deemed Marine Licences 3 and 4 within the **Volume 3, Draft DCO (application ref: 3.1)** to commit to no anchoring taking place within the Holderness Inshore Marine Conservation Zone (MCZ). Therefore, there is no longer any potential for direct impacts during cable installation activities to occur within the MCZ.
- 47. Therefore, no monitoring within the MCZs is proposed.

1.6.4.4 In-Principle Monitoring

- 48. As stated in section 1.4, monitoring must have a clear purpose in order to provide answers to specific questions where significant environmental effects have been identified. Monitoring should be targeted to address significant evidence gaps or uncertainty, which are relevant to the Projects and can be realistically filled, as well as those species or features considered to be the most sensitive to the potential effects including those of conservation, ecological and / or economic importance.

49. In this instance, with respect to the conclusions of the ES and MCZA, no monitoring or independent surveys are required.
50. However, given the conclusion of AEoI on the Dogger Bank SAC sandbank feature, monitoring would likely be required. Impacts assessed in the RIAA can be grouped into two broad categories:
- Abrasion and disturbance (temporary); this includes the following:
 - o Abrasion/disturbance of the substrate on the surface of the seabed.⁵
 - o Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion.
 - o Habitat structure changes – removal of substratum (extraction).
 - o Smothering and siltation rate changes (Heavy & Light).
 - Habitat loss (permanent), this includes the following:
 - o Physical change (to another seabed type).
 - o Physical change (to another sediment type).
51. As noted in section 1.1, monitoring requirements in relation to HRA compensation are described in **Volume 6, Appendix 3 - Project Level Dogger Bank Compensation Plan (application ref: 6.2.3)**.
52. In addition, the Applicants are aware of the set of broad benthic monitoring objectives which Natural England and the Joint Nature Conservation Committee have produced (see Annex B of Appendix J - Natural England's comments on the In-Principle Monitoring Plan [APP-247] and [REP2-044] [REP3-056]). These cover the conservation objectives for the Dogger Bank SAC and can be applied to developments across the Dogger Bank Zone. These objectives are:
- Objective 1: Determine the impacts on and recovery rates of sandbank physical features affected by wind farm installation, including large and fine scale topography, sediment composition and distribution;
 - Objective 2: Characterise and identify impacts on benthic biodiversity and community structure as a result of windfarm installation, i.e. changes in abundance, composition and distribution of native communities;
 - Objective 3: Determine the impacts of hard substrate infrastructure introduction on sedimentary benthic communities; and

⁵ Impact categories used in the RIAA are taken from Natural England's' Phase III Best Practice Advice for Evidence and Data Standards (Natural England, 2022) and are grouped here for ease

- Objective 4: Assess the impact of Objectives 2 and 3 on the wider community and structure i.e. linked receptors groups including epifauna, fish and birds.
53. Objective 1 is addressed in the proposals for geophysical surveys (which would capture large scale topographic changes (see **Table 1-2**) and benthic sampling (see **Table 1-3**).
54. Benthic sampling would also address Objectives 2 and 3. A focused programme of benthic grab sampling is proposed, both to ground truth the geophysical data and provide baseline particle size and benthic data for comparison with the post-construction position. Samples would be taken at a subset of works locations, which would be determined once the final design and layouts are known and confirmed. Grab sampling will be designed to capture localised, near-field, far-field and reference sites. In addition, visual monitoring of infrastructure (via drop down video (DDV) or ROV) would capture colonisation of structures.
55. Objective 4 would be addressed by the benthic sampling programme (including DDV / ROV surveys) and sandeel monitoring included in **Table 1-4**.

