NORTH FALLS

Offshore Wind Farm

Offshore In-Principle Monitoring Plan

Document Reference:	7.10
Volume:	7
APFP Regulation:	5(2)(q)
Date:	July 2024
Revision:	0

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Project	North Falls Offshore Wind Farm
Document Title	Offshore In-Principle Monitoring Plan
Document Reference	7.10
APFP Regulation	5(2)(q)
Supplier	Royal HaskoningDHV
Supplier Document ID	PB9244-RHD-ZZ-OF-RP-YE-0295

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	July 2024	Submission	CP	GK	RHDHV

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Glossary of Acronyms

AEoI	Adverse Effect of Integrity
DCO	Development Consent Order
DML	Deemed Marine Licence
EIA	Environmental Impact Assessment
ES	Environmental Statement
GGOWF	Greater Gabbard Offshore Wind Farm
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
IPMP	In-principle Monitoring Plan
MCA	Maritime Coastguard Agency
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
NFOW	North Falls Offshore Wind Farm
NPS	National Planning Statement
OSP	Offshore Substation Platform
SAC	Special Area of Conservation
SIP	Site Integrity Plan
SNCB	Statutory Nature Conservation Body
SNS	Southern North Sea
SPA	Special Protection Area
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

Glossary of Terminology

Array area	Infrastructure required to connect the Project to the National Grid connection point.
Array cables	Cables which link the wind turbine generators with each other, the offshore substation platform(s) and/or the offshore converter platform.
Bathymetry	Topography of the seabed.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the Environmental Impact Assessment (EIA) and information to support the Habitat Regulations Assessment (HRA).
Intertidal	The shore area between the level of mean high water springs (MHWS) and mean low water springs (MLWS).
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Offshore cable corridor	The corridor of seabed from array area to the landfall within which the offshore export cables will be located.
Offshore converter platform	Should an offshore connection be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing High Voltage Alternating Current (HVAC) and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the offshore substation platform(s) to the landfall, as well as auxiliary cables.
Offshore project area	The overall area of the array area and the offshore cable corridor.
Offshore substation platform(s)	Fixed structure(s) located within the array area, containing HVAC electrical equipment to aggregate the power from the wind turbine generators and increase the voltage to a more suitable level for export to shore via offshore export cables.
Platform interconnector cable	Cable connecting the offshore substation platforms (OSP) or the OSP and offshore converter platform.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Sandwave	Bedforms with wavelengths of 10 to 100m, with amplitudes of 1 to 10m.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the wind turbine generator foundations and OSP or / and offshore converter platform (OCP) foundations as a result of the flow of water.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Wind turbine generator	Power generating device that is driven by the kinetic energy of the wind.

1 Introduction

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) in the draft Development Consent Order (DCO) for North Falls Offshore Wind Farm ('North Falls' or 'the Project'). This document has been submitted with the DCO application and will be used as a basis for further discussions post consent.

2. 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 Project will be formally controlled and mitigated.

3. The IPMP provides a framework for further discussions post consent with the Marine Management Organisation (MMO) and the relevant Statutory Nature Conservation Bodies (SNCBs) 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 being granted consent. However, agreeing guiding principles reinforces commitments made in the Environmental Statement (ES) and provides the basis for the monitoring plan which needs to be submitted in satisfaction of the conditions of the DMLs. Final detailed plans for monitoring work will be produced closer to the time that the actual work will be undertaken, allowing refinements to be made based on detailed design and available knowledge and technology at that time.

4. The relevant topics and / or receptor groups that will be discussed in this plan are as follows:

   - Marine Geology, Oceanography and Physical Processes;
   - Marine Water and Sediment Quality;
   - Benthic and Intertidal Ecology;
   - Fish and Shellfish Ecology;
   - Marine Mammals; and
   - Offshore Ornithology.

5. Monitoring for the following topics is considered separately:

   - Offshore archaeology monitoring is addressed in the Outline Written Scheme of Investigation (Offshore) (Document Reference: 7.11);
   - Shipping and navigation monitoring is addressed in the Outline Marine Traffic Monitoring Plan (Document Reference: 7.21); and
   - Commercial fisheries monitoring is addressed in the Outline Fisheries Liaison and Co-existence Plan (Document Reference: 7.9)

1.2 Background

6. The North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project') is an extension to the existing Greater Gabbard Offshore Wind Farm (GGOW). When operational, North Falls would have the potential to generate renewable power for approximately 400,000 UK homes from up to 57 wind turbines.

