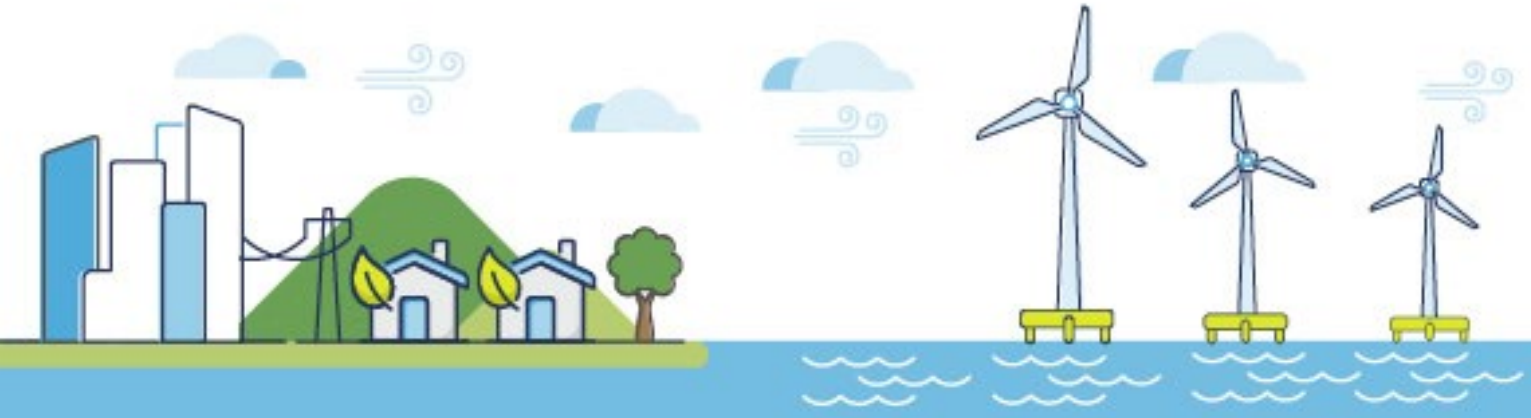
WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Chapter 17: Civil and Military Aviation



Document Code:	FLO-WHI-REP-0002-17	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0152	
Version Number:	0	
Date:	*Issue Date* 09/03/2023	
Prepared by:	RH	*Electronic Signature*
Checked by:	CB	*Electronic Signature*
Owned by:	EF	*Electronic Signature*
Approved by Client :	AP	*Electronic Signature*

Version Number	Reason for Issue / Major Changes	Date of Change
0	Draft for review	09/03/2023

Table of Contents

Table of Figures

Table of Tables

Glossary of Acronyms

Acronym	Definition
ACC	Area Control Centre
AD	Air Defence
ADR	Air Defence Radar
AGL	Above Ground Level
AIP	Aeronautical Information Handbook
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
APDO	Approved Procedure Design Organisation
ATC	Air Traffic Control
ATDI	Advanced Topographic Development and Imaging
ATS	Air Traffic Service
BEIS	Department for Business, Energy and Industrial Strategy
CAA	Civil Aviation Authority
CAS	Controlled Airspace
CAP	Civil Aviation Publication
CEA	Cumulative Effect Assessment
CNS	Communication, Navigation or Surveillance
DIO	Defence Infrastructure Organisation
DOC	Documented Operational Range
EEA	European Economic Area
EIA	Environmental Impact Assessment
ES	Environmental Statement
FIR	Flight Information Region
FL	Flight Level
GW	Giga Watts
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedures
IMC	Instrument Meteorological Conditions
IPC	Infrastructure Planning Commission
JTF	Joint Task Force
LARS	Lower Airspace Radar Service
LFA	Low Flying Area
LoS	Line of Sight
MCA	Maritime and Coastguard Agency
MDA	Managed Danger Areas
MDS	Maximum Design Scenario
MGN	Marine Guidance Note

Acronym	Definition
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MoD	Ministry of Defence
MRP	Military Aviation Authority Regulatory Publications
MW	Megawatts
NATS	National Air Traffic Services
NERL	NATS En-Route Limited
NGC	National Grid Company
nm	Nautical Mile
NPS	National Policy Statement
NPPF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Projects
OGA	Oil and Gas Authority
OREI	Offshore Renewable Energy Installations
OWIC	Offshore Wind Industry Council
OWL	Offshore Wind Ltd
PDE	Project Design Envelope
PEXA	Practice and Exercise Area
PINS	Planning Inspectorate
PSR	Primary Surveillance Radar
RA	Regulatory Articles
RAF	Royal Air Force
RAP	Recognised Air Picture
RCS	Radar Cross Section
RDP	Radar Data Processor
RoI	Republic of Ireland
RPM	Rotations Per Minute
SAR	Search and Rescue
SSR	Secondary Surveillance Radar
TCE	The Crown Estate
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
UIR	Upper Information Region
UK	United Kingdom
UKLFS	UK Low Flying System
WTG	Wind Turbine Generator

Glossary of Terminology

Defined Term	Description
Applicant	Offshore Wind Limited
Cumulative effects	The effect of the Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative effects are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Department for Business, Energy and Industrial Strategy (BEIS)	Government department that is responsible for business, industrial strategy, science and innovation and energy and climate change policy and consent under Section 36 of the Electricity Act.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation Platform (OSP) or the inter-array cable junction box (if no OSP), to the National Grid Company (NGC) Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Floating substructure	The floating substructure acts as a stable and buoyant foundation for the WTG. The WTG is connected to the substructure via the transition piece and the substructure is kept in position by the mooring system.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Inter-array cables	Cables which link the wind turbines to each other and the Offshore Substation Platform, or at the inter-array cables junction box (if no offshore substation). Array cables will connect the wind turbines to one and other and to the Offshore Substation (if utilised). The initial section for the inter-array cables will be freely suspended in the water column below the substructure (dynamic sections) while the on seabed sections of the cables will be buried where possible.
Landfall	Where the offshore export cables come ashore
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts and discussed with the relevant authorities and

Defined Term	Description
	stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by Offshore Wind Ltd (OWL) as the EIA process progresses.
Mooring system	The equipment (mooring lines and seabed anchors) that keeps the floating substructure in position during operation through a fixed connection to the seabed.
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cable junction box to the Landfall
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009
The Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all components offshore of MHWS. This includes the infrastructure within the windfarm site (e.g., wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore
Offshore Transmission Assets	The aspects of the project related to the transmission of electricity from the generation assets including the Offshore Substation Platform (as applicable)) or, Offshore Cable Corridor to MHWS at the landfall

Defined Term	Description
Offshore Transmission Owner	An OFTO, appointed in UK by Ofgem (Office of Gas and Electricity Markets), has ownership and responsibility for the transmission assets of an offshore windfarm.
Offshore Wind Limited	Offshore Wind Ltd (OWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd
Project Design Envelope	A description of the range of possible components that make up the Offshore Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
White Cross Offshore Windfarm	100 megawatts (MW) capacity offshore windfarm including associated onshore and offshore infrastructure
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

17. Civil and Military Aviation

17.1 Introduction

1. This chapter of the Environmental Statement (ES) presents the assessment of the potential effect of the White Cross Offshore Windfarm Project (the Offshore Project) on Civil and Military Aviation. Specifically, this chapter considers the potential impact of the Offshore Project seaward of Mean High-Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning phases.

2. The ES has been finalised with due consideration of pre-application consultation to date (see **Chapter 7: Consultation**) and the ES will accompany the application to the Marine Management Organisation (MMO) on behalf of the Secretary of State for The Department for Business, Energy and Industrial Strategy (BEIS) for Section 36 Consent and relevant Marine Licences under Marine and Coastal Access Act (2009).

3. This ES chapter:

   - Presents the existing environmental baseline established from desk studies, and consultation
   - Presents the potential environmental effects on civil and military aviation arising from the Offshore Project, based on the information gathered and the analysis and assessments undertaken
   - Identifies any assumptions and limitations encountered in compiling the environmental information
   - Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

17.2 Policy, Legislation and Guidance

4. **Chapter 3: Policy and Legislative Context** describes the wider policy and legislative context for the Offshore Project. The principal policy and legislation used to inform the assessment of potential impacts on civil and military aviation for the Offshore Project are outlined in this section.

5. Civil Aviation Authority (CAA) Civil Aviation Publication (CAP) 393: The Air Navigation Order (ANO), sets out aviation provisions (rules) together with regulations made under the Order. It sets out various Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 namely:

   - The Rules of the Air Regulations
   - The Air Navigation (General) Regulations

- The Air Navigation (Cosmic Radiation) (Keeping of Records) Regulations
- The Air Navigation (Dangerous Goods) Regulations
- Various Permanent Air Navigation (Restriction of Flying) Regulations
- The Civil Aviation Authority Regulations.

6. CAP 393 also includes the application and guidance for aviation obstruction lighting to wind turbines in UK territorial waters.

17.2.1 National Policy Statement

The specific assessment requirements for Civil and Military Aviation are set out within the overarching National Policy Statement (NPS) for Energy (EN-1) and NPS for Renewable Energy Infrastructure (EN-3) and **Table 17.1**. NPS are in the process of being re-drafted; where text differs between the current NPS EN-1 and NPS EN-3 and the draft NPS EN-1 and NPS EN-3 this has been presented with the text of the draft NPS in brackets. NPSs are statutory documents which set out the government's policy on specific types of Nationally Significant Infrastructure Projects (NSIPs) and are published in accordance with the Planning Act 2008. Although the Offshore Project is not an NSIP, it is recognised that due to its size of 100MW and its location in English waters, certain NPS are considered relevant to the Offshore Project and decision-making and are referred to in this ES.

