Report

Garrane Wind Farm

Aviation Review Statement

Document Number:	001/GE2025			
Author:	PT\DMG			
Approved for Release:	Rev 3.1	K Hayes	**Date:**	28/05/2025

Document Filename: *Garrane Wind Farm - Aviation Review Statement*

Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Garrane. As part of the review, the following subjects were considered:

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of Proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

Annex 14 - Obstacles Limitation Surfaces (OLS)

A review shows that the proposed wind farm would be located outside the Outer Horizontal Surface of the Shannon Runway Obstacle Limitation Surfaces (OLS), as defined in ICAO (International Civil Aviation Organization) Annex 14.

As the proposed wind farm is situated outside the Outer Horizontal Surface and there is no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Shannon Airport.

Annex 15 - Aerodrome Surfaces

Following a review of ”Terrain and obstacle requirements Area 1” as defined in ICAO Annex 15, wind turbines need to be registered if they are more than 100 meters above terrain. From the centre point (ARP – Airport Reference Point) of Shannon Airport to the boundary of the Area 1 of the Annex 15 Aerodrome Surface is 45 km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft. Should the proposed windfarm be permitted, the turbines would be within 45km of Shannon Airport’s ARP and would be greater than 100m in height. Therefore the turbines would be required to be included in the IAA Electronic Air Navigation Obstacle Dataset.

Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities. A review shows that the proposed wind farm is over 32 km from the BRA surfaces at Shannon Airport. At this distance there will be no impacts to the BRAs due to the proposed wind turbines at the proposed wind farm.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which may be used that will provide a minimum obstacle clearance of 1000ft above all obstacles within a sector of 25 nautical miles (46km) from the VOR/DME at Shannon Airport. The maximum turbine tip-height at the proposed wind farm site could be up-to 774ft above mean sea level (AMSL). There is over 1000ft from the maximum height of the wind farm to the MSA altitude and therefore there would appear to be no impact on the published MSA altitudes for Shannon Airport.

Instrument Flight Procedures

There are 9 Instrument Flight Procedures for flights to/from Shannon Airport. Due to the distance of the proposed wind farm from the airport, and as there are existing obstacles nearer to the airport than the proposed development, there should be no impacts to these flight procedures.

A detailed instrument flight procedure analysis is outside of the scope of this report; however, from the desktop assessment conducted it is envisaged that the MSA heights will not be required to be adjusted and the Air Navigation Service Provider (ANSP) at Shannon Airport is unlikely to require a detailed assessment on the impact of the proposed turbines on flight procedures.

Communications and Navigation Systems

As the proposed wind farm is approximately 37 km from the Localizer and transmitting antennas at Shannon Airport, it is very unlikely that wind turbines at the proposed development will have any impact on these ATS communications and radio navigational aids.

Radar Surveillance Sensors

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 16km safe distance from the surveillance radar system (SSR), for a "*Zone 4 - No Assessment*" condition. It has been highlighted in the analysis that turbines at the proposed farm would be located at a minimum distance of 35 km from the PSR/SSR radar stations at Shannon Airport and at

Woodcock Hill and in Assessment Zone 4 of the EUROCONTROL Guidelines. As the turbines are located in Assessment Zone 4, a detailed impact assessment on Radar Surveillance Systems will not be required by the IAA.

Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon Airport for calibration of instrument landing systems. It is unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. existing wind farms).

IAA - Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA are likely to request lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development would be considered as an en-route obstacle. The IAA-ANSP will require wind turbine obstacles to be fitted with an Obstacle Warning Light System.

Irish Air Corps / Department of Defence Safeguarding

The Irish Air Corps position on wind farms / tall structures are outlined in the paper which was published in 2014: "*Air Corps Wind Farm/ Tall Structures Position Paper*". In the position paper the Irish Air Corps (IAC) outlines restricted areas where they would object to the installation of wind turbines /tall structures. The areas defined by the Air Corps have been mapped and analysis shows that proposed wind farm site is located outside the restricted areas. As the proposed wind farm is not located in a restricted area it should have no impacts on the Irish Air Corps activities. . However, the DoD have made specific observations regarding an Aeronautical Obstacle Warning Light Scheme for the IAC. The Aeronautical Obstacle Warning Light Scheme is subject to agreement with DoD. Following agreement with the DoD\IAC the details would be submitted to the Planning Authority prior to construction. Any agreements on aviation lighting would be designed to minimise cumulative visual effects.

Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Irish Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). An assessment of GASU and EAS operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Abbreviations

AGL	Above Ground Level
AMSL	Above Mean Sea Level
ARP	Airport Reference Point
BRA	Building Restricted Area
DME	Distance Measuring Equipment
DoD	Department of Defence
EAS	Emergency Aeromedical Service
GASU	Garda Air Support Unit
GP	Glide Path
HLS	Helicopter Landing Site
IAA	Irish Aviation Authority
IAC	Irish Air Corps
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
ILS	Instrument Landing System
OLS	Obstacle Limitation Surface
PSR	Primary Surveillance Radar
RWY	Runway
SID	Standard Instrument Departure Route
STAR	Standard Arrival Route
SSR	Secondary Surveillance Radar
NATS	National Air Traffic Services (UK)
NM	Nautical Miles
VOR	VHF Omni-directional Range Station

Sections

Appendices

1. Introduction

This section provides a brief summary of the proposed wind farm development at Garrane and of the nearest significant aviation installation at Shannon Airport.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Limerick approximately 37 km southeast of Shannon Airport. Figure 1 shows the proposed wind farm site with respect to Shannon Airport and the IAA radar stations at Shannon and Woodcock Hill.

Figure 1. Location of proposed wind farm at Garrane

1.2 Shannon Airport

Table 2 below shows the co-ordinates of Shannon Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Shannon Airport operates in Class C controlled airspace with Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) Flight rules.

Location	Installation	Description	Airport Ref. Point ARP	ARP Distance to Proposed Wind Farm
Shannon, Co Clare	International Airport	Single Asphalt Runway Airspace: Class C	52 42 07 N 008 55 29 W (Mid-point of Runway 06/24).	36.3 km

Table 1. Shannon Airport Details

The aeronautical navigation aids at the aerodrome include DVOR/DME, NDB, ILS LOC and ILS GP.

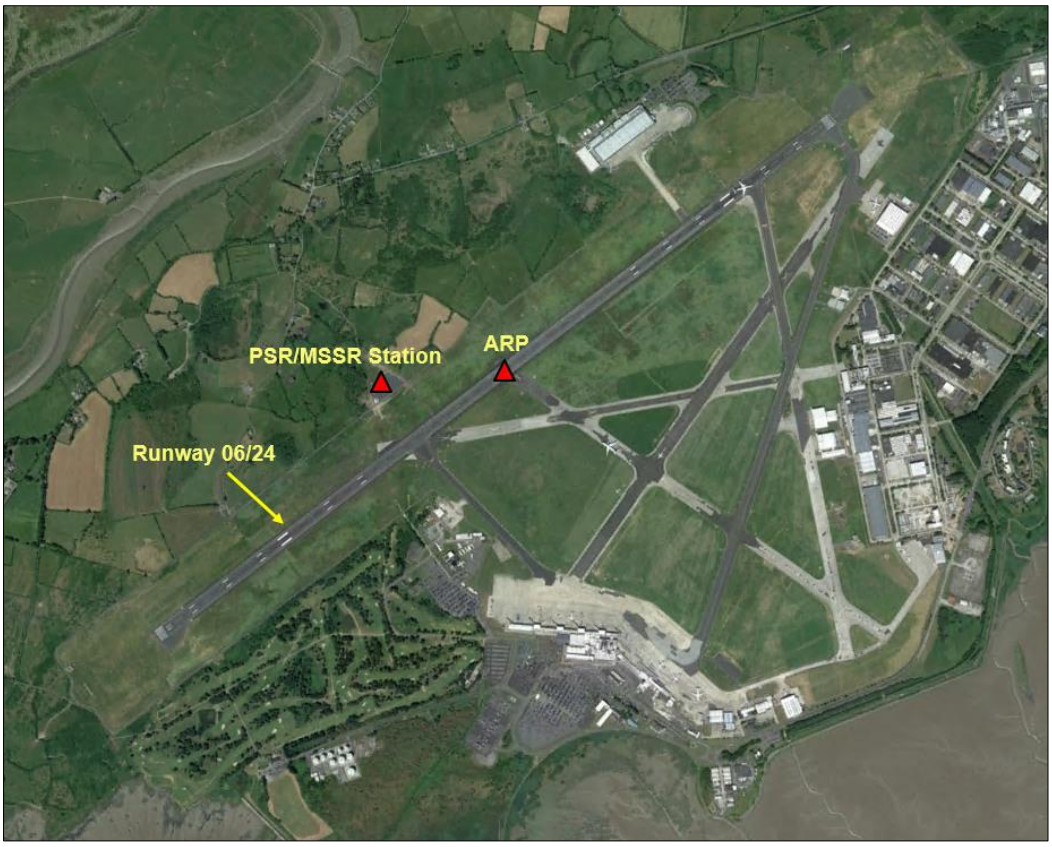


Figure 2. Shannon International Airport

2. Aviation Review

In this section a review of the following a review of the following Aviation topics is provided.

- Annex 14 - Obstacle Limitation Surfaces (OLS)
- Annex 15 – Aerodrome Surfaces
- Building Restricted Areas (BRA)
- Minimum Sector Altitudes (MSA)
- Instrument Flight Procedures
- Permitted Wind Farms in vicinity of proposed Wind Farm
- Communications, Navigation and Radar Surveillance Systems Safeguarding
- Flight Inspection and Calibration
- IAA - Aeronautical Obstacle Warning Light Scheme
- Department of Defence Aeronautical Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first was carried out by first plotting the proposed turbines and the airport obstacle surfaces. The obstacle limitation surfaces for Shannon Airport are plotted based on the following:

- Annex 14 to the Convention on International Civil Aviation Aerodromes Volume I - Aerodrome Design and Operations Seventh Edition July 2016"
- Certification Specifications and Guidance Material for Aerodromes Design CS-ADR-DSN Issue 4, 8th of December 2017

Figure 3 below shows the OLS in relation to the proposed Garrane wind farm. The distance from the Shannon Airport ARP, runway centre-point, to the nearest point of the proposed wind farm is 36km. The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surface which extends to 15km from the Shannon Airport Reference Point (ARP) or runway centre-point.

