15. CIVIL AND MILITARY AVIATION

15.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the potential impacts of the Offshore Array Area (OAA), Offshore 220kV Electrical Substation, as well as the Offshore Export Cable (OEC), the Offshore Export Cable Corridor (OECC) and the Landfall (together referred to as the 'Offshore Site') on aviation and radar. Specifically, this chapter considers the potential impact of the Offshore Site above Lowest Astronomical Tide (LAT) during the construction, operation and maintenance and decommissioning phases of the Project.

The primary purpose of the EIAR is outlined in Chapter 1: Introduction. It is intended that the EIAR will provide stakeholders with sufficient information to determine the significant effects of the Offshore Site on the receiving environment.

In particular, this EIAR chapter:

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

The assessment should be read in conjunction with following linked and supporting chapters:

- Chapter 14 - Shipping and Navigation - pertains to wind turbine generator (WTG) lighting and potential use of flashing lights on WTGs to avoid confusion to mariners from aviation lighting; and
- Appendix 5-9: Lighting and Marking Plan – outlines the lighting and marking specifications for the constructed WTG's.

The potential effects of turbines on aviation are widely publicised but the primary concern is one of safety. The dominant scenarios that lead to potential impacts are as follows:

- Physical obstruction: WTG's can present a physical obstruction to aircraft;
- Impacts on aviation radar systems and the provision of radar-based Air Traffic Services (ATS): WTG's can create unwanted radar clutter which appears on radar displays and can affect the provision of ATS to pilots. Radar clutter (or false radar returns) can make it difficult for air traffic controllers to differentiate between aircraft and those radar returns resulting from the detection of WTG's. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and seduce those returns from 'real' aircraft away from the true aircraft position; and
- Communication, Navigation and Surveillance (CNS) equipment: A wide range of systems, together with air-ground communications facilities, can be adversely affected by development of infrastructure projects; specifically, when located within the physical safeguarding zones of CNS equipment.

It should be noted that adverse effects on radar systems are only possible if the WTG blades are moving, therefore this impact (impacts on aviation radar systems) is generally applicable to the operation and maintenance phase only, or at the time of blade tip installation depending at which location that takes place (i.e. within the OAA or elsewhere).

15.1.1 Statement of Authority

This chapter has been prepared by Wing Commander Mike Coleman Royal Air Force (RAF) (Retd). Mike retired from the RAF in December 2012 after 27 years' service. His last appointment was as RAF lead for safeguarding against the impact of wind farms on United Kingdom (UK) Ministry of Defence (MoD) operations. In other roles, he headed the RAF Air Traffic Control (ATC) and Air Defence (AD) Standards organisation and served at RAF Lossiemouth as the Senior Air Traffic Control Officer. Prior to converting to ATC, he completed operational tours as a fast-jet navigator compiling nearly 1000 flying hours on the Tornado GR1.

Mike has since worked, for over ten years, for numerous wind farm developers in resolving wind farm-related aviation issues; including civil airport radar and safeguarding, UK MoD ATC and AD radar, low flying and aviation lighting, search and rescue and emergency helicopter operations and Met Office radar. Engagements on other projects include provision of aviation specialist input into UK and Ireland EIARs and provision of advice to discharge aviation planning conditions. Previous project experience includes Arklow Bank, Celtic Sea and Sea Stacks.

Review and quality assurance of this chapter has been undertaken by Xodus Group Ltd and MKO Ireland Ltd.

15.2 Legislation, Policy and Guidelines

15.2.1 Legislation

In addition to those listed in Section 1.2 of Chapter 1: Introduction, the legislation that is applicable to the assessment of aviation and radar is summarised below.

- International Civil Aviation Organization (ICAO) Annex 14 - Aerodromes;
- Doc 8168 – ICAO Procedures for Air Navigation Services – Aircraft Operations;
- EU REGULATION 923/2012 – Standardized European Rules of the Air;
- Irish Aviation Authority (IAA) Order (1999) En-Route Obstacles to Air Navigation; and
- IAA Order (2005) Obstacles to Aircraft in Flight.

15.2.2 Policy

The key policies that are applicable to the assessment of aviation and radar are summarised in Table 15-1.

Table 15-1 Key policies relevant to the assessment

Policy	Relevance to the assessment
National Marine Planning Framework (2021)	
Defence and Security Policy 1: Any proposal that has the potential to interfere with the performance by the	The potential effects of the construction, operation and maintenance and decommissioning phases of the Project have been assessed in Section 15.7, including potential

Policy	Relevance to the assessment
Defence Forces of their security and non-security related tasks must be subject to consultation with the Defence Organisation. This includes potential interference with: › Safety of navigation and access to naval facilities; › Firing, test or exercise areas; › Communication, and surveillance systems; and › Fishery protection functions. Proposals should only be supported where, having consulted with the Defence Organisation, they are satisfied that it will not result in unacceptable interference with the performance by the Defence Forces of their security and non-security related tasks.	effects on Ireland's Defence Forces. Ireland's Department of Defence (DoD) have been consulted and details of this engagement are set out in Table 15-2. Factored-in measures are discussed in Section Table 15-5.
Offshore Renewable Energy Development Plan (OREDP), DCCAE (2014)	
Aviation and Radar	
Collision: Ensure wind devices are lit with aviation lights and provide notification of the erection of wind devices to the IAA.	Aviation marking and lighting requirements are discussed in Section 15.7.
Radar Interference: Consultation with the IAA will be required and the location of wind devices supplied so they can be accurately plotted on the radar and any signals received from that area will not be confused with aeroplanes.	Consultation with IAA is set out in Table 15-2. Factored-in measures are discussed in Section Table 15-5.
Military Exercise Areas	
Disruption to General Activities: Avoidance of bye-lawed and danger sites. Carry out site selection studies in conjunction with liaison with the DoD and the MoD, UK where applicable.	The proposed development is outside any promulgated Military Exercise Areas, as discussed in Section 15.5.3. Consultation with DoD is set out in Table 15-2.