Table 17.1 Summary of NPS EN-1 and EN-3 policy / provisions relevant to Civil and Military Aviation

Summary	How and where this is considered in the ES
NPS for Energy (EN-1)	
"Where the proposed development could have an effect on civil and military aviation (and/or other defence assets) an assessment of potential effects should be set out in the ES." **EN-1, paragraph 5.4.10**	Construction, operation, maintenance, and decommissioning phases of the Offshore Projects have been assessed within the impact assessment at **Section 17.5, 17.6** and **17.7**.
"Consultation with the [Ministry of Defence] MOD, the CAA and [National Air Traffic Services] NATS and any aerodrome - licensed or otherwise – likely to be affected by the proposed development should be completed." **EN-1, paragraph 5.4.11**	Consultation activity is provided in **Section 17.3.7** and **Table 17.8**.
"Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of Communication, Navigation or Surveillance (CNS) infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures. It should also assess the cumulative effects of the project with other relevant projects in	The assessment of civil and military aviation flight patterns and infrastructure is provided in **Section 17.4.1** and cumulative effects within **Section 17.8**.

Summary	How and where this is considered in the ES
relation to aviation and defence." **EN-1, paragraph 5.4.12**	
"If any relevant changes are made to proposals during the pre-application and determination period, it is the responsibility of the applicant to ensure that the relevant aviation and defence consultees are informed as soon as reasonably possible." **EN-1, paragraph 5.4.13**	Consultation with relevant aviation and radar stakeholders has been undertaken for the Offshore Project and is summarised in **Section 17.3**.
"If there are conflicts between the Government's energy and transport policies and military interests in relation to the application, the [Infrastructure Planning Commission] IPC (now [Planning Inspectorate] PINS) 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." **EN-1, paragraph 5.4.15**	Consultation with relevant aviation and radar stakeholders, including the MOD, has been undertaken for the Offshore Project and is summarised in **Section 17.3.**
"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 IPC (now PINS) 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." **EN-1, paragraph 5.4.16**	Mitigation measures in relation to aviation and radar, including lighting requirements, are presented in **Section 17.5, 17.6, 17.7** and **17.8**.
"Where, after reasonable mitigation, operational changes, obligations and requirements have been proposed, the IPC (now PINS) considers that: 17.2.5 a development would prevent a licensed aerodrome from maintaining its licence; 17.2.6 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 17.2.7 the development would significantly impede or compromise the safe and effective use of defence assets or significantly limit military training; 17.2.8 the development would have an impact on the safe and efficient provision of en route air	Potential impacts, mitigation measures and residual effects are presented in this Chapter in **Sections 17.5, 17.6, 17.7** and **17.8**. The summary of the assessment is outlined in **Section 17.12**.

Summary	How and where this is considered in the ES
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-1, paragraph 5.4.17**	
NPS for Renewable Energy Infrastructure (EN-3) (2011)	
"Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety." **EN-3, paragraph 2.6.107**	Marking and lighting for aviation will be agreed post consent with the appropriate bodies including Trinity House, Maritime and Coastguard Agency (MCA), CAA and the MOD with regard of the relevant guidance outlined below. The requirement for approved marking and lighting post consent has been embedded in the project (**Section 17.5** and **17.7**).
"Detailed discussions between the applicant for the offshore wind farm and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application to the IPC (now PINS). As such, appropriate mitigation should be included in any application to the IPC, and ideally agreed between relevant parties." **EN-3, paragraph 2.6.187**	Consultation with relevant aviation and radar stakeholders has been undertaken for the Offshore Project and is summarised in **Section 17.3.7**. Additional mitigation measures are presented in **Section 17.5, 17.6** and **17.7**.
NPS for Renewable Energy Infrastructure (EN-3) (2021)	
"The applicant will also need to assess impacts on civil and military radar and other aviation and defence interests (Section 5.5 of EN-1)." **EN-3, paragraph 2.22.28**	Impacts on civil and military radar and aviation and defence interests are assessed in **Sections 17.1, 17.5, 17.6** and **17.7**.
"Review of up-to-date research should be undertaken, and all mitigation options presented. Aviation and navigation lighting should be minimised and/or on demand (as encouraged in EN-1 Section 5.5) to avoid attracting birds, taking into account impacts on safety." **EN-3, paragraph 2.29.5**	Marking and lighting for aviation and shipping will be agreed post consent with the appropriate bodies including Trinity House, MCA, CAA and the MOD with regard of the relevant guidance outlined below. The requirement for approved marking and lighting post consent has been embedded in the project (**Section 17.6** and **17.7**).

17.2.2 National Policy Statement

7. The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, updated July 2021) is the primary source of national planning guidance in England. There are no specific policies relevant to aviation and radar in the NPPF (Ministry of Housing, Communities and Local Government, updated July 2021).

17.3 Assessment Methodology

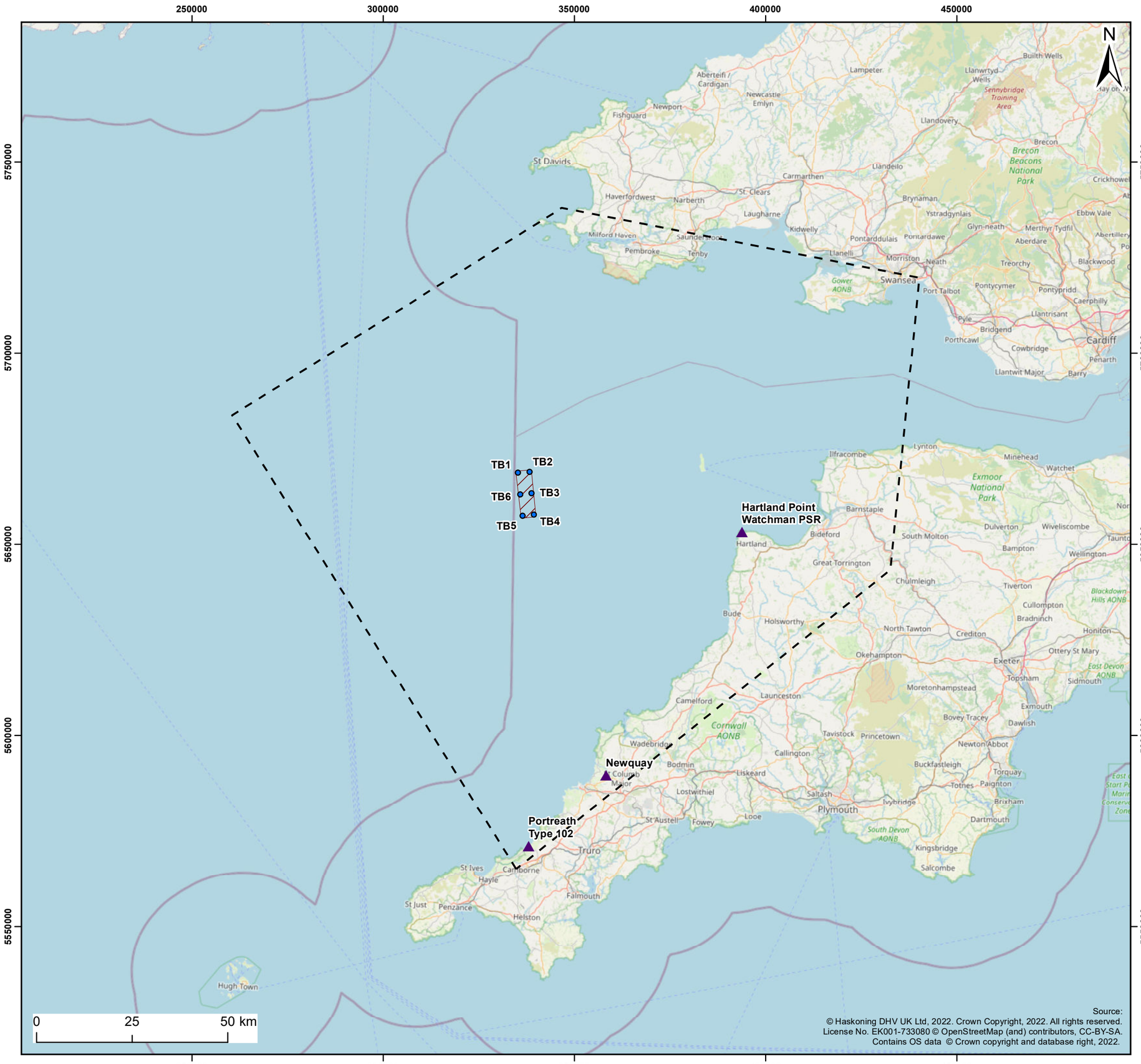
17.3.1 Study Area

8. Details of the location of the Offshore Project and the offshore components are set out within **Chapter 5: Project Description**.

9. The Civil and Military Aviation study area is defined by the distance over which effects on aviation flight operations from all the Offshore Project components (including Offshore Substations) may occur and by the location of any receptors that may be affected by those potential impacts.

10. The study area encapsulates the Windfarm Site and, for the purposes of the assessment of cumulative effects the buffer distances for direct and indirect aviation effects are 70km and 100km respectively.

11. This has been established using professional judgement and supported by Civil Aviation Authority (CAA) Publication (CAP) 764 *Policy and Guidelines on Wind Turbines* (CAA, 2016a) and aviation stakeholders operating in the study area in **Figure 17.1**.



Legend:

- Civil and Military Aviation Study Area
- Windfarm Site
- Turbines
- Radar

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Civil and Military Aviation Study Area

Figure: 17.1 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0325

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	18/10/2022	AB	CB	A3	1:1,000,000
P01	21/09/2022	AB	CB	A3	1:1,000,000

Co-ordinate system: WGS 1984 UTM Zone 30N

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together

17.3.2 Approach to Assessment

12. The assessment methodology for Civil and Military Aviation differs to that presented in **Chapter 6: EIA Methodology** in that the effect upon aviation safety is the primary concern of aviation stakeholders.