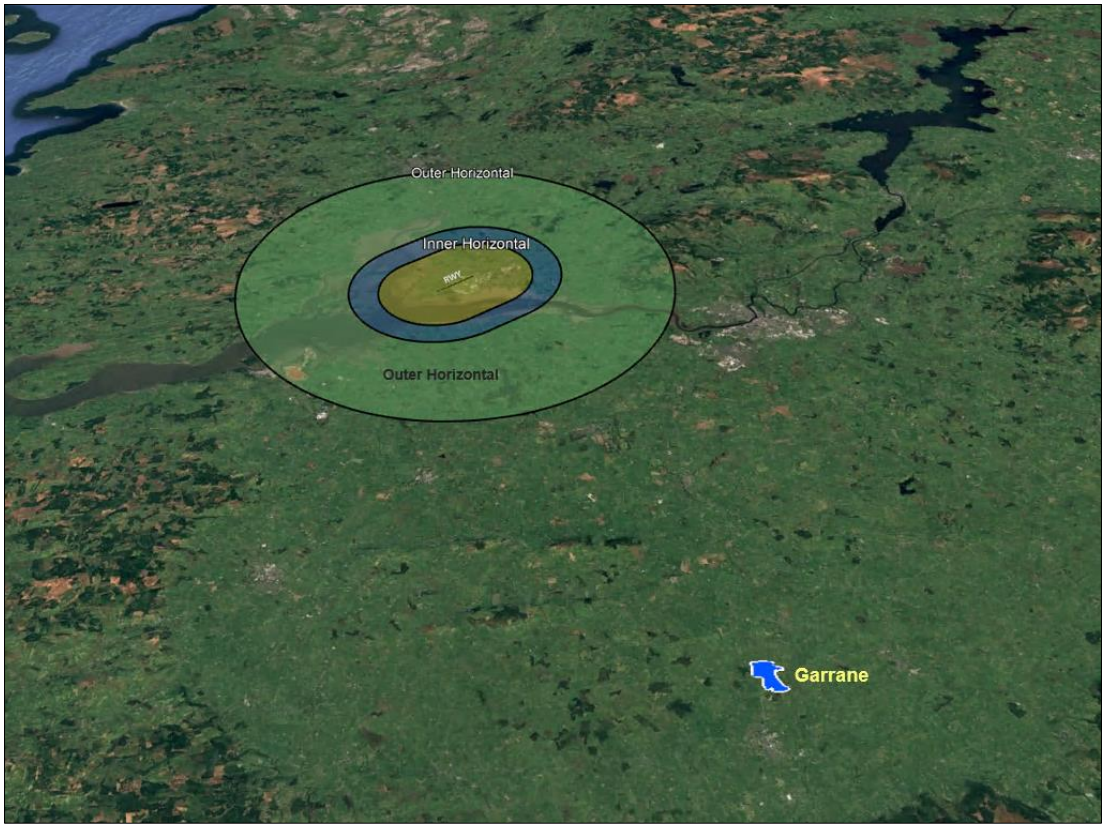


Figure 3. Garrane Wind Farm in relation to Shannon Airport OLS.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 14 Obstacle Limitation Surfaces	No action	None

Table 2. Aviation Impact Review - Annex 14 Obstacle Limitation Surfaces

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would penetrate the ICAO Annex 15 Aerodrome Surface as shown in Figure 4. The ”Terrain and obstacle requirements Area 1” is defined in ICAO Annex 15 as an area of 45km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 Surface is provided in Appendix A).

As the proposed wind farm is at a distance of 36 km from Shannon ARP there is penetration of the Annex 15 surface. All obstacles, if they are more than 100 meters above terrain for a distance of 45km from Shannon ARP, need to be registered in the IAA Air Navigation Obstacle Data Set. This 45km area is known as the TMA area i.e. Total Maneuvering Area and is used for en-route circling and maneuvering and is shown in Figure 4.

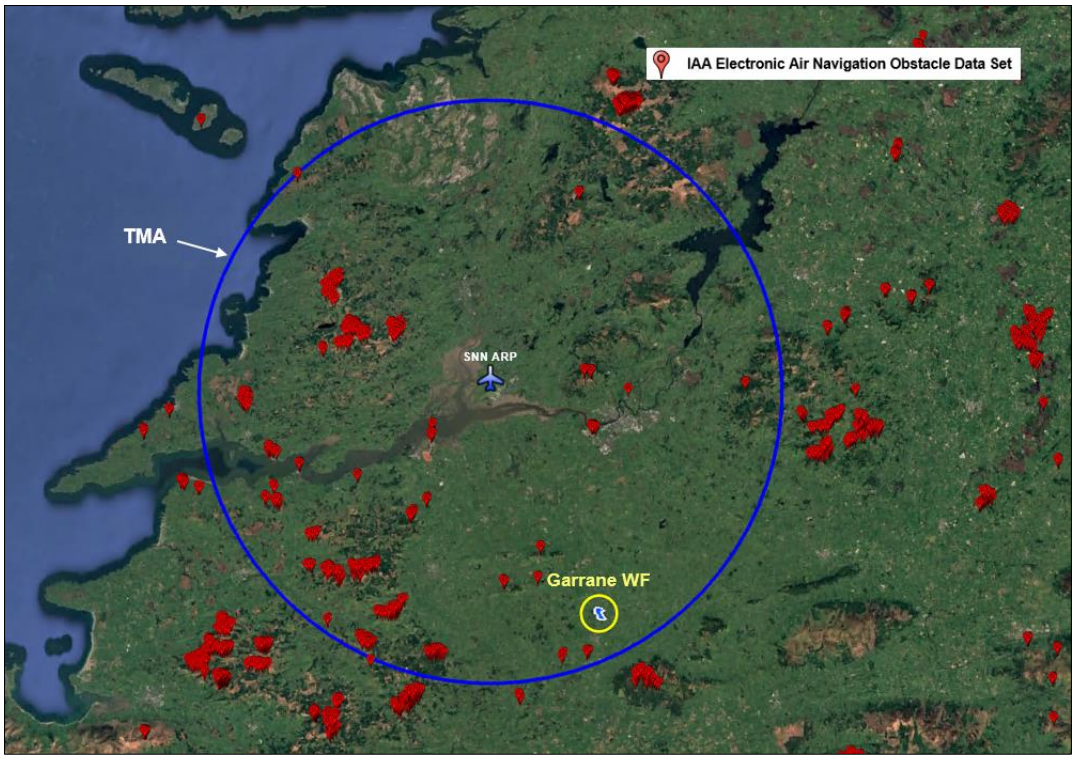


Figure 4. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

There are other existing tall structures (obstacles) in the vicinity of the proposed wind farm, notably the operational wind farms at Kilmeedy, Rathancally, Boolard, Knockatallig and Castlepook. These existing obstacles would shield any potential impacts from the proposed wind farm at Garrane. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 5.

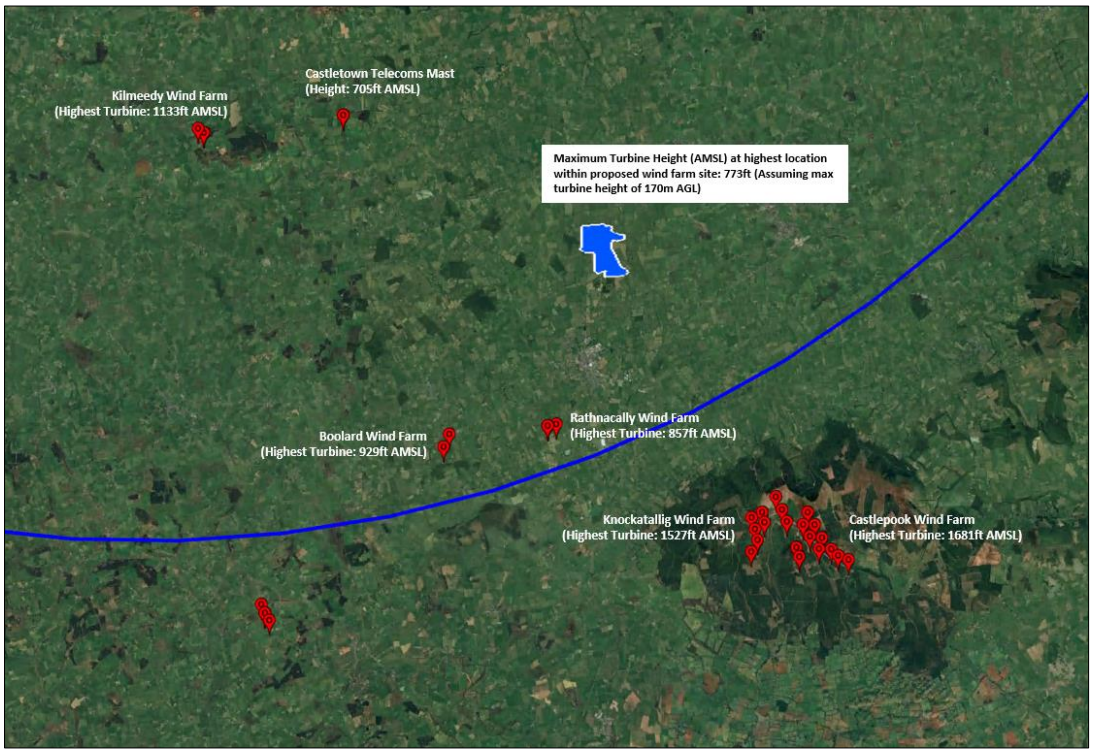


Figure 5. Permitted Obstacles in vicinity of Garrane Wind Farm

Although there are other obstacles in close proximity to the proposed wind farm, all new obstacles must be considered and assessed to see if they cause a "hazard to air navigation" and all Terrain Obstacle Data (including man-made obstacles) have to be considered by the relevant Aviation Authorities.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Annex 15 Aerodrome Surfaces	The proposed wind turbines would be required to be included in the IAA Obstacle Data Set.	None

Table 3. Aviation Impact Review - Annex 15 Aerodrome Surfaces

2.3 Building Restricted Areas (BRA)

A Building Restricted Area is the airspace surrounding an aviation facility that needs to be clear from physical intrusions. The purpose of the safeguarded areas is to identify developments with the potential for causing unacceptable interference to navigation facilities.