Table 1-3 In-Principle Monitoring Proposed – Benthic and Intertidal Ecology

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
Abrasion and disturbance (temporary) Habitat loss (permanent)	Annex 1 sandbank Other Potential habitats of principle importance	Pre- construction	Demonstrating the effects on habitat from the construction of the wind farm are in line with those assessed in the ES and HRA.	<p>Geophysical surveys would be carried out to fulfil monitoring requirements in relation to both benthic habitats and archaeology (in addition to the engineering needs of the Projects, see section 1.6.1).</p> <p>The scope of the geophysical surveys would be determined to discharge conditions within the DMLs of Volume 3, Draft DCO (application ref: 3.1).</p> <p>From a benthic habitats' perspective, the geophysical surveys would include high resolution bathymetry and side scan sonar to classify the habitats (and any trends over time), determine the location, extent and composition of any potential habitats of principle importance including biogenic or geogenic reef features (as defined by Irving (2009) and Gubbay (2007), whilst also informing the benthic sampling design. They would also be used to demonstrate the recovery of the physical form of the areas of seabed affected.</p>	<p>A construction programme and monitoring plan would be submitted at least six months prior to commencement of licensed activities and would include details of proposed pre-construction surveys, baseline report format and content, construction monitoring, post-construction surveys and monitoring and related reporting.</p> <p>Detail of the pre-construction surveys and outline of all proposed pre-construction monitoring shall be submitted to the MMO for written approval at least six months prior to the first survey.</p>
Abrasion and disturbance (temporary) Habitat loss (permanent)	Annex 1 sandbank Non-Native Invasive Species Other Potential habitats of principle importance	Pre- construction		<p>It is proposed that a focussed programme of benthic grab sampling is used, both to ground truth the geophysical data and provide baseline particle size and benthic data for comparison with the post-construction position. Samples would be taken at a subset of works locations, which would be determined once the final design and layouts are known and confirmed.</p> <p>Grab sampling would be undertaken in the Array Areas, Inter-Platform Cabling Area and in the area of the Offshore Export Cable Corridor that overlaps with the Dogger Bank SAC. The sampling stations would be selected to capture the different range of habitats and environments identified in the ES, in order to ensure that they are representative of the benthic environment in the Dogger Bank area.</p> <p>Targeted Drop Down Video (DDV) / Remotely Operated Vehicle (ROV) survey to confirm the presence, nature and extent of any potential habitats of principle importance features identified in the pre-construction geophysical data.</p> <p>No benthic sampling is proposed for the section of the Offshore Export Cable Corridor that lies outside the Dogger Bank SAC.</p> <p>Grab sampling will be designed to capture localised, near-field, far-field and reference sites.</p> <p>All grab samples will be analysed for infauna and particle size, with a sub-sample being taken for PSA. The particle size analysis will also be used to inform the monitoring undertaken in relation to sandeel (see section 1.6.5). MMO approved labs will be used to analyse results where applicable</p>	<p>Detail of post-construction and operational monitoring is to be submitted at least six months prior to commissioning. Surveys carried out post- construction, with provision of the agreed reports in the agreed format in accordance with the agreed timetable, unless otherwise agreed in writing with the MMO in consultation with the relevant SNCBs.</p>

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
Abrasion and disturbance (temporary) Habitat loss (permanent) Colonisation of Introduced Substrate, Including Invasive / Non-native Species	Annex 1 sandbank Non-Native Invasive Species Other Potential habitats of principle importance	Operation		<p>The detail of the post-construction monitoring will be confirmed based on the pre-construction results. However, at this stage the strategy is to sample the same locations pre and post-construction, whilst taking an adaptive approach to the sampling effort and duration of the monitoring that is required.</p> <p>Undertake monitoring of the colonisation of foundations / scour protection using DDV / ROV around a representative number of WTG foundations.</p> <p>The presence of non-native species will be recorded and reported on where identified through grab and imagery-based sampling techniques.</p> <p>Should drilling be utilised to install piled foundations, the Applicants will seek to ensure that no drill mounds (i.e. sediment arising from the drilling of the Projects foundations) persist above 3m from the surrounding seabed. <u>In the event that initial post-construction monitoring undertaken following the completion of construction identifies drill mounds that are present, an appropriate monitoring campaign focussing initially on an agreed subset of mounds will be developed in consultation with the MMO.</u></p> <p>In the event that such drill mounds greater than 3m are found to persist, an appropriate monitoring campaign will be developed in consultation with the MMO.</p>	

1.6.5 Fish and Shellfish Ecology

1.6.5.1 Conclusions of the Environmental Statement

56. No impact was greater than **minor adverse** for DBS East or DBS West in insolation or the Projects together.
57. Although no significant effects are predicted with regard to sandeel in the EIA, it is recognised that as an important prey species relevant to the nutrition function of the Dogger Bank SAC, therefore the suitability of habitat to support sandeel should be monitored.