17.3.2.1 Impact assessment criteria

13. The terms used to define magnitude and sensitivity are outlined in **Table 17.2** and **Table 17.3**.

Table 17.2 Definition of terms relating to receptor sensitivity

Sensitivity	Description
High	Receptor has very limited capacity to avoid, adapt to, accommodate, or recover from the anticipated effect. Receptor or the activities of the receptor, is of high value/critical importance to the local, regional or national economy; and/or the receptor or the activities of the receptor, is highly vulnerable to impacts that may arise from the Offshore Project and/or recoverability is slow and/or costly, long term or not possible.
Medium	Receptor has limited capacity to avoid, adapt to, accommodate, or recover from the anticipated effect. Receptor or the activities of the receptor, is of moderate value to the local, regional or national economy; and/or the receptor or the activities of the receptor, is somewhat vulnerable to impacts that may arise from the Offshore Project and/or has moderate to high levels of recoverability.
Low	Receptor has some tolerance to avoid, adapt to, accommodate, or recover from the anticipated effect. Receptor or the activities of the receptor, is of low value to the local, regional or national economy; and/or the receptor or the activities of the receptor, is somewhat vulnerable to impacts that may arise from the Offshore Project and/or has high levels of recoverability.
Negligible	Receptor is generally tolerant to and can accommodate or recover from the anticipated effect. Receptor or the activities of the receptor, is of very low value to the local, regional, or national economy; and/or the receptor or the activities of the receptor, is not generally vulnerable to effects that may arise from the Offshore Project and/or has high recoverability.

Table 17.3 Definition of terms relating to magnitude of an impact

Magnitude	Description
High	Loss of resource, but not affecting integrity of the resource; partial loss of or damage to key characteristics, features or components (adverse). Permanent/irreplaceable change, which is likely to occur. Improvement to, or addition of, key characteristics, features or components of the resource; improvement of attribute quality (beneficial).

Magnitude	Description
Medium	Minor loss of, or alteration to, one (or maybe more) key characteristics, features or components; measurable change in attributes, quality or vulnerability (adverse). Long-term though reversible change, which is likely to occur. Minor improvement to, or addition of, one (maybe more) key characteristics, features or components of the resource; minor improvement to attribute quality (beneficial).
Low	Very minor loss of, or alteration to, one (or maybe more) key characteristics, features or components; noticeable change in attributes, quality or vulnerability (adverse). Short- to medium-term though reversible change, which could possibly occur. Very minor improvement to, or addition of, one (maybe more) key characteristic, feature or element; very minor improvement to attribute quality (beneficial).
Negligible	Temporary or intermittent very minor loss of, or alteration to, one (or maybe more) characteristic, feature or element; possible change in attributes, quality or vulnerability (adverse). Short-term, intermittent, and reversible change, which is unlikely to occur. Possible very minor improvement to, or addition of, one (maybe more) characteristic, feature or element; possible improvement to attribute quality (beneficial).

14. The significance of the effect upon civil and military aviation is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The method employed for this assessment is presented in **Table 17.4**.

Table 17.4 Significance of an impact - resulting from each combination of receptor magnitude and the sensitivity of the effect upon it

		Negative Magnitude			Beneficial Magnitude				
		High	**Medium**	**Low**	**Negligible**	**Negligible**	**Low**	**Medium**	**High**
Sensitivity	**High**	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

17.3.2.2 Approach to the Aviation Assessment

15. This assessment has been based on the existing baseline environment, as described in **Section 17.3.3** and the Project Design Envelope (PDE) as detailed in **Chapter 5: Project Description**.

17.3.3 Worst-Case Scenario

16. In accordance with the assessment approach to the 'Rochdale Envelope' set out in **Chapter 6: EIA Methodology**, the impact assessment for Civil and Military Aviation has been undertaken based on a realistic worst-case scenario of predicted impacts. The Project Design Envelope for the Offshore Project is detailed in **Chapter 5: Project Description**.

17. **Table 17.5** presents the realistic worst-case scenario components considered for the assessment of Civil and Military Aviation.

Table 17.5 Definition of realistic worst-case scenario details relevant to the assessment of impacts in relation to Civil and Military Aviation

Impact	Realistic worst-case scenario	Rationale
Operation and maintenance - Creation of physical obstacle to low level aircraft operations	6 wind turbines with wind turbines at a maximum blade tip height of 284m amsl	Considered that maximum blade tip height, rather than maximum number of Wind Turbine Generators (WTGs) (8), is worst-case due to increased height of obstacle.
Operation and maintenance - Wind turbines causing interference on civil and military primary surveillance radar systems	6 wind turbines with wind turbines at a maximum blade tip height of 284m amsl	Considered that maximum blade tip height, rather than maximum number of WTGs (8), is worst-case due to increased Line of Sight visibility of taller turbines.

17.3.4 Baseline Data Sources

17.3.4.1 Desktop Study

18. A desktop study was undertaken to obtain information on Civil and Military Aviation. Data were acquired within the study area through a detailed desktop review of existing studies and datasets. Reference being made to CAA CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016a) which aids aviation stakeholders in understanding and addressing wind energy related issues thereby ensuring greater consistency in the consideration of the potential effect of proposed wind farm developments.

19. The sources of information presented in **Table 17.6** were consulted to inform the Civil and Military Aviation assessment.

Table 17.6 Data sources used to inform the Civil and Military Aviation assessment

Source	Title (Year)
CAACAP 764	Policy and Guidelines on Wind Turbines (CAA, 2016a)
CAA CAP 032	United Kingdom (UK) Integrated Aeronautical Information Package (IAIP) (CAA, 2022a)
CAA CAP 168	Licensing of Aerodromes (CAA, 2022b)
CAA CAP 393	The Air Navigation Order (ANO) 2016 and Regulations (CAA, 2016b); *Includes guidance regarding the aviation and maritime lighting of wind turbines in UK territorial waters*
CAA CAP 493	Manual of Air Traffic Services Part 1 (CAA, 2022c)
CAA CAP 670	Air Traffic Services Safety Requirements (CAA, 2019a)
CAA CAP 738	Safeguarding of Aerodromes (CAA, 2020a)
CAA CAP 1434	UK Flight Information Services (CAA, 2016c)
CAA Chart	Visual Flight Rules (CAA, 2022d)
Ministry of Defence (MOD), Military Aviation Authority (MAA)	Regulatory Publications (MRP) including Regulatory Articles (RA) and Manuals (MOD, 2022a)
MOD	UK Military Low Flying Handbook (MOD, 2022b)
MOD	Military Aeronautical Information Handbook (Mil AIP) (MOD, 2022c)
Maritime and Coastguard Agency (MCA)	Visual Meteorological Conditions (MGN) 654 (M+F) Offshore Renewable Energy Installations (OREI) (MCA, 2021)

17.3.4.2 Site Specific Survey

20. No site-specific surveys were undertaken.

17.3.5 Data Limitations

21. The data used in this chapter are the most up to date publicly available information which can be obtained from the data sources as cited. Data have also been provided through consultation as detailed in **Table 17.6**.

22. The results of the Line of Sight (LoS) analysis are conservative in the establishment of results and are provided to establish the worst-case possibility of impact to aviation stakeholders. Radar LoS results are theoretical in nature however, analysis is based on an industry standard for establishing the impact to aviation radar systems from operational wind turbines and it is considered will not have an implication for the conclusions of the assessment.

23. An assessment of airport Instrument Flight Procedures (IFP) within 50 Nautical Miles (NM) (93km) of the Offshore Project array area, Newquay Airport, will be completed.

17.3.6 Scope

24. Upon consideration of the baseline environment, the project description outlined in **Chapter 5: Project Description**, and Scoping Opinion (Case reference: EIA/2022/00002), several potential impacts upon Civil and Military Aviation are "Scoped out". These impacts are outlined, together with a justification for why they are not considered further, in **Table 17.7**.

Table 17.7 Summary of potential effects "scoped out" relating to Civil and Military Aviation

Potential Impact	Justification
NATS Air Traffic Control (ATC) Primary Surveillance Radar (PSR)	Scoping response summarised in **Table 17.8**.
NATS Secondary Surveillance Radar (SSR)	NATS advises that effects on SSRs are only relevant to consider when wind turbines are located less than 10km from the SSR[1]. The distance of the Offshore Project is greater than 10km from the nearest SSR in Devon.
Cornwall Airport Newquay PSR	Scoping response summarised in **Table 17.8**.
Increased air traffic in the area related to windfarm activities	There is no requirement for helicopter operations as part of the Offshore Project.
MOD Hartland Point (PSR)	Scoping response summarised in **Table 17.8**.
Meteorological Office Radar	The UK Meteorological Office (Met Office) undertakes to safeguard its radar infrastructure out to 20km from individual sites. The distance of the Offshore Project is greater than 20km from the nearest Met Office radar station (Cobbacombe Cross, Devon).
Oil and Gas Infrastructure	There is no oil and gas infrastructure within the Offshore Development Area.
Transboundary	The Offshore Project will not have significant effects on a European Economic Area (EEA) State due to the distance from the Republic of Ireland (RoI), the nearest European State.

17.3.7 Consultation

25. Consultation has been a key part of the development of the Offshore Project. Consultation regarding Civil and Military Aviation has been conducted throughout the

[1] https://www.nats.aero/services-products/catalogue/n/wind-farms-self-assessment-maps/

EIA. An overview of the project consultation process is presented within **Chapter 7: Consultation**.

26. A summary of the key issues raised during consultation specific to Civil and Military Aviation is outlined below in **Table 17.8**, together with how these issues have been considered in the production of this ES.