The navigation facilities to be considered at Shannon Airport include the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landings. The minimum safeguarded areas for these facilities are defined by the International Civil Aviation Organisation (ICAO) in the document ICAO EUR DOC 015, Section 7. The BRA parameters as specified by the ICAO are provided in Appendix B of this report.

Figure 6 below illustrates that the proposed wind farm at Garrane is over 32 km from the nearest BRA at Shannon Airport. At this distance, turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Shannon Airport.

Figure 6. Proposed Wind Farm relative to Shannon Airport BRAs (RWY 06 and RWY 24)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Building Restricted Areas	No action.	None

Table 4. Aviation Impact Review - Building Restricted Areas

2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is within 25 nautical miles from the VOR/DME at Shannon Airport. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified sectors. The wind turbines are located within the Main Sector (MSA 3000 ft), as shown in Figure 6. According to the wind farm location, the maximum construction height for the site would be 2000 ft/609.6m AMSL (3000 ft MVA minus 1000 ft).

A 558 ft (170 m) turbine located at the highest point (216 ft) within the proposed site boundary would result in an obstacle of 774 ft AMSL. This is below the 2000 ft threshold, therefore the MSA of the Main Sector will not be affected and there will be no impact on the published MSA altitude figures.

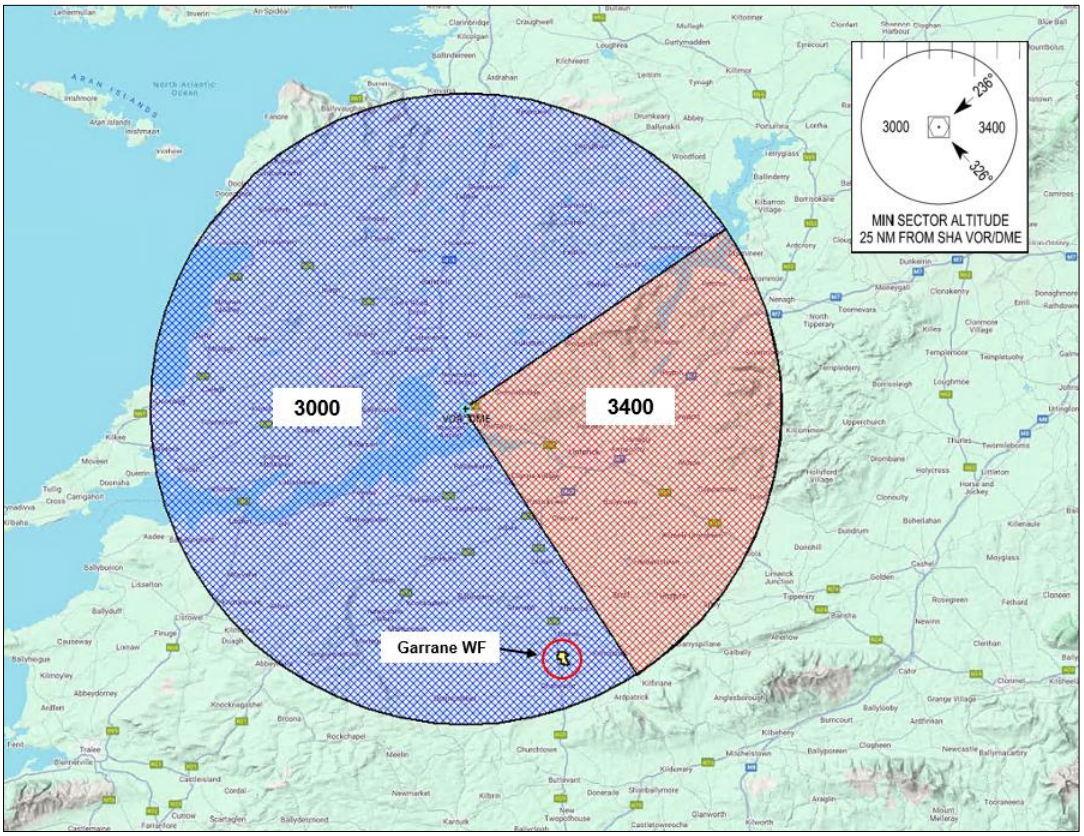


Figure 7. Shannon Airport (EINN) Minimum Sector Altitudes

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Minimum Sector Altitudes	No action	None

Table 5. Aviation Impact Review - Minimum Sector Altitudes

2.5 Instrument Flight Procedures

There are nine published Instrument and Visual Flight Procedures for departures and arrivals into Shannon Airport.

Due to the distance of the proposed wind farm from the airport (and as there are existing obstacles (e.g. existing wind farms)) it is unlikely that there will be any impacts on the Instrument Flight Procedures for flights to/from Shannon Airport. Table 6 below lists the Instrument Flight Procedures for Shannon Airport.

Aerodrome	Aerodrome Procedure	Chart ID	Likely WF Impacts
Shannon	RNAV Standard Instrument Departure Chart RWY 06 – ICAO	EINN AD 2.24-5	None
Shannon	RNAV Standard Instrument Departure Chart RWY 24 – ICAO	EINN AD 2.24-6	None
Shannon	NAV Standard Arrival Chart RWY 06 – ICAO	EINN AD 2.24-7	None
Shannon	RNAV Standard Arrival Chart RWY 24 – ICAO	EINN AD 2.24-8	None
Shannon	Instrument Approach Chart ILS or LOC RWY 06 – ICAO	EINN AD 2.24-10	None
Shannon	Instrument Approach Chart VOR RWY 06 – ICAO	EINN AD 2.24-11	None
Shannon	Instrument Approach Chart ILS CAT I & II or LOC 24 – ICAO	EINN AD 2.24-13	None
Shannon	Instrument Approach Chart VOR RWY 24 – ICAO	EINN AD 2.24-14	None
Shannon	Visual Approach Chart – ICAO	EINN AD 2.24-15	None

Table 6. Shannon Airport Instrument and Visual Flight Procedures

A detailed instrument flight procedure analysis is outside of the scope of this report; however, from the desktop assessment conducted it is envisaged that it is unlikely that the Air Navigation Service Provider (ANSP) at Shannon Airport will require a detailed assessment on the possible impact of the proposed wind farm on flight procedures.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Instrument Flight Procedures	No action	None.

Table 7. Aviation Impact Review - Instrument Flight Procedures

2.6 Permitted Wind Farms in vicinity of Proposed Wind Farm

The Planning References for the permitted Wind Farms in the vicinity of the proposed wind farm are shown below in Table 3. None of these wind farms required a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Description
Castlepook	11/4947 or PL04.240434	Operational Wind Farm
Knocknatallig	13/5885	Operational Wind Farm
Kilmeedy	https://maps.limerick.ie/planningenquiry	Operational Wind Farm
Rathnacally	https://planning.corkcoco.ie/ePlan/	Operational Wind Farm
Boolard	https://planning.corkcoco.ie/ePlan/	Operational Wind Farm

Table 8. Permitted Wind Farms in vicinity of proposed Wind Farm

2.7 Communication and Navigation Systems

The AIP document EINN AD 2-18/19 provides the information for communication and navigation facilities for Shannon Airport. The table below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids for the airport.

Aerodrome	ATS Communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of Wind Farm
Shannon	118 MHz –131 MHz	339 kHz – 1575 MHz	37 km	No impacts

Table 9. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 37 km from the Localizers and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter (e.g. less than 500m).

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Communication and Navigation Systems	No action	None

Table 10. Aviation Impact Review - Communication and Navigation Systems

2.8 Radar Surveillance Sensors

The tables below show the Irish Aviation Authority Assessment Zone arrangement for the two types of aviation radar surveillance systems: Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR).

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500m - 15km and in radar line of sight	Detailed Assessment
Zone 3	Further than 15km and in radar line of sight	Simple Assessment
Zone 4	Not in radar line of sight	No Assessment

Table 11. PSR Zone Arrangements

Zone	Description	Assessment Requirements
Zone 1	0 - 500m	Safeguarding
Zone 2	500m - 16km but within maximum instrumented range and in radar line of sight	Detailed Assessment
Zone 4	Further than 16km or not in radar line of sight	No Assessment

Table 12. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 16 km safe distance for a “Zone 4 - No Assessment” condition and detailed assessments are required for any proposed wind within 16km of a secondary surveillance radar.

It should be noted that in the UK, NATS (Air Traffic Control) safeguards SSR to a distance of 10 km. The guidelines used by NATS (*CAP 764: Chapter 2: Impact of wind turbines on aviation*) state that:

> *“Wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the turbines and the wind farm. These effects are typically only a consideration when the turbines are located very close to the SSR i.e. less than 10 km.”*

A review of the potential impact of the proposed wind farm on Radar Surveillance Sensors is presented below in Section 2.8.1. The review shows that the IAA should not require a radar assessment, as turbines at the proposed development would be located in Assessment Zone 4 for all of their radar installations (PSR and SSR).

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Radar Surveillance Sensors	No action	None.

Table 13. Aviation Impact Review - Radar Surveillance Sensors

2.8.1 Irish Aviation Authority (IAA) Radar Surveillance Sensors

To determine which PSR/MSR Assessment Zones are applicable to the proposed wind farm, a desktop assessment was carried out. The nearest radar surveillance sites to the proposed wind farm development are at Shannon Airport and at Woodcock Hill.

Figure 8. Radar Surveillance Sites relative to Garrane Wind Farm.

An assessment of the potential impact due to the proposed wind farm on these radar installations is provided in Section 2.8.1.1 and Section 2.8.1.2.

2.8.1.1 Woodcock Hill SSR Radar Assessment

The radar surveillance site at Woodcock Hill consists of a SSR system housed in the dome-shaped structure shown in Figure 9.

Figure 9. SSR at Woodcock Hill

Table 14 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

ID	Distance to SSR	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Garrane WF	35.7km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 14. EuroControl / UK Safeguarding Guidelines – Woodcock Hill SSR

As the table above show, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the SSR at Woodcock Hill.

2.8.1.2 Shannon SSR Radar Assessment

The radar surveillance site at Shannon Airport consists of a PSR and a SSR. The PSR and the SSR antennas are co-located on the same structure at Shannon Airport (Figure 10).

Figure 10. PSR and SSR at Shannon Airport

Table 15 below shows the (EuroControl & NATS) assessment zone applicable to the nearest point where a turbine could potentially be located. The applicable assessment zone has been based on distance from the Radar Station and whether a radar line-of-sight condition exists.