7. The Applicant, North Falls Offshore Wind Farm Ltd (NFOW), is a consortium between SSE Renewables Offshore Windfarm Holdings Limited (SSER) and RWE Renewables UK Swindon Limited (RWE), both of which are highly experienced developers.

2 Description of the Project

8. In response to feedback received on the Preliminary Environmental Information Report (PEIR), the North Falls array area has been adjusted to reduce the former southern array area (now the 'array area'), in addition to the removal of the former northern array (see Chapter 4 Site Selection and Assessment of Alternatives (Document Reference: 3.1.6)).

9. At this stage of the Project's development, some optionality is required to future-proof the DCO. In this regard, discussions to explore grid connection options, with the Department for Energy Security and Net Zero (DESNZ) and co-operation with the Offshore Transmission Network Review (OTNR) resulted in the consideration of three grid connection options:

   - Option 1: Onshore electrical connection at a National Grid connection point within the Tendring peninsula of Essex, with a project alone onshore cable route and onshore substation infrastructure.
   - Option 2: Onshore electrical connection at a National Grid connection point within the Tendring peninsula of Essex, sharing an onshore cable route (but with separate onshore export cables) and co-locating separate project onshore substation infrastructure with Five Estuaries; or
   - Option 3: Offshore electrical connection, supplied by a third-party.

10. The key offshore components and areas, reflecting the Project's adjustments and updates, are summarised below (see ES Chapter 5 Project Description (Document Reference: 3.1.7) for further information):

    - Under Options 1 and 2 the key offshore components would be:
      - Wind turbine generators (WTG) and their associated foundations;
      - Up to two offshore substation platforms (OSP) and their associated foundations to aggregate electricity from the WTGs and facilitate the export of electricity via the Project's offshore export cables;
      - Subsea cables:
        - Array cables between the WTGs and between the WTGs and OSP(s);
        - Platform interconnector cable between the OSPs, if required
        - Offshore export cables between the OSP(s) and landfall.

- Scour protection around foundations, where required; and
- Surface laid cable protection, where required.

- Under Option 3, the following key offshore components would be:
  - WTG and their associated foundations.
  - Up to one OSP and associated foundation to aggregate electricity from the wind turbine generators.
  - One offshore converter platform (OCP) and associated foundation to increase the electricity voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export via an HVDC interconnector cable supplied by a third party;
  - Array cables between the WTGs and the WTG and OSP(s)/OCP;
  - Platform interconnector cable between the OSP and OCP;
  - Scour protection around foundations, where required; and
  - Surface laid cable protection, where required.

11. The offshore project area comprises:

- Offshore wind farm area (hereafter the 'array area') - within which the WTGs, offshore substation platform(s), offshore converter platform (if required), platform interconnector cable, and array cables will be located;
- Offshore cable corridor - the corridor of seabed from array area to the landfall within which the offshore export cables will be located;

12. The array area has a total area of 95km^2 located approximately 40km (at the closest point) off the East Anglian coastline.

13. The offshore cable corridor runs from the array area to the landfall at Kirby Brook, routing around various constraints discussed further in ES Chapter 4 Site Selection and Assessment of Alternatives (Document Reference: 3.1.6).

14. The key project parameters are summarised in Table 2.1.

Table 2.1 Key project characteristics

Parameter	Details
Approximate offshore construction duration	Two years
Array area	95km^2
Offshore cable corridor length	57km
Wind farm site water depth range	3 – 56m
Array area approximate distance to shore	40km
Number of WTGs	Up to 57
Maximum WTG rotor diameter	337m
Maximum rotor tip height	377.4m above Mean High Water Springs (MHWS)
Minimum rotor tip clearance above sea level	27m above MHWS
Minimum separation between WTGs	944m in the cross wind direction; and 1180m in the downwind direction

Parameter	Details
Maximum array cable length	170km
Platform interconnector cable length	20km
Array/platform interconnector cable target minimum burial depth (where buried)	0.6m
Options 1 and 2 only	
Offshore cable corridor length	57km
No. of cable circuits	2
Export cable target minimum burial depth (where buried)	0.6m
No. of offshore substation platforms (OSP)	2
Option 3 only	
No. of offshore converter platforms (OCP)	1
No. of OSP	1
Wind turbine foundation type options	Monopile, multileg, gravity-base
OSP / OCP foundation type options	Monopile, jacket, gravity-base

3 General Guiding Principles for the Proposed Monitoring

15. Throughout the ES and supporting documentation the Applicant has taken steps to avoid or reduce significant impacts either through the project design ('embedded mitigation') or by 'additional' mitigation measures which will be applied during the construction, operation or decommissioning phases of the Project.