15.2.3 Guidance

The principal guidance and best practice documents used to inform the assessment of potential impacts on aviation and radar is summarised below.

› IAA (En-Route Obstacles to Air Navigation) Order 1999;

- IAA (Guidance Material for Obstruction Surveys) Aeronautical Services Advisory Memorandum (ASAM) No: 023, Issue 2 2015;
- IAA (Guidance Material on Off-Shore Wind Farms) ASAM No: 018, Issue 2 2015;
- IAA (Obstacles to Aircraft in Flight) Order 2005;
- IAA Integrated Aeronautical Information Package (IAIP), 2024; and
- IAA Visual Flight Rules (VFR) Aviation Chart 1:500,000, 2024.

15.3 Consultation

Consultation with statutory and non-statutory organisations is a key part of the EIA process. Consultation with regard to aviation and radar has been undertaken to inform the approach and scope of the assessment. The key stakeholders for aviation and radar, included:

- IAA as a statutory consultee to Ireland's planning system;
- Ireland's DoD as a statutory consultee to Ireland's planning system;
- Met Eireann as a statutory consultee to Ireland's planning system; and
- Shannon Airport as a statutory consultee to Ireland's planning system.

The feedback received throughout this process has been considered in preparing the EIAR.

Table 15-2 provides a summary of the key issues raised during the consultation process relevant to aviation and radar and details how these issues have been considered in the production of this EIAR chapter.

Table 15-2 Consultation responses relevant to Aviation and Radar

Consultee	Comment	How issues have been addressed
Scoping Responses		
AirNav Ireland	No response received.	N/A
Commissioner of Irish Lights (CIL)	CIL scoping response received on 11/10/2023 requesting a meeting to discuss the proposed development. Meetings held with CIL, Corio, MKO and Xodus on 22/11/2023 and 17/10.2024. CIL noted that: › Irish guidance document is still being worked on, but in the interim, there is an expectation that projects will align with MGN 654, and with the IALA requirements. › CIL will be most concerned with the lighting and marking aspects of the site that will need to be provided in accordance with industry standards. › CIL will undertake inspections of the lighting systems on the turbines during the operation and maintenance phase.	The Applicant acknowledges and accepts CIL's comments regarding the lighting and marking of the WTG's. Further detail on these aspects are covered in Section 15.7 and Appendix 5-9: Lighting and Marking Plan.

Consultee	Comment	How issues have been addressed
DoD	The Department provides observations in relation to County Development Plans, Local Area Plans and Strategic Environmental Assessments. The Department does not provide observations for individual projects and developments. As such, the Department will not provide observations on individual planning applications, Environmental Impact Assessments or any notification relating to an individual development.	The Applicant acknowledges DoD's comments. Further detail on DoD operations is covered in Sections 15.5 and 15.7.
Galway Airport	No response received.	
IAA	IAA recommended that consultation is undertaken with AirNav, Galway Aviation Services Limited, DoD and IRCG. Advised that it is likely that, in the event of planning consent being granted, the IAA would request that the Applicant should be conditioned to contact IAA to: › Agree an aeronautical obstacle warning light scheme for the offshore wind farm development, › Provide as-constructed coordinates in WGS84 format together with blade tip height elevations at each WTG location; and › Notify IAA of intention to commence crane operations with at least 30 days prior notification of their erection.	The Applicant acknowledges and accepts IAA's comments regarding aviation lighting and provision of information on the proposed development to allow accurate charting of the WTG's and notification of cranes. Further detail on these aspects is covered in Section 15.7 and Appendix 5-9: Lighting and Marking Plan.
Shannon Airport	Confirmed receipt of the Scoping Report and had forwarded to counterparts in AirNav Ireland for information and comment. No further correspondence received.	The Applicant acknowledges Shannon Airport's comments. Further detail on Shannon Airport operations are covered in Sections 15.5 and 15.7.

15.4 Assessment Methodology

Chapter 4: EIA Methodology provides a summary of the general impact assessment methodology applied to the Project. The following sections confirm the methodology used to assess the potential impacts on aviation and radar.

This EIAR chapter describes the potential impacts of the proposed development on aviation and radar during the construction, operation and maintenance and decommissioning phases. The receptors which are considered in this chapter include:

- Airspace designations;
- Military aviation operations;
- Military exercise and training areas;
- Major civil airport procedures;
- Minor civil aerodrome procedures;
- Helicopters; and
- Civil and military radar (including Met Eireann meteorological radar).

The approach to the assessment of cumulative impacts, inter-related effects and transboundary impacts is provided in Sections 15.8, 15.9 and 15.10 respectively.

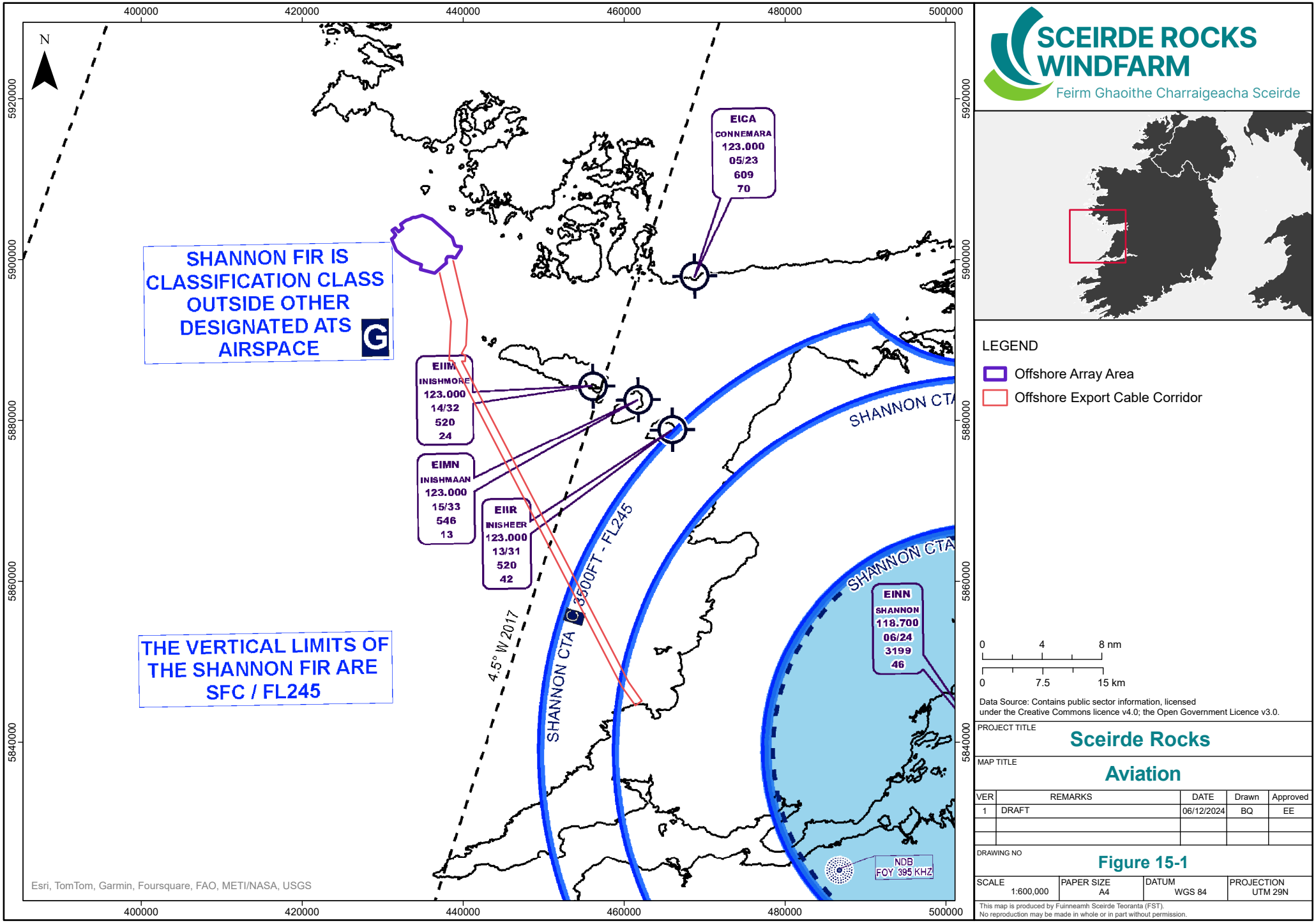
15.4.1 Study Area

The aviation and radar study area is determined by the range of the affected aviation receptors; in particular, Air Traffic Control (ATC) Primary Surveillance Radars (PSRs). The aviation and radar study area covers radars located in the west of Ireland that could potentially detect WTGs within the proposed development; with the extent of the aviation and radar study area defined by the furthest potential aviation receptor. The operating range of these radars can be up to 200 nautical miles (nm) (370 kilometres (km)); however, it is only the likely radar coverage over the Offshore Site that has been taken into account, as the question of whether the WTG's themselves are visible to radar is the determining factor relating to aircraft safety.

The aviation and radar study area are shown in Figure 15-1 below. This includes the OAA, OEC and OECC, as well as all areas that are of relevance to aviation and radar receptors. This includes:

- The airspace area designations including military exercise areas that intersect or are adjacent to the Offshore Site;
- The airspace used by helicopters on routes which may cross the Offshore Site area (i.e. helicopters used to service the Project during the operation and maintenance phase and emergency helicopters may require access to the Offshore Site area in the event of life-critical Search and Rescue (SAR) operations);
- Radars in the west of Ireland that could potentially detect the proposed development's WTG's; and
- The area within 9 nm (17 km) of the OAA boundaries (based on the potential for offshore oil and gas platforms and their associated 9 nm (17 km) consultation zones).

Figure 15-1 displays all aeronautical information within the aviation and radar study area, however only airspace designations relevant to the Project are labelled.



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor

0 4 8 nm

0 7.5 15 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Aviation

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 15-1

SCALE	PAPER SIZE	DATUM	PROJECTION
1:600,000	A4	WGS 84	UTM 29N

15.4.2 Data and information sources

15.4.2.1 Site specific surveys

No site-specific surveys have been undertaken to inform the EIAR for aviation and radar. This is because the baseline characterisation was developed through existing data sources and consultation is considered sufficient to inform the aviation and radar chapter.

15.4.2.2 Desk study

A comprehensive desk-based review was undertaken to inform the baseline for aviation and radar. Key data sources used to inform the assessment are set out in Table 15-3.

Table 15-3: Data sources

Data	Source	Date	Author
Sceirde Rocks Environmental Statement	Fuinneamh Sceirde Teoranta	2008	Aqua-Fact International Services Ltd.
CWP Offshore Scoping Report	Codling Wind Park Limited (CWPL)	2020	CWPL
CWP Onshore Infrastructure Scoping Report	CWPL	2021	CWPL
Sceirde Rocks Scoping Report	Fuinneamh Sceirde Teoranta	2023	MKO and Xodus
ENR 1.6: Radar services and procedures	IAA IAIP	2024	IAA
ENR 2.1: Air traffic services airspace	IAA IAIP	2024	IAA
ENR 5.2: Military exercise and training areas	IAA IAIP	2024	IAA
ENR 5.5: Aerial sporting and recreational activities	IAA IAIP	2024	IAA
ENR 6.1: Lower ATS routes	IAA IAIP	2024	IAA
Oil and Gas Latest Licence Acreage Report and Concession Map	Department of Communications, Climate Action and Environment (DCCAE)	2020	DCCAE

15.4.3 Impact Assessment

The significance of potential effects has been evaluated using a systematic approach, based upon identification of the importance / value of receptors and their sensitivity to the Project activity, together with the predicted magnitude of the impact.

In the absence of published policy and guidance for determining the effects of wind farms on aviation receptors, the terms used to define receptor sensitivity and magnitude of impact are based on expert judgement. Criteria have been adopted in order to implement a specific methodology for aviation and radar.

The methodology used for the aviation and radar assessment is a desk-based review using the data sources as described in Table 15-3. However, defining categories of receptor sensitivity and magnitude of impact is not appropriate for aviation as baseline aviation activities and equipment are highly sensitive to impacts and any magnitude of restriction on, or compromise to, activities or equipment (without embedded mitigation) is considered to be high. Therefore, the sensitivity of receptor and magnitude of impact will be explained via professional reasoning and judgement rather than via definitions of different categories. These judgements will feed into the determination of significance as shown in Table 15-4.

15.4.3.1 Significance Criteria

An impact assessment matrix will be used to determine the significance of an effect. In basic terms, the potential significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact, as shown in Table 15-4.

Table 15-4 Matrix for Determination of Significance

Sensitivity of Receptor	Magnitude of Impact			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Each level of significance can be described as follows:

- **Major** - Regular, frequent or permanent effects which require changes to existing operational and/or technical practice in order to mitigate adequately, or which are not capable of being mitigated adequately.
- **Moderate** - Periodic effects experienced which may require alterations to existing operational practice.
- **Minor** - Occasional effects experienced which do not require any alteration of existing operational and technical practice.
- **Negligible** - Normally no measurable change from baseline conditions which therefore do not require any alteration of existing operational and technical practice.

For the purposes of this assessment and in relation to the EIA Directive Regulations, as defined in Chapter 2: Background and Policy:

- a level of effect of moderate or more will be considered a 'Significant' effect; and
- a level of effect of minor or less will be considered 'Not Significant'.

Note that these levels (negligible to major) are specific to this topic, and differ from EPA definitions of significance, i.e., where moderate would be Not Significant.

15.4.4 Assumptions and limitations

No 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 in the following sections.

15.5 Baseline Conditions

The following section provides a description of the baseline conditions for aviation and radar and should be read in conjunction with Figure 15-1.

15.5.1 Airspace Designations

Ireland operates under the Flexible Use of Airspace (FUA) management concept, described by ICAO and developed by the European Organisation for the Safety of Air Navigation (Eurocontrol). The main principle of the FUA concept is that airspace should not be designated as civil or military airspace but is considered as one continuum in which all users' requirements are accommodated to the maximum extent possible. Any necessary airspace reservation or segregation is temporary, based on real-time usage within a specific time period (Department of Transport, Tourism and Sport (DTTS) et al., 2014).

The Offshore Site is located within the Shannon Flight Information Region (FIR) (see Figure 15-1), within which the IAA is the main provider of air navigation services. The IAA is a commercial semi-state company under the DTTS. The principal statutory functions of the IAA are to:

- Provide, or make arrangements for, the provision of air navigation services in Ireland's airspace (including adjacent airspace under international agreements);
- Provide communication services over the eastern part of the North Atlantic Region;
- Provide terminal (ATC) services at Cork, Dublin and Shannon airports; and
- Regulate the safety of Ireland's civil aviation industry and to oversee civil aviation security in the state.

In line with international aviation regulations, airspace in Ireland is categorised into seven classifications (Class A to Class G); the services provided within each classification are based on speed limitations, types of flights and rules for separation of aircraft.

The Offshore Site is situated in an area of Class G uncontrolled airspace which is established from the surface up to Flight Level (FL) 75 (7,500 feet (ft)) above which Class C controlled airspace is established from FL 75 up to FL 245 (24,500 ft). The structure of the airspace changes approximately 19 nm (35 km) to the southeast, with Class G uncontrolled airspace established from the surface up to 3,500 ft above mean seal level (amsl) and, above that, Class C controlled airspace from 3,500 ft (amsl) up to FL 245; this controlled airspace forms part of the Control Area surrounding Shannon Airport and provides increased protection for aircraft departing to/from the airport. Within these classifications of airspace, the following ATC rules apply:

- Class G Airspace: aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with, or receive a radar service

from, an ATC unit. Pilots of aircraft operating under VFR in Class G airspace are ultimately responsible for seeing and avoiding other aircraft and obstacles;
- Class C Airspace. Aircraft operating within Class C controlled airspace must be in receipt of an ATS from an appropriate ATC unit.

15.5.2 Military Aviation Operations

Ireland's DoD has its primary airbase at Casement Aerodrome, which is located at Baldonnel, County Dublin. Although Casement Aerodrome is located outside the aviation and radar study area, the DoD's Air Corps operates a fleet of fixed and rotary wing aircraft providing military support to the Army and Naval services throughout Ireland, together with non-military tasks such as Garda air Support, Air Ambulance, fisheries protection and the Ministerial Air Transport Service.

15.5.3 Military Exercise and Training Areas

The nearest military restricted aviation zone is located off the southwest coast of Cork; consequently, there are no military exercise and training areas within the aviation study area.

15.5.4 Major Civil Airport Procedures

The nearest major civil airport to the OAA is Shannon Airport located 48 nm (89 km) to the southeast. The proposed WTG's will be outside the 30 nm (56 km) safeguarding area for an airport of this nature; as recognised in CAP 764 – CAA Policy and Guidelines on Wind Turbines. Consequently, no major civil airport patterns and procedures will be affected by WTG's located within the OAA.

The Landfall or the OEC route is located 25 nm (46 km) to the west of Shannon Airport which is within the 30 nm (56 km) safeguarding area for the airport. However, as any construction work will involve trenching and groundworks only, no civil airport patterns and procedures will be affected by the OEC route.

15.5.5 Minor Civil Aerodrome Procedures

There are five minor aerodromes (Connemara, Inisheer, Inishmaan, Inishmore and Spanish Point) within the aviation study area (see Figure 15-1), the nearest of which is Inishmore located 13 nm (24 km) to the southeast of the OAA. All the aerodromes are operated under VFR conditions; as such, none of these aerodromes have any published patterns and procedures that can be affected by the Offshore Site.

15.5.6 Helicopters

Helicopters must avoid vessels and structures by keeping a minimum distance of 500 ft. In visual conditions, pilots may use designated helicopter routes, or they may opt to fly direct to their destination in open air space. When operating in poor weather, pilots must fly in accordance with Instrument Flight Rules (IFR) in which helicopters require a Minimum Safe Altitude (MSA) of 1,000 ft height clearance from obstacles within 5 nm (9 km) of the aircraft.

To help achieve a safe operating environment, UK guidance requires a consultation zone of 9 nm (17 km) radius around offshore helicopter destinations. No comparable guidance has been identified for Ireland and therefore UK guidance has been considered for the Offshore Site. There are presently no helicopter routes or offshore helicopter destinations in the vicinity of the Offshore Site area. There is also no oil and gas infrastructure including platforms, subsea facilities or wells which may require

helicopter access within 9 nm (17 km) of the OAA or OEC route. No regular helicopter flight paths servicing the oil and gas industry are therefore anticipated to cross the Offshore Site area.

In Ireland, the Irish Coast Guard (IRCG) operates five SAR helicopters deployed at bases in Dublin, Waterford, Shannon and Sligo, which respond to emergencies at sea, inland waterways, offshore islands and the mountains of Ireland. SAR is also considered within Chapter 14: Shipping and Navigation.

15.5.7 Civil and Military Radar (including Met Eireann Meteorological Radar)

Civil airspace and air traffic surveillance and management infrastructure is comprised of the following systems:

- Primary Surveillance Radar (PSR);
- Secondary Surveillance Radar (SSR); and
- Aeronautical Navigation Aids (NAVAIDs).

These are discussed in turn below, followed by military and meteorological radar systems.

15.5.7.1 PSR

PSRs are used for non-co-operative surveillance and to provide ATS to aircraft arriving and departing to / from aerodromes and airports and in the transit phase of flight. The IAA use PSR primarily for civil airport and military airfield operations in Ireland. There are three PSRs in Ireland located at Cork, Dublin and Shannon airports. The nearest PSR to the OAA is located at Shannon Airport approximately 48 nm (89 km) southeast.

15.5.7.2 SSR

SSR is used in conjunction with PSR to provide additional information about aircraft. SSR is used for co-operative surveillance of aircraft arriving and departing to / from aerodromes and airports and in the transit phase of flight. Only aircraft with a transponder can be detected by SSR.

The nearest SSR to the OAA is located at Shannon Airport, 48 nm (89 km) southeast which is outside the relevant 8 nm (15 km) safeguarding distances as per ICAO EUR DOC 015 (ICAO, 2015) and CAP 670 (UK Civil Aviation Authority (CAA), 2022).

15.5.7.3 NAVAIDS

No aeronautical radio navigation beacons have been identified in proximity to the Offshore Site. In Ireland, all NAVAIDs are located on land and the Offshore Site is outside the relevant safeguarding distances as per ICAO EUR DOC 015 (ICAO, 2015) and CAP 670 (CAA, 2022).

15.5.7.4 Military Radar

In Ireland, military ATS are provided by the Irish Air Corps using radar data fed directly from IAA-operated PSRs. At Casement Aerodrome (located at Baldonnel, County Dublin), military controllers provide ATS using radar data from the Dublin Airport PSR. Ireland's DoD has no dedicated PSRs that require safeguarding from the potential effects of the OAA.

15.5.7.5 Met Eireann Meteorological Radar

Meteorological radar detects precipitation and estimates its type, severity and motion. They are typically safeguarded within 30 km of their location (Meteo France, 2010). The nearest Met Eireann meteorological radar is located at Shannon Airport, 48 nm (89 km) to the southeast of the OAA. No meteorological radar has been identified within 30 km of the OAA which is the recognised consultation distance for a radar of this nature.

15.5.8 Climate Change and Natural Trends

Climate change and natural trends have been considered as part of the aviation and radar assessment however, it is concluded that, due to the unique nature of aviation operations, there will be no implications for aviation and radar operations related to climate change and natural trends.

15.5.9 Predicted Future Baseline

There are no anticipated future changes to the airspace environment in the vicinity of the Project that will affect this assessment of the impact on aviation and radar.

15.6 Receptor Evaluation

15.6.1 Consideration of data sources and quality.

The data used in this chapter are detailed in Table 15-3. The data used are the most up to date publicly available information which can be obtained from the applicable data sources as cited. Data has also been provided through consultation as detailed in Table 15-2. It is considered that the data employed in the assessment are robust and sufficient for the purposes of the impact assessment presented.

15.6.2 Mitigation by Design

The Project design set out in Chapter 5: Project Description includes a number of designed-in measures and management measures (or controls) which have been factored into the Project and are committed to be delivered as part of the Project.

These factored-in measures (i.e. mitigation by design) are standard measures applied to offshore wind development, including lighting and marking of the Project to reduce the potential for negative effects. Factored-in measures relevant to the assessment on aviation and radar are presented in Table 15-5. These measures are integrated into the Project and have therefore been considered in the impact assessment (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development.

Table 15-5: Factored in measures.

Factored in measures	Justification
A draft Lighting and Marking Plan (LMP) has been prepared which sets out specific requirements in terms of aviation lighting to be installed on the turbines. The LMP will be further developed in consultation with the IAA, DoD and IRCG. It will take into account DoD's requirement that WTGs are observable to night vision equipment. The draft LMP is included in Appendix 5-9: Lighting and Marking Plan.	To ensure appropriate lighting is in place to facilitate aeronautical safety.
IAA and IRCG will be consulted on the Project to ensure compatibility with SAR helicopter operations in the event of rescue missions within the site.	To ensure compatibility between marine navigation and SAR helicopter operations in terms of lighting requirements.
A minimum spacing of 500 m shall be maintained between blade tip to blade tip of all turbines.	To facilitate access by SAR helicopters operating under Instrument Meteorological Conditions (IMC) flight rules.
An Emergency Response and Cooperation Plan (ERCoP) will be in place for the Project. The ERCoP will refer to the marking and lighting of the WTG's and will consider helicopters undertaking SAR operations when rendering assistance to vessels and persons in the vicinity of the Project. An ERCoP is included in Appendix 5-4: ERCoP. A Lighting and Marking Plan is also included as Appendix 5-9.	To ensure appropriate lighting is in place to facilitate aeronautical safety during SAR operations.
The IAA will be informed of the locations, heights and lighting status of the WTG's, including estimated and actual dates of construction and the maximum heights of any construction equipment to be used, prior to the start of construction, to allow inclusion on aviation charts and in the IAA IAIP.	To comply with OREDP (DCCAE, 2014) which requires the IAA to be notified of the construction and location of WTG's.
All structures > 90 m amsl in height will be charted on aeronautical charts and reported to the IAA at least three months prior to construction, for input into the IAA's database of tall structures in Ireland.	An obstacle which is higher than 90 m in height is considered to have significance for the en-route operations of aircraft in Irish airspace.
Any temporary obstacles associated with wind farms which are of more than 90 m in height are to be alerted to aircrews by means of the Notice to Aviation (NOTAM) system.	Consultation with the IAA will be required to ensure that temporary obstacles of more than 90 m are identified to aircrews by NOTAM. Notification of temporary obstacles will be a condition of any planning consent. Measures will be adopted to ensure that the potential for risk of aircraft collision with the proposed development's infrastructure is minimised.
During the operation and maintenance phase, the operator of the Project will issue, as necessary, requests to the IAA to submit Aeronautical Information Circulars in the event of any failure of aviation lighting. Any light which fails shall be repaired or replaced as soon as is reasonably practicable.	To comply with IAA ASAM No.18 (IAA, 2015a) which contains the policy on actions in the event of the failure of aviation warning lights on offshore WTG's listed in the IAA IAIP.

Factored in measures	Justification
An alerting system for light failure will be put in place, such as remote monitoring or other suitable method agreeable to the IAA.	

15.6.3 Impact Assessment Methodology

15.6.3.1 Key parameters for assessment

The assessment of significance of effects has been carried out on the Project design detailed in Chapter 5: Project Description. This approach has allowed for a robust and full assessment of the Project. The project design parameters relevant to each potential impact are detailed in Table 15-6.

Table 15-6: Project design parameters and impacts assessed.

Potential impact	Phase			Project design option	Justification
	C	O	D		
Creation of physical obstacles affecting air traffic	C	O	x	**Construction phase** Installation of 30 WTGs within the OAA with tip height of 324.9 m above Lowest Astronomical Tide (LAT) including construction equipment (such as cranes) which will be no higher than 324.9 m above LAT; Offshore construction may take place over a period of up to three years. **Operation and maintenance phase** Presence of 30 WTGs within the OAA with tip height of 324.9 m above LAT, with maintenance equipment (such as cranes) no higher than 324.9 m above LAT; Operation and maintenance phase up to 38 years. **Decommissioning phase** As above for the construction phase.	These parameters represent the maximum height of infrastructure and associated installation equipment within the Offshore Site, which has the greatest potential for obstruction to air traffic.
Interference with civil PSR systems	x	O	x	**Operation and maintenance phase** Presence of 30 WTGs within the OAA with tip height of 324.9 m above LAT, with maintenance equipment (such as cranes) no higher than 324.9 m above LAT; Operation and maintenance phase up to 38 years.	These parameters represent the maximum height of infrastructure and associated maintenance equipment within the Offshore Site which has the greatest potential for interference with radar systems.

15.7 Likely Significant Effects and Associated Mitigation Measures

15.7.1 Do Nothing Scenario

If the Project doesn't proceed, the opportunity to capture the available renewable energy resource and connect it to Ireland's electricity grid would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions. In the event that the Project does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

There is potential for significant growth in offshore wind energy, with the Irish Government setting out plans for 5 gigawatts (GW) of offshore wind by 2030 and up to 37 GW by 2050; with much of the future capacity to be located of the west coast. Therefore, there is potential for an increase in aviation activity in Ireland to support future offshore energy developments. However, any increases in aviation activity will be managed by means of existing aviation rules enabling deconfliction between aviation assets to be maintained.

15.7.2 Construction Phase

15.7.2.1 Creation of physical obstacles affecting air traffic

The installation and presence of WTG's pose physical obstructions to aviation operations carried out in the vicinity of wind farms. WTG's can be difficult to see from the air, particularly in poor meteorological conditions, leading to a potential increase in obstacle collision risk. During the construction phase, the presence and movement of installation vessels (with onboard cranes) may also present a potential obstacle collision risk to aircraft operations; the cranes used during the construction phase will have a maximum operating height no higher than 324.9 m above LAT.

Sensitivity of the Receptor

Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. Under VFR conditions, pilots are ultimately responsible for seeing and avoiding obstructions such as WTG's and will be aware of their presence through the notification procedures set out in Table 15-5.

In terms of potential impact on DoD aviation operations, DoD have not provided additional feedback but are expected to request that the turbines are marked and lit and observable to night vision equipment (see Section 15.5.2). In terms of SAR operations, consultation has been carried out with IRCG on their requirements in relation to the Project. Furthermore, a Lighting and Marking Plan (LMP) has been developed in accordance with Irish Aviation Authorities (IAA) Guidance Material on Off-Shore Wind Farms, Aeronautical Services Advisory Memorandum (ASAM) No 18. Issue 2 (IAA, 2015). The draft LMP can be found at Appendix 5-9: Lighting and Marking Plan.

All aviation operations are deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Magnitude of Impact

The presence of construction infrastructure, such as installation vessels (with cranes no higher than 324.9 m above LAT) will be alerted to pilots under the Notice to Aviation (NOTAM) system (see Table 15-5). The NOTAM will provide details of potential hazards along a flight route, or at a location, which could affect the safety of flight. The cranes will also have appropriate aviation lighting installed.

In terms of the WTG's themselves, aircraft operating at low levels are required to set a Minimum Safe Altitude (MSA); this is the lowest altitude set in areas to ensure safe separation between aircraft and known obstacles. The MSA for aircraft operating in Instrument Meteorological Conditions (IMC) (i.e. poor weather conditions), enables aircraft to maintain a minimum of 1,000 ft (305 m) clearance between aircraft and known obstacles. The tip height of the proposed turbines is 324.9 m (1,066 ft) (above LAT). Therefore, the MSA in the area of the Project will need to be 2,100 ft (1,066 ft + 1,000 ft rounded to the next 100 ft) in order to maintain at least 1,000 ft vertical separation between the WTG's and aircraft.

As detailed in Table 15-5, potential impacts to low flying aircraft operating in the vicinity of the Project will be managed through the agreement of a LMP (see Appendix 5-9: Lighting and Marking Plan) with key aviation stakeholders, and notification of the locations, heights and lighting status of the WTG's to aviation stakeholders for inclusion in appropriate aviation documentation and charts. This will enable aviation operators to set an appropriate MSA over the proposed development. The LMP will also cover the lighting and marking details for the construction infrastructure (e.g. cranes).

Pre-Mitigation Effect

The impact on aviation is predicted to be of local spatial extent, short to medium term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Low**. Therefore, the effect of creating physical obstacles to air traffic as a result of installation of the proposed WTG's is minor, which is Not Significant (see Table 15-4).

Mitigation

A number of mitigation measures have been included within the Project design as detailed in Table 15-5 above.

Residual Effect

Following implementation of factored-in measures outlined in Table 15-5, the magnitude of the impact has been assessed as Low, with the maximum sensitivity of the receptor being High. No additional mitigation to that already identified in Table 15-5 is considered necessary. Therefore, the significance of effect of creating physical obstacles to air traffic as a result of installation of the proposed WTG's is minor, which is Not Significant.

Significance of Effect

The significance of effect of creating physical obstacles to air traffic as a result of installation of the proposed WTG's is Not Significant. Consequently, no significant residual effects have been predicted.

15.7.3 Operation and Maintenance Phase

15.7.3.1 Creation of physical obstacles affecting air traffic

Sensitivity of the Receptor

Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter; however, during flight, weather conditions or operational requirements may necessitate route adjustments. Under VFR conditions, pilots are ultimately responsible for seeing and avoiding obstructions such as WTG's and will be aware of their presence through the notification procedures set out in Table 15-5.

In terms of potential impact on DoD aviation operations, DoD have not provided additional feedback but are expected to request that the turbines are marked and lit and observable to night vision equipment (see Section 15.5.2).

In terms of SAR operations, consultation has been carried out with IRCG on their requirements in relation to the Project. Furthermore, a Lighting and Marking Plan (LMP) has been developed in accordance with Irish Aviation Authorities (IAA) Guidance Material on Off-Shore Wind Farms, Aeronautical Services Advisory Memorandum (ASAM) No 18. Issue 2 (IAA, 2015). The draft LMP can be found at Appendix 5-9: Lighting and Marking Plan.

Additionally, in the case that there may be 1-2 helicopter flights associated with the operation and maintenance off the OAA, no potential for negative significant effects is considered, based on the baseline information provided; there are no existing helicopter flight paths within the OAA and that the mitigations, including those by design and routing safety protocols in place for aviation operations, will ensure no significant potential effects.

All aviation operations are deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Magnitude of Effect

As discussed in Section 15.7.2.1, aircraft operating at low levels are required to set an MSA. The tip height of the proposed turbines is 324.9m (1,066 ft) (above LAT). Therefore, the MSA in the area of the Project will need to be 2,100 ft (1,066 ft + 1,000 ft rounded to the next 100 ft) in order to maintain at least 1,000 ft vertical separation between the WTG's and aircraft.

As detailed in Table 15-5, potential impacts to low flying aircraft operating in the vicinity of the Project will be managed through the agreement of a LMP (see Appendix 5-9: Lighting and Marking Plan) with key aviation stakeholders, and notification of the locations, heights and lighting status of the WTG's to aviation stakeholders for inclusion in appropriate aviation documentation and charts. This will enable aviation operators to set an appropriate MSA over the Project.

During maintenance periods, it may be necessary to use surface vessels with crane capabilities for replacement of component parts e.g. WTG blades. These temporary obstacles will be addressed under the NOTAM system as discussed in Table 15-5.

Pre-Mitigation Effect

The impact is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **Low**. Therefore, the effect of creating physical obstacles to air traffic as a result of operation of the proposed WTG's is **minor**, which is Not Significant (see Table 15-4).

Mitigation

A number of mitigation measures have been included within the Project design as detailed in Table 15-5 above.

Residual Effect

Following implementation of factored-in measures outlined in Table 15-5, the magnitude of the impact has been assessed as **Low**, with the maximum sensitivity of the receptor being **High**. No additional mitigation to that already identified in Table 15-5 is considered necessary. Therefore, the significance of effect of creating physical obstacles to air traffic as a result of operation of the proposed WTG's is **minor**, which is Not Significant (see Table 15-4).

Significance of Effect

The significance of effect of creating physical obstacles to air traffic as a result of operating the proposed WTG's is Not Significant. Consequently, no significant residual effects have been predicted.

15.7.3.2 Interference with Civil PSR Systems

WTG's have been shown to have detrimental effects on the performance of PSR systems and have the potential to affect the provision of radar-based ATS. These effects include the desensitisation of radar in the vicinity of WTG's, shadowing and the creation of unwanted returns which air traffic controllers must treat as aircraft returns. Unwanted radar clutter can affect the provision of ATS to pilots. Radar clutter (or false radar returns) can confuse air traffic controllers making it difficult to differentiate between aircraft and those radar returns resulting from the detection of WTG's. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and seduce those returns from real aircraft away from the true aircraft position.

It should be noted that adverse effect on PSRs is only possible if the WTG blades are moving, therefore this impact is applicable to the operational and maintenance phase only.

Sensitivity of the receptor

Desensitisation of the radar could result in aircraft not being detected by the radar and therefore not presented to air traffic controllers. Controllers use the radar to separate and sequence aircraft; therefore, maintaining situational awareness of all aircraft movements within the airspace is crucial to achieving a safe and efficient ATS, and the integrity of radar data is central to this process. The creation of unwanted returns displayed on the radar leads to increased workload for both controllers and aircrews. Furthermore, real aircraft returns can be obscured by a turbine's radar return, making the tracking of both conflicting unknown aircraft and the controllers' own traffic much more difficult.

Impact on civil PSR systems is deemed to be of high vulnerability, high recoverability and high value. The sensitivity of the receptor is therefore, considered to be **High**.

Magnitude of Impact

Given the distance of the proposed development from Shannon Airport (approximately 48 nm), adverse impact on the Shannon PSR system is not expected. However, as no feedback from AirNav Ireland has been received, it has to be considered that the proposed development may adversely impact the Shannon PSR system.

Pre-Mitigation Effect

The impact is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore from a precautionary approach, considered to be **High**. Therefore, the significance of effect of creating interference with civil PSR systems as a result operating the proposed WTG's is **major**, which is Significant (see Table 15-4).

Mitigation

If AirNav Ireland and Shannon Airport consider that the Project will adversely impact the Shannon PSR system, the Applicant will commence discussions with both stakeholders regarding potential mitigation solutions. There are proven processes and techniques available to mitigate the adverse impact of WTG's on PSRs. It is likely that any impacts could be mitigated by means of radar blanking; a technical mitigation solution routinely offered by aviation stakeholders that removes WTG returns from the ATC radar display. If required, the Applicant will negotiate a solution with AirNav Ireland and Shannon Airport with the aim of delivering a suitable radar mitigation solution prior to the operation phase of the proposed development.

Residual effect

Following implementation of additional mitigation, the magnitude of the impact has been assessed as **Low**, with the maximum sensitivity of the receptor being **High**. Therefore, the significance of effect of creating interference with civil PSR systems as a result of operation of the proposed WTG's is **minor**, which is Not Significant (see Table 15-4).

Significance of Effect

Following implementation of additional mitigation, the significance of effect of creating interference with civil PSR systems as a result of operating the proposed WTG's is Not Significant. Consequently, no significant adverse residual effects have been predicted in respect aviation and radar.

15.7.3.3 Decommissioning Phase

The effects of decommissioning activities are expected to be the same or similar to the effects from construction. The significance of effect is therefore **minor**, which is Not Significant.

15.8 Residual Effects

A summary of the significance of each impact is presented in Table 15-7, alongside its resulting residual effect. No significant negative residual effects of the Offshore Site are predicted.

Table 15-7 Summary of effects

Effect	Phase	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect	Residual Effect	Significance of Residual Effect
Creation of physical obstacles	Construction	High	Low	Minor; Not Significant	Project design measures to mitigate this	Minor; Not Significant

affecting air traffic					effect include implementation and adherence to a Lighting and Marking Plan (Appendix 5-9)	
Interference with Civil PSR Systems	Operation and maintenance	High	High	Major; Significant	Mitigation measures described in detail in 15.7.3.2	Minor; Not Significant

15.9 Cumulative Effects

The cumulative impact assessment takes into account the impact associated with the Project together with other projects and plans. The projects and plans selected as relevant to the cumulative impact assessment presented within this chapter are based upon the results of a screening exercise (see Appendix 4-1 of Chapter 4: EIA Methodology). Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

In terms of assessing aviation and radar cumulative effects, the impact on any aviation receptor is generally treated as a standalone, project specific impact. Whilst other WTG developments may be located in close proximity, the impact on each receptor is considered on a case-by-case basis.

The predicted effects from the Project on Civil and Military Aviation receptors are considered to be localised to within the footprint of the Project. Given that the impact on any radar system of the proposed WTGs is not considered significant, the Project will not present any cumulative effect on radar systems. Furthermore, given the distance of the Project from known offshore and onshore developments, the Project is also not considered to present any cumulative effect on military low flying or SAR/helicopter operations in the region.

The approach to the aviation and radar assessment examines the cumulative effects of the Project alongside the following projects:

- Other projects with consent but not yet constructed/construction not completed;
- Other projects in the planning process;
- Other projects currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact; and
- Offshore projects, which satisfy the definition of 'relevant maritime usage' under the Maritime Area Planning Act (2021) (i.e. wind farm projects designated as 'Relevant Projects' or 'Phase one Projects').

Based on the above and noting that all of the relevant projects and plans with the potential to have a cumulative effect with the project are over 30km from the OAA, there is no potential cumulative effects from other projects and activities in the Civil and Military Aviation Study Area and the significance of effect is therefore Not Significant.

15.10 Potential Inter-Related Effects

The aviation and radar assessment will be linked to Chapter 14: Shipping and Navigation due to the need to ensure that SAR helicopter lighting and marking requirements are considered jointly with SAR surface vessel lighting and marking requirements. Where design commitments have been made to

avoid, limit or mitigate impacts on receptors considered within this assessment, these have also been considered with those made in Chapter 14: Shipping and Navigation to avoid conflicting mitigation commitments between the two assessments. In doing so, a draft LMP check has been developed in order to ensure aviation and surface vessel lighting and marking requirements are compatible; see Appendix 5-9: Lighting and Marking Plan.

15.11 Transboundary Impacts

No potential for significant transboundary effects with regard to aviation and radar from the Proposed Development upon the interests of other states has been identified.

15.12 Conclusion

Information on aviation and radar receptors within the aviation and radar study area was collected through a desktop review and consultation with the relevant stakeholders.

The impacts assessed include creation of physical obstacles affecting air traffic; and interference with civil PSR systems.

Section 15.8 presents a summary of the potential mitigation measures and residual effects. The cumulative impacts were assessed in Section 15.9. Overall, it is concluded that there will be No Significant effects arising from the Project during the construction, operation and maintenance and decommissioning phases and there will be No Significant cumulative effects from the proposed development alongside other projects/plans.

No potential transboundary impacts have been identified in regard to effects of the proposed development.

Overall, it is concluded that there will be No Significant effects arising from the Offshore Site during the construction, operation and maintenance and decommissioning phases.