1.6.5.2 Conclusions of the RIAA

58. The assessment concludes no potential for AEoI on the River Derwent or Humber Estuary SAC migratory fish species in relation to both Projects alone and in-combination effects (see **Volume 6, RIAA (application ref: 6.1)**). Therefore, no monitoring of migratory fish species is proposed.

1.6.5.3 In-Principle Monitoring

59. **Table 1-4** provides information on the monitoring requirements for fish ecology. Where it is possible, synergies (e.g. collection of any required grab samples) with monitoring commitments made for benthic and intertidal ecology would be explored.

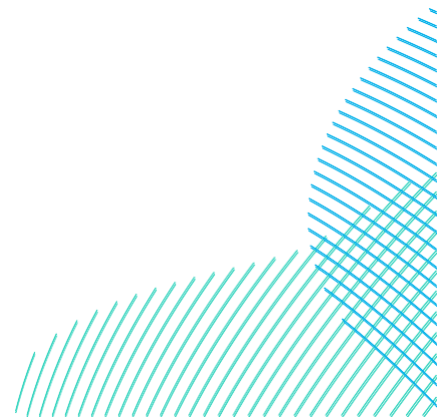


Table 1-4 In-Principle Monitoring Proposed – Fish and Shellfish Ecology

Potential Effect	Receptors	Stage	Headline reasons for monitoring	Monitoring Proposal	Details
Habitat loss	Sandeel	Pre- and post-construction	Determine the suitability of the wind farm site as sandeel habitat – demonstrating that any effects on habitat suitability from the construction of the wind farm are in line with those assessed in the ES.	Grab samples (number to be agreed with the MMO post-consent) to be taken at locations to be agreed with the MMO post-consent. Subsequent PSA of the samples to determine a likely preference or avoidance of the area by sandeels.	<p>A construction programme and monitoring plan would be submitted at least six months prior to commencement of licensed activities and would include details of proposed pre-construction surveys, baseline report format and content, construction monitoring, post-construction surveys and monitoring and related reporting.</p> <p>Detail of the pre-construction surveys an outline of all proposed pre-construction monitoring shall be submitted to the MMO for written approval at least six months prior to the first survey.</p> <p>Detail of post-construction and operational monitoring is to be submitted at least six months prior to commissioning.</p> <p>Surveys carried out post- construction, with provision of the agreed reports in the agreed format in accordance with the agreed timetable, unless otherwise agreed in writing with the MMO in consultation with the relevant SNCBs.</p>

1.6.6 Marine Mammals

1.6.6.1 Conclusions of the Environmental Statement

60. At a Projects-alone level, the residual effects from the Projects are assessed as no greater than **minor adverse** during construction for harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, grey seal and harbour seal from the following activities:
- Piling (physical and auditory injury and disturbance effects);
 - Other construction activities (physical and auditory injury);
 - Underwater noise and disturbance from construction vessels (physical and auditory injury);
 - Barrier effects from underwater noise;
 - Increased risk of Collision with vessels;
 - Disturbance at seal haul-out sites;
 - Changes to prey availability; and
 - Changes to water quality.
61. During operation, no greater than **minor adverse** effects are assessed for grey and harbour seal and harbour porpoise from the following activities:
- Underwater noise from operational turbines (physical and auditory injury);
 - Underwater noise from operation and maintenance activities (disturbance);
 - Underwater noise from operation and maintenance vessel disturbance;
 - Barrier effects from underwater noise;
 - Disturbance at seal haul-out sites;
 - Changes to prey availability; and
 - Changes to water quality.
62. The conclusions of the assessment are based on varying levels of confidence in the data used in the assessment. However, the conclusions of the assessment are of a precautionary nature where there is high uncertainty or low confidence in the data.