Table 17.8 Consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
Defence Infrastructure Organisation (DIO), MOD	25 Mar 2022, Letter Ref 10054463 (Scoping)	Assessments have determined that wind turbines within the three-dimensional envelope identified would be visible to radar systems used to conduct air traffic management. Specifically, the development would be visible to radar systems sited at Hartland Point and Portreath. Wind turbines have been shown to have detrimental effects on the performance of MOD Air Defence (AD), Air Traffic Control (ATC) and Range Control radars. The proposed wind farm development has the potential to present an obstacle and danger to military aircraft operating below the managed danger area (designated D064B and D064C) *as well as vessels operating/navigating within this area*. Fixed Wing military low flying training takes place throughout the United Kingdom down to a height of 250ft above ground level and in certain designated areas down to a height of 100ft above ground level. A turbine development of the height and at the location you propose may have an impact on low flying operations.	The Applicant acknowledges the effect and is continuing to engage with the DIO. The impact to MOD radar and offshore operations is considered in **Section 17.4.1**.
DIO, MOD	28 Oct 2022, Email Ref DIO Estates-SafegdgMgr1 (Engagement)	"At your request I have reassessed the White Cross Development using the following information: The Development consists of 5 – 8 Wind Turbine Generators (WTG) in the Celtic Sea and is located approximately 40 kilometres (km) west of Lundy Island. Blade tip height – 284m Hub height – 153m Rotor diameter – 262m	The impact to MOD radar and offshore operations is considered in **Section 17.4.1**.

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
		Grid references for Rochdale Envelope 156,000 161,000 180,000 161,000 156,000 122,000 180,000 122,000 187,405 138,561 The development is Radar Line of Sight for ADR at RAF Portreath, and therefore the MOD maintains its concerns. The development is Radar line of sight for Hartland Point; however, we have no concerns operationally. The development envelope provided falls within, but below, managed danger areas in which intense aerial activity takes place. These danger areas, designated D064B and D064C, refer to airspace between 5000 feet amsl and flight level 660. It is unlikely that the development proposed would have any significant impact in the operation of this airspace. The proposed wind farm development has the potential to present an obstacle and danger to military aircraft operating below the managed danger area as well as vessels operating/navigating within this area. I can confirm that the reduction in height does not change our position from what is set out in the scoping opinion response issued on 25/03/2022. A further assessment will be carried out once we are consulted on the EIA application.”	

Consultee	Date, Document, Forum	Comment	Where addressed in the ES
NATS	16 Aug 2022, Email Ref SG33861 (Engagement)	"NATS anticipates no impact from the proposal."	**Section 17.4.1**.
Cornwall Airport Newquay	23 Aug 2022, Email (Engagement)	"From our perspective at this stage, there is no anticipated effect. However, we reserve the right to refer this to our Approved Procedure Design Organisation (APDO) for our Instrument Flight Procedures (IFP). We are just about to appoint or tender for an IFP review, so this is a work in progress for us."	The Applicant acknowledges the effect and is continuing to engage with the airport. Cornwall Airport Newquay offshore operation is considered in **Section 17.4.1**.
CastleAir (*Helicopter operator from Lundy Island*)	19 Aug 2022, Email (Engagement)	"I am happy to advise that the site for this is well away from our routes and this will have no impact on operations to and from Lundy.	N/A
MCA Search and Rescue (SAR)	12 Dec 2022, Email (Engagement)	As per your last email, I have no additional concerns regarding this consultation other than the standard requirements through MGN 654 Annex 5."	MCA offshore operation is considered in **Section 17.6.1**.

17.4 Existing Environment

27. This section describes the existing environment in relation to Civil and Military Aviation associated with the White Cross Offshore Windfarm Project study area. It has been informed by a review of the sources listed in **Table 17.6**.

17.4.1 Current baseline

28. This section defines the baseline characterisation resulting from the desktop studies. **Figure 17.2** provides an illustration of the airspace construction above the Offshore Project array area.

17.4.1.1 Airspace Designation

29. In the UK Flight Information Region (FIR) and Upper Information Region (UIR), airspace is classified as A to G in accordance with International Civil Aviation Organisation (ICAO) standards (there is no airspace designated as Class B or Class F in the UK FIR/UIRs). Airspace Classes A, C, D and E are variants of Controlled Airspace (CAS)[2] in which aircraft commonly require an ATC clearance to operate within. Class G Airspace is airspace in which aircraft can operate without any clearance required or being in contact with ATC. The Offshore Project area would be located within a multi-layered area of Class G[3] uncontrolled airspace with overlaying Class C CAS.

30. Class G airspace up to Flight Level (FL) 195 overhead the proposed development (approximately 19,500 ft above mean sea level); any aircraft can operate in this area of uncontrolled airspace without any requirement to be in communication with an ATC Unit. Pilots of aircraft operating in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain, and obstructions. This is achieved through prudent planning (using published aviation charts, the UK IAIP (NATS, 2022) and local aerodrome instructions) and diligent 'lookout' throughout the flight. In addition, the proposed development would be located 20 NM from the military Low Flying Area (LFA) 2, covering Somerset and Devon below 2,000 ft above ground level (agl).

[2] CAS - Airspace in which Air Traffic Control exercises authority. In the UK, Class A, C, D and E airspace is controlled. Within controlled airspace flights are subject to air traffic control service with standard separation maintained between aircraft.

[3] Uncontrolled airspace - Airspace in which Air Traffic Control does not exercise any executive authority but may provide basic information services to aircraft in radio contact. In the UK, Class G airspace is uncontrolled. Aircraft operating in uncontrolled airspace may be in receipt of an Air Traffic Service (ATS); however, within this classification of airspace, pilots are ultimately responsible for their own terrain and obstacle clearance.

31. Class C CAS is established above FL 245; all aircraft operating in this airspace must be in receipt of an ATS from NATS, military controllers located at a NATS Area Control Centre (ACC) or under the control of military air defence controllers.

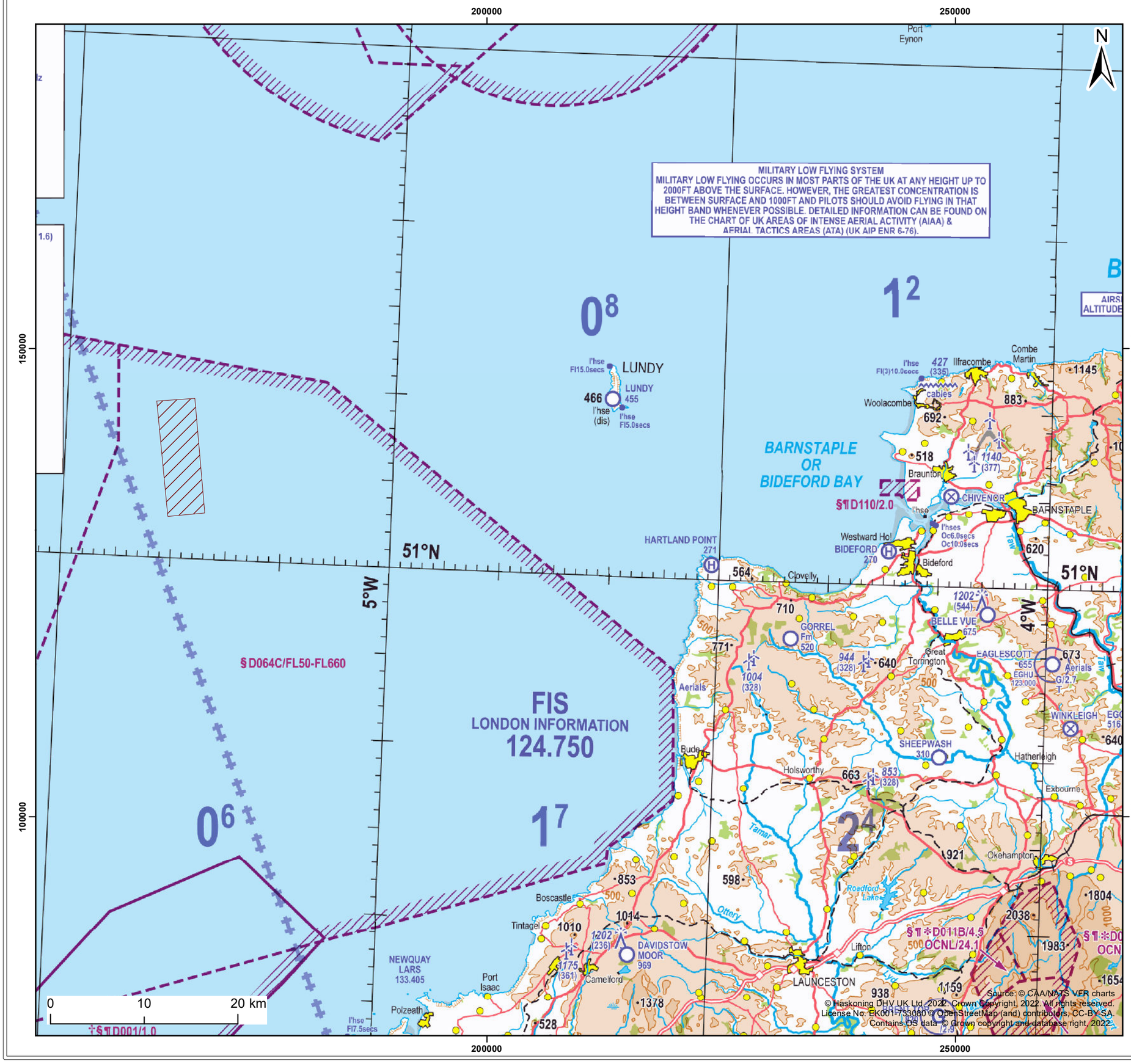
32. Above and surrounding the Offshore Project array area, the Class G airspace is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

33. Military air traffic controllers located at the Swanwick ACC utilise NATS radar for the provision of ATS to aircraft flying outside of and crossing CAS above FL 100 within radar and radio coverage.