16. 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 permitted development, 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, 2023a).
- Collaboration amongst developers and sea users on co-existence / co-location opportunities, shared mitigation, compensation, and monitoring is encouraged by the government and industry as set out in Paragraph 2.8.48 of the NPS EN-3 (DESNZ, 2023b).
- 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 (e.g. 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 data sets, as applicable to the hypothesis being tested.

- Monitoring should be targeted to address significant evidence gaps or uncertainty, which are relevant to the Project and can be realistically filled, as well as those species or features considered to be the most sensitive to the Project impacts including those of conservation, ecological and/or economic importance.
- Proposals for monitoring should be based, where relevant, on the good practice and outcomes of the latest review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms (MMO, 2014).
- 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 approach), including those surveys conducted in support of the Environmental Impact Assessment (EIA). This includes the potential for survey requirements to be adapted based on the results of the monitoring outlined in this document. Where it has been agreed that there are no significant impacts, monitoring need not be conditioned through the DMLs.
- The Applicant is supportive of appropriate strategic monitoring studies. Where the Applicant is made aware of new strategic monitoring studies and they are aligned with the Applicant's business goals, they will discuss with the relevant authorities if they are appropriate to discharging specific DML conditions.

4 North Falls Offshore Wind Farm Effects

17. The EIA assesses the potential for residual effects on receptors taking into account:
    - Linkages using the source > pathway > receptor model;
    - Embedded / Additional Mitigation;
    - Sensitivity to the impact;
    - Magnitude of the impact; and
    - Ecological / economic importance / value.
18. 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 project and can be realistically filled.
19. For each receptor, the residual impacts and major areas of uncertainty as predicted within the ES and Report to Information Appropriate Assessment are detailed. Monitoring has been deemed necessary and required as part of the DML where moderate or major adverse impacts are predicted in the assessment or where uncertainty remains at an industry-wide level.

5 In-principle Proposals for Monitoring

20. The following sections set out the In-principle proposals for monitoring in relation to each of the relevant topics and / or receptor groups covered in the ES.

5.1 Engineering related monitoring

21. In addition to the environmental survey and monitoring required by conditions of the DMLs within the DCO, additional studies will be undertaken for engineering purposes. Some of these will overlap with DML monitoring and wherever possible the Applicant will look to combine surveys for monitoring purposes with those already being carried out for engineering purposes. These are:

- Preconstruction geophysical survey;
- Geotechnical (e.g. cone penetration tests and vibrocoring) during detailed design;
- Preconstruction Unexploded Ordnance (UXO) survey;
- Remotely Operated Vehicle (ROV) survey;
- Cable burial survey; and
- Monitoring the condition of infrastructure (e.g. flaking paint).

22. The geophysical survey for engineering purposes will include a bathymetric side scan sonar survey of areas where works are planned to be carried out. The survey will meet the requirements of IHO Order 1a.

23. Surveys will also inform the need for maintenance works. Maintenance is discussed in the Outline Offshore Operation and Maintenance Plan (Document Reference: 7.20)

5.2 Monitoring requirements secured in the dDML

24. Pre-construction monitoring and surveys are secured through Condition of the DMLs in the Draft DCO (Document Reference: 6.1).

25. The outline pre-construction survey proposals must comprise:

(2) Subject to receipt from the undertaker of specific proposals pursuant to this condition, the pre-construction survey proposals must comprise, in outline—

(a) a full sea floor coverage swath–bathymetry survey of the Order limits and a buffer outside, that meets the requirements of IHO S44ed5 Order 1a, to—

(i) determine the location, extent and composition of any biogenic or geogenic reef features, as set out within the outline offshore in-principle monitoring plan;

(ii) inform future navigation risk assessments as part of the cable specification and installation plan; and

(iii) inform the identification of any archaeological exclusion zone and post consent monitoring of any such archaeological exclusion zone;

(b) a bathymetric survey that meets the requirements of IHO S44ed5 Order 1a of the area within the Order Limits within which it is proposed to carry out construction works.