63. Following acceptance of **Project Change Request 1 – Offshore and Intertidal Works (document reference 10.49)** by the Examining Authority in January 2025 (see Rule 9 and 17 letter - Procedural Decision and Request for further information dated 21st January 2025 [PD-012]), the Electrical Switching Platform (ESP) was removed from the Projects' Design Envelope. As a consequence, all potential cumulative residual effects for marine mammals were determined to be **minor adverse** (not significant) (see **Appendix B: Marine Mammal Environmental Statement Update (document reference 10.51)** for further information). Project-specific Site Integrity Plans (SIPs) for the Southern North Sea Special Area of Conservation (SAC) (**Volume 8, In Principle Southern North Sea SAC Site Integrity Plan (SIP) (application ref: 8.26)**), are proposed which would give due consideration to mitigation, if deemed required.

1.6.6.2 Conclusions of the RIAA

64. At the Projects-alone level, the assessments of effect from the Projects conclude that there would be no potential for adverse effect for the assessed SAC for marine mammals, during construction or operation.

The assessments for the Projects in-combination with other schemes concluded that there was the potential for an AEoI of the Southern North Sea SAC (for harbour porpoise from cumulative underwater noise during OWF piling and other marine mammal species as a result of disturbance) due to in-combination disturbance effects. However, with mitigation in place through the implementation of Marine Mammal Mitigation Protocol (MMMP) for piling (**Volume 8, Outline MMMP (application ref: 8.25)**), and **Volume 8, In Principle Southern North Sea SAC SIP (application ref: 8.26)**, there would be no greater than **minor adverse** effect on integrity.

1.6.6.3 In-Principle Monitoring

65. It is recognised that monitoring is an important element in the management and verification of the actual Projects' effects. The **Volume 8, Outline MMMP (application ref: 8.25)** and **Volume 8, In Principle Southern North Sea Site Integrity Plan (SIP) (application ref: 8.26)** contain key principles that provide the framework for any mitigation that could be required. As secured through the DMLs in the **Volume 3, Draft DCO (application ref: 3.1)**, if piled foundations are used in the final project design, underwater noise monitoring of the first four piles of each piled foundation type would be undertaken with the methods agreed with the MMO and relevant SNCBs in the pre-construction period. It is also acknowledged that monitoring at large distance ranges during the construction phase would be required to validate any predictions from the underwater noise modelling (detailed in **Volume 7, Appendix 11-3 Underwater Noise Modelling Report (application ref: 7.11.11.3)**).
66. To monitor the localised response of marine mammals to active sources of underwater noise and potential disturbance during construction, monitoring would be undertaken to record and report (as required as part of the **Volume 8, Outline MMMP (application ref: 8.25)**) the observed behavioural response of marine mammals where possible to noise sources, including in response to mitigations (e.g. Acoustic Deterrent Devices (ADDs) and the use of any noise abatement or reduction system), in order to validate the conclusions of the ES and RIAA. This would be undertaken through Marine Mammal Observers (MMObs) and Passive Acoustic Monitoring (PAM)) which are required to be reported as part of the mitigation in the MMMP during piling.
67. The Applicants are also supportive, in principle, of joint industry projects or alternative site based monitoring of existing marine mammal activity inside the area(s) within the Offshore Development Area in which it is proposed to carry out construction works and would welcome collaboration opportunities from SNCBs, non-government organisations or other developers in strategic monitoring programmes. This would likely be managed outwith the IPMP, through for example OWEAP.

1.6.7 Offshore Ornithology

1.6.7.1 Conclusions of the Environmental Statement

68. The potential effects that could arise during the construction, operation and decommissioning of the Projects have been discussed with Natural England, the Royal Society for the Protection of Birds and the MMO as part of the Evidence Plan Process (see **Volume 7, Chapter 12 Offshore Ornithology (application ref: 7.12)** of the ES).
69. At the DBS East and DBS West Projects-alone level, during the construction and operation and maintenance stages, no effects have been assessed to be greater than **minor adverse** for any bird species.
70. During construction, operation and maintenance stages, disturbance, displacement and barrier effects has been assessed as **minor adverse** significance for gannets (operation only), razorbills and guillemots.
71. Collision risk with wind turbines from DBS East and DBS West is assessed as **minor adverse** significance for gannet, great black-backed gull, herring gull, kittiwake and lesser black-backed gull when considered for all biological seasons against the most appropriate population scale.
72. Other schemes have been considered for how they might act cumulatively with the Projects and a screening process carried out. The cumulative assessment identified that most effects would be temporary, small scale and localised. Cumulative effects assessed included displacement and Collision risks and were assessed as **negligible to moderate adverse**.
73. The risk from cumulative operational displacement across all wind farms considered is assessed as no greater than **moderate adverse** significance for guillemots, while gannet, razorbill and puffin are assessed as no greater than **minor adverse**.
74. The risk to birds from cumulative collisions with wind turbines across all wind farms considered is assessed as no greater than **minor adverse** significance for all species except kittiwake and great black-backed gull which are assessed as **moderate adverse**. Therefore, it is proposed that any required monitoring should focus on the operational period when there is a pathway to the risk (collision with turbines) and, where possible, on kittiwake and great black-backed gull.