34. Newquay Airport, the main airport in Cornwall, provides a Lower Airspace Radar Service (LARS)[4] to participating aircraft up to FL 100 within uncontrolled airspace to a radius of 60 NM from the radar position, as well as a radar based ATS to aircraft inbound and outbound from the airport.

35. Within CAS, NATS En-route Limited (NERL) (which is a subsidiary of NATS) are the main ATS provider utilising several long-range PSR and SSR systems positioned to provide maximum coverage of UK airspace. Additionally, NATS has a licence obligation to provide radar data to other remote aviation stakeholders (such as the MOD) to a high quality and performance standard for the benefit of UK aviation. Any effect that the Offshore Project might have on NERL radar systems must be considered both in terms of effect on the civilian en-route services and in the context of its remote users such as the MOD and airports. NATS has confirmed that there are no SSR and PSR systems affected; therefore, NATS PSR and SSR are scoped out from further analysis.

[4] LARS – is available to all aircraft flying outside of controlled airspace up to FL 100 within the limits of radio and radar cover. The provision of LARS is at the discretion of the controllers concerned because they may be fully engaged in their primary tasks. Therefore, occasionally, the service may not be available.



Legend:

Windfarm Site

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Aviation Baseline

Figure:	Drawing No:
17.2	PC2978-RHD-ZZ-XX-DR-Z-0326

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	05/10/2022	AB	CB	A3	1:400,000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together

17.4.1.2 Military Practice and Exercise Areas (PEXA)

36. Military PEXAs are areas available for training use primarily by the UK armed forces but also those of overseas nations. They can be over land or water, or both, and may involve the firing of live ammunition. Airborne activity in PEXA may be affected by obstructions created by the physical presence of wind turbines. The DIO has stated that, it is unlikely that the Offshore Project would have any significant impact in the operation of Managed Danger Areas (MDA) D064B an D064C (FL 50 – 660), in which intense aerial activity takes place. Effects on PEXA are confined to possible interference with radar due to detection of operational wind turbines.

17.4.1.3 Military Low Flying Operations

37. The UK Low Flying System (UKLFS) used for military low flying activity covers the open airspace over the entire UK land mass and surrounding sea areas generally out to 2 NM from the coastline, from the surface to 2,000 ft agl or above mean sea level (amsl). However, the proposed development would be located 20 NM from the military LFA 2.

17.4.1.4 MCA Aeronautical SAR Low Flying Operations

38. MCA SAR operations are supported by helicopters (aeronautical SAR). SAR helicopters offshore operate from the surface to approximately 5,000 ft amsl.

17.4.1.5 Instrument Flight Procedures (IFP)

39. IFP design covers the planning of routes used by pilots and ATC from take-off to landing and is a complex and highly regulated process. All IFP design must be undertaken by an APDO that is authorised by the relevant State. In the UK, all IFP design must be undertaken in accordance with CAA requirements. wind turbines placed in proximity to IFP may adversely affect IFP safeguarded areas which may result in individual IFP being no longer fit for purpose without mitigation being applied.

17.4.1.6 Radar Line of Sight (LoS)

40. To inform the baseline, the radar LoS analysis has determined which radar systems have the potential to detect operational wind turbines at the maximum blade tip height placed within the Offshore Project array area. The layout of wind turbines does not have a material effect on establishing if theoretical radar LoS is possible.

41. Osprey utilised the Advanced Topographic Development and Imaging (ATDI) ICS LT (Version 22.4.7 x64) tool to model the terrain elevation profile between identified

PSR systems and the Offshore Project array. Otherwise known as a point-to-point radar LoS analysis, the result is a graphical representation of the intervening terrain and the direct signal LoS (considering earth curvature and radar signal properties). This is a limited and theoretical desk-based radar modelling study which is frequently used to establish the potential for individual windfarm developments to create an effect to aviation radar. However, there are unpredictable levels of atmospheric signal diffraction and attenuation within a given radar environment that can influence the probability of a wind turbine being detected. The analysis is designed to give an indication of the theoretical likelihood of a wind turbines being detected by the assessed radar system. The qualitative definitions utilised in the radar LoS assessment are defined in **Table 17.9**.

Table 17.9 Qualitative definition of radar LoS

Result	Definition
Yes	The wind turbine is highly likely to be detected by the radar: direct LoS exists between the radar and the wind turbine
Likely	The wind turbine is likely to be detected by the radar at least intermittently
Unlikely	The wind turbine is unlikely to be detected by the radar but cannot rule out occasional detection
No	The wind turbine is unlikely to be detected by the radar as significant intervening terrain exists

42. Radar detectability of wind turbines does not automatically provide justification for an objection from radar stakeholders. Other factors will determine the nature and severity of the operational impact on the receptor e.g:

- The consideration of airspace structure and classification in the wind turbine vicinity
- The operational significance of the airspace to the operator
- The range of the development from the radar source
- Aircraft traffic patterns and procedures
- The type of radar service provided to air traffic using the airspace.

43. A radar LoS analysis across the Offshore Project array has been completed in order to establish theoretical radar detectability of the wind turbines, placed within the array area to selected PSR systems located in the UK based on a maximum upper blade tip height of 284m amsl. To enable the analysis, points of reference in the form of 6 wind turbines within the boundary of the Offshore Project array, defined by the Rochdale Envelope area, with wind turbines at the worst-case blade tip height of 284m amsl which is considered to be the Maximum Design Scenario (MDS) and worst-

case for effects to aviation (fewest wind turbines at the tallest maximum tip height above the mean sea level). Radar LoS analysis has provided results (see **Figure 17.3**) which indicate theoretical, high detectability of the operational wind turbines placed in the Offshore Project array area at the maximum blade tip height of 284m amsl by MOD Portreath Air Defence Radar (ADR).

44. Radar operates by alternately transmitting a stream of high-power radio frequency pulses and 'listening' to echoes received back from targets within its radar LoS. Generally, air surveillance (aviation) radars employ a rotating antenna that provides 360° coverage in azimuth; the typical scan rate is 15 rotations per minute (rpm) thus illuminating a given target every four seconds.

45. PSR can distinguish between moving and static targets; for targets that are moving towards or away from the radar, the frequency of the reflected signal from a moving target changes between each pulse (transmit and receive) which is known as the Doppler shift. This can be most practically explained by considering the change in frequency of the engine sound heard by a pedestrian when a car passes by on the road – the sound as the car approaches is higher than the sound heard by the pedestrian as it travels away. The Doppler shift has the effect of making the sound waves appear to bunch up in front of the vehicle (giving a higher frequency) and spread out behind it (lower frequency). The true frequency of the engine is only heard when the car is immediately next to the pedestrian. The aviation radar receiver is 'listening' to the radio waves reflected from the moving object and working out whether the returned signal is of a higher or lower frequency (moving object) or if the returned frequency is the same as the transmitted signal (a stationary object).

46. Wind turbines are a significant cause of PSR false plots or clutter, as the rotating blades can trigger the Doppler threshold (minimum shift in signal frequency) of the Radar Data Processor (RDP) and therefore may be interpreted as aircraft movements (CAP 764). Significant effects have been observed on radar sensitivity caused by the substantial Radar Cross Section (RCS) of the wind turbine structural components (blades, tower and nacelle) which can exceed that of a large aircraft; the effect 'blinds' the radar (or the operator) to wanted targets in the immediate vicinity of the wind turbine. False plots and reduced radar sensitivity may reduce the effectiveness of the radar system itself to an unacceptable level and compromise the provision of a safe radar service to participating aircraft.

