RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Preliminary Environmental Information Report

Chapter 15 – Aviation and Radar

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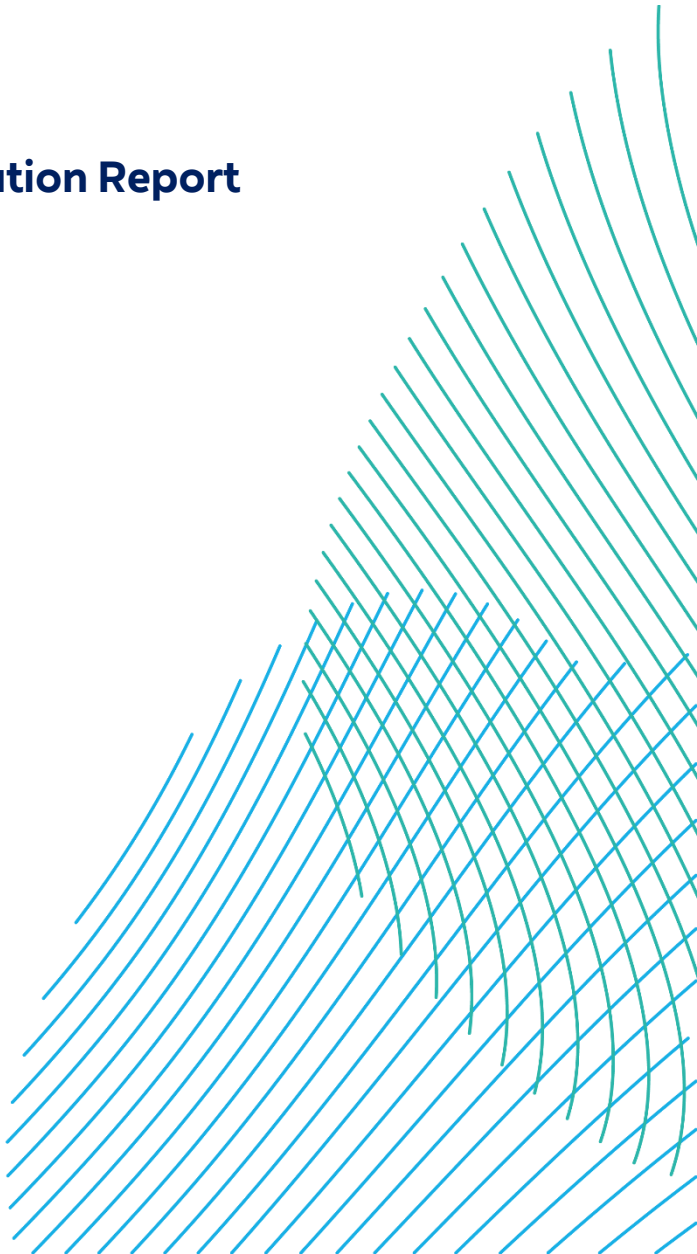

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Glossary

Term	Definition
Air Navigation Service Provider (ANSP)	A public or private entity managing air traffic on behalf of a company, region or country. NATS is the main ANSP in the UK.
Array Areas	The DBS East and DBS West offshore array areas, where the wind turbines and array cables will be located. The array areas do not include the offshore export cable corridor.
Cable Construction Compound	Area set aside to facilitate construction of the onshore export cables. These will be located adjacent to the onshore export cable corridor, with access to the highway.
Controlled Airspace	Defined airspace within which pilots must follow Air Traffic Control instructions implicitly. In the UK, Classes A, C, D and E are areas of controlled airspace.
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.
Flight Information Region (FIR)	Airspace managed by a controlling authority with responsibility for ensuring air traffic services are provided to aircraft flying within it.
Flight Level (FL)	An aircraft altitude expressed in hundreds of feet at a standard sea level pressure datum of 1013.25 hectopascals.
Offshore Converter Platforms (OCPs)	Offshore Converter Platforms (OCPs) will be required for the HVDC option. The OCPs are fixed structures located within the array area 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.

Term	Definition
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP and / or RCP) between the offshore substation/converter platforms and Transition Joint Bays at the landfall.
Offshore Export Cables	The cables which would bring electricity from the offshore substation platform(s) to the landfall.
Offshore Substation Platforms (OSPs)	Offshore Substation Platforms (OSPs) will be required for the HVAC option. These are fixed structures located within the array areas that contain electrical equipment to aggregate the power from the wind turbines, followed by conversion into a more suitable voltage for transmission through the offshore export cables to the Project's onshore grid connection points.
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 substations, Transition Joint Bays or temporary access routes; but includes construction compounds (purely for the cable route).
Onshore Export Cables	Onshore export cables take the electricity from the Transition Joint Bay to the onshore substations.
Onshore Substations	A compound containing electrical equipment required to transform and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network. There will be one onshore substation for each Project.
Onshore Substation Zones	Parcels of land within the Onshore Development Area where the onshore substation infrastructure (including the haul roads, temporary construction compounds and associated cable routeing) may be located.
Primary Surveillance Radar (PSR)	A radar system that measures the bearing and distance of targets using the detected reflections of radio signals.

Term	Definition
Scoping Opinion	The report adopted by the Planning Inspectorate on behalf of the Secretary of State.
Scoping Report	The report that was produced in order to request a Scoping Opinion from the Secretary of State.
Secondary Surveillance Radar (SSR)	A radar system that transmits interrogation pulses and receives transmitted responses from suitably equipped targets.
The Applicant	RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited as the owners of DBS West and DBS East respectively are the named undertakers that will have the benefit of the Development Consent Order. References in this document to obligations on, or commitments by, 'the Applicant' are given on behalf of RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited.
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South offshore wind farms).
Uncontrolled Airspace	Defined airspace in which Air Traffic Control does not exercise exclusive authority but may provide basic information services to aircraft in radio contact. In the UK, Class G is uncontrolled airspace.

Acronyms

Term	Definition
AARA	Air-to-Air Refuelling Area
AD	Air Defence
AD&OW	Air Defence and Offshore Wind
ADR	Air Defence Radar
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
amsl	Above mean sea level
ANO	Air Navigation Order
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATS	Air Traffic Service
ATSOCAS	Air Traffic Services Outside Controlled Airspace
BEIS	Department for Business, Energy and Industrial Strategy
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
cd	Candela
CEA	Cumulative Effect Assessment
CNS	Communications, Navigation and Surveillance
DA	Danger Area

Term	Definition
DBS	Dogger Bank South
DCO	Development Consent Order
DGC	Defence geographic Centre
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Cooperation Plan
ES	Environmental Statement
FIR	Flight Information Region
FL	Flight Level
Ft	Feet
GASCo	General Aviation Safety Council
HAT	Highest Astronomical Tide
HMRI	Helicopter Main Routing Indicator
HTZ	Helicopter Traffic Zone
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
ILT	Inspectie Leefomgeving en Transport

Term	Definition
IPMP	In-Principle Monitoring Plan
Km	Kilometre
LARS	Lower Airspace Radar Service
LAT	Lowest Astronomical Tide
M	Metre
MAA	Military Aviation Authority
MCA	Maritime and Coastguard Agency
MDA	Managed Danger Area
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MOD	Ministry of Defence
NERL	NATS (En Route) plc
Nm	Nautical miles
NOTAM	Notice to Airmen
NPS	National Policy Statement
NSL	NATS (Services) Limited
OCP	Offshore Converter Platform
OREI	Offshore Renewable Energy Installation
ORS	Official Record Series
OSP	Offshore Substation Platform
PEIR	Preliminary Environmental Information Report

Term	Definition
PEXA	Practice and Exercise Area
PSR	Primary Surveillance Radar
RAF	Royal Air Force
RRH	Remote Radar Head
RLoS	Radar Line of Sight
SAR	Search and Rescue
SARPs	Standards and Recommended Practices
SMS	Safety Management System
SSR	Secondary Surveillance Radar
TRA	Temporary Reserved Area
UK	United Kingdom
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
WTG	Wind Turbine Generator

15 Aviation and Radar

15.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) considers the likely significant effects of the Projects on Aviation and Radar, including the aviation interests of the United Kingdom (UK) Civil Aviation Authority (CAA), Ministry of Defence (MOD), regional airports, local aerodromes, NATS (that currently comprises NATS (En Route) plc (NERL) and NATS (Services) Limited (NSL)) and other UK aviation stakeholders. The chapter provides an overview of the existing environment for the proposed Offshore Development Area, followed by an assessment of likely significant effects for the construction, operation, and decommissioning phases of the Projects.

2. The assessment should be read in conjunction with the following linked chapters:

   - **Chapter 14 Shipping and Navigation** (due to marine activities associated with Search and Rescue (SAR) operations);
   - **Chapter 16 Infrastructure and Other Users** (which considers military activities and oil and gas operations); and
   - **Chapter 23 Seascape, Landscape and Visual Impact** (due to the effect of aviation lighting).

3. Additional information to support the Aviation and Radar assessment include:

   - **Appendix 15-1 Airspace Analysis and Radar Modelling**.

4. **Appendix 15-1** identifies the Primary Surveillance Radars (PSRs) liable to detect the Dogger Bank South (DBS) wind turbines and gives details of the Radar Line of Sight (RLoS) analyses. It also sets out a detailed analysis of the airspace occupied by the DBS East and DBS West array areas and summarises the effects that the Projects could have on aviation activities in the vicinity.

15.2 Consultation

5. Consultation with regard to Aviation and Radar has been undertaken in line with the general process described in **Chapter 6 EIA Methodology**. The key elements of consultation to date have included scoping. The feedback received has been considered in preparing the PEIR. **Table 15-1** provides a summary of how the consultation responses received to date have influenced the approach that has been taken.

6. This chapter will be updated following consultation on PEIR in order to produce the final assessment that will be submitted with the Development Consent Order (DCO) application. Full details of the consultation process will also be presented in the Consultation Report alongside the DCO application.

Table 15-1 Consultation Responses

Comment	Project Response
NATS / 09 August 2022 / Scoping Response	
The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company (NERL) has no safeguarding objection to the proposal.	Radar modelling in **Appendix 15-1** confirms that wind turbines within the DBS array areas would not be in RLoS of NATS radars.
MOD / 23 August 2022 / Scoping Responses	
Wind turbine development has the potential to affect, and be detectable by, radar systems and can have a significant and detrimental impact on the capability and operation of such systems. At paragraph 440, the report identifies that the nearest primary radar-equipped military airfield to the proposed development is Royal Air Force (RAF) Leeming which is located approximately 182km from the nearest point of the array areas. The report goes on to state that the proposed turbines would not be detectable to the PSR sited at RAF Leeming.	Radar modelling in **Appendix 15-1** confirms that wind turbines within the DBS array areas would not be in RLoS of the PSR at RAF Leeming.

