RWE

# RWE Renewables UK Dogger Bank South (West) Limited

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# Dogger Bank South Offshore Wind Farms

**Preliminary Environmental Information Report**

**Appendix 12-1 – Offshore Ornithology Technical Appendix**

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# Dogger Bank South Offshore Windfarm

# Ornithology Technical Appendix 12.1


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# CONTENTS

## Contents

## LIST OF TABLES

# INTRODUCTION

The proposed the Projects (DBS East and DBS West) will comprise offshore wind turbines (WTGs), offshore converter station, inter-array cables, interconnector cables and offshore and onshore export cables taking power to an onshore converter station. The Projects covers an area of 989km$^2$, split almost equally between DBS East and DBS West areas. At the closest point the array areas are located approximately 100km offshore.

The offshore ornithological assessment (Preliminary Environmental Information Report (PEIR), Chapter 12: Offshore Ornithology) is informed using baseline site characterisation data collected by digital aerial survey methods, conducted by APEM. Further details of the survey methods, analysis of the data collected, and the results obtained are provided in relevant sections of this technical report.

The aim of this report is to present full details of the baseline information from the site-specific surveys which have been used to undertake the offshore ornithology PEIR .

Sections on aerial survey methodology (section 2.1) and image analysis (section 2.3) were supplied by the aerial survey contractor (APEM). This Offshore Ornithology Technical Report comprises seven documents (including the current one – **Appendix 12.1**) containing the following data and information.

**Appendix 12.2** provides tables of the mean and 95% confidence intervals for total seabird abundance (bird in flight and on the water) and **Appendix 12.3** provides the equivalent densities, calculated for each calendar month for each species recorded, presented for the East and West array areas separately and combined, as well as for the array areas plus 2km buffers and array areas plus 4km buffers. Note that as the East and West sites share a border, their buffer zones overlap, so it is not appropriate to sum the abundance in the East and West buffer areas as this included double-counting.

**Appendices 12.4 and 12.5** provide the seasonal peak abundance and density data (respectively).

**Appendix 12.6** provides the collision risk modelling input parameters and outputs.

**Appendix 12.7** provides maps illustrating where birds were recorded during the APEM aerial surveys.

# DATA SOURCES

APEM commenced monthly aerial surveys across the wind farm and 4km buffer in March 2021, with the complete period of 24 months due to be completed in February 2023. Only the first 12 months were available for this PEIR.

## 2.1 Survey Methods

The following details of survey methods were supplied by APEM.

A series of strip transects spaced 2km apart were flown monthly between across the survey area, which includes a 4km buffer around the proposed the Projects array areas, resulting in an overall survey area of 1,672 km$^2$. The survey method has been designed to optimise the data collection for all bird and marine mammal species using transects flown at 396m using a twin-engine aircraft, resulting in a 1.5cm ground sampling distance (GSD) with a 10% coverage rate.

The methods and results presented herein are from the surveys of the Site plus 4 km buffer using APEM's bespoke camera system, the "Shearwater IV", customised by in-house specialists for surveying the offshore environment. The camera system is integrated with custom flight planning software that allows each survey transect to be accurately mapped out before the aircraft leaves the ground. Each image capture node is precisely defined, allowing the system to fire the camera exposures at exactly the right location. This ensures that each survey is flown with the same transect orientation and the camera is triggered at the same position along each transect within set tolerances. APEM's planning systems enable tolerances on flight path along survey lines to be set, automatically aborting survey lines that drift away from the aircraft's planned flight line.

During each survey, APEM's on-board camera technician continually monitored the imagery as it was collected to ensure the data collected was fit for purpose. The camera technician would make the decision to cease data collection should the conditions become unsuitable for surveying and/or data collection. Subsequently, the survey would then be resumed at the next earliest opportunity

Data captured comprised 1.5cm GSD digital still images collected in a grid-based design using a GPS-linked, bespoke flight management system to ensure the tracks were flown with a high degree of accuracy. The aircraft's internal GPS and IMU systems record to an accuracy of +/-3 to 5m as standard.

## 2.2 Summary of Quality Control

Internal QA was carried out on the data collected from each of the surveys. Images were assessed in batches with a different APEM staff member responsible for each batch. Each image containing birds and/or marine megafauna was reviewed and checked by APEM's dedicated QA Manager, ensuring that 100% of birds and marine megafauna recorded were subject to internal QA to confirm that all species were correctly identified. Images containing no birds and/or marine megafauna were removed and stored separately for further internal QA. Of these 'blank' images, 10% were randomly selected for QA. If there was <90% agreement, the entire batch was re-analysed independently by a different member of staff.