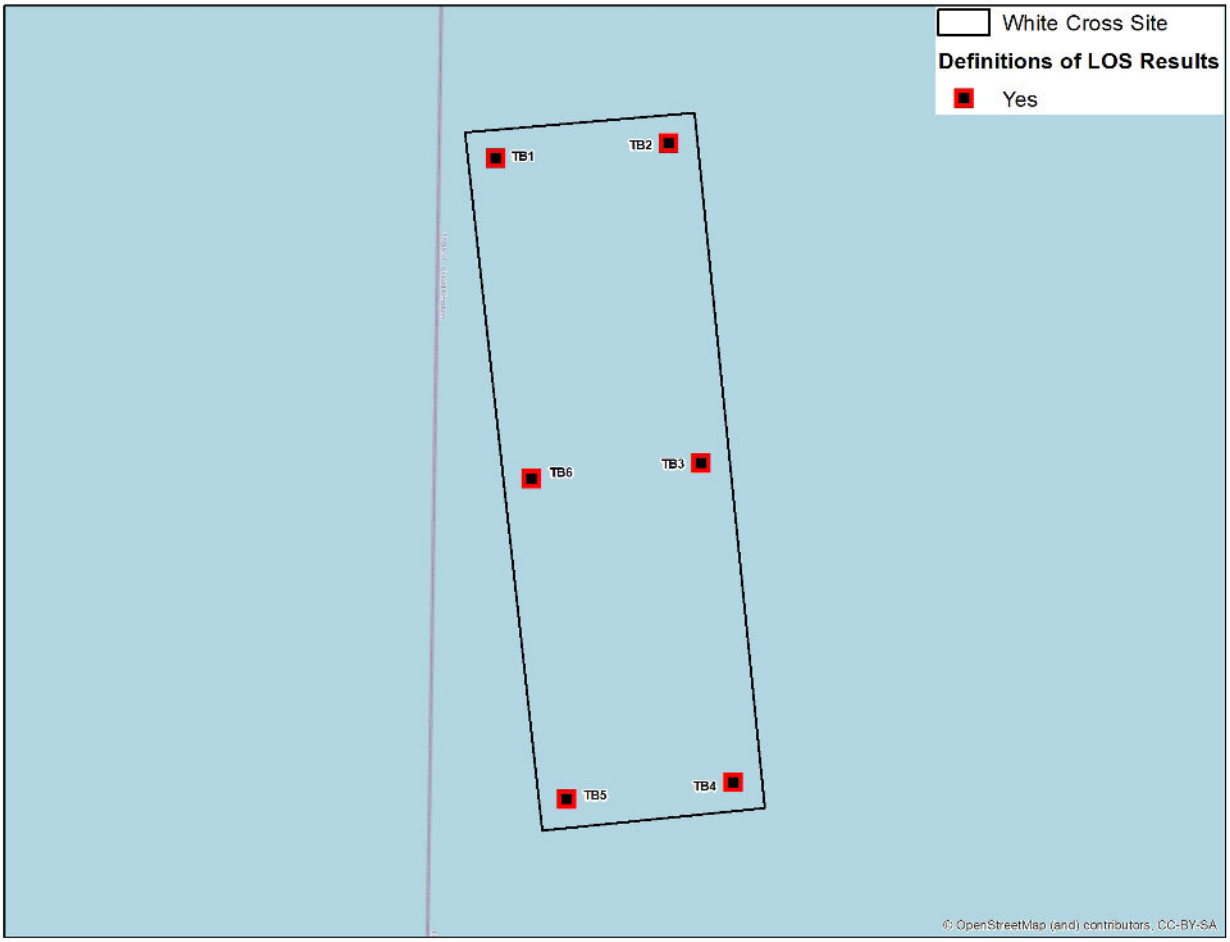


Figure 17.3 MOD Portreath ADR – Offshore Project Area Indicative (6 wind turbines with at a maximum blade tip height of 284m amsl modelled positions) Radar LoS Results

47. The Offshore Project array wind turbines lie on the edge of the Documented Operational Range (DOC)[5] of the Newquay Airport PSR.

48. No other aviation PSR systems will theoretically detect the Offshore Project array wind turbines at a maximum blade tip height of 284m amsl.

49. No other site-specific surveys have been undertaken to inform the ES for Civil and Military Aviation. Data has been gathered through consultation as detailed in **Table 17.6**.

[5] UK IAIP (CAA, 2022a), Newquay AD2.18

17.4.2 Do Nothing Scenario

50. The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the ES (EIA Regulations, Schedule 3, Paragraph 3). From the point of assessment, over the course of the development and operational lifetime of the Offshore Project (operational lifetime anticipated to be a minimum of 25 years), long-term trends mean that the condition of the baseline environment is expected to evolve. This section provides a qualitative description of the evolution of the baseline environment, on the assumption that the Offshore Project is not constructed, using available information and scientific knowledge of Civil and Military Aviation.

51. It is difficult to define what the likely evolution of the aviation interests in the Celtic Sea will be either with, or in the absence of the White Cross Offshore Windfarm Project. The Oil and Gas Authority (OGA) Annual Report and Accounts (OGA, 2019) reported a predicted decline in gas production and historically have disregarded the Celtic Sea. However, operators continue to find it difficult to predict production accurately as older fields mature and their reliability reduces.

52. The Government has set an ambition to deliver up to 5 Giga Watts (GW) of floating wind by 2030[6], with rapid expansion anticipated thereafter. To support this, The Crown Estate (TCE) is offering new leasing opportunities in the Celtic Sea for the first generation of commercial-scale floating offshore windfarms – unlocking up to 4 GW of new clean energy capacity between 2030 and 2035. TCE is developing a phased approach to provide opportunities for growth and investment and to facilitate the co-ordination of the necessary infrastructure, such as ports and grid connections into the long term. The Celtic Sea leasing phases are seen as the foundation for greater capacity in the future and help establish an industrial sector for the UK in the southwest.

53. Support aviation (including drones), indirect fixed-wing survey / protection and helicopter direct support is likely to increase in the far offshore areas but be insignificant in the Offshore Project array area. The Celtic Sea offshore wind

[6] https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/floating-offshore-wind/

infrastructure would be situated in the surrounding Class G uncontrolled[7] airspace where any aircraft can operate in this area of uncontrolled airspace without any requirement to be in communication with an ATC Unit. Pilots of aircraft operating in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain, and obstructions. There is expected to be no change to the present Class G airspace construct, with the embedded MDAs (D064B an D064C), or usage above the Offshore Project Array Area.

17.5 Potential impacts during construction

54. The potential impacts during construction of the Offshore Project have been assessed for Civil and Military Aviation. A description of the potential effect on Civil and Military Aviation receptors caused by each identified impact is given in this section.

17.5.1 Impact 1: Creation of physical obstacle to low level aircraft (including MCA aeronautical SAR) operations

55. The construction, and towing from port, of offshore generating infrastructure, wind turbines of the Offshore Project array, would lead to the creation of multiple physical vertical obstacles to flight. Wind turbines, and associated construction assets, might interfere and degrade aeronautical operations particularly at low levels over the sea.

17.5.1.1 Magnitude of impact

56. Wind turbine construction infrastructure above the mean sea level could pose a physical obstruction to flight operations, specifically military low flying and SAR, in the vicinity of the proposed development. Construction infrastructure and erected wind turbines can be difficult to see from the air, particularly in poor meteorological conditions leading to potential increased obstacle collision risk. Furthermore, during the construction phase, the presence and movement of associated infrastructure may present a potential obstacle collision risk to aircraft flight operations.

57. During flight, weather conditions or operational requirements may necessitate route adjustments. In Visual Meteorological Conditions (VMC)[8], pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines. Pilots will also

[7] Uncontrolled airspace - Airspace in which Air Traffic Control does not exercise any executive authority but may provide basic information services to aircraft in radio contact. In the UK, Class G airspace is uncontrolled. Aircraft operating in uncontrolled airspace may be in receipt of an ATS; however, within this classification of airspace, pilots are ultimately responsible for their own terrain and obstacle clearance.
[8] Visual Meteorological Conditions - A flight category which allows flight to be conducted under Visual Flight Rules (VFR) defined by in flight visibility and clearance from cloud

be aware, through normal aeronautical notification procedures, of the Offshore Project. Furthermore, when flying in Instrument Meteorological Conditions (IMC)[9] pilots may be utilising on board radar which detects obstructions. In IMC, pilots will be under the control of ATC with an appropriate level of ATC radar service, flying at an altitude which provides the required separation from obstacles below them.

58. The negative effect is predicted to be temporary and of local geographical, spatial extent, short-term duration, with a very minor loss of airspace availability with high reversibility. It is predicted that the impact will negatively affect the receptor directly. The magnitude is therefore, considered to be **Negligible**.

17.5.1.2 Sensitivity of the receptor

59. The MOD, MCA and ATS providers are being consulted with regard to the potential for the Offshore Project to create an obstruction to aviation activities conducted in the vicinity of construction infrastructure.

60. The low flying aircraft operator (including SAR) is deemed to have high value, but low vulnerability to the activity but have some tolerance to avoid, adapt to, and accommodate the anticipated effect with high recoverability. The sensitivity of the receptor is therefore, considered to be **Low**.

17.5.1.3 Significance of effect

61. There are no beneficial effects.

62. Overall, the magnitude of the negative impact is deemed to be negligible, and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **Negligible** significance, which is **not significant** in ES terms.

17.5.1.4 Further Mitigation

63. A range of mitigation measures, in the form of appropriate notification to aviation stakeholders, regularity of layout, lighting and marking (taking account of Marine Guidance Note (MGN) 654 (M+F) Offshore Renewable Energy Installations (OREI) (MCA, 2021)) to minimise effects to aviation flight operations (including SAR) would apply to the development of the Offshore Project. These will comply with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan

[9] Instrument Meteorological Conditions - Weather conditions which would preclude flight by the Visual Flight Rules; conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum

their flying activities in advance and to be familiar with any en-route obstacles they may encounter.

17.5.1.5 Residual effect

64. The effect will be of **Negligible** significance, following notification, which is **not significant** in ES terms.

17.6 Potential impacts during operation and maintenance

65. A description of the potential operation and maintenance phase effects of the Offshore Project on Civil and Military Aviation receptors caused by each identified discrete effect is given in this section.

17.6.1 Impact 1 (similar to Construction Impact 1): Creation of physical obstacle to low level aircraft (including MCA aeronautical SAR) operations

66. The operation and maintenance (including towing to and from port) of offshore generating infrastructure, wind turbines of the Offshore Project array, would lead to the creation of multiple vertical physical obstacles to flight. Wind turbines might interfere and degrade aeronautical operations particularly at low levels over the sea.

17.6.1.1 Magnitude of impact

67. Wind turbine operational infrastructure above the mean sea level, could pose a physical obstruction to flight operations, specifically military low flying operations and SAR, in the vicinity of the proposed development. Operational wind turbines can be difficult to see from the air, particularly in poor meteorological conditions leading to potential increased obstacle collision risk.

68. During flight, weather conditions or operational requirements may necessitate route adjustments. In VMC[10], pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of the Offshore Project. Furthermore, when flying in IMC[11] pilots may be utilising on board radar which detects obstructions and be under the control of ATC with an

[10] Visual Meteorological Conditions - A flight category which allows flight to be conducted under VFR defined by in flight visibility and clearance from cloud

[11] Instrument Meteorological Conditions - Weather conditions which would preclude flight by the Visual Flight Rules; conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum

appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

69. The negative effect is predicted to be of local geographical, spatial extent, long-term permanent duration with low reversibility but with a very minor loss of airspace availability. It is predicted that the impact will negatively affect the receptor directly. The magnitude is therefore, considered to be **Low**.