1.6.7.2 Conclusions of the RIAA

75. The Applicants' assessments conclude that a Projects-alone AEoI at all sites screened into the assessment can be ruled out.

76. In-combination AEol is ruled out for all sites and species except kittiwake (collision risk) and guillemot (displacement) from the Flamborough and Filey Coast Special Protection Area (SPA).

1.6.7.3 In-Principle Monitoring

77. It is the position of the Applicants that any ornithological monitoring proposal should be targeted to address any effects, evidence gaps or uncertainty of most relevance to the Projects and the specific species. **Table 1-5** outlines the potential in-principle monitoring. It should be emphasised that the Projects could not address all evidence gaps and areas of uncertainty, and the Applicants would not expect that the Projects would deliver all of the potential measures identified in **Table 1-5**. Rather, the identified measures would form the basis of discussion with Natural England in order to determine those most appropriate to take forward to implementation.
78. In order to take monitoring measures forward to implementation, they should address matters identified as:
- Being of key importance in the assessments for the Projects;
 - Associated with particularly high uncertainty; and
 - Can be addressed effectively at the project sites.
79. It is therefore important that priorities should be set not only to improve understanding of key aspects of uncertainty in the project impact assessments, but also to make the most effective use of opportunities afforded by the location and design of the Projects. This would allow the Projects to contribute as much as possible to tackling areas of uncertainty that are not already being investigated elsewhere, and to avoid topics where conditions at the Array Areas make particular studies less feasible and less likely to provide clear results.
80. It is important also to recognise that monitoring programmes are being undertaken / planned for the Dogger Bank A, B and C and Sofia projects. Therefore, it is crucial to consider what current or planned programmes aim to study and ensure that there is not duplication of effort and that any monitoring for the Projects complements or enhances other efforts:
- Monitoring of breeding populations within the Flamborough and Filey Coast SPA within foraging range of the Projects. Suitable monitoring and studies have been undertaken, it is therefore expected that the Projects would utilise these data to identify any relevant population changes. It is not, expected that the Projects would be required to undertake additional monitoring, but would need to ensure that existing activity continued.

- Dogger Bank A, B & C monitoring. The primary focus of the Dogger Bank A and B ornithology monitoring is to consider the extent to which birds (gannet and kittiwake mainly) using the wind farm sites during the breeding season are breeding adults from Flamborough and Filey Coast SPA (or other SPAs) or are non-breeders / immatures etc. The premise being that the wind farm sites are so far offshore that it is likely few breeding birds from UK colonies would use it. A secondary element of the monitoring is to determine displacement rates for guillemot and razorbill during the non-breeding season (when auk numbers are at their peak on these sites). For Dogger Bank C the focus is broadscale distributions of birds (mainly kittiwakes and auks) from a range of east coast colonies (both England and Scotland) during the non-breeding season using geo-locator tags to establish extent to which these birds use the wind farm site and Dogger Bank during the non-breeding seasons.
 - Sofia monitoring. This focusses on aerial surveys and use of LiDAR to measure flight heights (and hence derive collision risk implications). It also includes displacement studies on wintering auks.
81. A standalone offshore ornithological monitoring plan will be developed in the post-consent phase of the Projects in consultation with relevant stakeholders. The offshore ornithological monitoring plan will include details of surveys, including methodologies and timings, a proposed format, content and timings. The survey proposals within the offshore ornithological monitoring plan will specify each survey's objectives and explain how it will assist in either informing a useful and valid comparison with the pre-construction position and/or will enable the validation or otherwise of key predictions in the environmental statement. Monitoring reports will be provided to the MMO in an agreed format in accordance with an agreed timetable following completion of the survey programme.
82. It is also noted that the Applicants have submitted derogation proposals for kittiwake and guillemot and therefore the compensatory measures proposed include monitoring of their success as part of the proposals, see **Volume 6, Appendix 1 - Project Level Kittiwake Compensation Plan (application ref: 6.2.1)** and **Volume 6, Appendix 2 - Guillemot [and Razorbill] Compensation Plan (application ref: 6.2.2)**.