ID	Distance to PSR/SSR	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Garrane WF	37.6 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 15. EuroControl / UK Safeguarding Guidelines – Shannon PSR/SSR

As the tables above show, the proposed wind farm is within Assessment Zone 4 as specified by the EUROCONTROL guidelines, which would indicate that a detailed technical assessment would not be required for the impact on the PSR/SSR at Shannon Airport.

2.9 Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Shannon Airport for calibration of instrument landing systems. It is unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport runways and the flight inspection procedures should already account for the existing obstacles (e.g. adjacent wind farms).

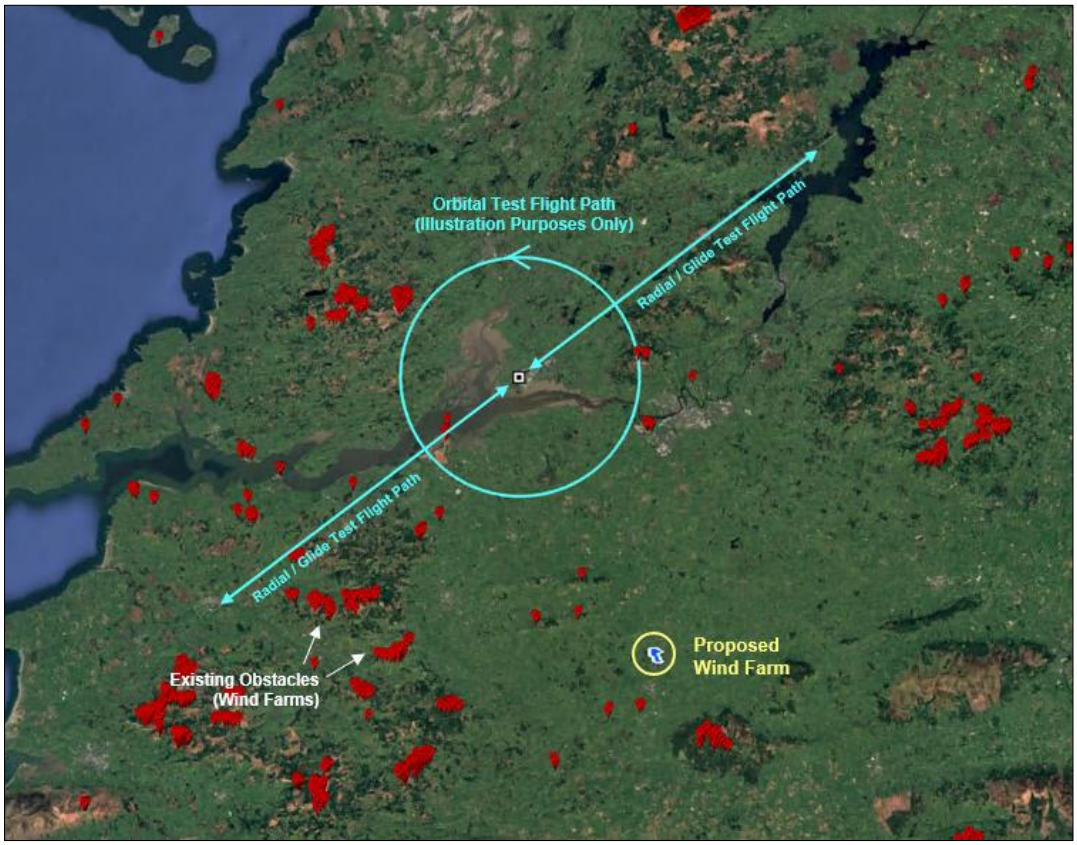


Figure 11. Flight Inspection and Calibration Test Procedures should account for Existing Obstacles (e.g. Kilmeedy, Rathancally, Boolard, Knockatallig and Castlepook wind farms)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Flight Inspection and Calibration	No action	None.

Table 16. Aviation Impact Review - Flight Inspection and Calibration

2.10 Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA-ANSP would require the lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development may be considered as an en-route obstacle. The developers of the proposed turbines would intend to implement an aeronautical obstacle warning light.

It is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014) where it states that

> *"Applicability: When considered as an obstacle a wind turbine should be marked and/or lighted."*

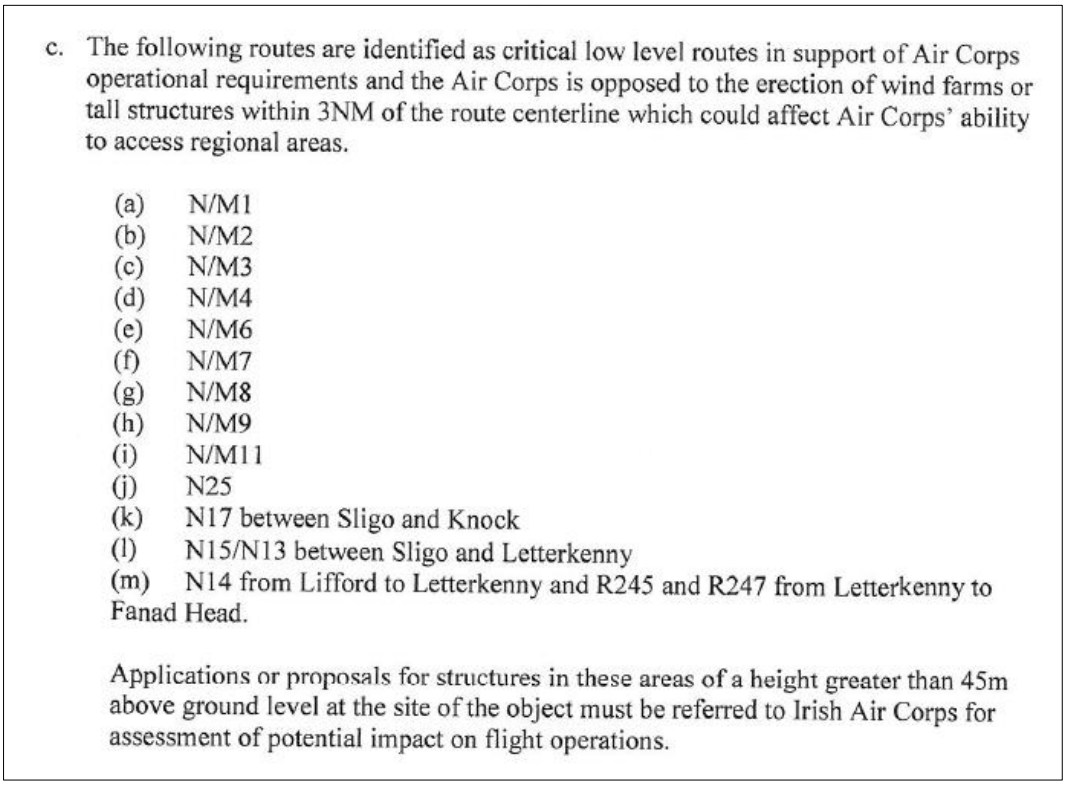
Aviation Impact Review	Mitigation Measure Action	Residual Impact
Aeronautical Obstacle Warning Light Scheme	It is likely that the IAA would request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with civil aviation industry standards. Subject to further consultation with the IAA.	None

Table 17. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

2.11 Irish Air Corps / DoD Safeguarding

The Irish Air Corps Position Paper "*Air Corps Wind Farm/ Tall Structures Position Paper*" published on 08th August 2014 (Ref. Appendix C) , states that the Air Corps are likely to oppose any wind farm / tall structure in the following restricted areas:

- Lands underlying military airspace for flying activity.
- Low Flying Area – LFTA WEST.
- A distance of 5 NM or less from military installations.
- Critical low level flying routes in support of Air Corps operation requirements.



c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps' ability to access regional areas.

(a) N/M1
(b) N/M2
(c) N/M3
(d) N/M4
(e) N/M6
(f) N/M7
(g) N/M8
(h) N/M9
(i) N/M11
(j) N25
(k) N17 between Sligo and Knock
(l) N15/N13 between Sligo and Letterkenny
(m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

Figure 12. Irish Air Corps – Critical Low Level Routes

Of the critical low level flying routes as listed in the Position Paper (Figure 12), the M7 is the nearest route to the proposed wind farm. The proposed wind farm site 116 NM (21.4 km) from the M7 and is outside the 3 NM restricted area.

As the proposed wind farm is located outside the restricted area, there should be no impacts on Irish Air Corps activities.

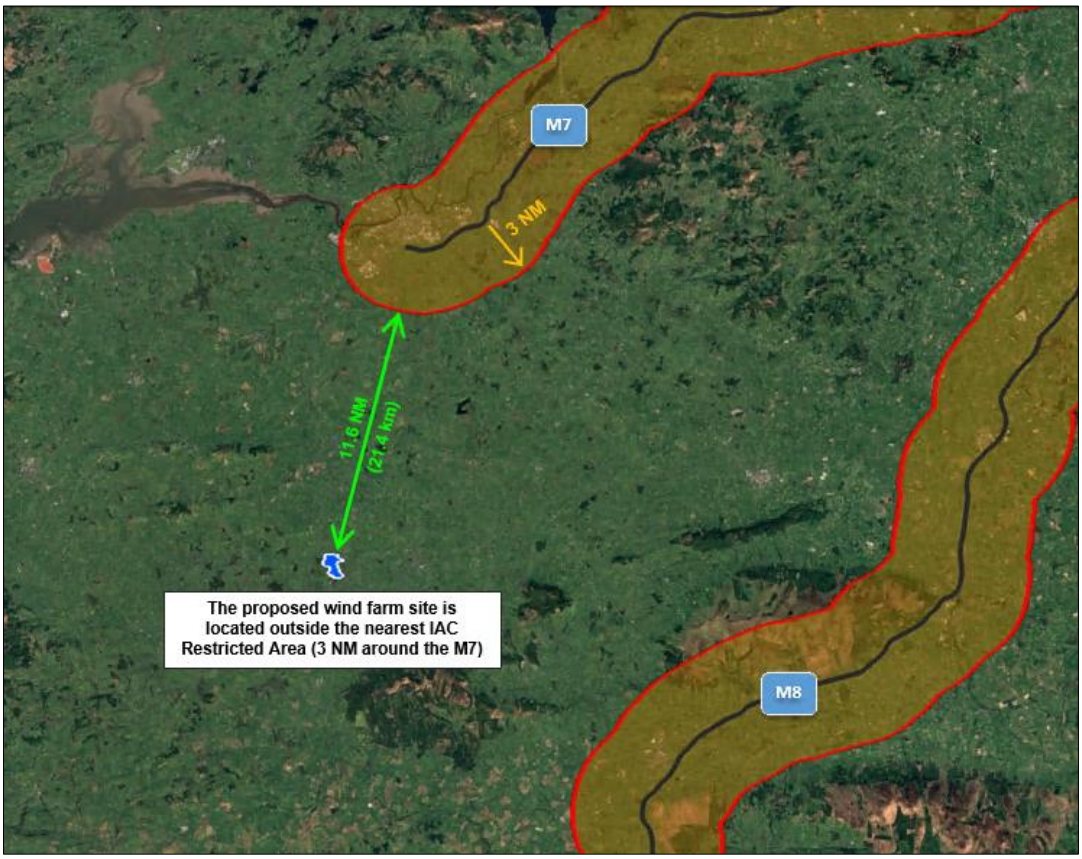


Figure 13. Irish Air Corps - Critical Low Level Route (M7)