17.6.1.2 Sensitivity of the receptor

70. The MOD, MCA and ATS providers are being consulted with regard to the potential for the Offshore Project to create an obstruction to aviation activities conducted in the vicinity of the Offshore Project array generation infrastructure.

71. The low flying aircraft operator (including SAR) is deemed to have high value, but low vulnerability to the activity but have some tolerance to avoid, adapt to, and accommodate the anticipated effect with high recoverability. The sensitivity of the receptor is therefore, considered to be **Low**.

17.6.1.3 Significance of effect

72. There are no beneficial effects.

73. Overall, the magnitude of the negative impact is deemed to be low, and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **Minor** significance, which is **not significant** in ES terms.

17.6.1.4 Further Mitigation

74. A range of mitigation measures, in the form of appropriate notification to aviation stakeholders, regularity of layout, lighting and marking (taking account of MGN 654 (M+F) OREI (MCA, 2021)) to minimise effects to aviation flight operations (including SAR) would apply to the development of the Offshore Project. These will comply with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter.

17.6.1.5 Residual effect

75. The effect will be of **Negligible** significance, following lighting and notification, which is **not significant** in ES terms.

17.6.2 Impact 2: Wind turbines causing interference on civil and military PSR systems

76. The operational wind turbines of the Offshore Project array area would be theoretically highly detectable by the Portreath ADR system. Wind turbines detectable by a radar system might degrade the system by creating false targets, reduce system sensitivity, create radar shadowing behind the wind turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets.

17.6.2.1 Magnitude of impact

77. The ability of MOD and operators of aviation radar systems to accurately use their respective radar systems for the provision of an ATS and State security, could be impacted by the presence of wind turbine interference and the production of radar clutter on radar displays. All radar system receptors aim to ensure 'clutter free' radar to continue to deliver a safe and effective ATS and to monitor UK airspace. In the case of the MOD Portreath ADR, to compile a Recognised Air Picture (RAP) to monitor the airspace in and around the UK in order to launch a response to any potential airborne threat, could be impacted by the presence of wind turbine interference and the production of radar clutter on ADR displays.

78. Without mitigation, the negative effect created by the detection of operational wind turbines although predicted to be of long-term, repetitious duration, will entail very minor alteration to the development of a RAP, due to the small geographic, special, extent of the Offshore Project array and have reversibility local spatial extent,. It is predicted that the impact will negatively affect the receptor directly. The magnitude is therefore, considered to be **Low**.

17.6.2.2 Sensitivity of the receptor

79. All radar receptors aim to ensure successful radar coverage to continue to deliver a safe and effective ATS and to monitor UK airspace. The radar stakeholder, in particular with regard to the MOD Portreath ADR, is considered to be of high vulnerability, low recoverability and high value. The sensitivity of these receptors is therefore considered to be **High**.

17.6.2.3 Significance of effect

80. There are no beneficial effects.

81. Overall, the magnitude of the negative impact is deemed to be low, and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **Moderate** significance, which is **significant** in ES terms.

17.6.2.4 Further Mitigation

82. The MOD, BEIS, TCE and the Offshore Wind Industry Council (OWIC) formed a Joint Task Force (JTF) whose aim is to enable co-existence of air defence and offshore wind. In September 2021, the task force published a strategy document entitled Air Defence and Offshore Wind, Working Together Towards Net Zero (JTF, 2021)[12] which sets out the process of the development of future technical radar mitigation schemes to mitigate ADR from the impact created by the radar detectability of operational wind turbines. One or two technical radar mitigation solutions have been identified and these systems have demonstrated that they could potentially support windfarm development, the JTF are working towards the procurement of an ADR technical mitigation solution which once deployed will provide an enduring solution.

17.6.2.5 Residual effect

83. The Applicant has and will continue to engage with the MOD prior to and during the application process and will continue this engagement and seek to identify agreed mitigation for the ADR system where required. The assumption that suitable mitigation would be agreed with the MOD reduces the negative significance created by the Offshore Project to **Minor**, below effect significance in ES terms.

17.7 Potential impacts during decommissioning

84. No decision has been made regarding the final decommissioning policy for the Offshore Project as it is recognised that industry best practice, rules and legislation change over time. The decommissioning methodology would be finalised nearer to the end of the lifetime of the Offshore Project to be in line with current guidance, policy and legalisation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works are likely to be subject to a separate licencing and consenting approach. The anticipated decommissioning activities are outlined in **Section 5.10** of **Chapter 5: Project Description**.

85. The potential impacts of the decommissioning of the Offshore Project have been assessed on Civil and Military Aviation. A description of the potential effect on Civil and Military Aviation receptors caused by each identified impact is given in this section.

[12] Together Towards Net Zero

17.7.1 Impact 1: (similar to Construction Impacts 1 and 2): Creation of physical obstacle to low level aircraft (including MCA aeronautical SAR) operations

86. The decommissioning of offshore generating infrastructure, wind turbines, would lead, initially, to the creation of multiple physical obstacles to flight which would then reduce over time. Wind turbines, and associated decommissioning assets, might initially interfere and degrade aeronautical operations particularly at low levels over the sea.

17.7.1.1 Magnitude of impact

87. Wind turbine decommissioning infrastructure above the mean sea level could pose a physical obstruction to flight operations, specifically to military low flying and SAR, in the vicinity of the proposed development. Decommissioning infrastructure erected and decommissioning wind turbines can be difficult to see from the air, particularly in poor meteorological conditions leading to potential increased obstacle collision risk. Furthermore, during the construction phase, the presence and movement of associated infrastructure may present a potential obstacle collision risk to aircraft flight operations.

88. During flight, weather conditions or operational requirements may necessitate route adjustments. In VMC, pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and will be aware through notification procedures of the Offshore Project. Furthermore, when flying in IMC pilots may be utilising on board radar which detects obstructions and be under the control of ATC with an appropriate level of radar service and flying at an altitude which provides the required separation from obstacles below them.

89. The negative effect is predicted to be temporary and of local geographical, spatial extent, short-term duration, with a very minor loss of airspace availability with high reversibility. It is predicted that the impact will negatively affect the receptor directly. The magnitude is therefore, considered to be **Negligible**.

17.7.1.2 Sensitivity of the receptor

90. The MOD, MCA and ATS providers are being consulted with regard to the potential for the Offshore Project to create an obstruction to aviation activities conducted in the vicinity of construction infrastructure.

91. The low flying aircraft operator (including SAR) is deemed to be of low vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **Low**.

17.7.1.3 Significance of effect

92. There are no beneficial effects.

93. Overall, the magnitude of the negative impact is deemed to be negligible, and the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **Negligible** significance, which is **not significant** in ES terms.

17.7.1.4 Further Mitigation

94. A range of mitigation measures, in the form of appropriate notification to aviation stakeholders, regularity of layout, lighting and marking (taking account of MGN 654 (M+F) OREI (MCA, 2021)) to minimise effects to aviation flight operations would expect to have already been in place, complying with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter.

17.7.1.5 Residual effect

95. The effect will be of **Negligible** significance, following notification, which is **not significant** in ES terms.

17.8 Potential cumulative effects

96. The approach to cumulative effects assessment (CEA) is set out in **Chapter 6: EIA Methodology**. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. Projects which are sufficiently implemented during the site characterisation for the Offshore Project have been considered as part of the baseline for the EIA. Where possible OWL has sought to agree with stakeholders the use of as-built project parameter information (if available) as opposed to consented parameters to reduce over-precaution in the cumulative assessment.

97. The impacts that are considered in the Civil and Military Aviation CEA are as follows:

- Creation of physical obstacle to aircraft operations
- Wind turbines causing interference on civil and military PSR systems.

17.8.1 Creation of physical obstacle to low level aircraft (including MCA aeronautical SAR) operations (Construction Impacts 1, Operation and Maintenance Impact 2 and Decommissioning Impact 1)

98. There is potential for cumulative effects on fixed wing and rotary aircraft (SAR helicopters) as a result of obstacles created by construction, operation, maintenance, and decommissioning activities associated with other Celtic Sea offshore renewable projects. For the purposes of this assessment, this possible cumulative effect has been assessed for projects within 40km of the Offshore Project, which is the maximum range where the creation of a cumulative aviation obstacle to fixed wing and rotary aircraft operating offshore may occur.

99. As for obstacles associated with the Offshore Project, at times of sufficient visibility (VMC) pilots are ultimately responsible for seeing and avoiding obstructions such as wind turbines and other infrastructure and will be aware through notification procedures of the projects. When flying in low visibility (IMC) pilots will be utilising on board radar which detects obstructions and be under the control of ATC with an appropriate level of radar service.

100. Aviation operations in the UK are highly regulated. The Offshore Project study area is located in airspace where the provision of an ATS is routine. The same rules of the air which maintain a safe operating environment in the current baseline will apply for the other projects offshore and in the Celtic Sea. Pilots of military low flying aircraft and other low flying operations (including SAR) are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter and will be notified of all project phases through notification procedures.

101. The impact is predicted to be of long-term duration, not reversable and continuous for the operational lifetime of the projects. It is predicted that the impact will negatively affect the aviation receptors operating in the airspace directly. Receptors will be notified of activity. The ability of aviation receptors to continue to operate safely in the vicinity of the windfarm sites remains as the obstacles are marked, lit and notified; however, in poor weather conditions and at night, some aircraft, dependent upon onboard systems and operator role, will alter tracks and operation to avoid the area.

17.8.1.1 Significance of effect

102. There are no beneficial effects.

103. In the context of the airspace available, there is not a substantial increase of negative effects. Overall, the magnitude of cumulative effects is deemed to be **Low** and the sensitivity of the receptors is considered to be **Low**. The effect will, therefore, be of **Minor** adverse significance for all scenarios, which is **not significant** in ES terms.