## 2.3 Bird Abundance and Density Estimates

The raw data, supplied as plane GPS track logs, containing details for each image location and observation logs, containing details of all objects (seabird, marine mammal, vessel, etc.) recorded were analysed using R (R Development Core Team 2012). Analysis was conducted for each survey separately. Bird locations were assigned to the following sub-zones; array (East or West), array plus 2km buffer and array plus 4km buffer (note that each buffer width also included the wind farm data).

Density (birds/km$^2$) and abundance were estimated using design-based methods, with the density estimated for the surveyed area and multiplied up to the total area to obtain an abundance estimate. This makes the assumption that the area surveyed is representative of the unsurveyed regions, thus the design of survey is important (hence 'design based').

Standard deviations and confidence intervals for each species were obtained using a bootstrap resampling method, with 1,000 iterations. Since bird observations recorded along a transect are analogous to events recorded over time, it was appropriate to employ a time-series bootstrap method. For each survey, the data along each transect were assigned to segments 500m long. A test for auto-correlation along the transects was conducted to identify for each species the maximum number of sequential segments over which significant auto-correlation could be detected. This distance (i.e. number of segments) defined the block size applied in the bootstrap simulations, where the block size is the smallest 'unit' resampled. Thus, if there was no evidence for a species' locations being auto-correlated along a transect then the block size was the individual segment (i.e. this yielded the maximum number of samples), while a significant estimate of auto-correlation across three segments, for example, would result in the data being grouped in blocks of three segments for resampling (taken to the extreme, if significant auto-correlation was detected across all segments along a transect, the block size would be the number of segments in the transect and resampling would be conducted at the level of transect). Auto-correlation varied markedly across species, being largely absent in the less abundant species (e.g. skua and small gulls) and quite prevalent in more abundant species (e.g. auks and kittiwake), where significant auto-correlation could be detected up to 20km along transects.

The upper and lower 95% confidence limits were obtained as the 25$^{th}$ and 975$^{th}$ values from the ranked bootstrap resampled data. The width of the confidence interval obtained using this method reflects the degree of aggregation in the species, with highly aggregated species estimated with lower precision (i.e. species observed frequently as individuals will have a small range of estimated densities, while species recorded in occasional large groups will have a wide range of estimated densities).

Analysis was conducted for the East and West areas separately and individually for each of the 12 surveys. Seasonal peaks were extracted from the monthly values, using the month assignments in Furness (2015), applying the full breeding seasons and adjusting the migration seasons to avoid overlaps (for example, if spring migration is defined as January to March and the full breeding season as March to August, the latter was prioritised and spring migration months treated as January to February).

Birds were recorded as either sitting on the sea surface ('sitting') or in flight ('flying'). Analysis was conducted with both datasets combined ('all birds') and for birds in flight only. The former were used in the baseline characterisation and displacement assessment, while the latter were used in the collision risk modelling (CRM).

## 2.4 Apportioning of birds not identified to species level

The full tables of positively identified birds and the unidentified groups are provided in Table 2-1 and Table 2-2 respectively.

**Table 2-1 Number of positively identified seabirds recorded in the 4km buffer area for both DBS East and DBS West array areas, summed across all surveys.**

| Species | East | West |
|---|---|---|
| Arctic skua | 2 | - |
| Black-headed gull | 5 | 5 |
| Common gull | 4 | 1 |
| Common tern | - | 1 |
| Fulmar | 127 | 196 |
| Gannet | 434 | 425 |
| Great black-backed gull | 39 | 34 |
| Great skua | 1 | 4 |

| Species | East | West |
| --- | --- | --- |
| Guillemot | 5995 | 5146 |
| Herring gull | 17 | 16 |
| Kittiwake | 3214 | 1941 |
| Lesser black-backed gull | 10 | 7 |
| Little gull | 32 | 2 |
| Puffin | 83 | 103 |
| Razorbill | 1296 | 804 |
| Red-throated diver | | 1 |

Approximately 26% of the seabirds recorded during the surveys could not be positively assigned to species level, of which almost all (99%) were either classed as either 'auk species' or 'guillemot/razorbill'. The 'auk species' group were assigned to guillemot, razorbill and puffin and the 'guillemot/razorbill' group to those species in proportion to the rates of positively identified birds. No other unidentified groups were apportioned to species due to the small numbers involved (53 in total across all surveys) and the challenge of appropriately assigning mixed membership groups (e.g. 'auk / shearwater species') to constituent species since there is no robust means to perform this. However, since the number of individuals involved was very small this does not have a material effect on the results obtained.