Table 1-5 In-Principle Monitoring Proposed – Offshore Ornithology

Potential Effect	Receptors	Stage	Headline reasons for monitoring	Monitoring Proposal	Details
Displacement from operational windfarm site	Auks	Pre-and Post Construction	<ul style="list-style-type: none"> To determine the level of displacement from Array Areas. 	Determine whether there is a change in abundance and distribution within the Array Areas and appropriate buffer zones following construction of the Projects.	<p>Analysis of pre- and post-construction aerial digital survey data of the windfarm site and buffer zones could be undertaken. The detailed requirements for this would be submitted to the MMO for approval six months before commencement of the first pre-construction survey for pre-construction monitoring. It is likely that the number of surveys required would be based on a power analysis.</p> <p>For post-construction monitoring, the detailed requirements would be submitted to the MMO for approval six months prior to completion of construction.</p> <p>Consideration would be given to methods to investigate spatial distributions in order to consider displacement at different scales (i.e. with respect to wind turbines or the Array Area as a whole).</p>
Collision risk	Offshore ornithology	Post-construction	<ul style="list-style-type: none"> Increase certainty of collision risk modelling parameters. Record potential collisions with wind turbine blades. 	Collision risk monitoring as agreed through consultation with the relevant SNCBs.	<p>The Applicants could optimise monitoring of this nature through alignment of the monitoring programmes in the Dogger Bank as far as possible with input from the relevant SNCBs.</p> <p>The final details of the monitoring would be provided in the Monitoring Plan to be produced post-consent.</p> <p>Remote monitoring approaches (e.g. camera and radar based systems) would be investigated for consideration, noting that these technologies are constantly developing so it is not realistic to provide details at this stage.</p>
N/A	Kittiwake	Pre-and Post Construction	<ul style="list-style-type: none"> Success of compensation measures. 	Potential monitoring measures are outlined in Appendix 1 Project Level Kittiwake Compensation Plan (application ref: 6.2.1)	<p>Monitoring could be developed and agreed by the Kittiwake Compensation Plan Steering Group.</p> <p>The final details of the monitoring would be provided in the monitoring plan to be produced post-consent in line with the requirements of the Kittiwake Strategic Implementation Monitoring Plan (KSIMP) as described within Appendix 1 Project Level Kittiwake Compensation Plan (application ref: 6.2.1).</p>
N/A	Guillemot	Pre-and Post Construction	<ul style="list-style-type: none"> Success of compensation measures. 	Potential monitoring measures are outlined in Appendix 2 Guillemot [and Razorbill] Compensation Plan (application ref: 6.2.2)	<p>Monitoring could be developed and agreed by the Guillemot Compensation Plan Steering Group.</p> <p>The final details of the monitoring would be provided in the monitoring plan to be produced post-consent in line with the requirements of the Guillemot Strategic Implementation Monitoring Plan (GSIMP) as described within Appendix 2 Guillemot [and Razorbill] Compensation Plan (application ref: 6.2.2).</p>

1.6.8 Commercial Fisheries

1.6.8.1 Conclusions of the Environmental Statement

The effects on commercial fisheries during the construction, operation and decommissioning stages of the Projects found that there would be effects of **negligible** to **minor adverse** significance on commercial fishing fleet receptors, and **moderate adverse** effects (pending the development of further mitigation as discussed in **Volume 7, Chapter 13 Commercial Fisheries (application ref: 7.13)** and included within **Volume 8, Outline Fisheries Liaison and Coexistence Plan (FLCP) (application ref: 8.28)**) on the dredge and inshore static vessels during construction and decommissioning stages of the Projects.

1.6.8.2 In-Principle Monitoring

83. No monitoring in relation to commercial fisheries is considered necessary, other than the standard arrangements for fisheries liaison, which would be agreed in the FLCP prior to the start of construction. The FLCP would be produced in accordance with **Volume 8, Outline FLCP (application ref: 8.28)** submitted with the DCO application.

1.6.9 Shipping and Navigation

1.6.9.1 Conclusions of the Environmental Statement

84. The residual effects of DBS East and DBS West have been assessed in **Volume 7, Chapter 14 Shipping and Navigation (application ref: 7.14)** of the ES with effects of broadly acceptable, with effects pre-additional mitigation being assessed as broadly acceptable to tolerable.

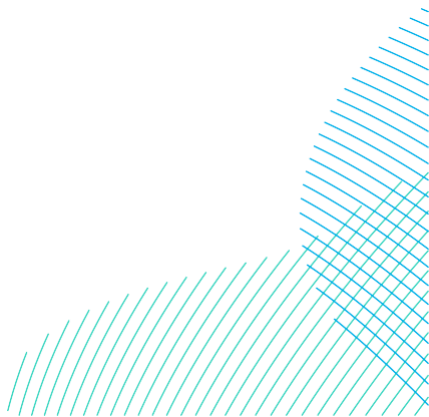
1.6.9.2 In-Principle Monitoring

85. **Table 1-6** provides information on the vessel traffic monitoring requirements for shipping and navigation.

Table 1-6 In-Principle Monitoring Proposed – Shipping and Navigation

Potential Effect	Receptors	Stage	Headline reasons for monitoring	Monitoring Proposal	Details
Effects on the levels of marine traffic across the Offshore Development Area	Marine traffic	Construction	Validate the predictions made in the ES and Navigational Risk Assessment with respect to potential effects on the levels of shipping traffic.	Construction monitoring shall include vessel traffic monitoring by Automatic Identification System (AIS), including the provision of reports on the results of that monitoring periodically as requested by the Maritime Coastguard Agency (MCA).	During construction, vessel traffic monitoring using AIS would be conducted, with the detailed requirements for this being agreed with the MMO and MCA six months before commencement of construction.
		Post-construction		Vessel traffic monitoring in line with the Outline Marine Traffic Monitoring Plan by AIS, totalling a maximum of 28 days taking account of seasonal variations in traffic patterns over one year, following the commencement of commercial operation. A report would be submitted to the MMO and the MCA following the end of the monitoring and periodically, if required, as requested by the MCA.	Post-construction vessel traffic monitoring would be in line with the Outline Marine Traffic Monitoring Plan and would consist of AIS monitoring for a maximum of 28 days (but not consecutively) and would take account of seasonal variation of traffic patterns over a year. This would be done at a suitable time as agreed with the MMO and MCA following the commencement of commercial operation.
Effect on marine traffic routeing and safety.	Marine Traffic	Construction	Ensure temporary aids to navigation are functional and fit for purpose.	Aids to Navigation Management plan that remains functional throughout the lifetime of the Projects with monitoring of Aids to Navigation function and reporting to Trinity House.	Aids to Navigation monitoring and reporting to be detailed within the Aids to Navigation Management Plan to be agreed with the MMO, in consultation with Trinity House, prior to commencement of construction.
		Post - construction	Ensure aids to navigation are functional and fit for purpose.		
Effect on marine traffic routing and safety.	Marine Traffic	Post- Construction	To ensure charted depth remains in line with that agreed in consultation with the MCA and nautical charts remain up to date. To ensure that cables do not become exposed and present a snagging risk to fishing or anchoring vessels.	Periodic monitoring of cable burial / protection.	Periodic monitoring of cable burial / protection with a risk-based approach to the method (this work would be undertaken for engineering and asset integrity purposes, with the frequency determined by need). Monitoring periodicity will be informed through an engineering view of risks of cable exposure and changes to cable protection levels which could lead to a risk of cable snagging by sea users. Where these risks are perceived to be higher, or changes are perceived to be potentially more frequent, then monitoring would be undertaken more frequently. Where risks of exposure are deemed to be lower, or the likelihood of changes are perceived to be lower, monitoring would be undertaken less frequently. The view of