17.8.2 Wind turbines causing interference on civil and military Primary Surveillance Radar systems (Operation and Maintenance Impact 2)

104. The potential impact created by the MOD radar systems detection of the Offshore Project also exists in relation to other Celtic Sea offshore renewable projects. Cumulative radar effect is only possible in the operational phase of the projects. For the purposes of this assessment, this impact has been assessed within 100km from the project, which is considered to be the maximum range where radar cumulative effect may occur.

105. Theoretical radar LoS analysis indicates that wind turbines with a tip height of 284m amsl within the Offshore Project array area would be theoretically detectable (by varying degrees) by the MOD Hartland Point PSR and the Portreath ADR radar systems. The potential cumulative effect will be increased radar clutter and possibly an increase in the individual signal processing demands of the affected radar systems. The worst-case magnitude of potential cumulative effects is deemed to be medium. However, on the basis that no in-LoS windfarm would be permitted to operate without the necessary radar mitigation in place (in agreement with key aviation stakeholders), it is considered that the projects will not contribute to adverse cumulative effects on aviation radar, and the magnitude is considered to be **Low**.

106. All radar operators will ensure 'clutter free' radar to continue to deliver a safe and effective ATS to their stakeholders and to monitor UK airspace in a safety critical environment. As described previously, the sensitivity of radar stakeholders is considered to be **High**.

17.8.2.1 Significance of effect

107. There are no beneficial effects.

108. The sensitivity of the receptors considered is high and the worst-case magnitude of potential cumulative effects is deemed to be negligible given that the cumulative LoS projects would not be operated without mitigation in place. The effect is **Minor** adverse, below effect significance in ES terms, for all scenarios given that an enduring technical radar mitigation solution exists across each cumulative project to mitigate its radar effect.

17.9 Potential transboundary impacts

109. The Scoping Report identified that there was no potential for significant transboundary effects regarding civil and military aviation from the Offshore Project upon the interests of other EEA States and this is not discussed further.

17.10 Inter-relationships

110. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation, maintenance, or decommissioning of the Offshore Project on the same receptor (or group). A description of the process to identify and assess these effects is presented in **Chapter 6: EIA Methodology**. The potential inter-relationship effects that could arise in relation to Civil and Military Aviation include both:

- **Project lifetime effects:** Effects arising throughout more than one phase of the Offshore Project (construction, operation, maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation; and
- **Receptor led effects:** Assessment of the scope for all relevant effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

111. **Table 17.10** serves as signposting for inter-relationships.

Table 17.10 Civil and Military Aviation Inter-relationships

Topic and description	Related chapter	Where addressed in this Chapter	Rationale
Aviation lighting	Shipping and Navigation	**Sections 17.5, 17.6** and **17.7**.	Any lighting requirements for maritime and aviation navigation will be balanced with aviation lighting requirements defined through consultation.
Impacts to MCA 43: Lundy and Outer Bristol Channel and MCA 42 Bideford Bay and Taw-Torridge Estuary	Seascape, Landscape Visual Impact Assessment	**Section 19.8**	This section provides an assessment of the visual effects arising from the visible lighting requirements (aviation and marine navigational) of the Windfarm Site.

17.11 Interactions

112. The impacts identified and assessed in this chapter have also been assessed for potential interact with each other, which could give rise to synergistic impacts as a

result of that interaction. No such interactions have been identified for Civil and Military Aviation that are not covered by the individual effects assessments.

17.12 Summary

113. This chapter has investigated the potential effects on Civil and Military Aviation receptors arising from the Offshore Project. The range of potential impacts and associated effects considered has been informed by the Scoping Opinion, aviation stakeholder engagement, as well as reference to existing policy and guidance.

114. **Table 17.11** presents a summary of the impacts assessed within this ES chapter, and the residual effects.

17.12.1 Wind turbines, including construction and decommissioning activities, creating physical obstacles to low level aircraft (including MCA aeronautical SAR) operations (Construction Impact 1, Operation and Maintenance Impact 1 and Decommissioning Impact 1)

115. The construction, operation and maintenance, and decommissioning of offshore generating infrastructure, wind turbines of the Offshore Project array, would lead to the creation of multiple vertical physical obstacles to flight. Wind turbines might interfere and degrade aeronautical operations particularly at low levels over the sea.

116. Overall, the magnitude of cumulative effects is deemed to be **Low** and, the sensitivity of the receptors is considered to be **Low**. The effect will, therefore, be of **Minor** adverse significance for all scenarios, which is **not significant** in ES terms. There are no beneficial effects.

17.12.2 Wind turbines causing interference on civil and military PSR systems (Operation and Maintenance Impact 2)

117. Wind turbines causing interference on MOD PSR and ADR systems has been identified as a significant impact. The operational wind turbines of the Offshore Project array area would be theoretically detectable by the MOD Hartland Point ATC PSR and Portreath ADR systems. Wind turbines detectable by a radar system might degrade the system by creating false targets, reduce system sensitivity, create radar shadowing behind the wind turbines and saturate the radar receiver leading to clutter potentially concealing real aircraft targets.

118. The ability of MOD and operators of aviation radar systems to accurately use their respective radar systems for the provision of an ATS and State security, could be impacted by the presence of wind turbine interference and the production of radar clutter on radar displays. Overall, the magnitude of the negative impact is deemed to

be **Low**, and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be of **Moderate** significance, which is **significant** in ES terms.

119. The MOD, BEIS, TCE and the OWIC JTF published a strategy document entitled Air Defence and Offshore Wind, Working Together Towards Net Zero (JTF, 2021)[13] which sets out the process of the development of future technical radar mitigation schemes to mitigate ADR from the impact created by the radar detectability of operational wind turbines. One or two technical radar mitigation solutions have been identified and these systems have demonstrated that they could potentially support windfarm development, the JTF are working towards the procurement of an ADR technical mitigation solution which once deployed will provide an enduring solution.

120. The Applicant has and will continue to engage with the MOD prior to and during the application process and will continue this engagement and seek to identify agreed mitigation for the ADR system where required. The assumption that suitable mitigation would be agreed with the MOD reduces the negative effect (magnitude of effect) created by the Offshore Project to **Minor**, below effect significance in ES terms. There are no beneficial effects.

17.12.3 Effects Summary

121. The assessment of cumulative effects from the Offshore Project and other developments and activities concluded the following:

- Creation of cumulative physical obstacles to aircraft operations would not significantly increase the minor adverse assessment for the Offshore Project in isolation; and
- Wind turbines causing interference on MOD PSR, and ADR systems would not significantly increase the moderate adverse assessment for the Offshore Project in isolation, given that a technical radar mitigation solution exists across each cumulative project to mitigate its radar effect.

122. The screening of transboundary impacts identified that there was no potential for significant transboundary effects regarding Civil and Military Aviation from the Offshore Project upon the interests of other EEA States.

[13] Together Towards Net Zero

Table 17.11 Summary of potential impacts for Civil and Military Aviation during construction, operation, maintenance and decommission of the Offshore Project

Potential impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation measure	Residual effect
Construction						
Impact 1: Creation of physical obstacle to low level aircraft operations	Low flying civil (including SAR) and military aircraft	**Negligible**	**Low**	**Negligible**	Array layout and regularity Lighting and marking Notification	**Negligible**
Operation and Maintenance						
Impact 1: Creation of physical obstacle to low level aircraft operations	Low flying civil (including SAR) and military aircraft	**Low**	**Low**	**Minor**	Array layout and regularity Lighting and marking Notification	**Negligible**
Impact 2: Wind turbines causing interference on civil and military primary surveillance radar systems	MOD radar systems	**High**	**Low**	**Moderate**	JTF whose aim is to enable co-existence of air defence and offshore wind	**Minor**
Decommissioning						
Impact 1: Creation of physical obstacle to low level aircraft operations	Low flying civil (including SAR) and military aircraft	**Low**	**Negligible**	**Negligible**	Lighting and marking Notification	**Negligible**

17.13 References

Civil Aviation Authority (CAA), Civil Aviation Publication (CAP) 764. (2016). Policy and Guidelines on Wind Turbines.

CAA CAP 032. (2022). United Kingdom (UK) Integrated Aeronautical Information Package (IAIP).

CAA CAP 168. (2022). Licensing of Aerodromes.

CAA CAP 393. (2016). The Air Navigation Order (ANO) 2016 and Regulations; Includes guidance regarding the aviation and maritime lighting of wind turbines in UK territorial waters

CAA CAP 493. (2022). Manual of Air Traffic Services Part 1.

CAA CAP 670. (2019). Air Traffic Services Safety Requirements.

CAA CAP 738. (2020). Safeguarding of Aerodromes.

CAA CAP 1434. (2016). UK Flight Information Services.

CAA Chart. (2022). Visual Flight Rules.

Department for Business, Energy and Industrial Strategy (2021a) Draft Overarching National Policy Statement for Energy (EN-1).

Department for Business, Energy and Industrial Strategy (2021b) Draft Overarching National Policy Statement for Renewable Energy Infrastructure (EN-3).

Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy (EN-1).

Department of Energy and Climate Change (2011b) Overarching National Policy Statement for Renewable Energy Infrastructure (EN-3).

JTF. (2021). Air Defence and Offshore Wind, Working Together Towards Net Zero.

Maritime and Coastguard Agency (MCA). (2021). Marine Guidance Note (MGN) 654 (M+F) Offshore Renewable Energy Installations (OREI).

Ministry of Defence (MOD). (2022). Military Aviation Authority Regulatory Publications (MRP) including Regulatory Articles (RA) and Manuals.

MOD. (2022). UK Military Low Flying Handbook.

MOD. (2022). Military Aeronautical Information Handbook (Mil AIP).

Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework.