61253

Environmental Impact Assessment Report

Cummeennabuddoge Wind Farm

Technical Appendix 16-2 Aviation Impact Assessment

Cummeennabuddoge Wind (DAC)

September 2024

Report

Cummeenabuddoge Wind Farm

Aviation Review Statement

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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 Cummeenabuddoge. 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 (DoD) Safeguarding
- Garda Support Unit (GASU) and the Emergency Aero-medical 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 Kerry and Cork Airport Runway Obstacles Limitation Surfaces, as defined in ICAO (International Civil Aviation Organization) Annex 14.

As the proposed wind farm is situated outside the Outer Horizontal Surfaces and there are no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Kerry Airport or Cork 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 an Airport to the boundary of the Area 1 of the Annex 15 Aerodrome Surface is 45km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft. Should the proposed wind farm be permitted, the turbines would be within 45km of the ARP at Kerry Airport 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 22 km from the Kerry Airport BRA and over 40 km from the Cork Airport BRA. At these distances there will be no impacts to the BRAs due to wind turbines at Cummeenabuddoge.

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 1000 ft above all obstacles within a sector of 25 nautical miles (46km) from the NDB at Kerry Airport and the VOR/DME at Cork Airport. The proposed wind farm is within 25NM of the NDB at Kerry Airport; however, there is over 1000ft from the maximum height of the wind farm to the applicable MSA Sector altitude and therefore there would appear to be no impact on the published MSA altitudes for Kerry or Cork Airports.

Instrument Flight Procedures

There are 33 published Instrument Flight Procedures for flights to/from Kerry and Cork Airports. Due to the distance of the proposed wind farm from the airports, and as there are existing obstacles nearer to the airports than the proposed development, there should be no impacts to these flight procedures.

Communications, Navigation and Surveillance System Safeguarding

As the proposed wind farm is more than 30 km from the Localizer and transmitting antenna at Kerry and Cork Airports, it is very unlikely that the proposed wind farm will have any impact on these ATS communications and radio navigational aids.

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 16 km safe distance from the surveillance radar system (SSR), for a "*Zone 4 - No Assessment*" condition. It has been highlighted in the analysis that the nearest of the proposed turbines would be located at a distance of 53 km from the radar station at Mount Gabriel and in Assessment Zone 4 of the EUROCONTROL Guidelines. As turbines at the proposed development would be 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 Kerry and Cork Airports for calibration of instrument landing systems.

Flight Inspection Procedures will not 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. terrain and existing wind farms).

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.

Irish Air Corps / Department of Defence (DoD) 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 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.

Garda Support Unit (GASU) and the Emergency Aero-medical Service (EAS)

The standard concerns that are being raised in recent consultations with the Irish Air Corps highlight the potential for obstacles to impact the operations of the Garda Air Support Unit (GASU) and the Emergency Aeromedical Service (EAS). An assessment of the GASU and EAS operations indicate 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
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 Cummeenabuddoge and of the nearest significant aviation installations at Kerry Airport and Cork Airports.

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Kerry approximately 30 km northeast of Kenmare. Figure 1 shows the proposed wind farm site with respect to Kerry Airport and Cork Airport. The location of the proposed development is in Class G Uncontrolled airspace between the two international airports.

Figure 1. Location of proposed wind farm at Cummeenabuddoge

1.2 Kerry Airport

Table 2 below shows the co-ordinates of Kerry Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Kerry 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
Farranfore, Co. Kerry.	International Airport	Single Asphalt Runway Airspace: Class C	52 10 51 N 09 31 26 W (Mid-point of Runway 08/26).	31 km

Table 1. Kerry Airport Details

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

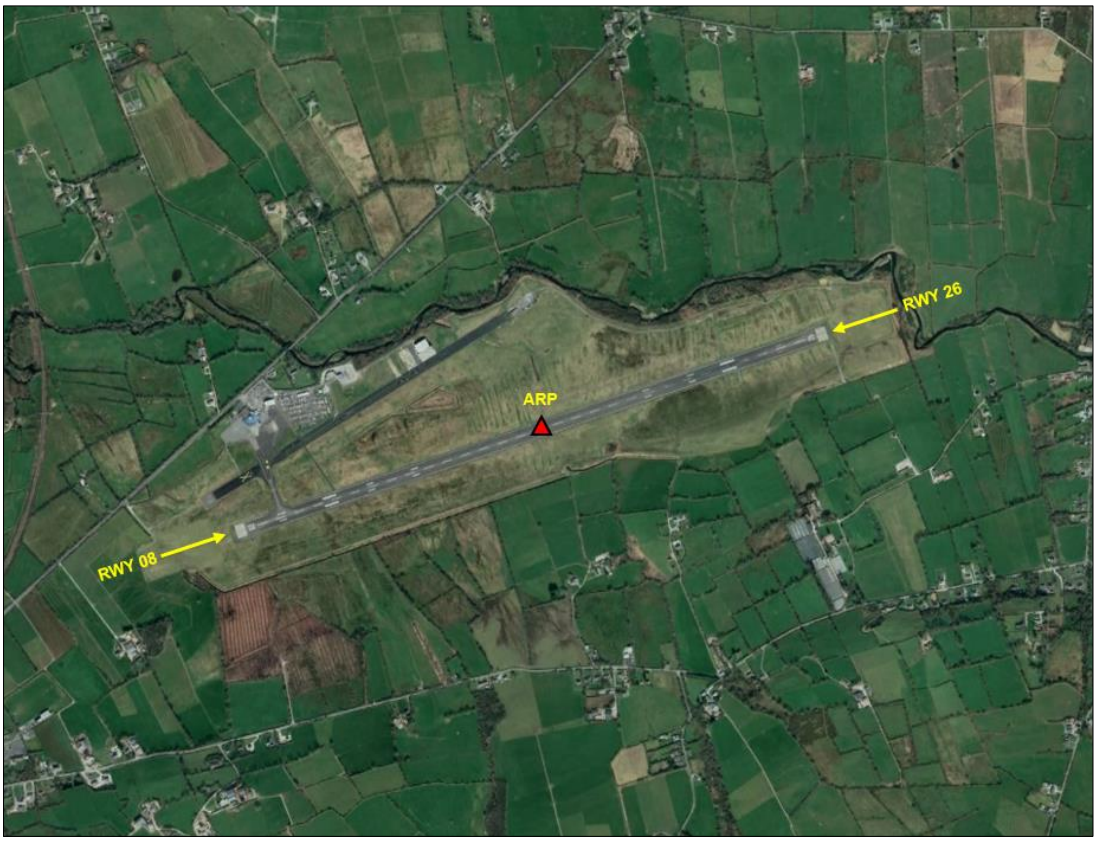


Figure 2. Kerry International Airport

1.3 Cork Airport

Table 2 below shows the co-ordinates of Cork Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Cork 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
Farmers Cross, Co Cork	International Airport	Two Asphalt Runways Airspace: Class C	51 50 29 N 08 29 28 W (Mid-point of Runway 16/34).	48 km

Table 2. Cork Airport Details

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

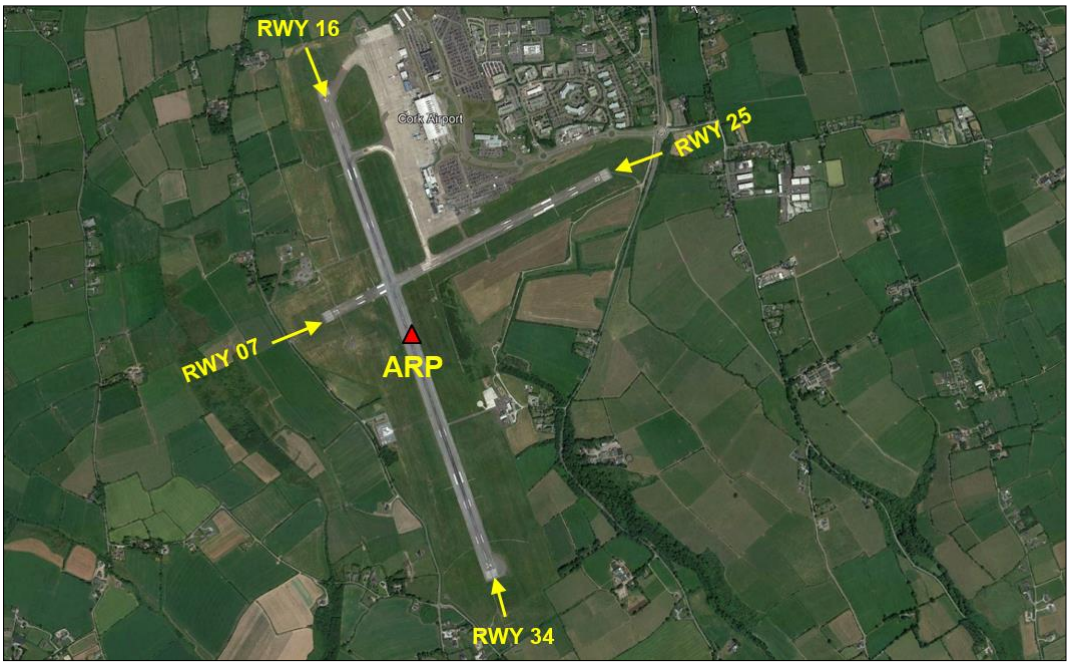


Figure 3. Cork International Airport

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
- Aeronautical Obstacle Warning Light Scheme
- Irish Air Corps / Department of Defence (DoD) 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 wind farm location and the airport obstacle surfaces. The obstacle limitation surfaces for aerodromes 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 4 below shows the Kerry and Cork Airport OLS surfaces in relation to the proposed wind farm. The distance from the ARP at Kerry and Cork Airports to the nearest of the proposed turbines is greater than 15 km. The analysis of the OLS plots indicates that the proposed turbines would not penetrate the Outer Horizontal Surfaces for these Airports which extends to 15 km from the Airport Reference Points (ARPs).

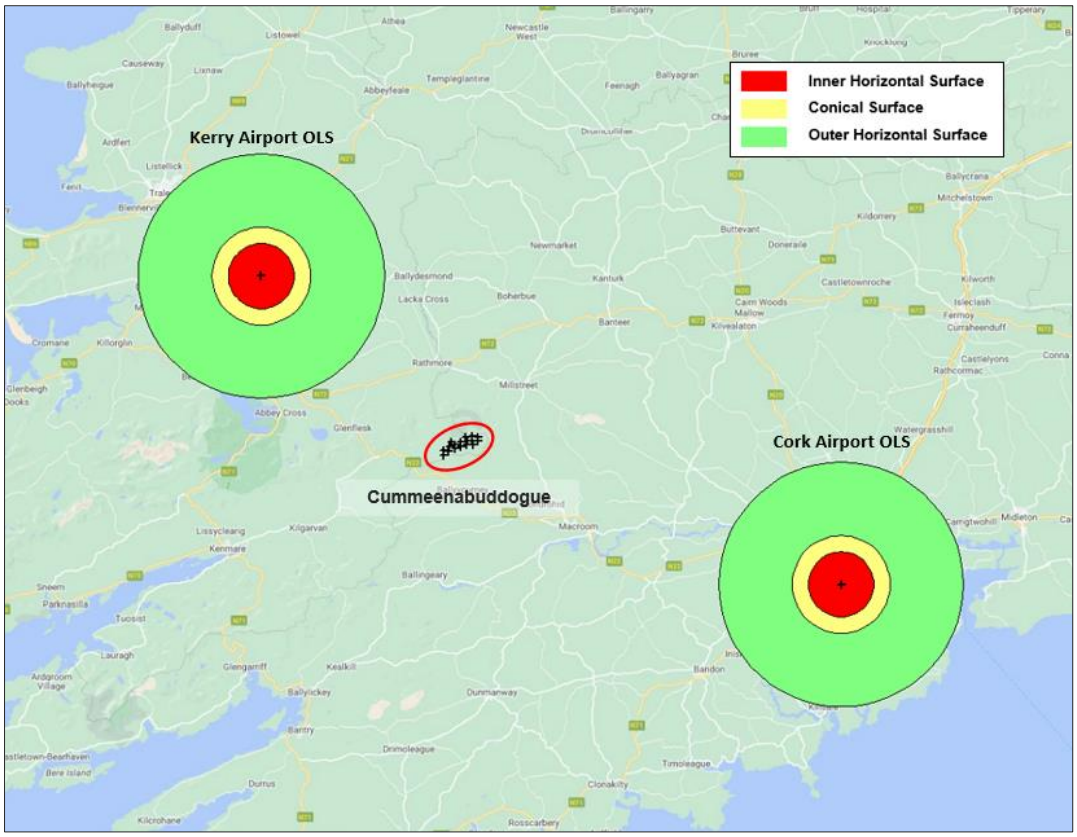


Figure 4. Cummeenabuddoge Wind Farm in relation to Aerodrome OLS Surfaces.

Aerodrome	Runway Code	Outer Horizontal Surface Applicable	Clearance Distance to Aerodrome OLS Surface
Kerry Airport	Runway Code 4	Y	16 km
Cork Airport	Runway Code 4	Y	33 km

Table 3. Clearance Distances to Aerodrome OLS Surfaces

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface as shown in Figure 4. The “Terrain and Obstacle Requirements Area” is defined in ICAO Annex 15 as an area of up to 45km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 and Area 2 Surface is provided in Appendix A).

As the proposed wind farm site is 31 km from the ARP at Kerry Airport, there is penetration of the Annex 15 surface for this Aerodrome. All obstacles, if they are more than 100 meters above terrain for a distance of up to 45 km from the ARP, need to be registered in the IAA Air Navigation Obstacle Data Set. This area is known as the TMA area i.e. Terminal Maneuvering Area and is used for en-route circling and maneuvering and is shown in Figure 5.

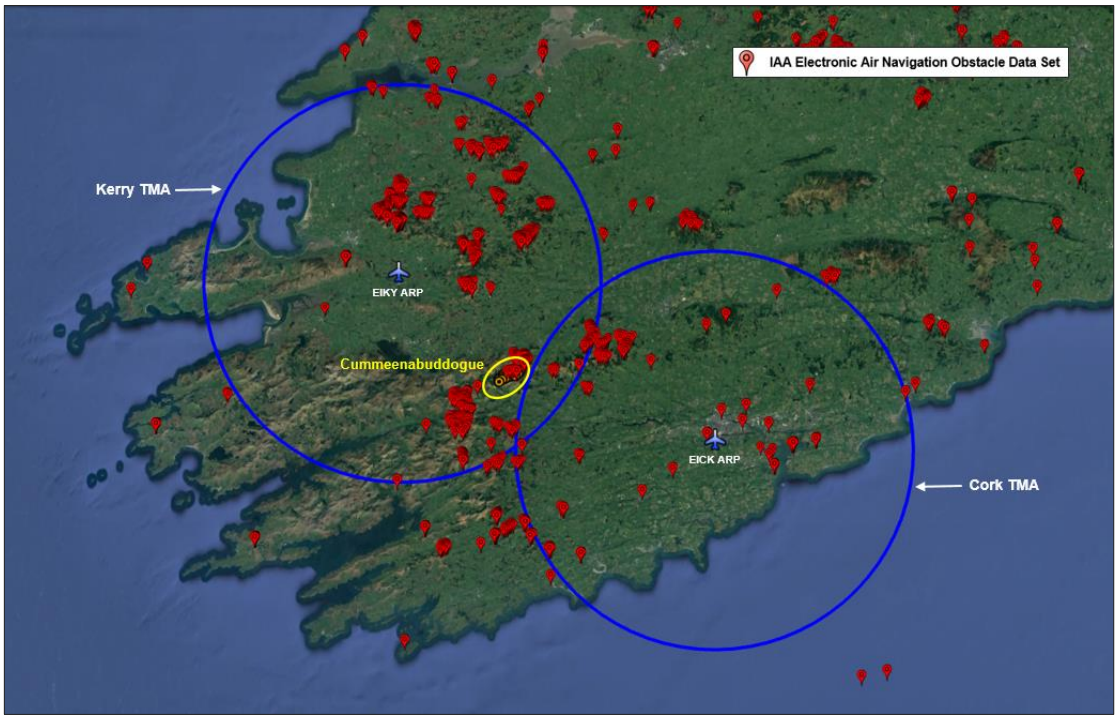


Figure 5. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

It should be noted that there are other existing tall structures (obstacles) nearer to the Kerry and Cork airports, e.g. the 2RN transmitter mast at Mullaghanish and the existing wind farms at Scartaglen, Coomacheo, Gneeves, Caherdowney, Curragh, Coomagearlaghy, Midas, Sillahertane, Bawnmore, etc.

These existing obstacles would shield any potential impacts from the proposed wind farm at Cummeenabuddoge. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 6.

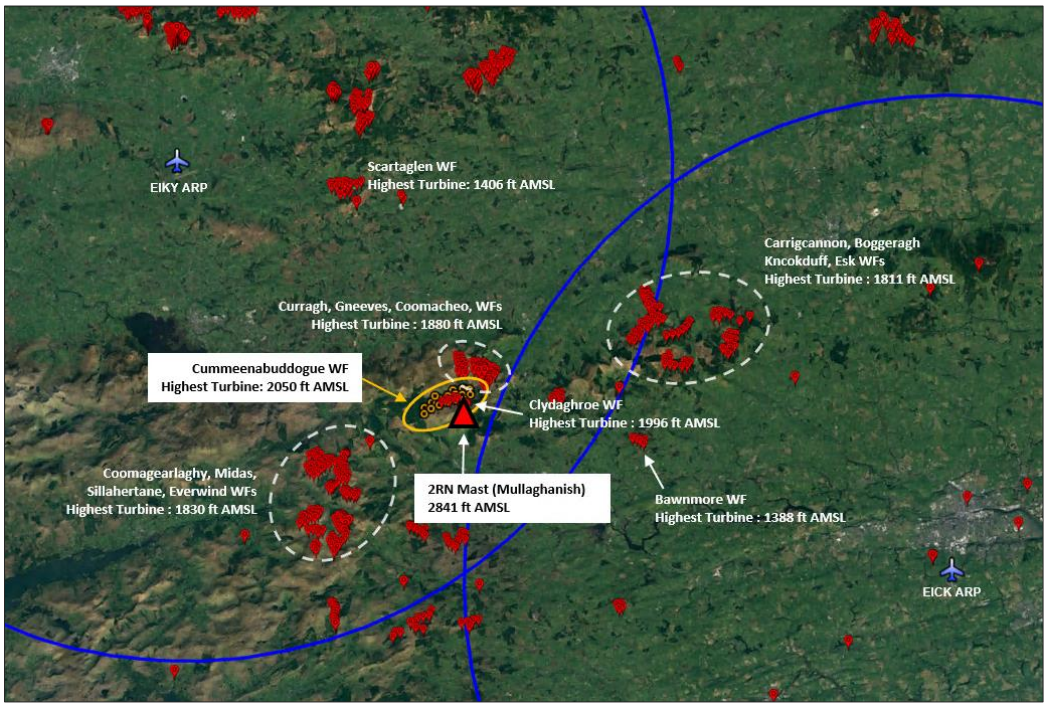


Figure 6. Permitted Obstacles in vicinity of Cummeenabuddoge Wind Farm

Although there are other obstacles closer to the airport than 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.

2.3 Building Restricted Areas (BRAs)

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 Ireland West Airport and Sligo Airports are 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.

2.3.1 BRA – Kerry Airport

Figure 7 below illustrates that the proposed wind farm at Cummeenabuddoge is over 22 km from the Kerry BRA (safeguarded area for Runway 26). At this distance, turbines at the proposed wind farm will have no impact on the Building Restricted Area for Kerry Airport.

Figure 7. Proposed Wind Farm relative to Kerry Airport BRA - RWY 26

2.3.2 BRA – Cork Airport

Figure 8 below illustrates that the proposed wind farm at Cummeenabuddoge is over 40 km from the Cork BRA (safeguarded area for Runway 16). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Cork Airport.

Figure 8. Proposed Wind Farm relative to Cork Airport BRA - RWY 16

2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm site is located more than 25 nautical miles (NM) from the VOR at Cork Airport, but within 25 NM of the NDB at Kerry Airport. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified sectors.

The proposed wind farm is located in the southeastern MSA Sector (MSA 3900 ft) of Kerry Airport, as shown below in Figure 9. According to the wind farm location, the maximum construction height for the site would be 2900 ft / 884 m AMSL (3900 ft MVA minus 1000 ft).

The tip-height of the highest of the proposed turbines would be 625m (2050 ft) AMSL. This is below the 2900 ft threshold, therefore the relevant MSA will not be affected and there will be no impact on the published MSA altitude figures.

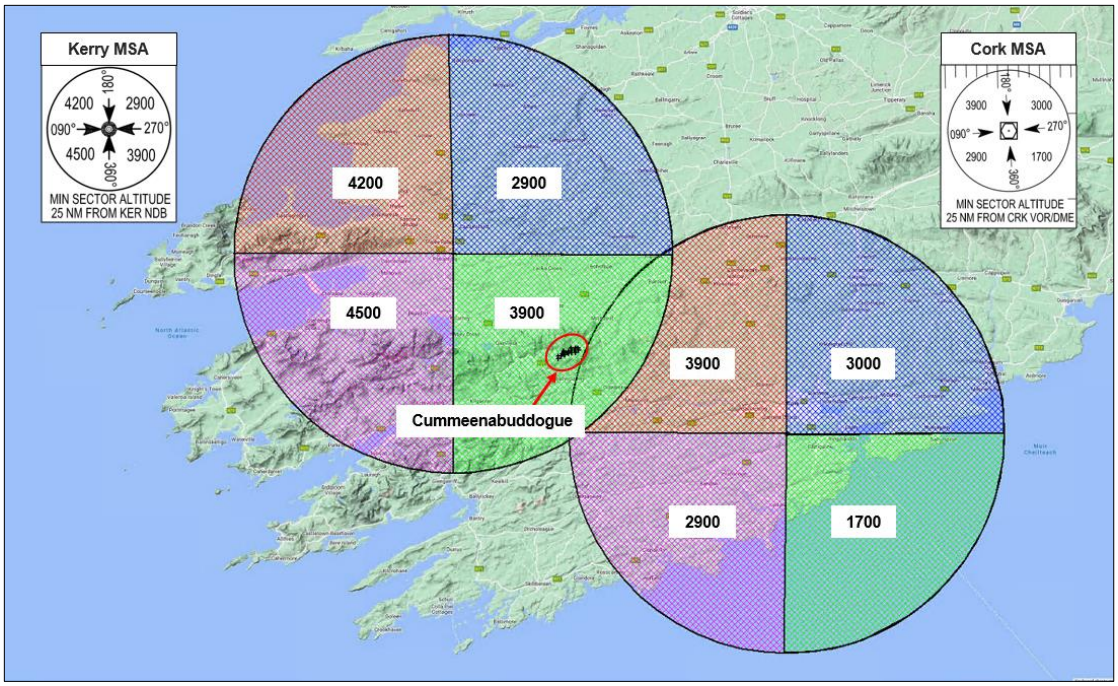


Figure 9. Minimum Sector Altitudes – Kerry and Cork Airports

2.5 Instrument Flight Procedures

There are 33 published Instrument and Visual Flight Procedures for arrivals to and departures from Kerry and Cork Airports.

Due to the distance of the proposed wind farm from Kerry and Cork Airports (and as there are existing obstacles adjacent to the proposed wind farm, it is unlikely that there will be any impacts on the Instrument Flight Procedures for flights to/from these Airports. Table 4 below lists the Instrument Flight Procedures for Kerry and Cork Airports.

Aerodrome	Aerodrome Procedure	Chart ID	Wind Farm Impacts
Kerry	Standard Departure Chart –Instrument RWY 26 CAT A, B - ICAO	EIKY AD 2.24-3	No Impacts.
Kerry	Standard Departure Chart –Instrument RWY 26 CAT C - ICAO	EIKY AD 2.24-4	No Impacts.
Kerry	Standard Departure Chart –Instrument RWY 08 CAT A, B- ICAO	EIKY AD 2.24-5	No Impacts.
Kerry	Standard Departure Chart –Instrument RWY 08 CAT C - ICAO	EIKY AD 2.24-6	No Impacts.
Kerry	Instrument Approach Chart RNP RWY 26 CAT A, B, C - ICAO	EIKY AD 2.24-7	No Impacts.
Kerry	Instrument Approach Chart ILS B OR LOC RWY 26 CAT A, B, C - ICAO	EIKY AD 2.24-8.1	No Impacts.
Kerry	Instrument Approach Chart NDB RWY 26 CAT A, B, C – ICAO	EIKY AD 2.24-9.1	No Impacts.
Kerry	Instrument Approach Chart RNP RWY 08 CAT A, B, C – ICAO	EIKY AD 2.24-10	No Impacts.
Kerry	Instrument Approach Chart NDB RWY 08 CAT A, B, C - ICAO	EIKY AD 2.24-11	No Impacts.
Kerry	Visual Approach Chart – ICAO	EIKY AD 2.24-13	No Impacts.
Cork	NAV (GNSS) Standard Departure Chart RWY 16 CAT A, B- ICAO	EICK AD 2.24-6	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 16 CAT C, D - ICAO	EICK AD 2.24-7	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 34 CAT A, B - ICAO	EICK AD 2.24-8	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 34 CAT C, D - ICAO	EICK AD 2.24-9	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 07 CAT A, B - ICAO	EICK AD 2.24-10	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 07 CAT C, D - ICAO	EICK AD 2.24-11	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 25 CAT A, B- ICAO	EICK AD 2.24-12	No Impacts.
Cork	RNAV (GNSS) Standard Departure Chart RWY 25 CAT C, D- ICAO	EICK AD 2.24-13	No Impacts.
Cork	RNAV (GNSS) Standard Arrival Chart RWY 16 - ICAO	EICK AD 2.24-14	No Impacts.
Cork	RNAV (GNSS) Standard Arrival Chart RWY 34 - ICAO	EICK AD 2.24-15	No Impacts.
Cork	RNAV (GNSS) Standard Arrival Chart RWY 07 CAT A, B - ICAO	EICK AD 2.24-16	No Impacts.
Cork	RNAV (GNSS) Standard Arrival Chart RWY 25 CAT A, B - ICAO	EICK AD 2.24-17	No Impacts.
Cork	Instrument Approach Chart RNP RWY16 - ICAO	EICK AD 2.24-18	No Impacts.
Cork	Instrument Approach Chart ILS Cat I & II or LOC RWY16 - ICAO	EICK AD 2.24-19.1	No Impacts.
Cork	Instrument Approach Chart VOR RWY16 - ICAO	EICK AD 2.24-20	No Impacts.

Cork	Instrument Approach Chart RNP RWY34 - ICAO	EICK AD 2.24-21	No Impacts.
Cork	Instrument Approach Chart ILS CAT I or LOC RWY34 - ICAO	EICK AD 2.24-22	No Impacts.
Cork	Instrument Approach Chart VOR RWY 34 - ICAO	EICK AD 2.24-23	No Impacts.
Cork	Instrument Approach Chart RNP RWY07 - ICAO	EICK AD 2.24-24	No Impacts.
Cork	Instrument Approach Chart VOR RWY 07 - ICAO	EICK AD 2.24-25	No Impacts.
Cork	Instrument Approach Chart RNP RWY25 (LNAV Only) - ICAO	EICK AD 2.24-26	No Impacts.
Cork	Instrument Approach Chart VOR RWY 25 - ICAO	EICK AD 2.24-27	No Impacts.
Cork	Visual Approach Chart - ICAO	EICK AD 2.24-28	No Impacts.

Table 4. Instrument and Visual Flight Procedures – Kerry and Cork Airports

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 5. None of these wind farms required a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Description
Scartaglen	TBC	Operational Wind Farm
Coomacheo	TBC	Operational Wind Farm
Gneeves	TBC	Operational Wind Farm
Caherdowney	TBC	Operational Wind Farm
Curragh	TBC	Operational Wind Farm
Coomagearlaghy	TBC	Operational Wind Farm
Midas	TBC	Operational Wind Farm
Sillahertane	TBC	Operational Wind Farm
Bawnmore	TBC	Operational Wind Farm
Clydaghroe	TBC	Operational Wind Farm

Table 5. Permitted Wind Farms in vicinity of Proposed Wind Farm

2.7 Communication Navigation and Surveillance Systems

In this section the possible impact of the proposed wind farm on the Communication, Navigation and Radar Surveillance Systems for the aerodromes at Kerry and Cork are assessed.

2.7.1 Communications and Navigation Systems

The AIP documents EIKY AD 2-18/19 and EICK AD 2-18/19 provides the information for communication and navigation facilities for Kerry and Cork Airports respectively. The table below shows the channel frequencies for the ATS communications Facilities and the Radio Navigation and Landing Aids for each airport.

Aerodrome	ATS Communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of wind fam
Kerry	118 MHz –124 MHz	334 KHz – 330 MHz	31 km	No impacts
Cork	109 MHz – 121 MHz	109 MHz – 1575 MHz	48 km	No impacts

Table 6. Impacts on Communications and Navigation Systems

As the proposed wind farm is over 30 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.

2.7.2 Radar Surveillance Systems

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 7. 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 8. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 16km 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 10km. 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."*

2.7.2.1 Irish Aviation Authority (IAA) Radar Surveillance Sensors

To determine which Assessment Zones are applicable to the proposed wind farm a desktop assessment was carried out. The nearest radar surveillance site to the proposed wind farm development is at Mount Gabriel, County Cork.

Figure 10. Radar Surveillance Site(s) relative to Cummeenabuddoge Wind Farm.

2.7.2.1.1 Mt Gabriel Radar Assessment

The radar surveillance site at Mt Gabriel consists of two SSR installations. Figure 11. Shows one of the SSR installations. The SSR antennas are housed in the dome-shaped structure at the top of the tower.

Figure 11. Mt Gabriel Radar Station.

Table 9 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.

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Cummeenabuddoge	53km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 9. EuroControl / UK Safeguarding Guidelines – Mt Gabriel Radar Station

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 radar station at Mt Gabriel.

2.8 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 Kerry and Cork Airports 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. terrain and existing wind farms).

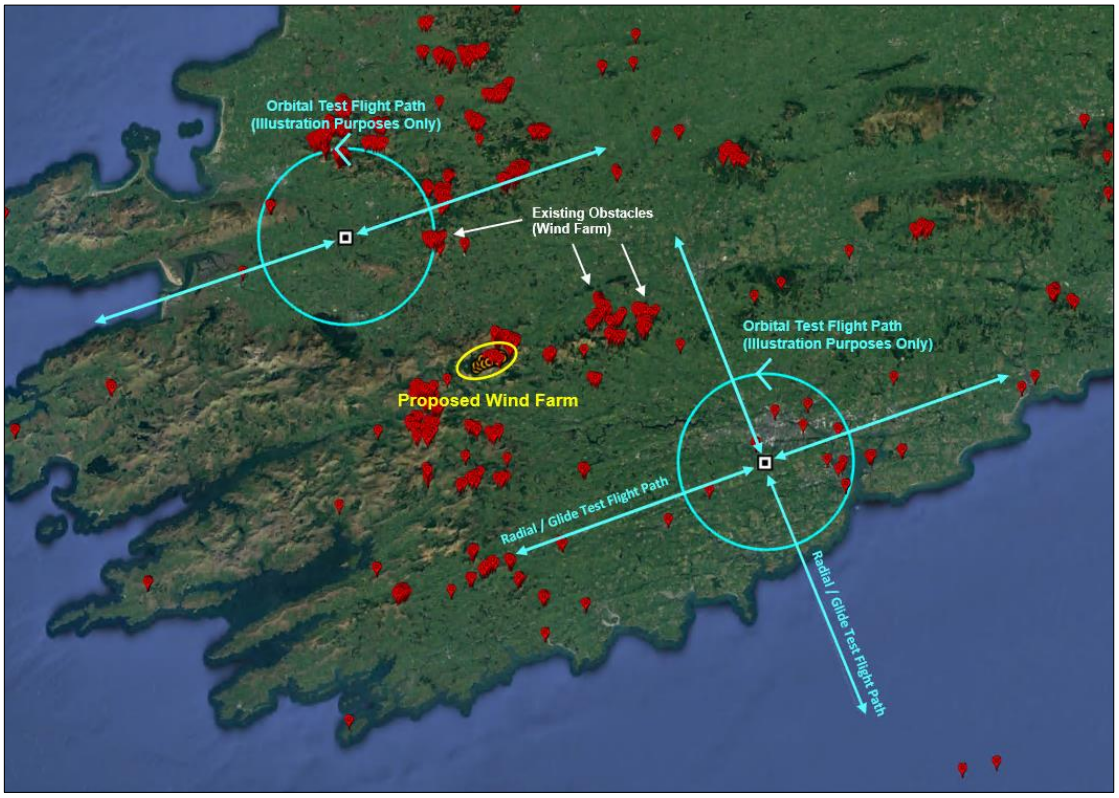


Figure 12. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

2.9 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.

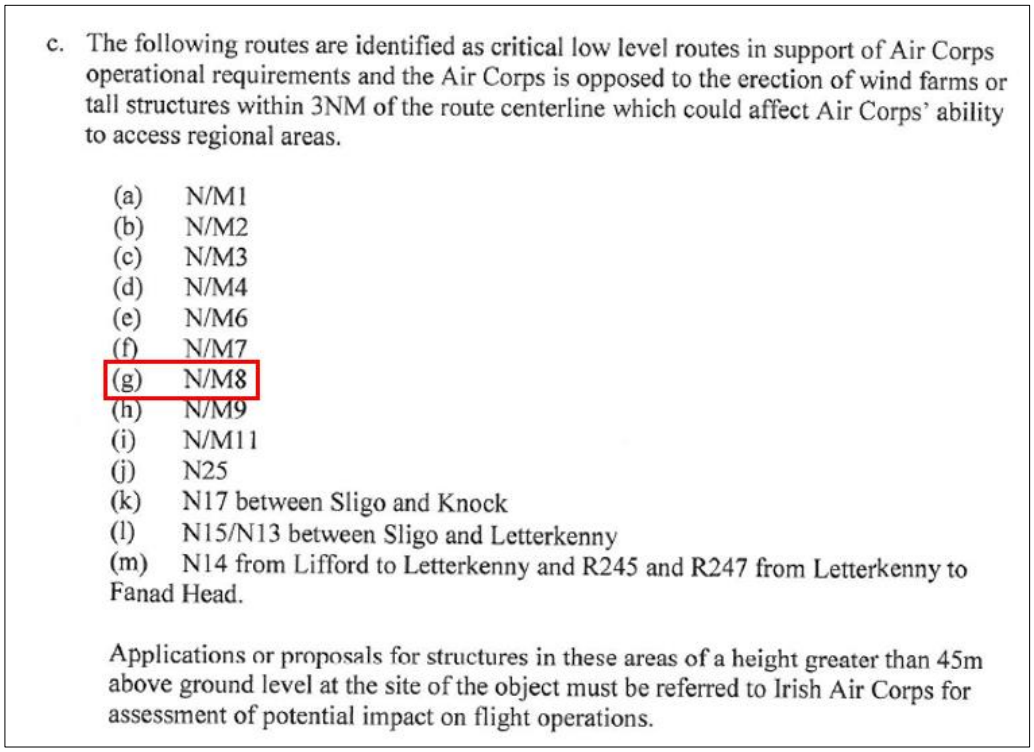
It is recommended that lighting requirements should be in accordance with Chapter Q – Visual Aids for denoting Obstacles; CS ADR.DSN.Q.851 and GM.ADR.DSN.Q.851 (Pages 729/730) of the EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014) where it states that

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

2.10 Irish Air Corps / DoD Safeguarding

The Irish Air Corps Position Paper "*Air Corps Wind Farm/ Tall Structures Position Paper*" published on 08th August 2014 (Appendix B), 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. (Areas contained in Danger Areas EI-D1, EI-D5, EI-D6, EI-D13, EI-D14, Restricted Areas EI-R15, EI-R16 within 20 NM of Baldonnel, MOAs 3 and 4 within 20 NM of Baldonnel.
- Low Flying Training Areas within MOA 4 in the areas of; Blessington, Edenderry/Allenwood/Rathangan, Kilmeague/Newbridge.
- Low Flying Training Area West – LFTA WEST.
- A distance of 5 NM or less from military installations.
- Critical low level flying routes (as listed below in Figure 13) 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 13. Irish Air Corps – Critical Low Level Routes

The nearest of the Air Corps restricted areas to the proposed wind farm is the 3NM restricted area around the M8 Motorway, as shown in Figure 14 below. As the proposed wind farm is located outside the restricted area, there should be no impacts on Irish Air Corps activities.

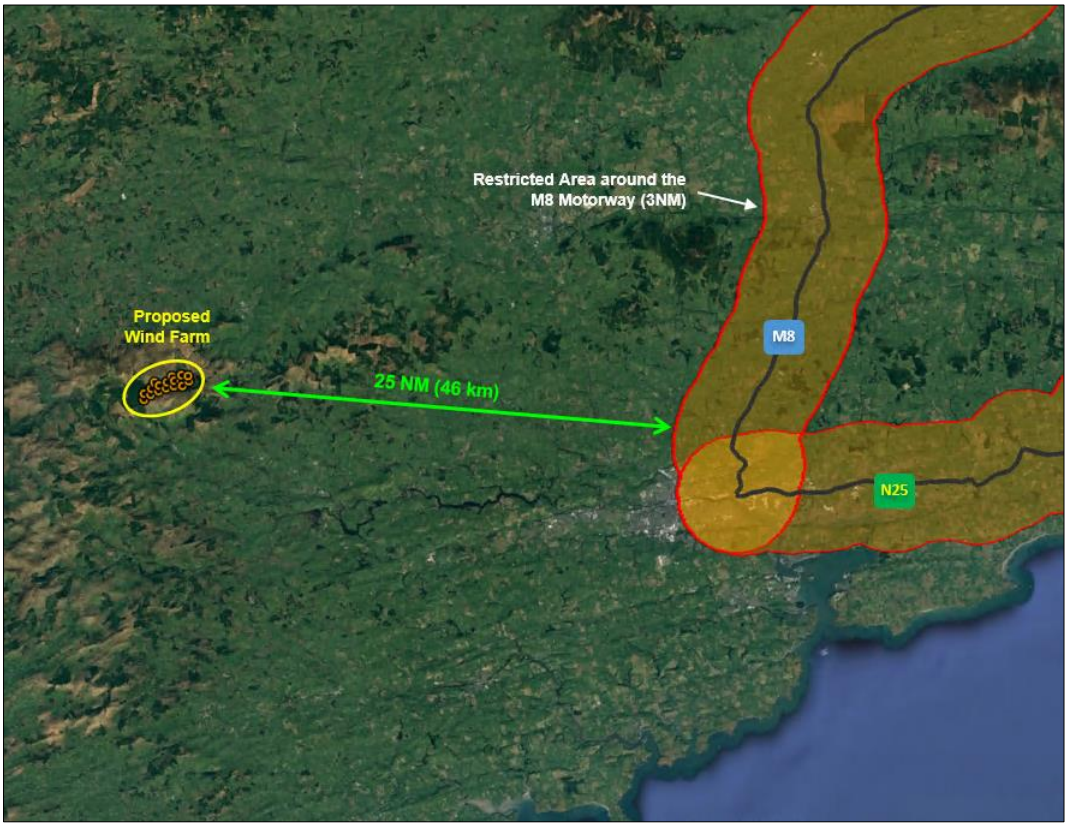


Figure 14. Proposed Wind Farm relative to Critical Low Level Flight Route (M8)

2.11 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 2.11.1 and 2.11.2 that follow.

2.11.1 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 15. GASU - Pilatus Britten-Norman BN 2T-4S Defender 4000

Figure 16. GASU - Eurocopter EC135 T2

The proposed windfarm is over 45 km from the nearest IAC restricted area, i.e. the 3NM restricted area around the M8 motorway, and is located in mountainous and forested terrain. In addition, the area in the vicinity of Cummeenabuddoge is sparsely populated and is surrounded by existing obstacles (e.g. 2RN Mast and existing wind farms). For these reasons, it is highly unlikely that the proposed wind farm development would have any 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 farm be permitted the turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly.

GASU Aircraft	Impact of proposed wind farm - 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 area. 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 mountainous and forested 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 10. Impact of proposed wind farm on GASU Operations

2.11.2 The Emergency Aeromedical Service (EAS)

This Emergency Aeromedical Service is based in and operates from the Custume Barracks in Athlone. The aircraft utilised by the EAS is an Irish Air Corps Euro-copter 135 and is used for time-critical medical emergencies. Figure 17 below shows the flying times from the EAS base at Athlone.

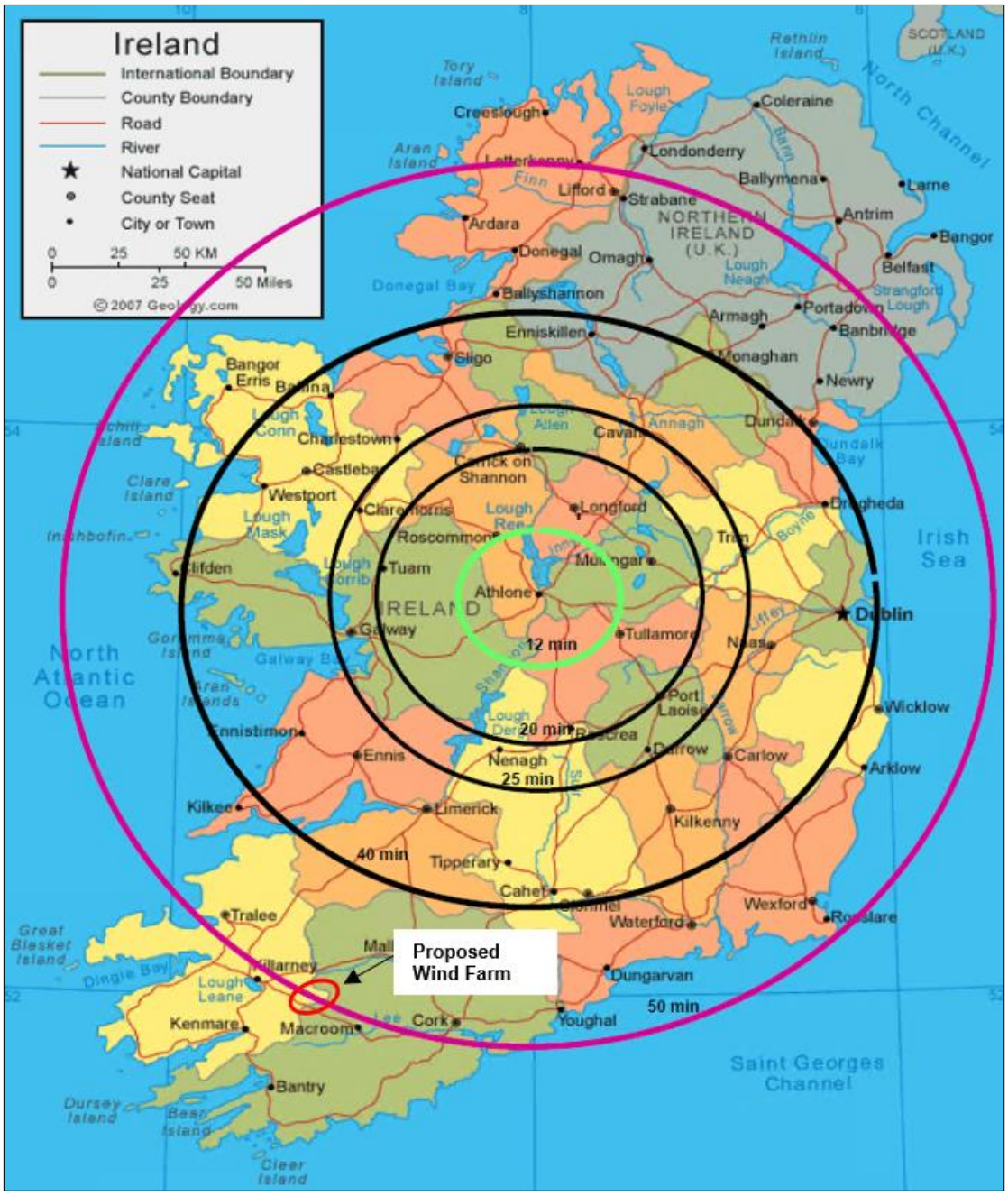


Figure 17. EAS – Flying Times from Athlone

The proposed wind farm is located approximately 30 km northeast of Kenmare and in an area that is sparely populated. Helicopter landings are highly unlikely to occur in the subject area due to the location's mountainous and forested terrain.

Also, should the proposed wind farm at Cummeenabuddoge be permitted the turbine locations would be submitted to the IAA and aviation charts and GNSS databases would be updated accordingly. EAS helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines).

In addition, the proposed wind farm development is surrounded by existing obstacles including existing wind turbines and the 2RN Telecoms Mast on the summit of Mullaghanish. Any flights from Athlone to West Cork / West Kerry would divert around these existing obstacles.

EAS Aircraft	Impact of proposed wind farm – Opinion
Helicopter (Eurocopter EC135)	Low – Helicopter landings in the subject area would not occur as the proposed wind farm is sparely populated, surrounded by existing obstacles and is located in mountainous and forested 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 11. Impact of proposed wind farm on EAS Operations

3. Summary

A summary of the aviation review for the proposed wind farm at Cummeenabuddoge is provided in Table 10 below.

Item	Impact \ Observation	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	Turbines at the proposed wind farm would be outside the Obstacle Limitation Surfaces for Kerry and Cork Airport.
Annex 15 - Aerodrome Surfaces	OBV	Observation : Turbines at the proposed wind farm would penetrate the ICAO Annex 15 Aerodrome Surface for Kerry Airport. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Kerry Airport, need to be registered in the IAA Air Navigation Obstacle Data Set. The IAA may request that the turbines be included in the IAA Aeronautical Electronic Obstacle Data Sets. It should be noted that other existing tall structures nearer to Kerry Airport (e.g. the existing turbines at Scartaglen, Coomacheo, Gneeves, etc.) 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 (BRAs)	None	A review shows that Cummeenabuddoge is over 22 km from the BRA for Kerry Airport and over 40 km from the BRA for Cork Airport. At these distances 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 NDB at Kerry Airport. The maximum allowable structure in the applicable sector is 2900ft (AMSL). Turbines at the proposed wind farm would not exceed the 2900ft threshold, therefore the MSA of the relevant 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 proposed wind farm site is sufficiently far from Kerry and Cork Airports that the instrument flight procedures for approach and departure flights to/from the airports are unlikely to be impacted for precision aircraft
Communication and Navigation Systems	None	As the proposed wind farm is over 25 km from the Localizers and transmitting antennas at Kerry and Cork Airports, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Systems Safeguarding	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 ARPs at Kerry and Cork Airports that there would be no impacts.
Aeronautical Obstacle Warning Light Scheme	OBV.	Observation : It is possible that the IAA may request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance to industry standards. Subject to further consultation with the IAA.
Irish Air Corps / DoD Safeguarding	None	The proposed wind farm is located outside the Irish Air Corps Restricted Areas.
GASU and EAS	None	An assessment of the GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Table 12. Cummeenabuddoge Wind Farm – Aviation Review Summary

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

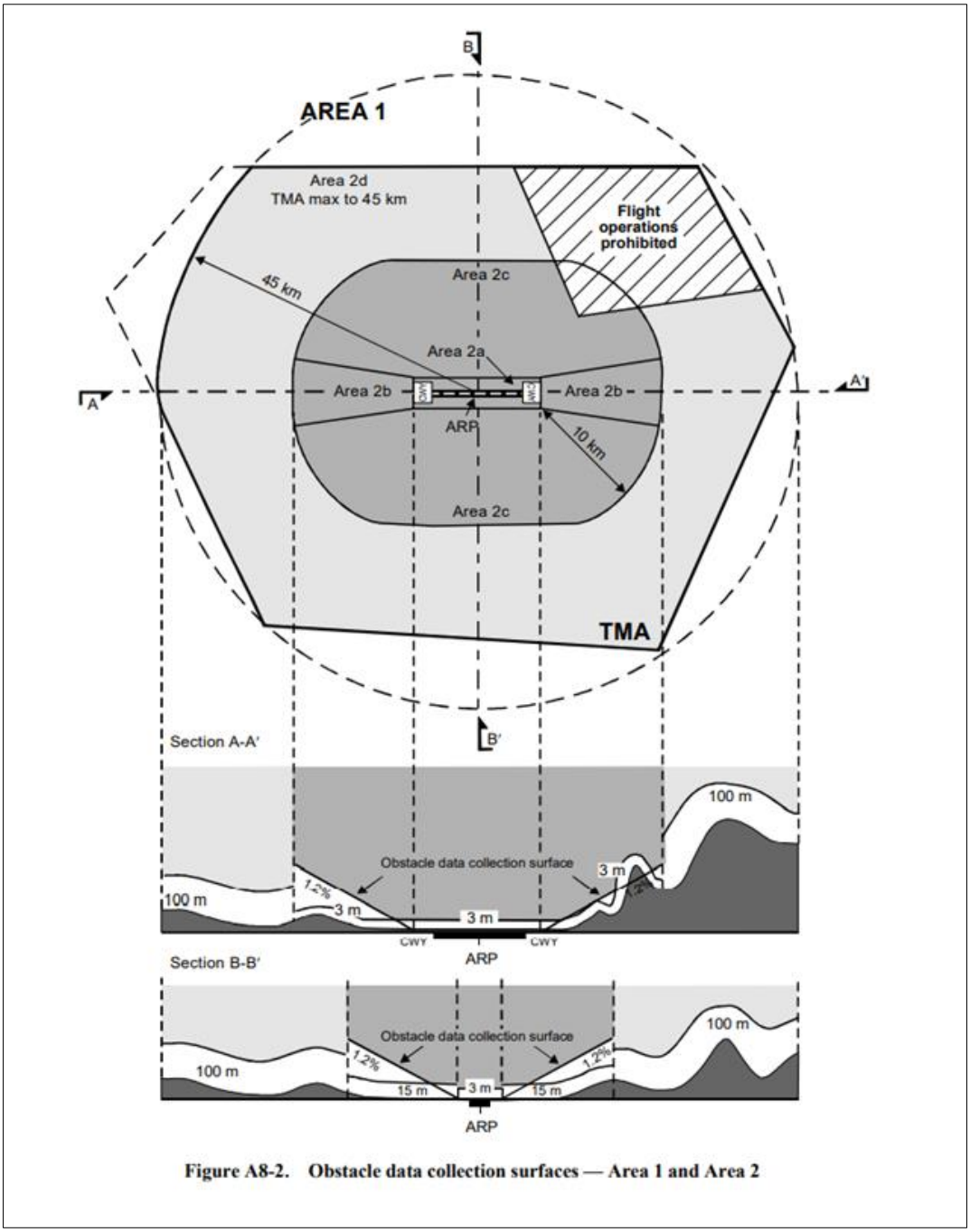


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

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.

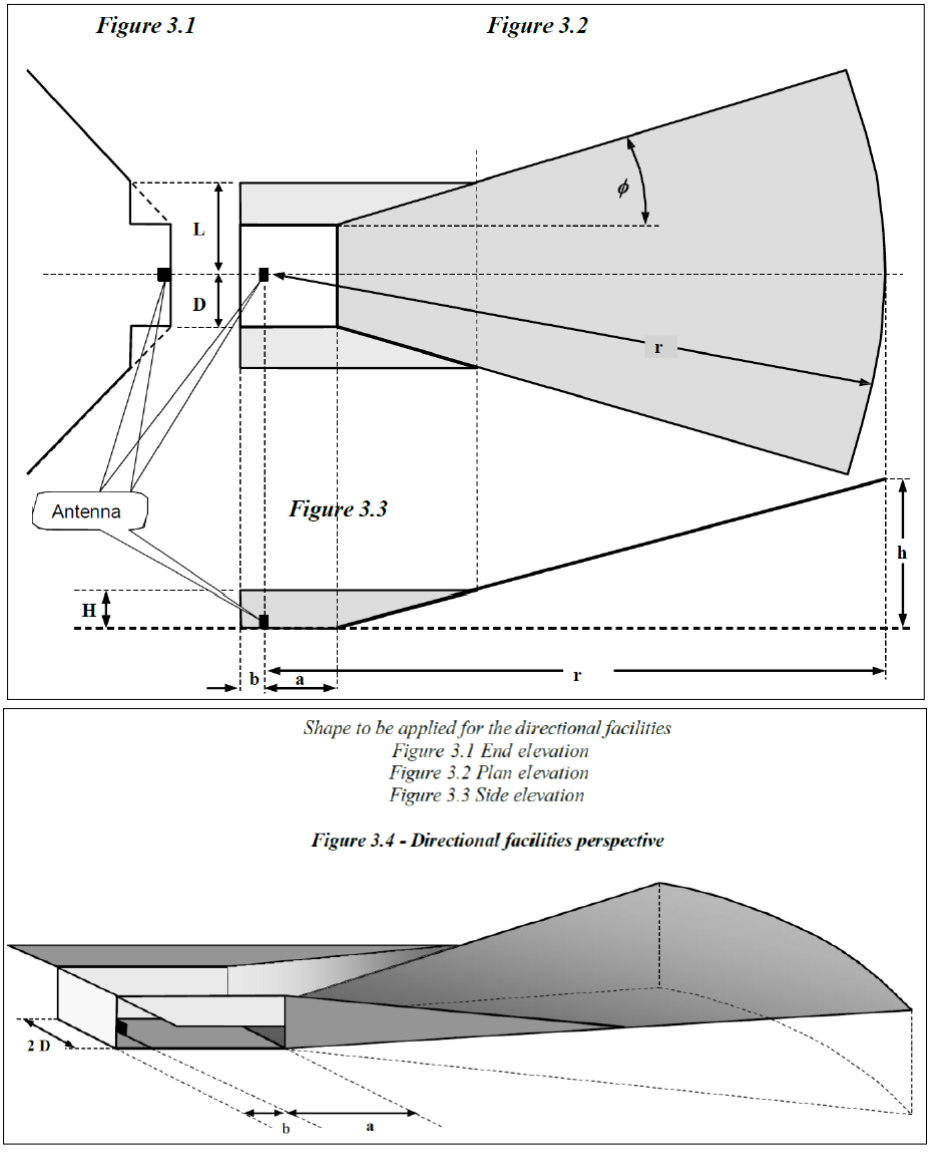


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

*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)