26. *(3) The pre-construction survey(s) carried out pursuant to paragraphs (2)(a)(ii) and (2)(b) must fulfil the requirements of MGN654 and its supporting 'Hydrographic Guidelines for Offshore Renewable Energy Developer' (as relevant).*

27. The outline construction monitoring plan must include:

- vessel traffic monitoring by automatic identification system for the duration of the construction period, with provision for a report to be submitted to the MMO, Trinity House, and the MCA annually during the construction period for the authorised development; and
- where piled foundations are to be employed, unless otherwise agreed by the MMO in writing, details of proposed monitoring of the noise generated by the installation of the first four piled foundations of each piled foundation type to be constructed.

28. The outline post-construction survey plan must include:

- details of a survey to determine any change in the location, extent and composition of any biogenic or geogenic reef feature identified in the pre-construction survey in the parts of the offshore Order limits in which construction works were carried out. The survey design must be informed by the results of the pre-construction benthic survey;
- a bathymetric survey to monitor the effectiveness of archaeological exclusion zones. The data will be analysed by an accredited archaeologist as defined in the marine written scheme of archaeological investigation;
- any ornithological monitoring required by the ornithological monitoring plans; and
- vessel traffic monitoring by automatic identification system for a duration of three consecutive years following the completion of construction of the authorised development, unless otherwise agreed in writing by the MMO, with provision for a report to be submitted annually to the MMO, Trinity House, and the MCA.

5.3 Marine Geology, Oceanography and Physical Processes

5.3.1 Conclusions of the Environmental Statement

29. No residual effects greater than negligible were predicted within the ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10).

30. The Applicant would undertake swath bathymetry (wide beam/multibeam) survey within the Order limits for monitoring purposes. This information would also help inform the interpretation of the benthic survey campaign (see Section 5.5).

31. As discussed in Section 5.1, a higher resolution survey for engineering purposes would be undertaken in areas where works are planned to be carried out.

5.3.2 In-principle Monitoring

32. Table 5.1 provides information on the proposed monitoring for marine geology, oceanography, and physical processes. The proposed monitoring will be discussed with Natural England and subject to the approval of the MMO.

Table 5.1 In-principle Monitoring Proposed - Marine Geology, Oceanography and Physical Processes

Likely significant effect	Receptor(s)	Phase	Reasons 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	Engineering and design purposes Input in to benthic and other related ecological surveys and monitoring requirements as agreed with the MMO.	A single survey within the agreed North Falls array area and offshore cable corridor survey areas using full seabed coverage swath-bathymetric, MBES and SSS surveys (to meet the requirements of IHO Order 1a and Marine Guidance Note (MGN) 654 (M+F) and its Checklist). .	Scope of surveys and programmes and methodologies for the purposes of monitoring shall be submitted to the MMO for written approval at least 6 months prior to the commencement of any survey works. Surveys carried out for up to 3 years post-construction, which could be non-consecutive years, 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 statutory nature conservation bodies Post-construction survey would be undertaken within 12 weeks of completion after any cable repair or replacement works.
		Post-construction	Structural integrity / engineering (scour) To identify any unburied or shallow buried cables ensuring the successful burial of cables after installation, repairs, or replacements To determine any change in the location, extent and composition of any biogenic or geogenic reef feature identified in the pre-construction survey in the parts of the offshore area. Where sandwave levelling is required monitoring will review evidence of sandwave recovery.	Targeted surveys within the North Falls array area and offshore cable corridor using full seabed coverage swath-bathymetric surveys. For this purpose the undertaker will, prior to the first such survey, submit a desk based assessment (which takes account of all factors which influence scour) to identify the location of wind turbines with greatest potential for scour. The survey will be used to validate the desk based assessment. The quantity of turbines subject to monitoring will be confirmed following the completion of detailed design studies and in consultation with the MMO.	

5.4 Marine Water and Sediment Quality

5.4.1 Conclusions of the Environmental Statement

33. No residual impacts greater than minor adverse were predicted within the ES Chapter 9 Marine Water and Sediment Quality (Document Reference: 3.1.11).

5.4.2 In-principle monitoring

34. As stated in Section 4, monitoring must have a clear purpose in order to provide answers to specific questions where significant environmental impacts have been identified. Monitoring should be targeted to address significant evidence gaps or uncertainty, which are relevant to the Project and can be realistically filled, as well as those species or features considered to be the most sensitive to the potential impacts including those of conservation, ecological and / or economic importance.

35. In this instance no monitoring is proposed.

5.5 Benthic and Intertidal Ecology

5.5.1 Conclusions of the Environmental Statement

36. Likely significant effects over benthic and intertidal ecology were assessed as minor adverse significance for the Project alone and cumulative effects were predicted as moderate significance in the ES Chapter 10 Benthic and Intertidal Ecology (Document Reference: 3.1.12).

5.5.2 Conclusions of the Report to Inform Appropriate Assessment (RIAA) and Marine Conservation Zone (MCZ) Assessment

37. The Project has no direct impact on any site designated for benthic habitats or species. Indirect effects on designated sites are assessed in the RIAA Part 2 (Document Reference: 7.1.2) and the MCZ Assessment (Document Reference: 7.3) which conclude there will be no adverse effect on integrity of any Special Area of Conservation (SAC) or risk of hindering the conservation objectives of an MCZ.

5.5.3 In-principle monitoring

38. The following table provides information on the monitoring requirements for benthic ecology. Where practicable, synergies with monitoring commitments made in Section 5.3 would be explored in interpreting geophysical data.

39. Pre-construction geophysical surveys will be undertaken within the order limits with ground truthing (grab samples or drop down video) to identify the location, extent, and composition of biogenic or geogenic reef features present within the offshore project area. The identification of areas with the presence of features such as *Sabellaria spinulosa* reef and/or Piddocks in clay will inform micrositing, where practicable.

40. The pre-construction surveys will also be designed to provide a baseline for monitoring change during the post-construction monitoring. The Applicant notes that power analysis is an informative step in survey design when the purpose of the study is to detect trends/change in density/abundance. Such an analysis can provide insight into the number of samples and precision required for a trend to be detected. A prerequisite to running power analyses is a clear hypothesis of what is to be tested, including the amount of change and the period within which it is to be detected, and the required statistical power. Therefore, the survey design and sampling approach will be designed so that it will set a baseline to achieve an appropriate power to detect changes in the benthic communities. This could be informed by the baseline surveys for North Falls used to inform the EIA, and desk study of existing data (e.g., from the Galloper and Greater Gabbard OWF surveys).

41. Post-construction monitoring of these features would be subject to the findings of the pre-construction surveys. In addition, post-construction grab sampling at 10% of the WTG foundations would be undertaken to determine no significant changes to benthic communities and no significant spread of INNS.

Table 5.2 In-principle Monitoring Proposed – Benthic and Intertidal Ecology

Likely significant effect	Receptor(s)	Phase	Reasons for monitoring	Monitoring proposal	Details
Effects on any biogenic or geogenic reef feature present within the proposed construction works area	Biogenic or geogenic reef	Pre-construction	Determine the location and extent of any biogenic or geogenic reef feature present within areas of the Order Limits in which it is proposed to carry out any construction works to inform the appropriate mitigation if found	Undertake geophysical survey to inform engineering design options and analyse results for potential reef. Undertake ground-truthing of potential biogenic or geogenic reef feature present through drop-down video (or grab sample where visibility prevents confirmation through video). Methods should provide a baseline for post construction monitoring and be agreed with the MMO.	Survey programmes and methodologies for the purposes of monitoring shall be submitted to the MMO for written approval at least 6 months prior to the commencement of the geophysical survey and the dropdown video survey works. Submit a plan for any clearance activity for potential UXO showing the proposed activity area and details of any required exclusion zones or environmental micrositing to the MMO for approval with a minimum of three months prior to UXO clearance activities being undertaken. Surveys must be undertaken no longer than 12-18 months prior to UXO clearance or commencement of construction. Unless both UXO clearance and commencement of construction occurs within 18 months of the survey being undertaken, a second survey and report will be required prior to UXO clearance or commencement of construction.
		Post-construction	To determine no significant changes to benthic community	Subject to the findings of the pre-construction surveys, undertake post-construction monitoring of biogenic or geogenic reef features.	Details to be set out in a post-construction monitoring plan in accordance with the outline offshore in-principle monitoring plan for written approval by the MMO in consultation with the relevant statutory nature conservation body
Spread of non-native marine	Benthic communities	Operation	To determine no significant changes to benthic community and no significative spread of	Undertake monitoring of the benthic communities comprising grab samples and video around 10% of WTG foundations.	Survey programmes and methodologies for the purposes of monitoring shall be submitted to the

Likely significant effect	Receptor(s)	Phase	Reasons for monitoring	Monitoring proposal	Details
invasive species			marine non-native species on the infrastructure	Analysis of sample data to determine species composition and the presence of any marine non-native species.	MMO for written approval at least 6 months prior to the commencement of any survey works.