Comment	Project Response
Similarly, the effect of the development on Air Defence Radar (ADR) is acknowledged at paragraph 441 which identifies the context of the application site relative to Remote Radar Head (RRH) Staxton Wold, RRH Trimingham, and RRH Brizlee Wood. The impact of the development on those radars should be considered as the design is progressed and any impact will need to be mitigated, it will be for the applicant to provide appropriate technical mitigation(s).	Radar modelling in **Appendix 15-1** confirms that wind turbines within the DBS array areas would not be in RLoS of the Brizlee Wood and Trimingham radars, but could be in RLoS of the Staxton Wold radar. The impact on the Staxton Wold radar is assessed in sections 15.6.1.1, 15.6.2.1 and 15.6.3.1.
Through paragraph 443 of the Scoping Report, it is acknowledged that the offshore array may fall wholly or partially within Southern Managed Danger Area (MDA) Practice and Exercise Areas (PEXA) D323B, D323C, and D323D. The lower vertical limits of blocks of danger area airspace are also noted.	The existing military airspace is described in section 15.5.3. The lower vertical limits of the danger areas would be well above the Projects' infrastructure and there would thus be no impact on activities within the airspace.
In addition, the cable route indicated in the Scoping Report passes through Practice and Exercise Areas (PEXA) D323K, D323D, and D323C. The applicant should be advised to take account of the current published MOD Practice and Exercise Areas (PEXA) in preparation of their development proposal. The MOD has highly surveyed routes which maybe relevant to the installation of the export cables & associated infrastructure. MOD should be consulted at the next stage of any application.	Noted. The existing military airspace is described in section 15.5.3. The lower vertical limits of the danger areas would be well above vessels involved in cable installation and there would thus be no impact on activities within the airspace. However, the MOD will be consulted to ensure that there is no potential impact on MOD surveyed routes.
With regard to aviation safety, the requirement to install aviation safety lighting on the turbines proposed is set out in Table 2-32 Existing Datasets. The MOD would request that the development is fitted with MOD accredited aviation safety lighting in accordance with the Air Navigation Order 2016. The MOD will also require that sufficient information is submitted to ensure accurate marking of the development on aeronautical charts.	Notification of data to the MOD and lighting requirements are addressed in section 15.3.3.

Comment	Project Response
The potential for unexploded ordnance (UXO) to be present within the study area and the necessity for clearance is acknowledged within the Scoping Report. The potential presence of UXO and disposal sites should be a consideration during the installation and decommissioning of turbines, cables, and any other infrastructure, or where other intrusive works are necessary.	Noted. See **Chapter 16 Infrastructure and Other Users**.
The landfall and onshore elements of the proposal, described in section 1.5.2 and 1.5.3 of the Scoping Report, identifies landfall at one of two sites close to Skipsea and an 80km² area within which two substations may be sited and an export cable will connect landfall with onshore substations. As the proposal matures MOD would hope to be consulted in order that any impact on MOD assets can be identified.	Noted. The MOD was emailed on 03/03/2023 offering a meeting to provide an update on the Projects and engage in further consultation.
The Planning Inspectorate / 02 September 2022 / Scoping Opinion	
Impacts on civil and military radar systems due to permanent structures during construction and decommissioning phases (excluding Saxton Wold Military Radar). The Inspectorate agrees that this matter can be scoped out as permanent structures would only be present during the operational phase and impacts arising from construction activity e.g., cranes and vessels will be separately assessed.	Potential PSR impacts during the construction phase are assessed in section 15.6.1.1. Any required radar mitigations will be agreed before construction commences, and in place before turbine blades are installed or allowed to rotate.

Comment	Project Response
The Scoping Report describes the existing radar facilities in the region and makes reference to distance ranges which have been considered in identifying receptors. The distances to airports and radar facilities are given but the ranges applied are not described and this information should be included in the ES. Airspace classification and control information is also described but is difficult to understand from the text. Consideration should be given to the inclusion of suitable figures in the ES to aid understanding of the existing aviation environment in relation to the Proposed Development and how this has informed the assessment.	Distance ranges to airports and radar facilities are described in sections 0 and 15.5.3. **Figure 15-1**, **Figure 15-2** and **Figure 15-3** are included to aid understanding of the existing aviation environment.
The assessment of the effects on military low flying arising from operation of the Proposed Development in the ES should be undertaken using accurate charting of the Wind Turbine Generators (WTGs). Where the final layout/ height mix of WTGs has not been decided, the worst-case scenario(s) should be assessed. It is noted at figure 2-25 that there is a Helicopter Main Routeing Indicator (HMRI 8) which passes within 2 nautical miles of the south-eastern corner of the Dogger Bank South East array area, so the results of any consultation required should form part of the ES.	Worst-case scenarios are presented in **Table 15-2** and have been used for the assessments. The potential impact of the DBS East array area on HMRI 8 is acknowledged in sections 15.6.1, 15.6.2 and 15.6.3. Consultation with relevant platform operators and offshore helicopter operators to agree any required mitigation will be detailed within the Environmental Statement (ES).
The Scoping Report states that the assessment will be supported by further desk-based studies, including radar line of sight modelling to identify sensitive receptors. There does not appear to be any criteria presented to identify how significant effect will be determined. The ES should provide clarity on how the assessment has been undertaken, taking account relevant guidance and aspect specific methodology and detail the methodology used.	The RLoS modelling methodology is described in **Appendix 15-1**. The impact assessment methodology is detailed in section 15.4.2.

Comment	Project Response
The Inspectorate considers that there may be a requirement for aviation safety lighting to mitigate potential significant effects to military low flying and civilian helicopter movements from the presence of WTGs and other offshore infrastructure. The Applicant should seek to agree the specification of any aviation safety lighting with relevant consultation bodies. Any significant effects associated with the lighting on ecological receptors should also be assessed in the ES.	Lighting requirements are detailed in section 15.3.3.2.
The Scoping Report states at section 2.11.3 there is potential impacts to military and civil aviation, including via physical structures of the Proposed Development. The inter-relationships with other aspects e.g., infrastructure and other users, and tourism should be assessed in the ES if significant effect is likely.	Inter-relationships with Infrastructure and Other Users, Seascape, Landscape and Visual Impact, and Shipping and Navigation are discussed in section 15.10.

15.3 Scope

15.3.1 Study Area

7. The aviation and radar study area has been defined on the basis of the potential for wind turbines within the DBS array areas to have an impact on civil and military radars, taking into account required radar operational ranges. In general, PSRs installed on civil and military airfields have an operational range of between 40 nautical miles (nm) and 60nm. All radar equipped airfields within 60nm of the array areas are therefore included in the aviation and radar study area. En route radars operated by NERL and military Air Defence (AD) radars are required to provide coverage at ranges in excess of 60nm and so all such radars with potential RLoS of wind turbines in the array areas are also included in the aviation and radar study area.

8. The aviation and radar study area includes the DBS East and West array areas and the airspace between the array areas and the UK mainland, extending from the MOD AD radar facility at RRH Brizlee Wood to the north, to the MOD AD radar facility at RRH Trimingham to the south and the NERL radar facility at Great Dun Fell to the west.

9. The criteria in the following sections have been used to identify receptors within the study area.

15.3.1.1 Civil Aerodromes

10. Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines (CAA, 2016) states the distances from various types of aerodromes where consultation should take place. These distances include:

- Aerodromes with a surveillance radar: 30 kilometres (km);
- Non-radar equipped licensed aerodromes with a runway of more than 1,100 metres (m): 17km;
- Licensed aerodromes where the wind turbines will lie within airspace coincidental with any published Instrument Flight Procedures (IFPs);
- Unlicensed aerodromes with runways of more than 800m: 4km;
- Unlicensed aerodromes with runways of less than 800m: 3km;
- Gliding sites: 10km; and
- Other aviation activity such as parachute sites and microlight sites: 3km.

11. CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. For example, aerodromes may utilise their radars at ranges considerably in excess of 30km.

12. As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes (CAA, 2022a) to determine whether a proposed development will breach obstacle clearance criteria at any aerodromes.

15.3.1.2 Ministry of Defence

13. It is necessary to consider the aviation, air defence and other activities of the MOD. This includes:

- MOD airfields, both radar and non-radar equipped;
- MOD AD radars; and
- MOD Practice and Exercise Areas (PEXAs) for both aviation and non-aviation activities.

15.3.1.3 NERL Facilities

14. It is necessary to consider the possible effects of wind turbines upon NERL radar systems; a network of primary and secondary radar facilities around the country.

15.3.1.4 Other Aviation Activities

15. Other aviation activities considered include:

- General military low flying training operations; and
- Military and civilian 'off-route' fixed-wing and helicopter operations, SAR missions and offshore helicopter operations in support of the oil and gas industry.

15.3.1.5 Meteorological Radio Facilities

16. Wind turbines have the potential to adversely impact meteorological radio facilities such as weather radar. The Met Office must be consulted when wind turbine proposals are within a 20km radius zone of any of their UK weather radar sites.

17. The aviation and radar study area may be reviewed and amended for the ES stage in response to such matters as refinement of the array areas, feedback from consultees, and / or the identification of additional constraints.

18. Airports and radars within the aviation and radar study area that are under consideration are shown on **Figure 15-1**.

15.3.2 Realistic Worst Case Scenario

15.3.2.1 General Approach

19. The realistic worst case design parameters for likely significant effects scoped into the Environmental Impact Assessment (EIA) for the Aviation and Radar assessment are summarised in **Table 15-2**. These are based on the project parameters described in **Chapter 5 Project Description**, which provides further details regarding specific activities and their durations.

20. In addition to the design parameters set out in **Table 15-2**, consideration is also given to the different development scenarios still under consideration and the possible phasing of the construction as set out in sections 15.3.2.2 to 15.3.2.5.

Table 15-2 Realistic Worst Case Design Parameters

	Parameter			
	DBS East or DBS West in isolation	**DBS East and DBS West concurrently**	**DBS East and DBS West sequentially**	**Notes and rationale**
Construction				
Impacts on civil and military PSR systems due to high construction vessels / cranes and partially complete structures.	Up to 100 wind turbines. Maximum blade tip height of 450m above Mean High Water Springs (MHWS). High crane installation vessels. Construction period of five years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. High crane installation vessels. Construction period of five years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. High crane installation vessels. Construction period of seven years.	Maximum number of the tallest wind turbines, or maximum number of wind turbines for the Projects. (Either of the above scenarios could be worst-case and both have been assessed for all impacts). Potential impacts starting from a point of zero infrastructure present to full presence over the construction period.

	Parameter			
	DBS East or DBS West in isolation	**DBS East and DBS West concurrently**	**DBS East and DBS West sequentially**	**Notes and rationale**
Creation of an aviation obstacle environment.	Up to 100 wind turbines. Maximum blade tip height of 450m above MHWS. High crane installation vessels. Up to six offshore substation / converter platforms height 205m above Lowest Astronomical Tide (LAT). Construction period of five years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. High crane installation vessels. Up to 11 offshore substation / converter platforms height 205m above LAT. Construction period of five years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. High crane installation vessels. Up to 11 offshore substation / converter platforms height 205m above LAT. Construction period of seven years.	Maximum number of the tallest wind turbines, or maximum number of wind turbines for the Projects. (Either of the above scenarios could be worst-case and both have been assessed for all impacts). Maximum physical obstruction to aviation operations due to the size and number of above sea level infrastructure within the DBS array areas. Potential impacts starting from a point of zero infrastructure present to full presence over the construction period.

	Parameter			
	DBS East or DBS West in isolation	**DBS East and DBS West concurrently**	**DBS East and DBS West sequentially**	**Notes and rationale**
Increased air traffic in the area related to wind farm construction activities.	Up to 730 helicopter return trips per construction year are anticipated.	Up to 1460 helicopter return trips per construction year are anticipated.	Up to 730 helicopter return trips per project per construction year are anticipated (i.e. 1460 per year where construction periods overlap).	Helicopter trips as a result of being engaged in works on the Projects causing increased likelihood of aircraft to aircraft collision.
Operation				
Wind turbines causing permanent interference on civil and military PSRs.	Up to 100 wind turbines. Maximum blade tip height of 450m above MHWS. Operational lifetime of 30 years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. Operational lifetime of 30 years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. Operational lifetime of 32 years.	Maximum number of the tallest wind turbines, or maximum number of wind turbines for the Projects. (Either of the above scenarios could be worst-case and both have been assessed for all impacts). Impact present for operational lifetime.

	Parameter			
	DBS East or DBS West in isolation	**DBS East and DBS West concurrently**	**DBS East and DBS West sequentially**	**Notes and rationale**
Creation of an aviation obstacle environment.	Up to 100 wind turbines. Maximum blade tip height of 450m above MHWS. Up to six offshore substation / converter platforms height 205m above LAT. Operational lifetime of 30 years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. Up to 11 offshore substation / converter platforms height 205m above LAT. Operational lifetime of 30 years.	Up to 200 wind turbines. Maximum blade tip height of 450m above MHWS. Up to 11 offshore substation / converter platforms height 205m above LAT. Operational lifetime of 32 years.	Maximum number of the tallest wind turbines, or maximum number of wind turbines for the Projects. (Either of the above scenarios could be worst-case and both have been assessed for all impacts). Maximum physical obstruction to aviation operations due to the size and number of above sea level infrastructure within the DBS array areas. Impact present for operational lifetime.

	Parameter			
	DBS East or DBS West in isolation	**DBS East and DBS West concurrently**	**DBS East and DBS West sequentially**	**Notes and rationale**
Increased air traffic in the area related to wind farm support activities.	Maximum number of 20 helicopter return trips per year during Operation phase. Operational lifetime of 30 years.	Maximum number of 20 helicopter return trips per year during Operation phase. Operational lifetime of 30 years.	Maximum number of 20 helicopter return trips per year during Operation phase. Operational lifetime of 32 years.	Helicopter trips as a result of being engaged in works on the Projects causing increased likelihood of aircraft to aircraft collision. Impact present for operational lifetime.
Decommissioning				
No final decision regarding the final decommissioning policy for the onshore project infrastructure including landfall, onshore cable route and onshore substation has yet been made. It is also recognised that legislation and industry best practice change over time. However, it is likely that offshore project infrastructure will be removed above the seabed and reused or recycled where practicable. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. It is anticipated that for the worst case scenario, the impacts will be no greater than those identified for the construction phase.			

15.3.2.2 Development Scenarios

21. There are currently two possible electrical solutions being considered for DBS West, HVAC or HVDC. Due to the distance of the array area offshore DBS East will be an HVDC project. Therefore, there are two possible electrical solutions for the Projects:

- One HVDC project and one HVAC project; or
- Two HVDC projects.

22. Offshore the most significant difference between an HVAC solution and an HVDC solution is that if an HVAC electrical solution is used an additional platform will be required along the offshore export cable. In addition, a HVAC solution will require two additional cable lays offshore, over and above the four lays that would be required for two HVDC projects.

23. In order to ensure that a robust assessment has been undertaken, all development scenarios and options have been considered to ensure the realistic worst-case scenario for each topic has been assessed. Further details are provided in **Chapter 5 Project Description**.

15.3.2.3 Construction Scenarios

24. The following principles set out the framework for how the Projects may be constructed (relating to both onshore and offshore works):

- DBS East and DBS West may be constructed at the same time, or at different times;
- If built concurrently, both Projects could be constructed in five years;
- If built non-concurrently, either Project could be built first;
- If built non-concurrently, each Project would require a five year period of construction;
- If built non-concurrently, it is anticipated that there would be up to a two year lag between the start of construction for the first project and the start of construction for the second project; and
- Assuming a maximum construction period per Project of five years, and taking the above into account, the maximum construction period over which the construction of both Projects could take place is seven years.

25. In order to determine which construction scenario presents the realistic worst case for each receptor and impact, the assessment considers both maximum duration effects and maximum peak effects, in addition to each Project being developed in isolation, drawing out any differences between each of the two Projects.

26. The three construction scenarios considered by the Aviation and Radar assessment are therefore:

- Build DBS East or build DBS West in isolation;
- Build DBS East and DBS West concurrently – reflecting the maximum peak effects; and
- Build the Projects sequentially with a lag of up to two years – reflecting the maximum duration of effects.

27. The individual, concurrent and sequential construction scenarios all allow for flexibility to build out the Projects using a phased approach. This will allow the Projects to adapt to National Grid Electricity Transmission Operator's development plans for the onshore grid connection points. Under a phased approach the maximum timescales for individual elements of the construction have been assessed.

28. Any differences between the Projects, or differences that could result from the manner in which the first and the second Projects are built (concurrent or sequential and the length of any gap) are identified and discussed where relevant in section 15.6. For each potential impact, only the worst case construction scenario for two Projects is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in section 15.6.

15.3.2.4 Operation Scenarios

29. Operation scenarios are described in detail in **Chapter 5 Project Description**. The assessment considers the following scenarios:

- Only DBS East in operation;
- Only DBS West in operation; and
- The two Projects operating concurrently, with or without a lag of up to two years between each Project commencing operation.

30. If the Projects are built out using a phased approach, there would also be a phased approach to starting the operational stage. The worst case scenario for the operational phases for the Projects have been assessed. See section 5.1.1 of **Chapter 5 Project Description** for further information on phasing scenarios for the Projects.

31. The operations lifetime of each Project is expected to be 30 years.

15.3.2.5 Decommissioning Scenarios

32. Decommissioning scenarios are described in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a Decommissioning Programme prior to construction, however for the purpose of this assessment it is assumed that decommissioning of the Projects could be conducted separately, or at the same time.

15.3.3 Mitigation Embedded in the Design

33. This section outlines the embedded mitigation relevant to the Aviation and Radar assessment, which has been incorporated into the design of the Projects (**Table 15-3**). Where other mitigation measures are proposed, these are detailed in the impact assessment (section 15.6).

15.3.3.1 Information, Notifications and Charting

34. The Projects would create an obstacle environment which can be partially mitigated by compliance with appropriate international and national requirements for the promulgation of the obstacle locations on charts and in aeronautical documentation, together with the permanent marking and lighting of obstacles.

35. Measures would be adopted at the commencement of works on the Projects to ensure that aviation stakeholders are made aware of the creation of a further aviation obstacle environment in the North Sea. These measures would include issuing Notices to Airmen (NOTAMs) and Aeronautical Information Circulars (AICs), warning of the establishment of obstacles within the DBS array areas and publicity in such aviation publications as Safety Sense and the General Aviation Safety Council (GASCo) Flight Safety magazine.

36. At least 10 weeks before construction commences, details of the position, height above mean sea level (amsl) and lighting for all permanent structures would be forwarded to the NATS Aeronautical Information Service (AIS) for inclusion in the Aeronautical Information Publication (AIP) and on relevant aeronautical charts, as notifiable permanent obstructions. This permanent information would replace the short-term NOTAMs that would continue to be issued to cover the Projects until construction has been completed.

37. En route navigation charts would be updated as the site construction proceeds. All obstacles over 300 feet (ft) amsl must be notified to the Defence Geographic Centre (DGC) for inclusion in the UK AIP (section ENR5.4), on aeronautical maps and in MOD databases.

15.3.3.2 Marking and Lighting

38. The international marking and lighting requirement, as set out in the International Civil Aviation Organisation (ICAO) document Annex 14 (ICAO, 2022), specifies that:

- "*A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.*"; and
- *"The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study."*

39. UK regulations adopt ICAO Annex 14's requirements for the lighting of wind turbines but do not require that wind turbines follow the ICAO recommendation for paint colour. Although CAP 764 does set out the ICAO recommendation by way of guidance. In terms of marking the wind turbines, in keeping with recent practice for offshore wind farms, it is anticipated that Trinity House would require all structures to be painted yellow from the level of Highest Astronomical Tide (HAT) to a height directed by Trinity House (at least 15m), and above the yellow section all wind turbines would be painted submarine grey.

40. The Projects would be lit in accordance with the Air Navigation Order (ANO). ANO Article 222 defines an 'en route obstacle' as any building, structure or erection, the height of which is 150m or more above ground level and requires these to be lit. Article 223 modifies the Article 222 requirement with respect to offshore wind turbines, requiring these to be lit where they exceed 60m above HAT with a medium intensity (2000 candela (cd)) steady red light mounted on the top of each nacelle and requires for limited downward spillage of light. Article 223 allows for the CAA to permit that not all wind turbines are lit in this way. CAP 764 states that the CAA will permit that only wind turbines on the periphery of any wind farm need to be equipped with aviation warning lighting and such lighting, where achievable, shall be spaced at longitudinal intervals not exceeding 900m. There is no current routine requirement for offshore obstacles to be fitted with intermediate vertically spaced aviation lighting.

41. CAA guidance has been subject to coordination with maritime agencies to avoid confusion with maritime lighting. To that end, the CAA has indicated that the use of a flashing red Morse Code letter 'W' is likely to be approved to resolve potential issues for the maritime community.

42. The Maritime and Coastguard Agency (MCA) is seeking that wind turbine blade tips are marked in red, together with markings down the blade, to provide a SAR helicopter pilot with a hover reference point as set out in Marine Guidance Note (MGN) 654 Annex 5 (MCA, 2021b). The MCA also seeks a lighting scheme comprising 200cd red / infra-red lights on the nacelles of non-Article 223 wind turbines, to be operated on demand during SAR operations and a wind turbine shutdown protocol to be applied during rescue situations. An Emergency Response and Cooperation Plan (ERCoP) would be developed and implemented for all phases of the Projects, based upon the MCA's standard template. Appropriate lighting would be utilised to facilitate heli-hoisting if undertaken within the array areas, as outlined in CAP 437: Standards for Offshore Helicopter Landing Areas (CAA, 2021a).

43. To satisfy MOD requirements, the wind turbines would also be required to be fitted with infra-red lighting in combination with the ANO Article 223 lights. MOD lighting guidance indicates that provided combination infra-red / 2000cd visible red lights are used to light the wind turbines required to be lit under ANO Article 223, this satisfies the MOD operational requirement.

Table 15-3 Embedded Mitigation Measures

Parameter	Mitigation Measures Embedded into the Project Design
Information, notifications and charting	Aviation stakeholders would be made aware of the Projects via NOTAMs and obstacle details would be passed to the DGC and NATS. AIS at least 10 weeks before construction commences for inclusion in the AIP and on relevant aeronautical charts. Compliance will be secured by a DCO requirement.
Lighting and marking	Lighting and marking of obstacles would be in accordance with Article 223, MCA (MGN 654), and CAA and MOD requirements. Although the anticipated requirements are outlined in the section above, the final lighting and marking requirements will be agreed prior to construction. Requirements will be detailed in a Lighting and Marking Plan document and compliance will be secured by a DCO requirement.

15.4 Assessment Methodology

15.4.1 Policy, Legislation and Guidance

15.4.1.1 National Policy Statements

44. The assessment of potential impacts upon Aviation and Radar has been made with specific reference to the relevant National Policy Statements (NPS). The specific assessment requirements for Aviation and Radar, as detailed in the NPS, are summarised in **Table 15-4** together with an indication of the section of this chapter where each is addressed.

45. It is noted that the NPS for Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for Electricity Networks Infrastructure (EN-5) are in the process of being revised. Draft versions were published for consultation in September 2021 by the Department for Business, Energy and Industrial Strategy (BEIS) (2021a, 2021b and 2021c respectively). A review of these draft versions has been undertaken in the context of this PEIR chapter, and any proposed amendments different to the existing NPS have been highlighted in **Table 15-4**. Any further changes to these draft revisions resulting from the consultation process will be considered in the ES.

46. Following the consultation in 2021 on the draft energy NPS, a new consultation opened on 30 March 2023 on revised drafts of the energy NPSs, including EN1, EN3 and EN5. Due to the timing of this consultation, and finalisation of this PEIR we have been unable to review and take these revised draft NPS into account within these documents. However, these will be reviewed and incorporated into the final ES where relevant.

Table 15-4 NPS Assessment Requirements

NPS Requirement	NPS Reference	PEIR Section Reference
EN-1 NPS for Energy		
If the proposed development could have an effect on civil and military aviation, then the assessment should: • Consult the MOD, CAA, NATS and any aerodrome – licensed or otherwise – likely to be affected by the proposed project in preparing an assessment of the proposal on aviation or other defence interests; • Include potential impacts of the project upon the operation of CNS [Communications, Navigation & Surveillance] infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures; and • Assess the cumulative effects of the project with other relevant projects in relation to aviation and defence.	Paragraphs 5.4.10 to 5.4.13	Consultation undertaken with relevant civil and military aviation stakeholders is detailed in section 15.2. Consultation will continue with stakeholders throughout the EIA process. Effects on civil and military aviation during the phases of the Projects are assessed in section 15.6. A full assessment of cumulative effects will be provided in the ES. A preliminary assessment is presented in section 15.8.
If there are conflicts between the Government's energy and transport policies and military interests in relation to the application, the decision maker should expect the relevant parties to have made appropriate efforts to work together to identify realistic and pragmatic solutions to the conflicts. In so doing, the parties should seek to protect the aims and interests of the other parties as far as possible.	Paragraph 5.4.15	Potential mitigation for impacts on military radars are discussed in section 15.6.2.1.5. Engagement with the MOD will continue throughout the EIA process.

NPS Requirement	NPS Reference	PEIR Section Reference
There are statutory requirements concerning lighting to tall structures. Where lighting is requested on structures that goes beyond statutory requirements by any of the relevant aviation and defence consultees, the decision maker should satisfy itself of the necessity of such lighting taking into account the case put forward by the consultees. The effect of such lighting on the landscape and ecology may be a relevant consideration.	Paragraph 5.4.16	Marking and lighting requirements are discussed in section 15.3.3.2.
Where, after reasonable mitigation, operational changes, obligations and requirements have been proposed, the decision maker considers that: • A development would prevent a licensed aerodrome from maintaining its licence; • The benefits of the proposed development are outweighed by the harm to aerodromes serving business, training or emergency service needs, taking into account the relevant importance and need for such aviation infrastructure; or • The development would significantly impede or compromise the safe and effective use of defence assets or significantly limit military training;	Paragraph 5.4.17	The Projects have the potential to generate clutter on radar displays and thus have an effect on the safe and effective use of defence assets. However, technical mitigation is being sought, as discussed in section 15.6.2.1.5. Once mitigation has been implemented there will be no significant effects on any of the stated infrastructure or services.

NPS Requirement	NPS Reference	PEIR Section Reference
• The development would have an impact on the safe and efficient provision of en route air traffic control services for civil aviation, in particular through an adverse effect on the infrastructure required to support communications, navigation or surveillance systems; consent should not be granted.		
EN-3 NPS for Renewable Energy Infrastructure		
Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety.	Paragraph 2.6.107	Proposed lighting is discussed in section 15.3.3.2. In accordance with ANO Article 223, lighting intensity would be reduced at and below the horizontal and further reduced when visibility in all directions from every wind turbine is more than 5km.
Where a wind farm potentially affects other infrastructure or activity, a pragmatic approach should be employed by the decision maker. The decision maker should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.	Paragraph 2.6.183	Potential effects during the various phases are assessed in section 15.6. Negative impacts will be minimised, and risks reduced through the embedded mitigation measures outlined in section 15.3.3 and by continuing engagement with relevant stakeholders to agree any appropriate additional mitigation measures.

NPS Requirement	NPS Reference	PEIR Section Reference
The decision maker should be satisfied that the site selection and design of the wind farm has avoided or minimised disruption or economic loss or any adverse effects on safety to other offshore industries. The decision maker should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	Paragraph 2.6.184	Potential effects on offshore helicopter operations are assessed in section 15.6. Consultation with relevant platform operators and offshore helicopter operators will be undertaken to agree any potential mitigation measures and ensure offshore oil and gas operations in the vicinity of the array areas are safeguarded.
Where schemes have been carefully designed and the necessary consultation has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on other offshore infrastructure to a level sufficient to enable the decision maker to grant consent.	Paragraph 2.6.186	Embedded mitigation measures are outlined in section 15.3.3 and further mitigation measures discussed in section 15.6.
Detailed discussions between the applicant and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such, appropriate mitigation should be included in any application and ideally agreed between relevant parties. In some circumstances, the decision maker may wish to consider the potential to use conditions involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.	Paragraphs 2.6.187 to 2.6.188	Consultation was initiated with NATS and the MOD at the Scoping stage. Further engagement with the MOD and other relevant aviation stakeholders will continue throughout the EIA process in order to agree appropriate mitigations, if required, prior to application submission.

NPS Requirement	NPS Reference	PEIR Section Reference
Draft EN-3 NPS for Renewable Energy Infrastructure		
Aviation and navigation lighting should be minimised **and/or on demand** to avoid attracting birds, taking into account impacts on safety.	Paragraph 2.29.5	Proposed lighting is discussed in section 15.3.3.2. In accordance with ANO Article 223, lighting intensity would be reduced at and below the horizontal plane and further reduced when visibility in all directions from every wind turbine is more than 5km.
The Secretary of State should be satisfied that the site selection and design of the wind farm has avoided or minimised disruption or economic loss or any adverse effects on safety to other offshore industries. **Applicants will be required to demonstrate that risks to safety will be reduced to as low as reasonably practicable.** The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.	Paragraph 2.34.11	Potential effects on offshore helicopter operations are assessed in section 15.6. Consultation with relevant platform operators and offshore helicopter operators will be undertaken to agree any potential mitigation measures and ensure offshore oil and gas operations in the vicinity of the array areas are safeguarded.

15.4.1.2 Other

47. In addition to the NPS, there a number of pieces of legislation, policy and guidance applicable to the assessment of Aviation and Radar. These include:

- CAP 168: Licensing of Aerodromes (CAA, 2022a);
- ANO 2016/765 (CAA, 2022b);
- CAP 764: Policy and Guidelines on Wind Turbines (CAA, 2016);
- CAP 670: Air Traffic Services Safety Requirements (CAA, 2019);
- CAP 437: Standards for Offshore Helicopter Landing Areas (CAA, 2021a);
- CAP 1616: Airspace Change (CAA, 2021b);
- CAP 032: UK Aeronautical Information Publication (AIP) (CAA, 2023);
- UK Military AIP (MOD, 2023);
- Military low flying in the United Kingdom: the essential facts (MOD, 2017);
- MOD Obstruction Lighting Guidance (Low Flying Operations Flight, 2020);
- MCA MGN 654 Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021a);
- MCA document: Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR (Search and Rescue) and Emergency Response (MCA, 2021b; and
- ICAO Annex 14: Aerodrome Design and Operations (ICAO, 2022).

48. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

Data and Information Sources

49. Sources that have been used to inform the assessment are listed in **Table 15-5**.

Table 15-5 Data and Information Sources

Data Set	Spatial Coverage	Year	Notes
CAP 032: UK AIP (CAA, 2023)	Full coverage across the DBS aviation study area.	2023	The main resource for information and flight procedures at all licensed UK airports as well as airspace, en route procedures, charts and other air navigation information.
UK Military AIP (MoD, 2023)	Full coverage across the DBS aviation study area.	2023	The main resource for information and flight procedures at all military aerodromes.

15.4.2 Impact Assessment Methodology

50. **Chapter 6 EIA Methodology** provides a summary of the general impact assessment methodology applied. The following sections describe the methods used to assess the likely significant effects on Aviation and Radar.

15.4.2.1 Significance of Effect

51. In assessing the significance of the effects from the Projects it is necessary to identify whether or not there would be an impact on aviation operations. The aviation industry is highly regulated and subject to numerous mandatory standards, checks and safety requirements (for example CAP 670), many international in nature and requiring the issue of operating licences. In all cases, the sensitivity or magnitude of the impact on operations can only be identified by the appropriate aviation organisation conforming to the Risk Classification Scheme used to quantify and qualify the severity and likelihood of a hazard occurring.

52. The Risk Classification Scheme is a fundamental element of an aviation organisation's Safety Management System (SMS), which must be acceptable to, and approved by, the UK CAA or the Military Aviation Authority (MAA), as appropriate. As such, for the purposes of this assessment, no detailed grading has been made of the magnitude of the impact or sensitivity of the receptor on the basis that any potential reduction in aviation safety cannot be tolerated. Instead, the following definitions of basic significance have been used as defined in **Table 15-6**. This represents a deviation from the standard methodology presented within **Chapter 6 EIA Methodology**.

Table 15-6 Definition of Effect Significance

Significance	Definition
Major significant	Receptor would be unable to continue safe operations or safe provision of air navigation services (radar) or effective air defence surveillance in the presence of the wind turbines. Technical or operational mitigation of the impact would be required.
Moderate significant	Receptor would be able to continue safe operations but with some restrictions in place.
Not significant	The Projects would have little effect on the aviation receptor, or the level of effect would be acceptable to the aviation receptor.
No change	The Projects would have no effect on the aviation receptor and would be acceptable to the aviation receptor.

15.4.3 Cumulative Effect Assessment Methodology

53. The cumulative effect assessment (CEA) considers other plans and projects that may result in cumulation with the Projects. **Chapter 6 EIA Methodology** provides details of the general framework and approach to the CEA that will be undertaken for the Projects.

54. The full assessment of cumulative effects will be undertaken during the later stages of the EIA, once further information is available on a number of projects such as the Outer Dowsing Offshore Wind Farm, Hornsea Project Four decision and the Sheringham Shoal and Dudgeon Extension Projects examination. However, for the purposes of the PEIR, it is possible to identify a number of projects and plans which are likely to feature in that assessment and consider the extent to which cumulative effects might arise. Section 15.8 presents the following preliminary information regarding cumulative effects:

- Screening for cumulative effects; and
- A preliminary short list of plans and projects considered for CEA, including a brief description as to how projects have been screened in and the initial tier level they have been assigned.

15.4.4 Transboundary Effects Assessment Methodology

55. There are no transboundary effects with regard to Aviation and Radar as the Offshore Development Area would not be sited in proximity to any international boundaries. CAP 764 advises wind turbine developers to contact the CAA for specific guidance when developments are likely to approach the limits of the UK Flight Information Region (FIR), and uses the existing East Anglia ONE development, which straddles the UK and Dutch FIR boundaries, as an example. The nearest international airspace boundary is 134km south-east of the DBS array areas. Some UK airspace is delegated to the Netherlands, as described in section 15.5, but this area is more than 40km east of the DBS array areas. All aircraft operating in the vicinity of the DBS array areas will be within UK airspace and subject to UK air traffic regulations. Transboundary effects are therefore scoped out of this assessment and not considered further.

15.4.5 Assumptions and Limitations

56. This preliminary assessment is considered to be an interim stage in the EIA process. The results presented in the following sections are based on early design assumptions and initial assessments which will be refined and presented in the final ES to be submitted as part of the DCO application.

57. No further overarching assumptions or limitations have been identified that apply to the assessment for Aviation and Radar. Where routine assumptions have been made in the course of undertaking the assessment, these are noted throughout.

15.5 Existing Environment

58. An initial desktop study was undertaken to determine those aviation stakeholders that were likely to be affected by the Projects, including all radar systems within operational range.

59. The main issue identified is associated with potential wind turbine interference for PSRs. Due to the physical size of the wind turbines proposed, there is also potential for the wind turbines to become aviation obstacles or obstructions, particularly to helicopters engaged in offshore operations. This is considered within the impact assessment.

60. CAP 764 advises that wind turbine effects on Secondary Surveillance Radars (SSRs) can be caused due to the physical blanking and diffracting effects of the wind turbine towers, depending on the size of the wind turbines and the wind farm. However, CAP 764 goes on to say that these effects are only a consideration when the wind turbines are located close to the SSR, i.e. less than 10km. NATS recommend a safeguarded zone of radius 28km around their SSR facilities. The closest SSR (Claxby) is 162km from the DBS array areas. As all known SSRs are outside the stipulated parameters by a significant margin they will not be affected by the wind turbines and are therefore not considered further.

61. Similarly, there will be no measurable effects upon other terrestrial based aviation Communications, Navigation and Surveillance (CNS) systems as the Projects are considerably outside applicable safeguarding limits pertaining to such CNS infrastructure. Therefore, terrestrial CNS infrastructure (other than PSR) are not considered further.

15.5.1 Radar Modelling and Airspace Analysis

62. Computer modelling using a contemporary software modelling tool (HTZ communications) has been undertaken to predict if RLoS exists between PSRs and wind turbines within the DBS array areas, and the likelihood of the rotating wind turbine blades being detected. This exercise identified those PSRs that could detect the wind turbines and has been based on wind turbines with a maximum tip height of between 336m and 452m above mean sea level (amsl)[1].

63. The RLoS modelling undertaken is based on generic data as the specific and detailed characteristics of the modelled PSRs are considered commercially sensitive. Therefore, contemporary PSR performance characteristics and publicly available PSR data has been used in lieu. Modelling by radar operators with detailed configuration data may reveal marginally different results. However, confidence is high that the PSR performance characteristics used have a high level of compatibility with actual PSR performance.

64. **Appendix 15-1** details the computer modelling undertaken and uses the outputs of the modelling to identify potential impacts and, where necessary, to determine potential mitigation strategies for inclusion in this document. **Appendix 15-1** also provides further details of the airspace analysis undertaken. An overview of the existing civil and military airspace environment is shown on **Figure 15-2** and summarised in the following sections.

[1] Radar modelling was based on tip heights AMSL as opposed to above MHWS. Within the DBS array areas MHWS is approximately 1.3m amsl, therefore tip heights of 336m for smaller wind turbines and 452m amsl for larger wind turbines incorporate additional precautionary height buffers above the proposed maximum tip heights of 333.87m and 450.14m above MHWS.

15.5.2 Civil Aviation

65. The airspace above and adjacent to the Offshore Development Area is used by civil and military aircraft and lies within the London Flight Information Region (FIR) for ATC, the airspace regulated by the UK CAA. Approximately 29km north of the DBS array areas is the boundary between the London FIR and the Scottish FIR, which is also regulated by the UK CAA.

66. The London FIR is adjacent to the Amsterdam FIR, whose boundary is approximately 134km south-east of the array areas and is regulated by the Netherlands Inspectie Leefomgeving en Transport (ILT). A portion of UK FIR airspace known as North Sea Area V is also delegated to the Netherlands, as depicted on **Figure 15-2**. Within this area, which lies approximately 41km east of the DBS array areas, the Netherlands provides an Air Traffic Service (ATS) to all aircraft at Flight Level (FL) 55 (approximately 5,500ft amsl) and below.

67. Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of ATS is provided and under what conditions. In the UK there are five classes of airspace: A, C, D, E and G. The first four are controlled airspace classes while Class G is uncontrolled. Within controlled airspace aircraft are monitored and instructed by ATC, whereas in uncontrolled airspace aircraft are not subject to ATC instruction but rather operate according to a simple set of regulations. ATC may still provide information, if requested, to ensure flight safety.

68. Aircraft operate under one of two flight rules: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is conducted with visual reference to the natural horizon while IFR flight requires reference solely to aircraft instrumentation.

69. From sea level to FL195, approximately 19,500ft or 5,950m amsl, the airspace in the vicinity of the DBS array areas is Class G uncontrolled airspace. This airspace is used predominantly by low level flight operations and generally by aircraft flying under VFR. Under VFR flight the pilot is responsible for maintaining a safe distance from terrain, obstacles, and other aircraft.

70. In uncontrolled airspace, aircraft are not obliged to be in receipt of an ATS, although it is open to pilots to seek Air Traffic Services outside Controlled Airspace (ATSOCAS) from the designated ATS provider. The extent of the ATSOCAS supplied will depend on the CNS capability of the ATS provider, its workload and any regulatory provisions relating to the carriage of CNS equipment by aircraft (for example, transponders). All aircraft above approximately 10,000ft amsl in the London FIR are required to carry and operate transponders in accordance with national regulations.

71. Above FL195 is Class C controlled airspace in the form of a Temporary Reserved Area (TRA). This airspace, TRA 006, has an upper vertical limit of FL245, approximately 24,500ft amsl, and is available for use by both military and civil aircraft, though its main use is to accommodate VFR military flying activity. Above FL245 are airways known as ATS routes. Aircraft fly along ATS routes using either ground-based electronic aids or Global Navigation Satellite System waypoints for navigation.

72. To gain access to controlled airspace, a pilot must comply with various mandatory requirements. This includes establishing two-way radio communications with the designated ATC authority for the specified airspace and obtaining permission to enter it. The pilot must then comply with instructions received. In this way, the controllers know of all the air traffic in the defined airspace. The controllers can then take appropriate measures to ensure that standard separation minima are maintained between all known aircraft by using various techniques that may or may not include the use of PSR.

73. Flight procedures in the vicinity of the Offshore Development Area are conducted in accordance with national UK CAA and MOD Standards and Recommended Practices (SARPs) as promulgated in the UK AIP.

74. Given that all aircraft operating above circa 10,000ft amsl are required to be equipped with and operate transponders, the significance of primary radar for the provision of an ATS is more acute in the lower airspace outside of controlled airspace and is especially relevant to helicopter operators.

75. To enhance flight safety and expedite SAR operations over the southern North Sea, various Flight Information Services are provided by NATS Anglia Radar based at Aberdeen Airport. These services are available to helicopters operating in support of the offshore oil and gas and renewables industries and other civil and military aircraft transiting the airspace. The Anglia Radar Area of Responsibility in which these services are available is depicted on **Figure 15-2** and extends from sea level to FL65 (approximately 6,500ft amsl).

76. There are no radar-equipped airports within 60nm (111km) of the DBS array areas. The nearest such airports are Humberside, 152km to the south-west, and Teesside, 172km west of the DBS array areas, as shown on **Figure 15-1**. Controllers at both these airports may provide a Lower Airspace Radar Service (LARS) to aircraft operating outside controlled airspace at a maximum range of 30nm (56km) from the Humberside facility and 40nm (74km) from the Teesside facility. The DBS array areas are not below airspace coincidental with any published IFPs for either Humberside or Teesside and RLoS modelling detailed in **Appendix 15-1** shows that wind turbines within the DBS array areas would not be detected by the Humberside or Teesside PSRs. Impacts on civil airports and radars are thus scoped out of the assessment.

77. The nearest major European airport is Schiphol Airport in the Netherlands, which lies approximately 290km from the DBS array areas and is outside any area of effect.

78. NERL provides en route civil air traffic services within the London FIR. NERL operates a network of radar facilities which provide en route information for both civil and military aircraft. The closest NERL radars to the DBS array areas are based at Claxby, 162km to the south-west, Cromer, 165km to the south, and Great Dun Fell, 237km to the west. The Claxby and Cromer radars are utilised by NATS Anglia Radar. RLoS modelling detailed in **Appendix 15-1** shows that it is unlikely that wind turbines within the DBS array areas would be detected by the Claxby, Cromer or Great Dun Fell radars, therefore impacts on NERL radars are scoped out of the assessment.

15.5.3 Military Aviation

79. The DBS array areas and export cable corridor lie beneath the Southern Managed Danger Area (MDA), one of four MDA complexes in UK airspace that provide segregated airspace for military training. These areas of airspace are not permanently active, but rather are activated on request. Specifically, the DBS East array area is beneath Danger Areas (DAs) EG D323C to D, the DBS West array area is beneath DAs EG D323B to D, while the offshore export cable corridor is beneath DAs EG D323B to D and K.

80. When activated, EG D323B to D have vertical limits from FL50 (approximately 5,000ft amsl) up to FL660 (approximately 66,000ft amsl). EG D323K has a lower limit of FL150 (approximately 15,000ft amsl). Activities within the Southern MDA include high energy manoeuvres, ordnance, munitions and explosives, and electrical/optical hazards.

81. The Southern MDA in the vicinity of DBS is shown on **Figure 15-2**. Also shown on **Figure 15-2** is the Staxton DA (EG D412), approximately 21km north-west of the DBS West array area. When active, the Staxton DA has vertical limits from the surface to 10,000ft amsl. Ordnance, munitions and explosives activities take place within the Staxton DA.

82. Area 06 and Area 07, shown to the north-west and north-east of the DBS array areas on **Figure 15-2**, are Air-to-Air Refuelling Areas (AARAs) with vertical limits of FL100 (approximately 10,000ft amsl) to FL290 (approximately 29,000ft amsl). Within AARA airspace, fuel is transferred from tanker aircraft to receiver aircraft under a radar control service provided by military controllers based at Swanwick.

83. There are no further PEXAs identified, including PEXAs for non-aviation activities, in the vicinity of the DBS array areas.

84. There are no radar-equipped military airfields within 60nm (111km) of the DBS array areas. The nearest such airfield is Royal Air Force Leeming, 182km west of the DBS array areas (**Figure 15-1**). Controllers at this station offer a LARS to a range of 30nm (56km). RLoS modelling detailed in **Appendix 15-1** shows that wind turbines within the DBS array areas would not be detected by the Leeming PSR. Impacts on radar-equipped military airfields are thus scoped out of the assessment.

85. The MOD safeguard a network of long range high powered AD radars used to provide the UK with airspace surveillance and security and to fulfil national and international obligations. The nearest MOD AD radars to the DBS array areas are based at RRH Staxton Wold, 116km to the west, RRH Trimingham, 167km to the south, and RRH Brizlee Wood, 210km to the north-west. RLoS modelling detailed in **Appendix 15-1** shows that it is unlikely that wind turbines within the DBS array areas would be detected by Trimingham PSR or Brizlee Wood PSR and so these radars are scoped out of the assessment. However, RLoS modelling does show that wind turbines within up to 0.4% of the DBS East array area and up to 89% of the DBS West array area would be visible to Staxton Wold PSR.