Potential Effect	Receptors	Stage	Headline reasons for monitoring	Monitoring Proposal	Details
					<p>risk will be initially informed by issues such as seabed mobility and volumes of shipping traffic.</p> <p>The risks will be understood when final CBRAs have been completed and final installation plans, layouts and designs are in place. At that point a monitoring programme can be brought forward with a periodicity which reflects the engineering view of risks, to be updated post construction in light of the results of the cable as-built status. As an indication projects might typically undertake routine surveys every five years, with potential increased frequency in areas of higher risk, as determined based on survey results and levels of cable exposure. Monitoring will endure as deemed necessary across Project lifetimes.</p>



1.6.10 Offshore Archaeology and Cultural Heritage

1.6.10.1 Conclusions of the Environmental Statement

86. The construction, operation and decommissioning stages of the Projects would result in a range of potential effects upon the marine archaeological and cultural heritage environment. At the Projects project-alone level, the effects that have been assessed are anticipated to be reduced to a **minor adverse** residual effect or are considered to be **negligible** on the basis of embedded mitigation and best practice, including further interpretation / assessment of geophysical and geotechnical data post consent. Furthermore, known archaeological receptors are not considered to be subject to significant cumulative effects on the basis that they should be avoided due to appropriate mitigation.

1.6.10.2 In-Principle Monitoring

87. **Table 1-7** provides information on the monitoring requirements for offshore archaeology and cultural heritage. The principle mechanism for delivery of monitoring for offshore archaeology and cultural heritage is through agreement on the Written Scheme of Investigation (WSI) (Offshore) (in accordance with **Volume 8, Outline WSI (Offshore) (application ref: 8.22)** and / or further activity specific method statements to be agreed with the MMO in consultation with Historic England.

Table 1-7 In-Principle Monitoring Proposed – Offshore Archaeology and Cultural Heritage

Potential Effect	Receptor/s	Stage	Headline reason/s for monitoring	Monitoring Proposal	Details
All direct and indirect effects on the archaeological resource	All Archaeology receptors	Pre-construction / Construction	Validate the predictions made where reasonable in the ES with respect to potential effects on the archaeological resource and to inform selection of appropriate mitigation.	<p>Volume 8, Outline WSI (offshore) (application ref: 8.22) has been compiled which makes provision for all archaeological mitigation that might be required in the light of pre-construction investigations, including field investigation, post-fieldwork activities, archiving and dissemination of results.</p> <p>Full sea floor coverage swath-bathymetric surveys undertaken to International Hydrographic Organisation (IHO) Order 1A standard, geotechnical, magnetometer, geophysical and SSS of the area(s) within the Development Area in which it is proposed to carry out construction works, including a 500m buffer area around the site of each works.</p> <p>This should include the identification of sites of historic or archaeological interest (A1 receptors) and any unidentified anomalies to agreed dimensional criteria (A2 receptors), which may require the refinement, removal or introduction of archaeological exclusion zones and to confirm project specific micro-siting requirements (for A2 receptors).</p>	<p>The WSI includes provision to update the document as the project design is refined and as the results of further archaeological assessment become available. With the final agreed WSI acting as a ‘point-in-time’ document and submitted to the MMO six months in advance of the licenced activities.</p> <p>The Applicants have submitted Volume 8, Outline WSI (Offshore) (application ref: 8.22) with the DCO application. A WSI would be in place prior to licenced activities.</p>
All direct and indirect effects on the archaeological resource	All Archaeology receptors	Operation	Validate the predictions made in the ES, where reasonable, with respect to potential effects on the archaeological resource and to inform selection of appropriate mitigation	Specific requirements relating to monitoring during post-construction (including a conservation program for finds) as detailed in the WSI. Notably the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) shall be followed during all intrusive works.	<p>The WSI produced pre- construction would be a ‘point-in-time’ document, with the specific methodology for each subsequent package of archaeological works (i.e. construction or operation) to be taken forward through archaeological method statements produced under the umbrella of the WSI and agreed with the archaeological curator.</p> <p>Survey and work package specific archaeological objectives would be established on a case-by-case basis.</p>

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