5.6 Fish and Shellfish Ecology

5.6.1 Conclusions from the Environmental Statement

42. No residual effect greater than minor adverse for the project alone or cumulatively for the Project has been identified in ES Chapter 11 Fish and Shellfish Ecology (Document Reference: 3.1.13).

5.6.2 In-principle monitoring

43. As previously discussed, monitoring should be targeted to address significant evidence gaps or uncertainty, which can be realistically filled. No monitoring or independent surveys are proposed for fish and shellfish ecology.

5.7 Marine Mammals

5.7.1 Conclusions of the Environmental Statement

44. The effects on Marine Mammals during the construction, operation and decommissioning phases of the Project have been assessed in ES Chapter 12 Marine Mammals (Document Reference: 3.1.14).

45. At a project alone level, the residual effects from the Project are assessed as minor adverse at worst during construction for harbour porpoise, minke whale and grey and harbour seal, from the following:

- Piling (physical and auditory injury, disturbance and behavioural impacts);
- UXO clearance (physical and auditory injury and behavioural impacts);
- Other construction activities (physical and auditory injury, disturbance and behavioural impacts);
- Construction vessels (physical and auditory injury and disturbance);
- Barrier effects from underwater noise;
- Vessel collision risk;
- Disturbance at seal haul out sites;
- Indirect impacts through changes in water quality; and
- Changes in prey resource.

46. During operation, up to minor adverse effects are assessed for harbour porpoise, minke whale and grey and harbour seal from the following activities:

- Underwater noise from operational turbines (physical and auditory injury and disturbance);
- Underwater noise from maintenance activities (physical and auditory injury and disturbance); and
- Operation and maintenance vessels (auditory injury and disturbance and collision risk).

47. All the other likely significant effects were determined to be negligible to minor adverse for construction, operation and decommissioning. No significant effects were identified.

48. All potential cumulative residual effects were determined to be negligible to minor adverse (not significant). A Project-specific Site integrity Plan (SIP) for the Southern North Sea (SNS) Special Area of Conservation (SAC) has been proposed which will give due consideration to mitigation and management measures, if deemed required.

49. It should also be noted that the contribution of the Project to the cumulative assessment of harbour porpoise, the most common species in the area, is very small with less than 1% of the reference population (North Sea Management Unit) assessed as being potentially disturbed during piling operations and up to 2% of the reference population potentially being disturbed with all noisy activities (i.e. piling, UXO clearance, seismic, and geophysical etc).

5.7.2 Conclusions of the RIAA

50. At the Project-alone level, the assessments of effect from the Project conclude that there would be no potential for adverse effect for the assessed SACs for marine mammals, during construction or operation, with the implementation of the Marine Mammal Mitigation Protocol (MMMP) for piling (Outline MMMP (Document Reference: 7.7)) and the In-Principle SNS SAC SIP (Document Reference: 7.8).

51. The assessments for the Projects in-combination with other schemes concluded that there was the potential for an Adverse Effect of Integrity (AEoI) of the SNS SAC (for harbour porpoise from cumulative underwater noise during OWF piling) due to in-combination disturbance effects. However, with mitigation in place for the implementation of MMMP for piling (Outline MMMP (Document Reference: 7.7)), and In-Principle SNS SAC SIP (Document Reference: 7.8), there would be no adverse effect on integrity.

5.7.3 In-principle monitoring

52. It is recognised that monitoring is an important element in the management and verification of the actual Project impacts. The draft MMMP (Document Reference: 7.7) and in principle SNS SAC SIP (Document Reference: 7.8) contain key principles that provide the framework for any mitigation that could be required. If piled foundations are used in the final project design, underwater noise monitoring of the first four piles of each piled foundation type will be undertaken with the methods agreed with the MMO and relevant SNCBs in the pre-construction period.