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Department of Defence – IAC Restricted Areas	No action	None

Table 18. Aviation Impact Review – IAC Restricted Areas

2.11.1 Department of Defence – IAC Aeronautical Obstacle Warning Light Scheme

A detailed assessment of the DoD\IAC Aeronautical Obstacle Warning Light Scheme is beyond the scope of this report. However, the appropriate lighting scheme for Garrane would depend on; the existing obstacle environment, airspace class (i.e. Class G for Garrane) and existing Irish/ EU lighting standards and regulations. Any requirement by the DoD\IAC for all turbines to be illuminated should also be reviewed to determine if cardinal or perimeter lighting could be implemented and also if infrared lighting could designed meet the IAC aeronautical lighting requirement.

Further consultations with the Department of Defence / Irish Air Corp would be required to reach agreement on the ddetails of the aeronautical lighting requirements . Following agreement with the DoD\IAC the details would be submitted to the Planning Authority prior to

construction. Any agreements on aviation lighting would be designed to minimise cumulative visual effects.

Also prior to construction the Department of Defence and the Planning Authority would be informed of the wind turbine tip heights and co-ordinates at least thirty days in advance of erection.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Department of Defence - IAC Aeronautical Obstacle Warning Light Scheme	Aviation Lighting subject to agreement with DoD	No Impact (Subject to agreement with DoD)

Table19. Aviation Impact Review - IAC Aeronautical Obstacle Warning Light Scheme

2.12 Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

The standard concerns that are being raised in recent consultations with the Air Corps also highlight the potential for obstacles that could impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). The excerpt below is taken from a response received from the IAC in relation to a third-party wind farm project:

> "*Having consulted with the subject matter experts in the Irish Air Corps, the Department of Defence wishes to make the following observations:*
>
> - *The Department of Defence cannot support, based on military advises, the erection of wind farms or other tall structures within 3 NM of roads identified as critical low level routes in support of operational requirements. The erection of obstacles within low-level helicopter routes could affect the Irish Air Corps ability to access regional areas and to fulfil its role.*
> - *If this proposed development was to go to the planning stage, the Department of Defence would be obligated to raise the following concerns and advise the planning authorities that the proposed windfarm*
>
> *a) lies wholly within 3 nautical miles of the [Motorway/National Road] which is identified as a critical low level route used by state aircraft on operational taskings. A windfarm or any other tall structures within a low-level route will be an obstacle to state aircraft not operating within the civil rules of the air;*
>
> *b) The [Motorway/National Road] low level route requires protection from obstacles for low level state aircraft on operational tasking's such as:*
>
> *(i) The Garda Air Support Unit (GASU)*
> *(ii) The Emergency Aeromedical Service (EAS)"*

An assessment of the possible impacts of the proposed wind farm on the Garda Air Support Unit and the Emergency Aeromedical Service operations is provided in Sections 2.12.1 and 2.12.2 that follow.

2.12.1 The Garda Air Support Unit (GASU)

The Garda Air Support Unit is based at Casement Aerodrome, Baldonnel and is typically deployed to incidents in the following cases:

- Immediate threat to life
- Incidents of a criminal, terrorist or other nationally important nature
- Immediate threat of serious public disorder
- Tasks leading to the prevention or detection of crime
- Evidence gathering
- Intelligence gathering
- Photographic tasks
- Traffic Management/Monitoring

The unit consists of one fixed-wing aircraft (a Pilatus Britten-Norman BN 2T-4S Defender 4000) and two helicopters (Eurocopter EC 135 T2).

Figure 14. GASU - Pilatus Britten-Norman BN 2T-4S Defender 4000

Figure 15. GASU - Eurocopter EC135 T2

The proposed wind farm is located in an area that is sparsely populated and on agricultural terrain. For these reasons, it is highly unlikely that the proposed wind farm development would have any significant impacts on GASU operations.

In the unlikely event of GASU operations in the general area, it should be noted that all modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farms be permitted the associated turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

GASU Aircraft	Impact of proposed wind farms - Opinion
Fixed-wing Airplane (Pilatus Britten-Norman BN 2T-4S Defender 4000)	Low – Fixed-wing aircraft are unlikely to be deployed in low level activity in the subject areas. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	Low – Helicopter landings in the subject area would not occur as the proposed wind farm located in an area that is sparsely populated and on agricultural terrain. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 20. Impact of proposed wind farm on GASU Operations

2.12.2 The Emergency Aeromedical Service (EAS)

The air ambulance service in Ireland is known as the Emergency Aeromedical Service (EAS). The EAS crew (which include National Ambulance Service (NAS) paramedics) deal with time-critical emergency callouts to major emergencies such as road collisions and urgent medical events. The EAS currently operate two air ambulance helicopters operating from two bases:

- Custume Barracks, Athlone, Co Westmeath.
- Rathcoole Aerodrome, Rathcoole, Mallow, Co Cork.

The two helicopter bourne emergency air ambulances consist of an Air Corps operated aircraft based at Custume Barracks in Athlone and an aircraft located at Rathcoole in North Cork. The service is known as the Emergency Aeromedical Service (EAS) in Ireland. Athlone is a solely State-run operation whereas Cork is managed by Malta-based Gulf Med Aviation Services. This service replaced the Irish Community Air Ambulance (ICAA).

A review of the possible impacts of the proposed wind farm on the aviation activities from each of the EAS bases is provided in Section 2.13.1 and Section 2.13.2 that follow.

2.12.2.1 EAS - Custume Barracks, Athlone

The EAS base at Custume Barracks is a solely state-run operation and the aircraft utilised at this air ambulance base is an Irish Air Corps Euro-copter 135. The flight times from the EAS base at Athlone are sown in Figure 16.

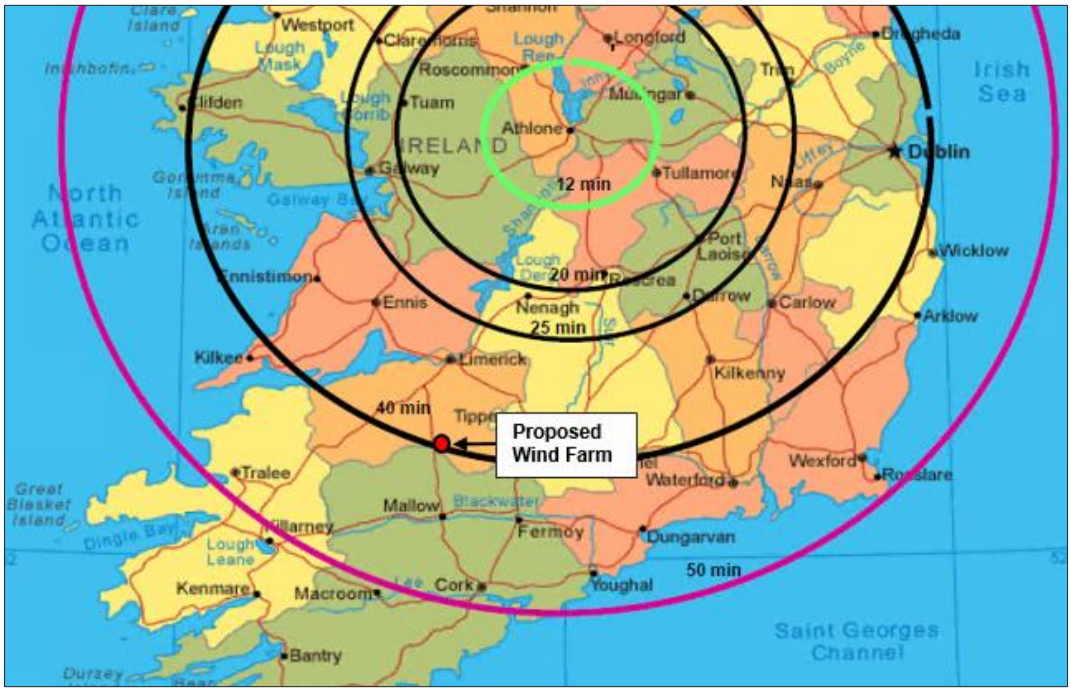


Figure 16. EAS – Flying Times from Custume Barracks, Athlone

As Figure 16 shows, flights times from Custume Barracks to the southwest of Ireland would be over 40 minutes. Time-critical medical emergencies in the southwest are unlikely to be attended to by the EAS crew from this base. In the event that the Custume Barracks helicopter is required in the southwest, the footprint of the proposed wind farm is relatively small and the impact of any diversions due to the proposed turbines would be negligible.

In addition, the helicopter would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

For the reasons outlined above any impacts on EAS operations from Custume Barracks are expected to be negligible and turbines at the proposed wind farm should have no impact on EAS flights from Custume Barracks.

2.12.2.2 EAS – Rathcoole Aerodrome

The EAS service in the southwest of Ireland is operated out of the aerodrome at Rathcoole Flying Club and is managed by Malta-based Gulfmed Aviation Services. Gulfmed Aviation became the EAS operator effective from Saturday, February 11th 2023 when they took over from the previous provider. Rathcoole Aerodrome is 37 km form the proposed wind farm site at Garrane as shown below in Figure 17.