15.5.4 Helicopter Main Routing Indicators

86. Helicopter Main Routing Indicators (HMRIs) are routes typically and routinely flown by helicopters operating to and from offshore destinations and are promulgated for the purpose of highlighting concentrations of helicopter traffic to other airspace users. HMRI promulgation does not predicate the flow of helicopter traffic. Whilst HMRIs have no airspace status and assume the background airspace classification within which they lie (in the case of the southern North Sea, Class G), they are used by the Air Navigation Service Provider (ANSP) and helicopter operators for flight planning and management purposes. In summary, HMRIs are recognised routes to assist in regularising routeings and effectively managing traffic safely and do not comprise controlled airspace.

87. HMRIs have no promulgated lateral dimensions although CAP 764 states that there should be no obstacles within 2nm (3.7km) either side of the route centreline. The 2nm distance is based upon operational experience, the accuracy of navigation systems, and practicality. Such a distance provides time and space for helicopter pilots to descend safely to an operating altitude below the icing level.

88. HMRIs over the southern North Sea are shown on **Figure 15-3**. They generally extend vertically from 1,500ft amsl to FL60 (approximately 6,000ft amsl), although icing conditions or other flight safety considerations may require helicopters to operate below 1,500ft amsl. HMRI 8 routes from the coast, east of Humberside Airport to the Munro offshore platform and passes within approximately 1.5nm of the DBS East array area. All other HMRIs are more than 2nm from the DBS array areas.

89. Planned obstacles within 2nm of an HMRI should be consulted upon with the helicopter operators and the ANSP which in this case is Anglia Radar.

90. The proposed maximum wind turbine tip height of 452m amsl is equivalent to 1,500ft amsl rounded up to the nearest 100ft. Helicopters operating under IFR must maintain at least 1,000ft vertical clearance above the highest obstacles within 5nm, and will therefore need to transit the array areas at a minimum altitude of 2,500ft amsl. Under VFR, helicopters must maintain a minimum of 500ft separation from obstacles.

91. The ability of a helicopter to fly higher over wind turbines depends on the icing level, and on days of low cloud base helicopters could be required to fly lower and extend their routings around wind turbine obstacles.

15.5.5 Offshore Helidecks

92. To help achieve a safe operating environment, a 9nm (16.7km) consultation zone for planned obstacles exists around offshore helicopter destinations, in accordance with CAA/CAP 764. Within 9nm (16.7km), obstacles such as wind turbines can potentially impact upon the feasibility of helicopters to safely fly low visibility or missed approach procedures at the associated helideck site. There are four offshore helidecks within 9nm of the DBS array areas (**Figure 15-3**), which are listed in **Table 15-7**. Of these platforms, it is understood that Cavendish is no longer in production and is subject to a decommissioning programme.

Table 15-7 Offshore Helideck Ranges from DBS Array Areas

Platform	Operator	Range from DBS Array Areas (nm)
Cavendish	INEOS Industries	1.62
Cygnus A (AUQ)	Neptune E&P	8.89
Cygnus B (BWHP)	Neptune E&P	6.68
Munro MH	Harbour Energy	5.99

93. As stated in CAP 764, this zone does not prohibit development, but is a trigger for consultation with offshore helicopter operators, the operators of existing installations and exploration and development locations to determine a solution that maintains safe offshore helicopter operations alongside proposed developments. The CAA advises wind energy lease holders, oil and gas developers, and petroleum licence holders to discuss their development plans with each other to minimise the risks of unanticipated conflict.

94. Helicopter Traffic Zones (HTZs) are established around individual and groups of offshore platforms to notify of helicopters engaged in platform approaches, departures and inter-platform transits. HTZ airspace extends vertically from sea level to 2,000ft amsl and laterally to 1.5nm (2.8km) from the platform helidecks.

15.5.6 Search and Rescue

95. SAR operations are a highly specialised undertaking involving not only aviation assets, but also small boats, ships and shore-based personnel. SAR operations are generally carried out in extremely challenging conditions and at all times of the day and night. There are 10 helicopter SAR bases, incorporating 22 aircraft, around the UK with Bristow Helicopters providing helicopters and aircrew.

96. The nearest SAR base is at Humberside Airport, approximately 152km south-west of the DBS array areas. Its helicopters can provide rescue services up to approximately 460km away from base.

97. The random nature of people, watercraft or aircraft in distress makes it very difficult to determine the routes taken by SAR aircraft. Fixed wing SAR aircraft would tend to stay at higher altitudes in a command-and-control role during major incidents, whilst helicopters would be used in a low-level role, sometimes in support of small rescue boats.

15.5.7 Future Trends

98. In the event that the Projects are not developed, an assessment of future conditions for Aviation and Radar has been carried out and is described within this section.

99. Although the aviation industry is under long-term pressure to reduce its contribution to climate change, this is not considered to have significant implications for the Aviation and Radar baseline parameters discussed above. However, an increasing amount of offshore oil and gas infrastructure in the North Sea is being decommissioned which will potentially reduce the volume of helicopter traffic to and from offshore platforms.

15.6 Assessment of Significance

15.6.1 Potential Effects During Construction

15.6.1.1 Impact 1: Impacts on Staxton Wold PSR due to High Construction Vessels / Cranes and Partially Complete Structures

15.6.1.1.1 DBS East and DBS West in Isolation

100. Wind turbines and other tall obstacles have the potential to impact PSRs which would in turn affect the effectiveness of surveillance services due to interference on radar displays, as radar operators are unable to distinguish between those primary radar returns generated by the obstacles and aircraft.

101. To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. The rotating blades of wind turbines impart a Doppler frequency shift to the reflected radar pulse, which the radar receiver 'sees' as a moving target; these targets are then presented on the radar display as primary radar returns, indistinguishable from those returns originating from aircraft. This is not a steady effect but has dependency on the axis of rotation of the turbine in relation to the radar. Such unwanted radar returns are known as 'clutter'.

102. Until such time as wind turbine blades were allowed to rotate at operational speeds, Staxton Wold PSR would not detect the partially completed structures. In the same way, tall construction vessels and cranes that were in RLoS would not be moving fast enough to generate PSR clutter. Therefore, there would be no impact on Staxton Wold PSR.

103. Any radar mitigations required would be implemented before any relevant turbine becomes operational.

15.6.1.1.2 DBS East and DBS West Together

104. As with the previous scenario, there would be no impact on Staxton Wold PSR.

15.6.1.1.3 Significance of Effect – DBS East or DBS West in Isolation

105. As a result of non-detection of obstacles during the construction phase, the significance of effect is **No Change**.

15.6.1.1.4 Significance of Effect – DBS East and DBS West Together

106. As a result of non-detection of obstacles during the construction phase, the significance of effect is **No Change**.

15.6.1.2 Impact 2: Creation of an Aviation Obstacle Environment

15.6.1.2.1 DBS East and DBS West in Isolation

107. Construction of the wind farm would involve the installation of infrastructure above sea level which could pose a physical obstruction to aircraft utilising the airspace in the vicinity of the DBS East or West array areas. From a starting point of no infrastructure within the DBS East or West array area, the infrastructure outlined in **Table 15-2** would gradually be installed over a period of five years.

108. Specifically, permanent or temporary obstacles could increase collision risk for:

- General military low flying training and operations;
- Helicopter traffic transiting to and from offshore oil and gas helidecks;
- Helicopters utilising HMRI 8 (DBS East only); and
- Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions over the southern North Sea.

15.6.1.2.2 DBS East and DBS West Together

109. The impact would be similar as for the Projects in isolation but over a larger area and if the DBS East and West array areas were constructed sequentially the construction phase would extend an additional two years, to a total of up to seven years.

15.6.1.2.3 Significance of Effect – DBS East or DBS West in Isolation

110. Embedded mitigation in the form of compliance with international and national SARPs with respect to notification, charting, marking and lighting is summarised in **Table 15-3**. This would make pilots aware of the addition of infrastructure to the array area, and it is assumed that pilots would comply with aviation regulatory requirements.

111. The Projects would occupy uncontrolled (Class G) airspace (below approximately 19,500ft amsl), therefore the responsibility for avoiding other traffic and obstacles rests with captains of civilian and military aircraft. Thus, logically a pilot would avoid the charted areas, and individually lit wind turbines and any other obstacles, laterally or vertically, by the legislated standard minimum separation distance. This is outlined in CAA Official Record Series (ORS) 4 No. 1496: (UK) Standardised European Rules of the Air – Exceptions to the Minimum Height Requirements (CAA, 2021c), which sets out that to avoid persons, vessels, vehicles and structures, pilots must give clearance of a minimum distance of 500ft. This applies equally to the avoidance of wind turbines and any other structure.

112. Military operations are subject to separate rules sponsored by the MOD. Pilots of military aircraft would be required to ensure that a Minimum Separation Distance of 250ft from any person, vessel, vehicle, or structure exists whilst operating in the vicinity of the array areas. The charting and lighting of the Projects should also be taken into account by MOD low flying units and SAR operators.

113. It is assumed that aviation stakeholders would adhere to all relevant CAA and MOD safety guidance in the conduct of their specific operations to ensure safe operations for all users of the airspace above the Projects.

114. An ERCoP would be developed and implemented for all phases of either Project.

115. Considering embedded mitigation and assuming compliance with aviation regulatory requirements, the significance of effect has been assessed to be **Moderate Significant**.

15.6.1.2.4 Significance of Effect – DBS East and DBS West Together

116. Considering embedded mitigation and assuming compliance with aviation regulatory requirements, the significance of effect has been assessed to be **Moderate Significant**.

15.6.1.2.5 Mitigation and Residual Significance of Effect – DBS East or DBS West in Isolation

117. Consultation with relevant platform operators and offshore helicopter operators is necessary to determine whether additional mitigation plans are required to safeguard offshore oil and gas helicopter operations in the vicinity of either DBS array area. Appropriate separation between activities would minimise effects on operations.

118. Engagement will continue with relevant stakeholders to agree appropriate mitigation in addition to the embedded mitigation. The additional mitigation required will be detailed within the ES. Embedded mitigation together with the required additional mitigation would likely mean that the residual effect significance will be **Not Significant**.

15.6.1.2.6 Mitigation and Residual Significance of Effect – DBS East and DBS West Together

119. Engagement will continue with relevant stakeholders to agree appropriate mitigation in addition to the embedded mitigation. The additional mitigation required will be detailed within the ES. Embedded mitigation together with the required additional mitigation would likely mean that the residual effect significance will be **Not Significant**.

15.6.1.3 Impact 3: Increased Air Traffic in the Area Related to Wind Farm Construction Activities

15.6.1.3.1 DBS East or DBS West in Isolation

120. Up to two helicopter return trips per day during offshore construction are anticipated per Project. The possible increase in air traffic would bring with it the potential increased risk of aircraft collision in the airspace around either Project.

15.6.1.3.2 DBS East and DBS West Together

121. Up to four helicopter return trips per day during offshore construction are anticipated for the Projects. The impact would be similar to a Project in isolation but over a larger area and if the DBS East and West array areas were constructed sequentially the construction phase would extend an additional two years to seven years.

15.6.1.3.3 Significance of Effect – DBS East or DBS West in Isolation

122. The increase in air traffic would be managed by the existing ATS infrastructure, provided in accordance with national procedures, and pilots would be expected to operate in accordance with regulatory requirements.

123. Assuming compliance with regulatory requirements and national procedures, the significance of effect on aircraft operators in the vicinity of either Project is considered to be **Not Significant**.