53. In accordance with conditions of the DMLs (Draft DCO, Document Reference: 6.1) *where piled foundations are to be employed, unless otherwise agreed by the MMO in writing, details of proposed monitoring of the noise generated by the installation of the first four piled foundations of each piled foundation type to be constructed collectively under this licence and the licence granted under* [the relevant schedules 8, 9 and 10] *of the Order.*

54. The Applicant has agreed for one of the first four piles to be within an area anticipated to generate the greatest underwater noise emissions. This is likely

to be determined through detailed ground investigations, with areas of hard substrate and / or depth being correlated with higher anticipated noise emissions.

55. In addition, the Applicant has included in Table 5.3 potential compliance monitoring as secured through the MMMP and the in principle SNS SAC SIP. Details of this potential monitoring will be dependent upon the requirements of the final approved plan and protocol.

56. The focus of the marine mammal monitoring will be on harbour porpoise, as they are the most common species in the area, and due to the presence of the SNS SAC. However, where monitoring methods allow, and sufficient data is collated, data will also be collected and reported on for all other marine mammal species groups.

Table 5.3 In-principle Monitoring Proposed – Marine Mammals

Likely significant effect	Receptor(s)	Phase	Reasons for monitoring	Monitoring proposal	Details
Potential injury / disturbance resulting from underwater noise	Harbour porpoise, minke whale, grey seal, harbour seal	Construction	Determine that the maximum Permanent Threshold Shift ranges predicted are not being breached.	Noise measurements taken from the first four piled foundations of each piled foundation type will be undertaken. One of the monitored piles will be at a location anticipated to generate the greatest underwater noise emissions.	The final design and scope of monitoring will be agreed with the relevant stakeholders and included within the final Monitoring Plan submitted for approval. In the event that the monitoring shows noise levels which are significantly different to those predicted, all piling activity must cease until an update to the MMMP and further monitoring/mitigation requirements have been agreed.
Potential disturbance resulting from underwater noise	Harbour porpoise	All phases	Determine the potential behavioural impacts of underwater noise generating activities on harbour porpoise.	Determine the potential behavioural impacts of underwater noise generating activities through monitoring of harbour porpoise' echolocation 'clicks' using passive acoustic monitoring (PAM) devices.	Greater detail on the design of the monitoring will be discussed with SNCBs. The Applicant intends to optimise monitoring of this nature through alignment of the monitoring programmes for other OWFs as far as possible with input from the relevant SNCBs. The final details of the monitoring will be provided in the Monitoring Plan to be produced post-consent. One key knowledge gap is that of the appropriateness of the Effective Deterrent Ranges (EDRs) used to assess the potential for disturbance from piling within the SNS SAC. The validation of the relevant EDRs could be one area investigated within this monitoring programme.
Potential disturbance resulting from underwater noise	Harbour porpoise	All phases	To ensure measures and controls managed through the SIP are monitored for effectiveness.	The form of monitoring will be dependent on project design, construction method and the mitigation/management measures required within the final SIP.	The final design and scope of monitoring will be agreed with the relevant stakeholders and included within the final Monitoring Plan submitted for approval.
Potential injury resulting from underwater noise	Marine mammals	Construction	Reporting of MMMP measures.	The form of monitoring will be dependent on project design, construction method and the mitigation measures required.	The final design and scope of any monitoring will be agreed with the relevant stakeholders and included within the final MMMP submitted for approval.

5.8 Offshore Ornithology

5.8.1 Conclusions from the Environmental Statement

57. The impacts that could potentially arise during the construction, operation and decommissioning of the Project have been discussed with Natural England and RSPB as part of the Evidence Plan process (see ES Chapter 13 Offshore Ornithology) (Document Reference: 3.1.15).

58. During the construction and operational phases, no effects have been assessed to be greater than of minor adverse significance for any bird species.

59. Displacement likely significant effects (both Project alone and cumulative) on gannet, guillemot, razorbill and red-throated diver would be of minor adverse significance at most during any biological season throughout construction and operation phases.

60. The risk to birds from collisions with wind turbines from the Project alone is assessed as minor adverse significance for gannet, great black-backed gull, kittiwake and lesser black-backed gull when considered for all biological seasons against the most appropriate population scale.

61. The risk to birds from cumulative collisions with wind turbines across all wind farms considered is assessed as minor adverse significance for gannet and moderate adverse significance for great black-backed, gull kittiwake and lesser black-backed gull. The combined cumulative effect of displacement and collision on gannet is assessed as a moderate adverse significance.

5.8.2 Conclusions of the RIAA

62. The RIAA concludes no adverse effect on integrity for all European sites with ornithological qualifying features, with the exception of lesser black-backed gull from the Alde-Ore Estuary Special Protection Area (SPA) for which an adverse effect on integrity could not be ruled out for in-combination collision risk.