It should be noted that there are over 100 existing wind turbines which are nearer to the aerodrome than the proposed wind farm at Garrane. The nearest of the existing wind farms to Rathcoole is Carrigcannon which is just 6 km to the southeast of the EAS aerodrome.

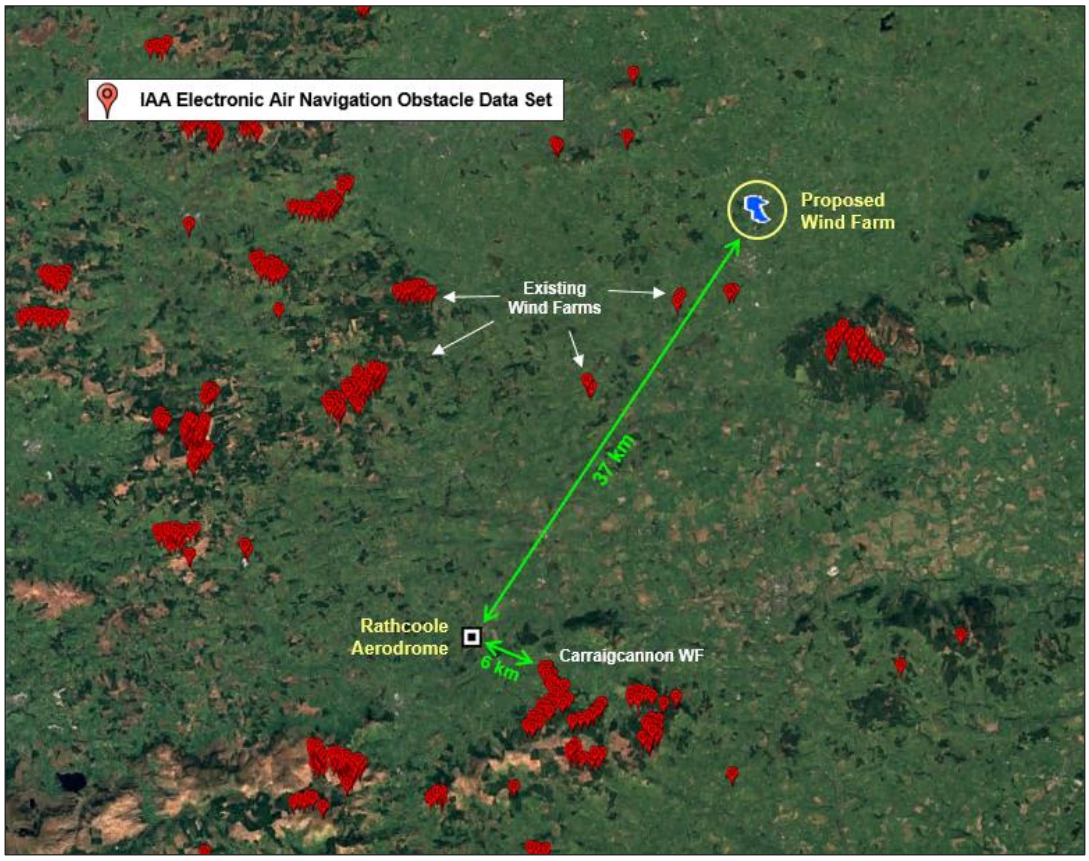


Figure 17. EAS – Rathcoole Aerodrome

The aerodrome is licensed by the IAA and its Aeronautical Information Package (AIP), shown below in Figure 18, states that the type of traffic permitted at the aerodrome is VRF (Visual Flight Rules) only. The aerodrome is in Class G (uncontrolled) airspace and pilots flying to/from Rathcoole are obliged to fly by VFR and in accordance with the *IAA Rules of The Air*.

EIRT AD 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRATIVE DATA

1	**ARP and its site**	520620N 0085900W -
2	**Direction and distance from (city)**	13NM W of Mallow
3	**AD Elevation, Reference Temperature & Mean Low Temperature**	281ft / 20.5°C (Max Temp) 0.4°C (MNM Temp)
4	**Geoid undulation at AD ELEV PSN**	190ft
5	**MAG VAR/Annual Change**	5° (2014)/11' decreasing
6	**AD Operator, address, telephone, telefax, email, AFS, Website**	Post: Mr. Dennis Crowley Rathcool Flying Club Rathcool Mallow Co. Cork Phone:+353 83 829 9938 Email: dcrowley045@gmail.com
7	**Types of traffic permitted (IFR/VFR)**	VFR
8	**Remarks**	Nil

Figure 18. Extract from Rathcoole AIP – VFR Only

The following observations are made regarding EAS flights from the aerodrome at Rathcoole:

- The footprint of the proposed wind farm at Garrane is relatively small and any adjustments for EAS flights in the region would have negligible impacts on flight times.

- In good weather conditions, a wind farm at Garrane could potentially be used as a visual landmark to aid Visual Flight Rules (VFR) navigation. There are existing wind farms in the area (e.g. Boolard, Rathnacally, Kilberehert, etc.) and the addition of new turbines at Garrane could make it easier for pilots to identify their flight position.

- The Irish IAIP contains the IAA Rules of The Air Order 2004, which outline the Visual Meteorological Conditions (VMC) minima for aircraft flying under Visual Flight Rules. The requirements for flying by VFR rules in Class G uncontrolled airspace are:

    - *Flights below 3,000 ft AMSL required to remain clear of cloud and in sight of the surface at all times. with a minimum flight visibility of 5 km. (This visibility minimum is reduced to 3 km for aircraft operating at an indicated airspeed of 140 knots (kts) or less and 1 km for helicopters operating below 1,000 ft.)*
    - *VFR flight are not permitted in conditions worse than the stated minima. If visibility conditions change pilots should adjust their route in accordance with regulation.*
    - *VFR pilots operating in the Class G uncontrolled airspace are legally obliged to avoid obstacles (e.g. turbines) by 500 ft.*
    - *VFR pilots operating in the Class G uncontrolled airspace are ultimately responsible for their own terrain and obstacle clearance.*

    As the Rules of the Air state, in Class G uncontrolled airspace, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and therefore he/she would be required to be aware of wind turbines if flying to/from the airfield in question. This can achieved by prudent flight planning by the VFR pilot prior to flight.

- All modern aircraft are equipped with a range of Global Navigation Satellite Systems (GNSS), e.g. GPS, GLNASS, Galileo, etc. These GNSS systems provide pilots with accurate navigation information including data to avoid obstacles during VFR operations. Should the proposed wind farm at Garrane be permitted the turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly. The turbine locations would be added to aviation flight charts and clearly marked as en-route obstacles. This would enable VFR pilots to plan their flight routes accordingly.

For the reasons outlined above any impacts on EAS flights in the area are expected to be negligible and turbines at the proposed wind farm should have no significant impact on EAS operations from Rathcoole.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Emergency Aeromedical Service (EAS)	The proposed wind turbines would be required to be included in the IAA Obstacle Data Set.	None

Table 21. Aviation Impact Review - Emergency Aeromedical Service (EAS)

3. Summary

A summary of the aviation review for the proposed wind farm at Garrane is provided in Table 21 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	Turbines at proposed wind farm would be located outside the OLS Surfaces for Shannon Airport.
Annex 15 - Aerodrome Surfaces	None	All obstacles, if more than 100 meters above terrain for a distance of 45 km from center point of Shannon Airport, need to be registered in the IAA Air Navigation Obstacle Data Set. As the proposed wind farm at Garrane is located within 45 km of Shannon Airport, the IAA may request that the proposed turbines be included in the IAA Aeronautical Electronic Obstacle Data Sets. It should be noted that other existing tall structures in the vicinity of Garrane (e.g. existing turbines at Kilmeedy, Rathancally, Boolard, Knockatallig and Castlepook wind farms) are also located within the ICAO Annex 15 Aerodrome Surface and are already listed in the IAA Aeronautical Electronic Obstacle Data Sets.
Building Restricted Areas	None	A review shows that Garrane is more than 32 km from the BRAs for Shannon Airport. At this distance there would be no impacts due to the proposed wind farm.
Minimum Sector Altitudes (MSA)	None	A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm is within 25 nautical miles from the VOR/DME at Shannon Airport. The maximum allowable structure in the applicable sector is 2000ft (AMSL). Turbines at the proposed wind farm would not exceed the 2000ft threshold, therefore the MSA of the applicable sector will not be affected and there will be no impact on the published MSA altitude figures.
Instrument Flight Procedures	None	A review shows that the instrument flight procedures for RWY 06 and RWY 24 standard instrument departures are unlikely to be impacted for precision aircraft.
Communication and Navigation Systems	None	As the proposed wind farm is approximately 37 km from the Localizer and transmitting antenna at Shannon Airport, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Sensors	None	The proposed wind turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Impact Assessment will not be required
Flight Inspection and Calibration	None	The annual Flight Inspection Procedures will not be impacted by the proposed wind farm as the proposed site is sufficiently far from the ARP at Shannon Airport that there would be no impacts. In addition, the Flight Inspection Procedures should already account for existing obstacles.
Aeronautical Obstacle Warning Light Scheme	None	If permitted, the wind farm should be fitted with Aeronautical Obstacle Warning Lights in accordance with civil aviation industry and regulatory standards. Subject to further consultation with the IAA.
Irish Air Corps / DoD Safeguarding	None.	The proposed wind farm is not located in an IAC restricted area and it is highly unlikely that turbines at the proposed site would have any impact on IAC aviation activity. The DoD have made specific observations regarding an Aeronautical Obstacle Warning Light Scheme for the IAC. A review of the specified IAC Aeronautical Obstacle Warning Light Scheme is subject to a further detailed assessment.
Garda Air Support Unit and Emergency Aeromedical Service	None	An assessment of GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Table 22. Garrane Wind Farm – Aviation Review Summary

APPENDIX A - ICAO Annex 15 Area 1 and Area 2 Surfaces.