15.6.1.3.4 Significance of Effect – DBS East and DBS West Together

124. Assuming compliance with regulatory requirements and national procedures, the significance of effect on aircraft operators in the vicinity of the Projects is considered to be **Not Significant**.

15.6.2 Potential Effects During Operation

15.6.2.1 Impact 1: Wind Turbines Causing Permanent Interference on Staxton Wold PSR

15.6.2.1.1 DBS East or DBS West in Isolation

125. Both the DBS East and the DBS West array areas would be within the operational range of Staxton Wold PSR. Radar modelling detailed in **Appendix 15-1** shows that wind turbines with a maximum blade tip height of 452m amsl would be theoretically detectable by Staxton Wold PSR within at least 0.4% of the DBS East array area and at least 88.8% of the DBS West array area. The final number of wind turbines detected would depend on the maximum tip heights of individual wind turbines and the detailed array layouts selected.

126. When operational (in other words, with blades fitted and rotating), wind turbines have the potential to generate 'clutter' (or false targets) upon radar displays because current generation PSRs are unable to differentiate between the moving blades of wind turbines and aircraft. As a consequence, radar operators can be unable to distinguish between primary radar returns generated by wind turbines and those generated by aircraft. This could compromise the ability of the MOD to undertake its Air Defence role utilising the Staxton Wold AD PSR.

127. Staxton Wold PSR has recently been upgraded to an Indra Lanza Long-Range Tactical Radar 25 (LTR-25) system. Detailed technical information for this system is not publicly available, however it can be stated that all wind turbines that are in RLoS would be detected by the radar.

15.6.2.1.2 DBS East and DBS West Together

128. The impact would be similar to a Project in isolation but over a larger area and if the DBS East and West array areas were constructed sequentially the operational phase would extend an additional two years, up to thirty-two years.

15.6.2.1.3 Significance of Effect – DBS East or DBS West in Isolation

129. Should DBS East be built in isolation there may be scope for a wind turbine layout that would be acceptable to the MOD, given the small area of DBS East within which wind turbines of maximum blade tip height would be in RLoS of Staxton Wold PSR. Notwithstanding, without additional mitigation the significance of any effect on the MOD's ability to provide security from airborne threats has been assessed to be **Major Significant** for DBS East in isolation.

130. Given that most of the DBS West array area would be in RLoS of Staxton Wold PSR there is unlikely to be a layout that would be acceptable to the MOD without mitigation. Therefore, without additional mitigation the significance of any effect on the MOD's ability to provide security from airborne threats has been assessed to be **Major Significant** for DBS West in isolation.

15.6.2.1.4 Significance of Effect – DBS East and DBS West Together

131. Without additional mitigation, the significance of effect on the MOD's ability to provide security from airborne threats has been assessed to be **Major Significant**.

15.6.2.1.5 Mitigation and Residual Significance of Effect – DBS East or DBS West in Isolation

132. In August 2019 an Air Defence and Offshore Wind (AD&OW) Windfarm Mitigation Task Force was formed as a collaborative initiative between MOD, Department for Business, Energy and Industrial Strategy (BEIS), the Offshore Wind Industry Council and The Crown Estate. The aim of the Task Force is to enable the co-existence of UK Air Defence and offshore wind by identifying potential mitigations and supporting processes, allowing offshore wind to contribute towards meeting the UK Government's Net Zero target without degrading the nation's AD surveillance capability.

133. The AD&OW Strategy and Implementation Plan (S&IP) sets the direction for this collaboration by identifying, assessing and deploying solutions that will enable the co-existence of AD&OW operations such that neither is unduly nor excessively compromised. The S&IP may lead to significant changes to current AD PSR characteristics and capabilities that in turn affect the potential impact that either Project may have.

134. In support of the S&IP, in March 2020 the MOD Defence and Security Accelerator and BEIS launched an Innovation Challenge to reduce and remove the impact of wind farms on the UK's AD surveillance systems by seeking technological proposals in four areas:

- Alternatives to radar;
- Technologies applied to the wind turbine or installation;
- Technologies applied to the radar, its transmission or return; and
- Technological mitigations not covered by the above.

135. Phase 2 of the competition was launched in April 2021[2] seeking proposals to address four main subject areas:

- Reduction of clutter or the impact of clutter;
- Ensuring efficient detection and tracking time;
- Technologies to mitigate against larger turbine blades and wider turbine spacing development; and
- Alternate methods of surveillance.

136. Of twenty submitted proposals, contracts for up to six proposals were due to start in September 2021 and be completed by March 2023.

137. The ultimate aim of the S&IP is to have mitigations in place to support offshore wind developments by Q2 2025, and therefore it is expected that such mitigation will be available before the start of construction of either Project.

138. Engagement with the MOD will continue throughout the DCO pre-application process phase to agree a suitable mitigation for the impact of either Project on Staxton Wold PSR.

139. Following the application of additional mitigation, the residual significance of the effect is assessed to be **Not Significant**.

15.6.2.1.6 Mitigation and Residual Significance of Effect – DBS East and DBS West Together

140. Engagement with the MOD will continue throughout the DCO pre-application process phase to agree a suitable mitigation for the impact of the Projects on Staxton Wold PSR.

141. Following the application of additional mitigation, the residual significance of the effect is assessed to be **Not Significant**.

[2] Windfarm Mitigation for UK Air Defence - GOV.UK (www.gov.uk)

15.6.2.2 Impact 2: Creation of an Aviation Obstacle Environment

15.6.2.2.1 DBS East or DBS West in Isolation

142. During the operational lifetime of either Project the infrastructure outlined in **Table 15-2** would be present within either the DBS East or the DBS West array area. This could pose a physical obstruction to aircraft utilising the airspace in the vicinity of either Project.

143. Specifically, permanent or temporary obstacles could increase collision risk for:

- General military low flying training and operations;
- Helicopter traffic transiting to and from offshore oil and gas helidecks;
- Helicopters utilising HMRI 8 (DBS East only); and
- Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions over the southern North Sea.

15.6.2.2.2 DBS East and DBS West Together

144. The impact would be similar to a Project in isolation but over a larger area and if the DBS East and West array areas were constructed sequentially the operational lifetime would extend an additional two years, to up to thirty-two years.

15.6.2.2.3 Significance of Effect – DBS East or DBS West in Isolation

145. Embedded mitigation in the form of compliance with international and national SARPs with respect to notification, charting, marking and lighting is summarised in **Table 15-3**. This would make pilots aware of the addition of infrastructure to the array area, and it is assumed that pilots would comply with aviation regulatory requirements, as detailed in section 15.6.1.2.3.

146. An ERCoP would be developed and implemented for all phases of the Projects.

147. Considering embedded mitigation and assuming compliance with aviation regulatory requirements, the significance of effect has been assessed to be **Moderate Significant**.

15.6.2.2.4 Significance of Effect – DBS East and DBS West Together

148. Considering embedded mitigation and assuming compliance with aviation regulatory requirements, the significance of effect has been assessed to be **Moderate Significant**.

15.6.2.2.5 Mitigation and Residual Significance of Effect – DBS East or DBS West in Isolation

149. Consultation with relevant platform operators and offshore helicopter operators is necessary to determine whether additional mitigation plans are required to safeguard offshore oil and gas helicopter operations in the vicinity of either DBS array area. Appropriate separation between activities would minimise effects on operations.

150. Engagement will continue with relevant stakeholders to agree appropriate mitigation in addition to the embedded mitigation. The additional mitigation required will be detailed within the ES. Embedded mitigation together with the required additional mitigation would likely mean that the residual effect significance will be **Not Significant**.

15.6.2.2.6 Mitigation and Residual Significance of Effect – DBS East and DBS West Together

151. Engagement will continue with relevant stakeholders to agree appropriate mitigation in addition to the embedded mitigation. The additional mitigation required will be detailed within the ES. Embedded mitigation together with the required additional mitigation would likely mean that the residual effect significance will be **Not Significant**.

15.6.2.3 Impact 3: Increased Air Traffic in the Area Related to Wind Farm Support Activities

15.6.2.3.1 DBS East or DBS West in Isolation

152. A maximum of 20 helicopter return trips per year associated with support activities are envisaged during the operation phase. The possible increase in air traffic would bring with it the potential increased risk of aircraft collision in the airspace around either Project.

15.6.2.3.2 DBS East and DBS West Together

153. The impact would be similar to a Project in isolation but over a larger area and if the DBS East and West array areas were constructed sequentially the operational lifetime would extend an additional two years, up to thirty-two years.

15.6.2.3.3 Significance of Effect – DBS East or DBS West in Isolation

154. The safety of aircraft operating in uncontrolled airspace ultimately resides with the aircrew who would be expected to operate in accordance with regulatory requirements and who may request the provision of an ATS that would be provided in accordance with national procedures.

155. Due to the predicted low number of movements during the operation phase of either Project and assuming compliance with regulatory requirements and national procedures, the effect on aircraft operators in the vicinity of either Project is considered to be **Not Significant**.

15.6.2.3.4 Significance of Effect – DBS East and DBS West Together

156. Due to the predicted low number of movements during the operation phase of the Projects and assuming compliance with regulatory requirements and national procedures, the effect on aircraft operators in the vicinity of the Projects is considered to be **Not Significant**.

15.6.3 Potential Effects During Decommissioning

15.6.3.1 Impact 1: Impacts on Staxton Wold PSR due to Cranes and Partially Dismantled Structures

15.6.3.1.1 DBS East or DBS West in Isolation

157. During the gradual decommissioning of above sea level infrastructure within either DBS array area any impact on Staxton Wold PSR would be removed. Firstly, wind turbines would be made inoperative and the blades of wind turbines would cease rotating, before being removed from the array area. In addition, the mitigation applied for the operation phase would remain in place during the decommissioning phase until such time as all wind turbine blades were removed to ensure no impact on Staxton Wold PSR.

15.6.3.1.2 DBS East and DBS West Together

158. The mitigation applied for the operation phase would remain in place during the decommissioning phase until such time as all wind turbine blades were removed to ensure no impact on Staxton Wold PSR.

15.6.3.1.3 Significance of Effect – DBS East or DBS West in Isolation

159. The significance of effect is considered to be **No Change** during the decommissioning phase as either of the DBS array areas returns to pre-development conditions.

15.6.3.1.4 Significance of Effect – DBS East and DBS West Together

160. The significance of effect is considered to be **No Change** during the decommissioning phase as the DBS array areas return to pre-development conditions.

15.6.3.2 Impact 2: Removal of an Aviation Obstacle Environment

15.6.3.2.1 DBS East or DBS West in Isolation

161. During the decommissioning phase, the above sea level infrastructure outlined in Table 15-2 would be removed. This would gradually reduce the physical obstruction to aircraft utilising the airspace in the vicinity of either DBS East or DBS West.

162. Specifically, permanent or temporary obstacles could increase collision risk for:

- General military low flying training and operations;
- Helicopter traffic transiting to and from offshore oil and gas helidecks;
- Helicopters utilising HMRI 8 (DBS East only); and
- Other offshore fixed-wing and helicopter operations, including those undertaking SAR missions over the southern North Sea.

15.6.3.2.2 DBS East and DBS West Together

163. The impact would be similar but over a larger area.

15.6.3.2.3 Significance of Effect – DBS East or DBS West in Isolation

164. Embedded mitigation in the form of compliance with international and national SARPs with respect to notification, charting, marking, and lighting, as summarised in **Table 15-3**, would be retained until decommissioning was completed.