63. An HRA Derogation case is provided with the Application for this species, which includes compensatory measures. Monitoring in relation to the compensation is described in the ES Appendix 2 Lesser Black-back Gull Compensation Document (Document Reference: 7.2.3).

64. In addition, in response to consultation with Natural England, a without prejudice derogation case, including compensatory measures and associated monitoring, is provided for the following:

- Displacement effects on red-throated diver from the Outer Thames Estuary SPA;
    - Monitoring of compensation is described in the ES Appendix 3 Red-throated Diver Compensation Document (Document Reference: 7.2.2);
- Collision risk on kittiwake from the Flamborough and Filey Coast SPA;
    - Monitoring of compensation is described in the ES Appendix 4 Kittiwake Compensation Document (Document Reference: 7.2.4); and

- Displacement effects on guillemot and razorbill from the Flamborough and Filey Coast SPA;
    - Monitoring of compensation is described in the ES Appendix 5 Guillemot and Razorbill Compensation Document (Document Reference: 7.2.5).

5.8.3 In-principle monitoring

65. It is the position of the Applicant that any ornithological monitoring proposal should be targeted to address impacts, evidence gaps or uncertainty of most relevance to the Project and the specific species.

66. Therefore, the Applicant considers that offshore ornithology monitoring for the Project should focus on the potential displacement of red-throated divers and collision risk impacts on seabird species. This has the potential to be undertaken in collaboration with other OWF projects. The final details will be included in an Ornithological Monitoring Plan, to be agreed post consent with the MMO, in consultation with Natural England.

67. In accordance with Condition [27(2)(c)] of Schedule 8 (post-construction monitoring) of the generation assets DML (Draft DCO, Document Reference: 6.1) ornithological monitoring requirements should follow condition [21(1)(j)]; "*an offshore monitoring plan for the relevant stage which accords with the principles set out in the outline offshore in-principle monitoring plan".*

68. The Applicant notes that power analysis is an informative step in survey design when the purpose of the study is to detect trends/change in density/abundance. Such an analysis can provide insight into the number of samples and precision required for a trend to be detected. A prerequisite to running power analyses is a clear hypothesis of what is to be tested, including the amount of change and the period within which it is to be detected, and the required statistical power.

69. Pre-construction baseline surveys will form part of the analysis of impacts from the wind farm post consent. Therefore, the survey design and sampling approach will be designed so that it will set a baseline to achieve an appropriate power to detect trends/changes in the populations/distributions of key species within the North Falls array area + buffer. This could be informed by the baseline surveys for North Falls used to inform the EIA, and desk study of existing data (e.g., from the Galloper and Greater Gabbard OWF surveys).

70. As discussed above, monitoring of compensation proposals is provided separately, in the documents listed above.

71. Table 5.4 provides information on the monitoring requirements for ornithology.

Table 5.4 In-principle Monitoring Proposed – Offshore Ornithology

Likely significant effect	Receptor(s)	Phase	Reasons for monitoring	Monitoring proposal	Details
Displacement from operational array area	Red-throated diver	Pre- and post-construction	To determine the level of displacement from the North Falls array area, and specifically to determine the area of the Outer Thames Estuary SPA affected by North Falls displacement. Potential for change in distribution of the species within the Outer Thames Estuary Special Protection Area (SPA).	Determine whether there is a change in abundance and distribution within the array area and appropriate buffer zones following construction of the wind farm.	Analysis of pre- and post-construction aerial digital survey data of the array area and buffer zones will be undertaken. The detailed requirements for this will 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 will be based on a power analysis. For post-construction monitoring, the detailed requirements will be submitted to the MMO for approval six months prior to commissioning.
Collision risk	Offshore ornithology	Post-construction	Increase certainty of collision risk modelling (CRM) parameters Record potential collisions with wind turbine blades	Install collision risk monitoring system as agreed through consultation with the relevant SNCBs.	Monitoring through the installation of a collision risk monitoring system. To include estimation of flux (rate of passage of birds through the array) for target species, to enable collision rate to be estimated. The final details of the monitoring will be provided in the Monitoring Plan to be produced post-consent. There is potential for optimisation through alignment of the monitoring programmes with other OWF projects as far as possible with input from the relevant SNCBs.

6 References

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