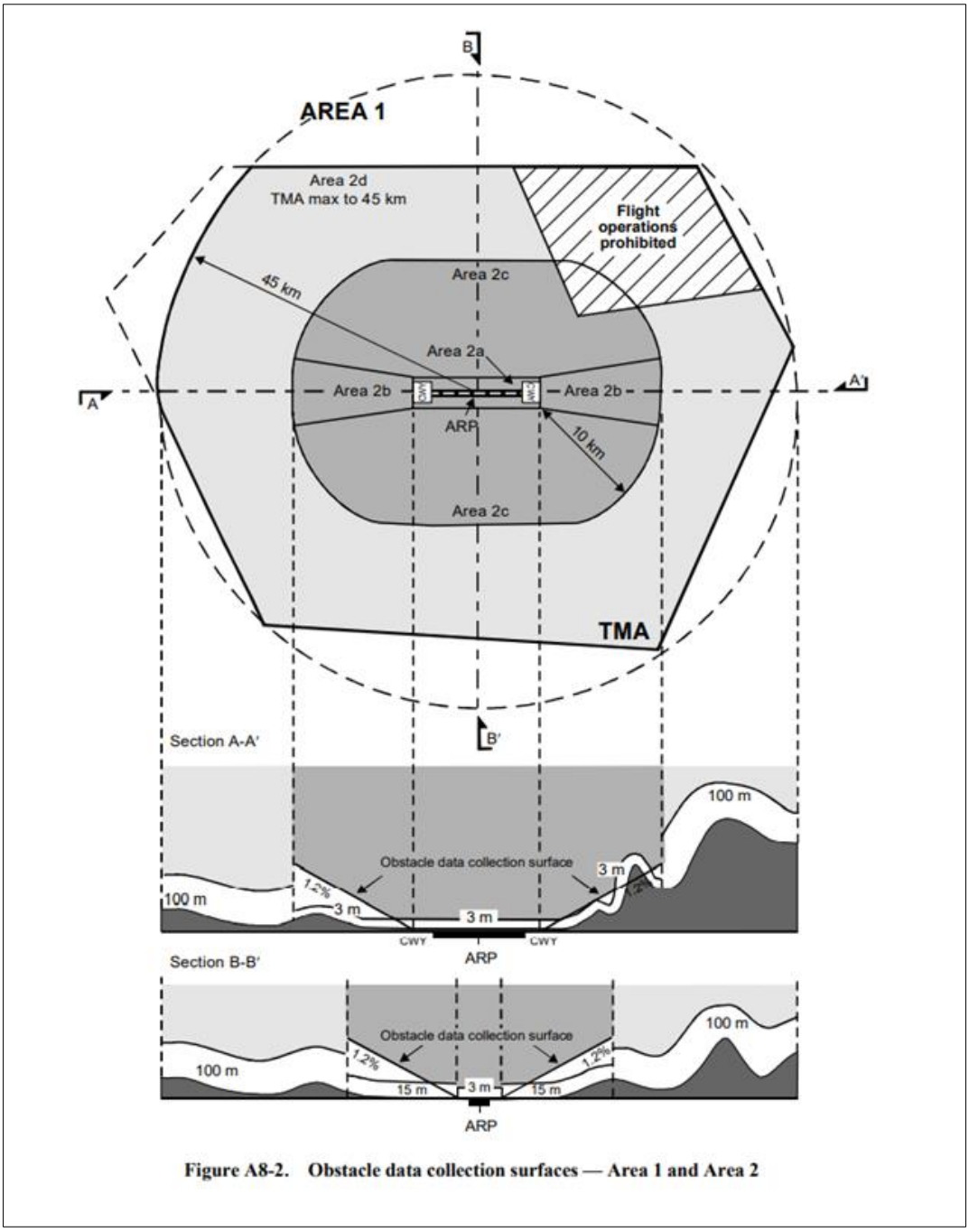


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

Figure A1 - ICAO Annex 15 Area 1 and Area 2 Surfaces.

APPENDIX B - ICAO Building Restricted Areas.

Figure B1 below shows an example BRA shape for directional facilities. Table B1 provides harmonized guidance figures for the directional navigational facilities in accordance with Figure B1.

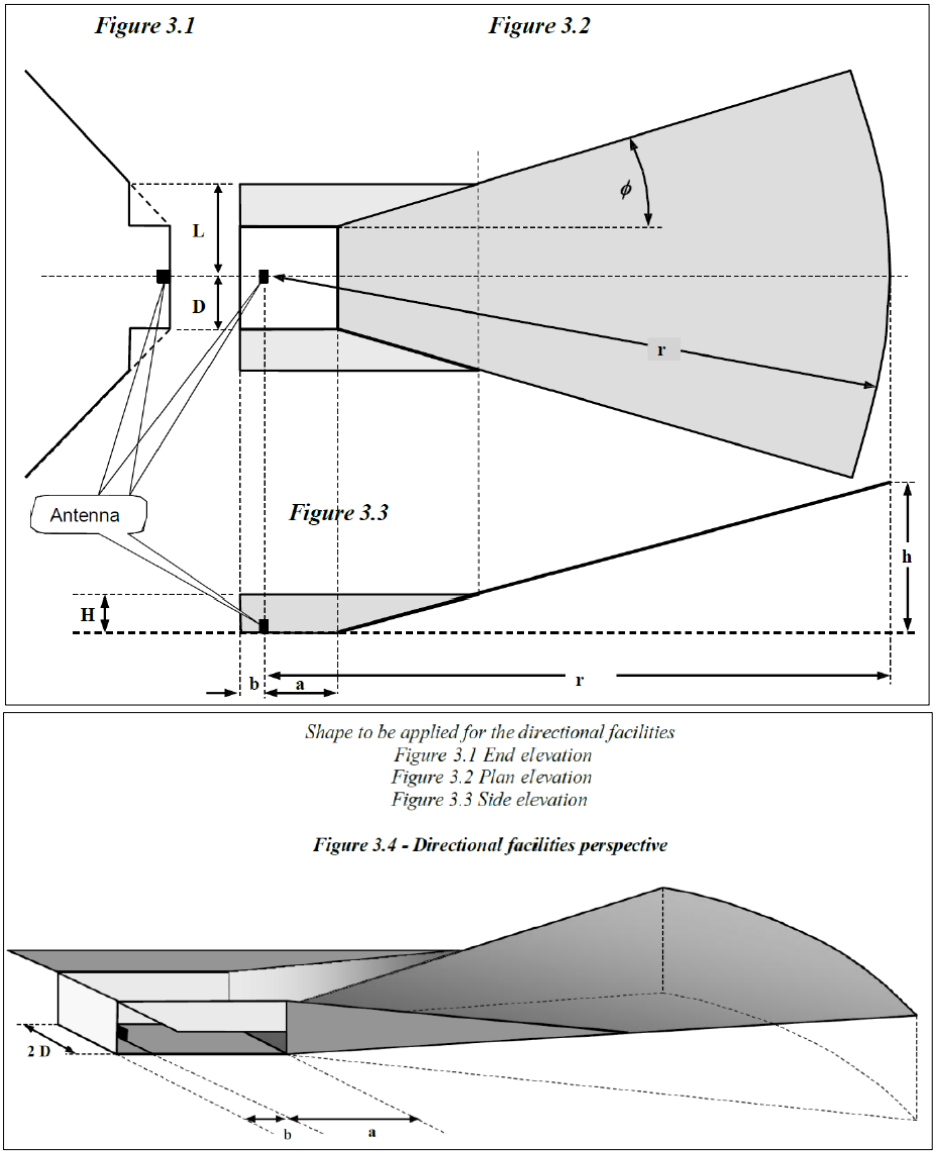


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

*Type of **navigation** facilities*	***A*** *(m)*	***b*** *(m)*	***h****(m)*	***r*** *(m)*	***D*** *(m)*	***H*** *(m)*	***L*** *(m)*	***ϕ*** *(°)*
ILS LLZ (medium aperture single frequency)	Distance to threshold	500	70	a+6000	500	10	2300	30
ILS LLZ (medium aperture dual frequency)	Distance to threshold	500	70	a+6000	500	20	1500	20
ILS GP M–Type (dual frequency)	800	50	70	6000	250	5	325	10
MLS AZ	Distance to threshold	20	70	a+6000	600	20	1500	40
MLS EL	300	20	70	6000	200	20	1500	40
DME (directional antennas)	Distance to threshold	20	70	a+6000	600	20	1500	40

Table B1 - Harmonized guidance figures for the directional navigational facilities (ICAO EUR DOC 015 Table 2)

APPENDIX C – Air Corps Wind Farm / Tall Structures Position Paper, August 2014

Óglaigh na hÉireann
DEFENCE FORCES IRELAND

Ceanncheatru an Aer Chor
Air Corps Headquarters

08 August 14

GOC AC

Air Corps Wind Farm/Tall Structures Position Paper

Sir,

1. The attached is the draft Air Corps Position Paper agreed and developed in concert with the flying units under the auspices of CAS Ops.
2. It is recommended that it be forwarded to the Directorate of Operations for transmission to the Department of Defence.
3. The AC position contained within this paper should be notified to planning authorities including An Bord Pleanala. It should also be forwarded to the Department of the Environment, Heritage and Local Government to inform its policies and guidance in respect of wind farms.

Raymond Martin, Lt Col
CATSO

CATSO, Ceanncheatru an Aer Chor, Aerodrom Mhic Easmuinn, BAC 22.
CATSO Air Corps Headquarters, Casement Aerodrome, Baldonnel, Dublin 22
Ph +353 (0)1 403 7513 *Fax: +353 (0)1 403 7850*

Óglaigh na hÉireann
DEFENCE FORCES IRELAND

Ceanncheatru an Aer Chor
Air Corps Headquarters

Air Corps Wind farm/Tall Structures Position Paper.

1. **Objective:**
This position paper is intended to ensure that
   a. Air Corps operations and training may be accomplished in a safe and economical manner;
   b. Baldonnel remains a viable aerodrome for IFR and VFR traffic;
   c. The ability to train military flying skills is protected;
   d. Vital navigation routes to and from the regions to Baldonnel and the Dublin area are protected to safeguard the ability of the Air Corps to fulfill its role.

2. **Statement of position.**

   a. The Air Corps is opposed the erection of wind farms or other obstacles which will affect its ability to train and operate in a safe and economic manner.

   b. The Air Corps is opposed to any wind farms or tall structures in the following areas:

   (1) Lands underlying military airspace used for flying activity

   (a) The area contained in Danger Area EI-D1.
   (b) The area contained in Danger Area EI-D5.
   (c) The area contained within Danger Area EI-D6.
   (d) The area contained within Danger Area EI-D13.
   (e) The area contained within Danger Area EI-D14.
   (f) The area contained within Restricted Area EI-R15.
   (g) The area contained within Restricted Area EI-R16 within 20NM of Baldonnel.
   (h) The area contained within Military Operating Areas, MOAs 3 and 4 within 20NM of Baldonnel.