**Table 2-2 Number of birds assigned to species groups in the 4km buffer area for both DBS East and DBS West array areas, summed across all surveys.**

| Species | East | West |
| --- | --- | --- |
| Arctic / common tern | 3 | 19 |
| Auk / shearwater species | 3 | - |
| Auk species | 117 | 98 |
| Black-backed gull species | 5 | 5 |
| Guillemot/razorbill | 3810 | 2904 |
| Gull species | - | 1 |
| Large gull species | 3 | 6 |
| Puffin / little auk | - | 1 |
| Skua species | - | 2 |
| Small gull species | 15 | 2 |
| Shearwater species | - | 1 |
| Unidentified bird species | 5 | 4 |

## 2.5 Availability Bias

Guillemots, razorbills and puffins spend a proportion of their time foraging beneath the water surface and therefore some individuals present in a given area will not be observable in aerial images. Density and abundance estimates need to be adjusted to allow for these unobserved individuals.

Fixed species-specific correction factors were applied to the number of each auk species recorded on the sea surface. The values used for guillemot and razorbill were those recommended by JNCC in its submission during the examination phase of East Anglia ONE (JNCC 2013), referred to as Method C, which stated that 24% of guillemots and 17% of razorbills are underwater at any time (these percentages do not include birds in flight). For puffin a value of 14% was used, taken from Spencer (2012), and as applied in the Hornsea 4 wind farm assessment.

Availability bias adjustment was applied following apportioning of unidentified auks among species. For completeness, three sets of auk density and abundance estimates are provided:

- The unapportioned values without adjustment for availability bias,
- As above with the inclusion of unidentified auks apportioned using the relative numbers of positively identified individuals, and
- As above following adjustment for availability bias.

## 2.6 Spatial Distributions

Maps of the array areas and bird observations are provided in Appendix 12.#. For species recorded in low numbers these figures plot all the observations (i.e. obtained across all surveys), while more commonly recorded species are combined by season (using the definitions in Furness 2015). The seasons used are detailed in Table 2-3.

**Table 2-3 Species specific seasonal definitions and biologically defined minimum nonbreeding population sizes (in brackets) have been taken from Furness (2015).**

| Species | Breeding | Migration-free breeding | Migration - autumn | Winter | Migration - spring | Non-breeding |
|---|---|---|---|---|---|---|
| Fulmar | Jan-Aug | Apr-Aug | Sep-Oct (957,502) | Nov (568,736 | Dec-Mar (957,502) | - |
| Gannet | Mar-Sep | Apr-Aug | Sep-Nov (456,298) | - | Dec-Mar (248,385) | - |
| Arctic skua | May-Jul | Jun-Jul | Aug-Oct (6,427) | - | Apr-May (1,227) | - |
| Great skua | May-Aug | May-Jul | Aug-Oct (19,556) | Nov-Feb (143) | Mar-Apr (8,485) | - |
| Puffin | Apr-Aug | May-Jun | Jul-Aug | Sep-Feb | Mar-Apr | Mid-Aug-Mar (231,957) |
| Razorbill | Apr-Jul | Apr-Jul | Aug-Oct (591,874) | Nov-Dec (218,622) | Jan-Mar (591,874) | - |
| Guillemot | Mar-Jul | Mar-Jun | Jul-Oct | Nov | Dec-Feb | Aug-Feb (1,617,306) |
| Common tern | May-Aug | Jun | Jul-Sep (308,841) | - | Apr-May (308,841) | - |
| Kittiwake | Mar-Aug | May-Jul | Aug-Dec (829,937) | - | Jan-Apr (627,816) | - |
| Little gull (Not included in Furness 2015) | Apr-Jul | May-Jul | - | - | - | Aug-Apr |
| Lesser black-backed gull | Apr-Aug | May-Jul | Aug-Oct (209,007) | Nov-Feb (39,314) | Mar-Apr (197,483) | - |
| Herring gull | Mar-Aug | May-Jul | Aug-Nov | Dec | Jan-Apr | Sep-Feb (466,511) |
| Great black-backed gull | Mar-Aug | May-Jul | Aug-Nov | Dec | Jan-Apr | Sep-Mar (91,399) |

## 2.7 Flight Height

Bird flight height was estimated from the digital still images. It was determined using bespoke APEM software that applies a set of rules developed in-house and trigonometry to provide an estimate of flight height. This method is dependent upon image quality, size of the bird species and the size of the bird relative to the image. It is not possible to accurately estimate flight heights for birds that are diving or turning sharply, as these individuals are not fully stretched out and therefore their measured lengths are not comparable to the reference length of the relevant species, therefore, these individuals were deemed unsuitable for flight height analysis.

### 2.8 Collision Risk Modelling

CRM was conducted using the Band (2012) model, scripted to run in the R statistical environment by DMP Stats and HiDef[1]. Since flight height estimation methods from digital aerial images contain unknown degrees of error and bias all modelling used Band CRM Option 2.

Typically the largest source of variation in collision mortality estimates is due to variation in densities, therefore upper and lower 95% confidence estimates on density (calculated as described above) were used alongside the central point density for each calendar month. The full set of input parameters and results are provided in Appendix 12.6.

## ORNITHOLOGY BASELINE

### 3.1 Overview of Bird Species Recorded

The following bird species (Table 3-1) were recorded during surveys within the Projects array areas plus 4km buffer (the presence of the species is noted as E or W for the DBS East and DBS West array areas respectively).

**Table 3-1 Bird species recorded during surveys of the array areas and the 4km buffer between March 2021 and February 2022.**

| Species | Array Area | 4km buffer |
|---|---|---|
| Red-throated Diver | W | W |
| Fulmar | E,W | E,W |
| Gannet | E,W | E,W |
| Arctic skua | E | E |
| Great Skua | E,W | E,W |
| Puffin | E,W | E,W |
| Razorbill | E,W | E,W |
| Guillemot | E,W | E,W |
| *Guillemot / razorbill* | *E,W* | *E,W* |
| Common Tern | E,W | E,W |
| Kittiwake | E,W | E,W |
| Little Gull | | E,W |
| Common Gull | E | E,W |
| Lesser Black-backed Gull | E | E,W |

[1] https://github.com/HiDef-Aerial-Surveying/stochLAB

| Species | Array Area | 4km buffer |
|---|---|---|
| Herring Gull | E,W | E,W |
| Great Black-backed Gull | E,W | E,W |

## SUMMARY SPECIES ACCOUNTS

The following species accounts use the values in Appendix 12.2, the estimated abundance of birds recorded both in flight and on the sea surface in the DBS East and DBS West array areas.

### 4.1 Arctic skua

#### 4.1.1 DBS East

Arctic skuas were only recorded in the array area in October (peak 9) and in the DBS East array 4km buffer in August and October (peak 9).

#### 4.1.2 DBS West

No Arctic skuas were recorded in the DBS West array.

### 4.2 Arctic tern

#### 4.2.1 DBS East

Arctic terns were only recorded in the array area and 4km buffer in July, with an estimate of 17 individuals.

#### 4.2.2 DBS West

Arctic terns were only recorded in the array area and 4km buffer in July, with an estimated of 10 individuals.

### 4.3 Common gull

#### 4.3.1 DBS East

Common gulls were recorded in August and November in the array and 4km buffer. The peak abundance in the array was 17 and in the 4km buffer was 26.

#### 4.3.2 DBS West

Common gulls were not recorded in the array area and were only recorded in November in the 4km buffer with an estimated abundance of 8.

### 4.4 Common scoter

#### 4.4.1 DBS East

Common scoters were only recorded in August in the array area and 4km buffer, with a peak abundance of 17.

#### 4.4.2 DBS West

Common terns were not recorded in DBS West.

## 4.5 Common tern

### 4.5.1 DBS East

No common terns were recorded in DBS East.

### 4.5.2 DBS West

Common terns were only recorded in May in the array area and 4km buffer, with a single individual resulting in a peak abundance of 8.

## 4.6 Fulmar

### 4.6.1 DBS East

Fulmars were recorded in the wind farm and 4km buffer in all months. The array area peak was 190 (November) and the 4km buffer peak was 328 in September.

### 4.6.2 DBS West

Fulmars were recorded in the wind farm and 4km buffer in all months. The array area peak was 185 (August) and in the 4km buffer the peak was 352 (November).

## 4.7 Gannet

### 4.7.1 DBS East

Gannets were recorded in the 4km buffer in all months except January and all months except January and February in the array area . The array area peak was 754 (March) and the 4km peak was 1,110 in October.

### 4.7.2 DBS West

Gannets were recorded in the array and 4km buffer in all months except January and December. The array area peak was 516 in May and in the 4km buffer the peak was 829 in the same month.

## 4.8 Great black-backed gull

### 4.8.1 DBS East

Great black-backed gulls were recorded in the array area in January, February, June, November and December, and also in April in the 4km buffer . The array area peak was 109 in January and the 4km buffer peak was 217 in the same month.