165. An ERCoP would be developed and implemented for all phases of either Project.

166. Any additional mitigation plans required to safeguard offshore oil and gas helicopter operations would remain in place during the decommissioning phase.

167. The effect on the aviation sector during the decommissioning phase would be reduced to pre-development conditions.

168. The significance of effect has been assessed to be **No Change** for the decommissioning phase.

15.6.3.2.4 Significance of Effect – DBS East and DBS West Together

169. Considering embedded mitigation and the retention of any required additional mitigation plans, the significance of effect has been assessed to be **No Change**.

15.6.3.3 Impact 3: Increased Air Traffic in the Area Related to Wind Farm Decommissioning Activities

15.6.3.3.1 DBS East or DBS West in Isolation

170. Up to one helicopter return trip per day during the decommissioning phase is anticipated. The possible increase in air traffic would bring with it the potential increased risk of aircraft collision in the airspace around either Project.

15.6.3.3.2 DBS East and DBS West Together

171. Up to two helicopter return trips per day during the decommissioning phase are anticipated. The impact would be similar to a Project in isolation but over a larger area and if the DBS East and West array areas were decommissioned sequentially the decommissioning phase would extend by an additional two years to seven years.

15.6.3.3.3 Significance of Effect – DBS East or DBS West in Isolation

172. The safety of aircraft operating in uncontrolled airspace ultimately resides with the aircrew who would be expected to operate in accordance with regulatory requirements and who may request the provision of an ATS that would be provided in accordance with national procedures.

173. Assuming compliance with regulatory requirements and national procedures, the effect on aircraft operators in the vicinity of either Project is considered to be **Not Significant**.

15.6.3.3.4 Significance of Effect – DBS East and DBS West Together

174. Assuming compliance with regulatory requirements and national procedures, the significance of effect on aircraft operators in the vicinity of the Projects is considered to be **Not Significant**.

15.7 Potential Monitoring Requirements

175. Monitoring requirements will be described in the In-Principle Monitoring Plan (IPMP) submitted alongside the DCO application and further developed and agreed with stakeholders prior to construction based on the IPMP and taking account of the final detailed design of the Projects.

176. No monitoring relevant to this chapter is anticipated, however any potential requirements will be agreed with stakeholders prior to construction taking into account the final detailed design of the Projects.

15.8 Preliminary Assessment of Cumulative Effects

177. As detailed in section 15.4.3, this section presents a preliminary assessment of cumulative effects in relation to Aviation and Radar. The final CEA will be undertaken within the ES chapter.

15.8.1 Initial Screening for Cumulative Effects

178. **Table 15-8** below details the potential cumulative effects that may occur between the Projects and other plans, projects and activities. Only potential impacts assessed in section 15.6 where the potential for cumulative effects has been identified (not significant, moderate significant or major significant) will be taken forward to the final CEA (i.e. those assessed as 'no change' are not taken forward as there is no potential for them to contribute to a cumulative impact).

Table 15-8 Potential Cumulative Effects

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Construction			
Impact 1: Impacts on Staxton Wold PSR due to high construction vessels / cranes and partially complete structures	No	High	There would be no impact on Staxton Wold PSR during the construction phase, and therefore there is no potential for cumulative effects.
Impact 2: Creation of an aviation obstacle environment	Yes	High	Wind turbines and high construction vessels / cranes associated with other developments create aviation obstacles, restricting the available airspace.
Impact 3: Increased air traffic in the area related to wind farm construction activities	Yes	High	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.
Operation & Maintenance			
Impact 1: Wind turbines causing permanent interference on Staxton Wold PSR	Yes	High	Other wind farm projects could impact Staxton Wold PSR, increasing the area of effects.

Impact	Potential for Cumulative Effects	Data Confidence	Rationale
Impact 2: Creation of an aviation obstacle environment	Yes	High	Wind turbines associated with other developments create aviation obstacles, restricting the available airspace.
Impact 3: Increased air traffic in the area related to wind farm support activities	Yes	High	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.
Decommissioning			
Impact 1: Impacts on Staxton Wold PSR due to cranes and partially dismantled structures	No	High	Any mitigations required in the operation phase would remain in place until all wind turbine blades were removed. Cranes and static structures would have no impact on Staxton Wold PSR.
Impact 2: Removal of an aviation obstacle environment	No	High	Embedded mitigation and any additional mitigation would be retained until decommissioning was completed.
Impact 3: Increased air traffic in the area related to wind farm decommissioning activities	Yes	High	Air traffic activities associated with other developments have the potential to cumulatively increase the risk of aircraft collision.

15.8.2 Plans/Projects Considered for Cumulative Impacts

179. A high-level list of plans/projects that may result in cumulative effects with the Projects is detailed in **Table 15-9**. For Aviation and Radar, a search distance of 100km from the DBS array areas has been used to determine the initial list of projects considered for the CEA. This represents the maximum range at which radar cumulative effects are considered to occur. The potential cumulative effect of radar impacts on ATC operations diminishes as the separation between windfarm sites increases. A separation distance of 100km is considered to be a pragmatic range beyond which cumulative effects will be negligible.

180. Plans / projects have been assigned a tier level between 1 and 7, based on the most recent guidance (see **Chapter 6 EIA Methodology**). For the final CEA at ES, this high-level list will be reviewed and screened to ensure all relevant plans / projects are considered in the final assessment. All listed plans / projects will be re-examined at ES to ensure each assigned tier remains accurate at the time of writing.

181. In addition to other offshore wind farms, the classes of projects that could potentially be considered for the cumulative assessment of aviation and radar includes oil and gas platforms.

182. With respect to these Projects, the cumulative assessment considers existing projects to be part of the baseline conditions for the surrounding area. As such, it is not expected that the Projects will contribute to cumulative effects with existing activities, and therefore these have not been the subject of further assessment. **Table 15-9** lists the high-level plans/projects currently in planning that may result in cumulative effects with the Projects.

Table 15-9 High-Level List of Plans/Projects Screened For Further Assessment in the Full CEA

Tier	Plan / Project	Distance to Offshore Development Area (km)
Offshore Wind Farms		
2	Dogger Bank A	7
2	Dogger Bank B	17
2	Sofia	33
3	Dogger Bank C	56
6	Dogger Bank D	68 (estimated)
3	Hornsea Project Four	20
2	Hornsea Project Two	40
2	Hornsea Project Three	45

15.9 Interactions

183. The effects identified and assessed in this chapter have the potential to interact with each other. For example, the effects of the creation of an obstacle environment and increased air traffic due to wind farm activities interacting on helicopter / SAR traffic or military low flying. The worst-case effects assessed within section 15.6 take these potential interactions into account, therefore the assessments are considered conservative and the levels of significance appropriate.

15.10 Inter-relationships

184. For Aviation and Radar potential inter-relationships exist between other topics assessed within this PEIR including Infrastructure and Other Users, Seascape, Landscape and Visual Impact, and Shipping and Navigation. A summary of the potential inter-relationships is provided in **Table 15-10**.

185. Aviation lighting fitted to offshore wind turbines could cause confusion to the maritime community as the specification for the lighting to be displayed below the horizontal plane of the light filament itself could cause mariners some confusion. This confusion could result in wind turbines with conflicting warning lighting representing a collision risk to maritime surface vessels.

186. Work has been undertaken to develop an aviation warning light standard where, from the nature of the lighting, it will be apparent to mariners that the aviation lighting is clearly distinguishable from maritime lighting. Where it is evident that the default aviation warning lighting standard may generate issues for the maritime community, a developer can make the case, that is likely to receive CAA approval, for the use of a flashing red Morse Code letter 'W' instead. See CAP 764 paragraph 3.16.

Table 15-10 Aviation and Radar Inter-relationships

Topic and Description	Related Chapter	Where Addressed in this Chapter	Rationale
Operation			
Aviation lighting fitted to offshore wind turbines.	Chapter 14 Shipping and Navigation Chapter 23 Seascape, Landscape and Visual Impact	Section 15.3.3.	Potential confusion to the maritime community and visual effects associated with lighting.
Creation of an aviation obstacle environment. Increased air traffic in the area related to wind farm activities.	Chapter 14 Shipping and Navigation Chapter 16 Infrastructure and Other Users	Sections 15.6.2.2 and 15.6.2.3.	Impacts on helicopter traffic associated with oil and gas and SAR operations.

15.11 Summary

187. This chapter has provided a characterisation of the existing environment for Aviation and Radar based on existing publicly available data. The desk-based assessment has considered effects with respect to impacts on radar and UK airspace predicted due to the physical presence of the Projects and associated air traffic during the construction, operation and decommissioning phases. Potential impacts are physical obstruction to aircraft, increased air traffic in the area related to wind farm activities, and interference on radars caused by rotating wind turbine blades.

188. Potentially affected aviation stakeholders include military radar facilities, and offshore fixed-wing and helicopter flights such as military low flying, SAR operations, and helicopter support for the oil and gas industry.

189. A range of mitigation measures will be embedded in the Projects' design to reduce potential aviation effects. These include the development of an ERCoP to mitigate the effects on SAR operations, notification to aviation stakeholders of the location and height of all structures during construction of the wind farms, and an aviation obstacle lighting scheme agreed with the relevant authorities.

190. Consultation will be initiated with aviation stakeholders to agree additional appropriate mitigations to safeguard offshore oil and gas helicopter operations.

191. Potential technical mitigation solutions for AD radar interference are being sought and such solutions will be discussed and agreed with the MOD.

192. No other significant effects on Aviation and Radar have been identified.

193. **Table 15-11** presents a summary of the preliminary effects assessment undertaken with respect to the Projects in relation to Aviation and Radar.

Table 15-11 Summary of Potential Likely Significant Effects on Aviation and Radar

Potential Impact	Receptor	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Construction					
Impact 1: Impacts on Staxton Wold PSR due to high construction vessels / cranes and partially complete structures.	MOD	No Change	N/A	No Change	No Change
Impact 2: Creation of an aviation obstacle environment.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	Moderate Significant	Consultation with offshore platform and helicopter operators to agree appropriate separation between wind turbines and oil and gas platforms and HMRI 8.	Not Significant	Not Significant

Potential Impact	Receptor	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Impact 3: Increased air traffic in the area related to wind farm construction activities.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	N/A	Not Significant	Not Significant
Operation					
Impact 1: Wind turbines causing permanent interference on Staxton Wold PSR	MOD	Major Significant	Technical mitigation solution to be agreed with MOD.	Not Significant	Not Significant

Potential Impact	Receptor	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Impact 2: Creation of an aviation obstacle environment.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	Moderate Significant	Consultation with offshore platform and helicopter operators to agree appropriate separation between wind turbines and oil and gas platforms and HMRI 8.	Not Significant	Not Significant
Impact 3: Increased air traffic in the area related to wind farm support activities.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	N/A	Not Significant	Not Significant

Potential Impact	Receptor	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Decommissioning					
Impact 1: Impacts on Staxton Wold PSR due to cranes and partially dismantled structures.	MOD	No Change	N/A	No Change	No Change
Impact 2: Removal of an aviation obstacle environment.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	No Change	N/A	No Change	No Change

Potential Impact	Receptor	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Impact 3: Increased air traffic in the area related to wind farm decommissioning activities.	Military low flying Helicopter traffic transiting to and from offshore oil and gas helidecks Helicopters utilising HMRI 8 Other offshore fixed-wing and helicopter operations, including SAR	Not Significant	N/A	Not Significant	Not Significant

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