   (2) Areas wherein military flying occurs at low level as identified in the annexes listed below.
   (a) Annex A: Low flying training areas within MOA 4 in the areas of
      a. Blessington
      b. Edenderry/Allenwood/Rathangan
      c. Kilmeague/Newbridge

   (b) Annex B: low flying training area West (LFTA WEST).

(3) A distance of 5NM or less from military installations.

c. The following routes are identified as critical low level routes in support of Air Corps operational requirements and the Air Corps is opposed to the erection of wind farms or tall structures within 3NM of the route centerline which could affect Air Corps' ability to access regional areas.

(a) N/M1
(b) N/M2
(c) N/M3
(d) N/M4
(e) N/M6
(f) N/M7
(g) N/M8
(h) N/M9
(i) N/M11
(j) N25
(k) N17 between Sligo and Knock
(l) N15/N13 between Sligo and Letterkenny
(m) N14 from Lifford to Letterkenny and R245 and R247 from Letterkenny to Fanad Head.

Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

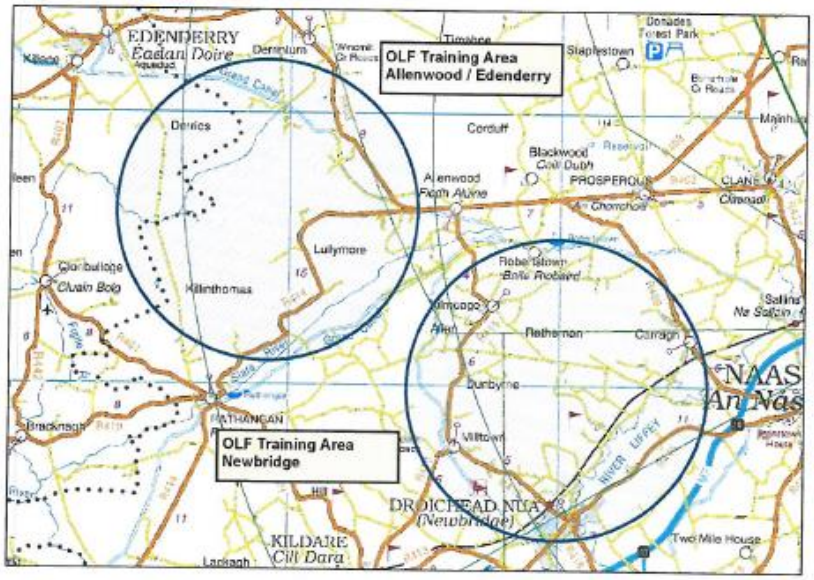
d. In MOA 4 outside of the areas identified in b.(1) (2) and (3), and in MOA 5, applications or proposals for objects of a height greater than 45m above ground level at the site of the object must be referred to the Irish Air Corps for assessment of potential impact on flight operations.

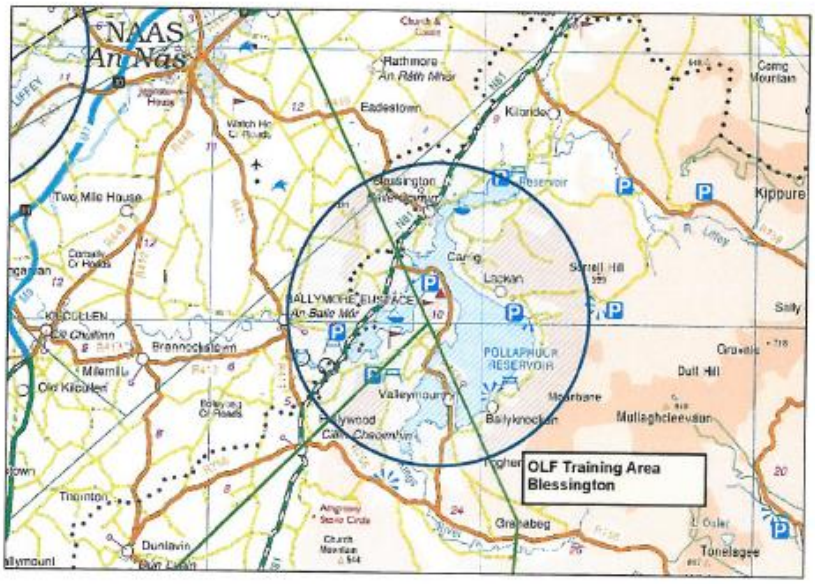
e. In all locations where wind farms or masts are permitted it should be a condition that they meet the following lighting requirements

(1) Single turbines or structures, or turbines delineating corners of a wind farm, should be illuminated by high intensity strobe lights (Red).
(2) Obstruction lighting elsewhere in a wind farm will be of a pattern that will allow the hazard be identified and avoided by aircraft in flight.
(3) Obstruction lights used should be incandescent or of a type visible to Night Vision Equipment. Obstruction lighting fitted to obstacles must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

Annex A

Low Flying Areas - MOA 4





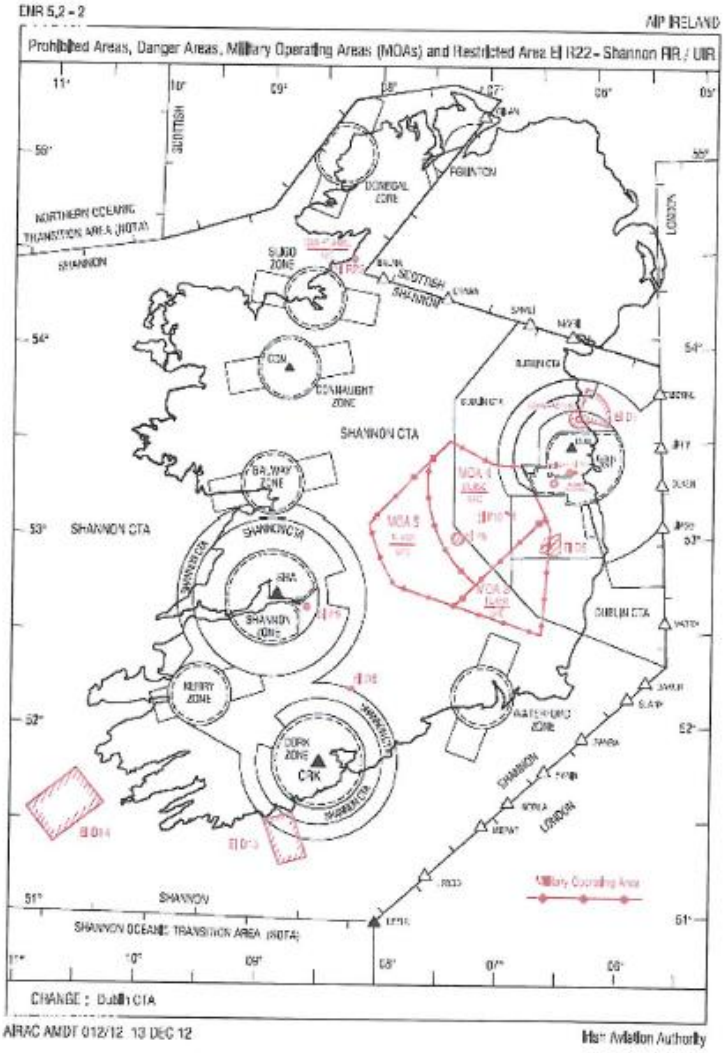
Annex B

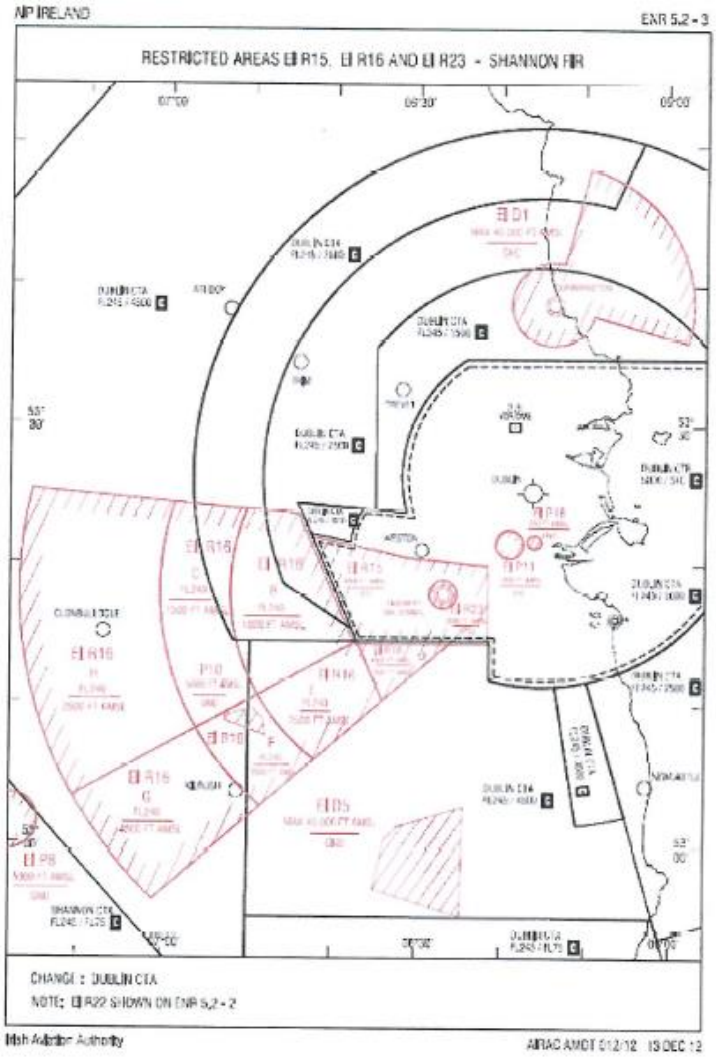
Low Flying Area – LFTA WEST

1. Area contained within the following grid L6972; L6945; M0745; M0772
2. Routes are primarily within valley areas.
3. Applications for wind farms/masts should be referred to Air Corps Operations for assessment against low flying routes.

Annex C

Designated Airspace
Restricted Areas, Danger Areas and Military Operating Areas





Annex D

Low Level Routes