### 4.8.2 DBS West

Great black-backed gulls were recorded in all months except March, April, May, July, August and September in the wind farm, and additionally in April in the 4km buffer. The array area peak was 59 in January and in the 4km buffer was 127 in the same month.

## 4.9 Great northern diver

### 4.9.1 DBS East

Great northern divers were not recorded in the East array or 4km buffer.

#### 4.9.2 DBS West

Great northern divers were only recorded in the wind farm and 4km buffer in June with a single individual, giving an abundance of 9 in the array and 4km buffer.

### 4.10 Great skua

#### 4.10.1 DBS East

Great skuas were only recorded in the wind farm and 4km buffer in August. The peak in the array area and the 4km buffer was 9.

#### 4.10.2 DBS West

Great skuas were recorded in the wind farm and 4km buffer between September and November. The peak in the array area and 4km buffer was 17 (November).

### 4.11 Guillemot (including apportioned unidentified birds and accounting for availability bias)

#### 4.11.1 DBS East

Guillemots were recorded on the array area and 4km buffer in all months. Abundance peaked with 17,349 in the array area (March) and 26,658 in the 4km buffer (March).

#### 4.11.2 DBS West

Guillemots were recorded on the array area and 4km buffer in all months. Abundance peaked with 11,254 in the array area and 24,099 in the 4km buffer in March.

### 4.12 Herring gull

#### 4.12.1 DBS East

Herring gulls were recorded in March, June and November in the array area and additionally in April in the 4km buffer. The array area peak abundance was 136 (June) and in the 4km buffer the peak was 145 (June).

#### 4.12.2 DBS West

Herring gulls were recorded in January, April and June in the array area and additionally in March and November in the 4km buffer. The array area peak abundance was 9 (June) and in the 4km buffer was 25 (November).

### 4.13 Kittiwake

#### 4.13.1 DBS East

Kittiwakes were recorded in all months in the array area and 4km buffer. The array area peak was 13,123 (March) and in the 4km buffer peak was 15,849 in the same month.

#### 4.13.2 DBS West

Kittiwakes were recorded in all months in the array area and 4km buffer. The array area peak was 4,149 (March) and in the 4km buffer was 5,898 in the same month.

## 4.14 Lesser black-backed gull

### 4.14.1 DBS East

Lesser black-backed gulls were recorded in March, May, and June in the array area and additionally in July and October in the 4km buffer. The array area peak abundance was 85 in June and in the 4km buffer was 85 in the same month.

### 4.14.2 DBS West

Lesser black-backed gulls were not recorded in the array area and only in October in the 4km buffer. The 4km peak abundance was 17.

## 4.15 Little auk

### 4.15.1 DBS East

No little auks were not recorded in DBS East.

### 4.15.2 DBS West

Little auks were only recorded in the array area and 4km buffer in December. The peak abundance in the array area was 17 and in the 4km buffer the peak was 42.

## 4.16 Little gull

### 4.16.1 DBS East

Little gulls were not recorded in the array area and only recorded only in the 4km buffer in September with an estimated abundance of 294.

### 4.16.2 DBS West

Little gulls were not recorded in the array area and only recorded only in the 4km buffer in September with an estimated abundance of 33.

## 4.17 Puffin (including apportioned unidentified birds and accounting for availability bias)

### 4.17.1 DBS East

Puffins were recorded in the array area and 4km buffer in March, April, July, August, September and October. The peak abundance in the array area was 367 in October and in the 4km buffer was 563 in the same month.

### 4.17.2 DBS West

Puffins were recorded in the array area and the buffers in March, April, July, August, September and October. The peak abundance in the array area was 254 in October and in the 4km buffer was 483 in the same month.

## 4.18 Razorbill (including apportioned unidentified birds and accounting for availability bias)

### 4.18.1 DBS East

Razorbills were recorded on the array area and 4km buffer in all months. Abundance peaked in the array area with 6,600 in March and 9,078 in the 4km buffer in the same month.

### 4.18.2 DBS West

Razorbills were recorded on the array area and buffers in all months. Abundance peaked in the array area with 3,204 in April and in the 4km buffer with 4,260 in the same month.

## 4.19 Red-throated diver

### 4.19.1 DBS East

No red-throated divers were recorded in DBS East.

### 4.19.2 DBS West

Red-throated divers were only recorded in the array area and 4km buffer in May with a single individual. The array area and 4km buffer abundance peak was 8.

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