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Appendix 17.1

Aviation Review Statement

Report

Shancloon 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 Shancloon. 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 Ireland West 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 at Ireland West Airport.

Annex 15 - Aerodrome Surfaces

Following a review of “Terrain and Obstacle Requirements” as defined in ICAO Annex 15, turbines at the proposed development would need to be registered if they are more than 100 meters above terrain. The distance from the centre point (ARP – Airport Reference Point) of Ireland West Airport to the boundary of 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, turbines would be within 45km of the ARP at Ireland West Ireland 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 35 km from the Ireland West Airport BRAs. At these distances there will be no impacts to the BRAs due to the proposed wind turbines at Shancloon.

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 25 nautical miles (46km) of the VOR/DME at Ireland West Airport and the NDB at Sligo Airport. There is over 1000ft from the maximum height of the wind farm to the applicable MSA Sector altitudes and therefore it is highly unlikely that there would be any impact on the published MSA altitudes for Ireland West Airport.

Instrument Flight Procedures

There are 16 published Instrument Flight Procedures for flights to/from Ireland West 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, therefore it is highly unlikely that there would be any impacts to these flight procedures.

Communications, Navigation and Surveillance System Safeguarding

As the proposed wind farm is more than 41 km from the Localizer and transmitting antennas at Ireland West Airport, it is very unlikely that wind turbines at the proposed development will have any impact on these ATS communications and radio navigational aids.

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 located at the proposed farm would be located at a minimum distance of over 90 km from the SSR radar stations at Dooncarton, Shannon Airport and Woodcock Hill 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 Ireland West 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. 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.

Private Airfields - VFR Flying

A due diligence survey was carried out to identify whether there are any private airfields on agricultural lands in proximity to the proposed windfarm which operate in Class G (unlicensed) airspace. There was no access to these fields and they were assessed by means of aerial and roadside surveys. During the course of the surveys there was evidence that there may have been a grass-strip that may have been used at some point in time as a private air fields at Kilconly and Castlehackett. It is highly unlikely that there will be any impact on either these air fields as a result of the proposed wind farm"

Irish Air Corps Position on Wind Farms / Tall Structures

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

The proposed wind farm is 19 km from the nearest Irish Air Corps (IAC) restricted zone and is located in a largely rural area with relatively poor road access. For these reasons, it is highly unlikely that the proposed wind farm development would have any impacts on GASU fixed-wing aircraft or helicopter flights / operations.

For the same reasons, any potential EAS operations in the area are also unlikely to be impacted. In the unlikely event of an EAS operation in the general area, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects, is relatively clear of obstacles (e.g. trees) and have good road access (to link up with the local ambulance service). The sports fields at Shrule, Caherlistrane or Kilconly would be a much more suitable HLS for any such emergency landings in Shancloon area.

Sections

Appendices

Abbreviations

AGL	Above Ground Level
AMSL	Above Mean Sea Level
ARP	Airport Reference Point
BRA	Building Restricted Area
DME	Distance Measuring Equipment
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

1. Introduction

This section provides a brief summary of the proposed wind farm development at Shancloon and of the nearest significant aviation installation at Ireland West Airport and the airfields at Kilconly and at Castlehacket.

1.1 Wind Farm Site Information

The proposed wind farm development is located approximately 8 km northwest of Tuam in Co Galway. Figure 1 shows the proposed wind farm site with respect to Ireland West Airport and to the airfields at Kilconly and Castlehacket.

Figure 1. Location of proposed wind farm at Shancloon

1.2 Ireland West Airport

Table 2 below shows the co-ordinates of Ireland West Airport and the distance from the Airport Reference Point (ARP) to the proposed wind farm site. Ireland West 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
Ireland West Airport, Charlestown, Co Mayo	International Airport	Single Asphalt Runway Airspace: Class C	53 54 37 N 08 49 06 W (Mid-point of Runway 08/26).	41.5 km

Table 1. Ireland West Airport Details

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

Figure 2. Ireland West 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
- Private Airfields (VFR Flying)
- Irish Air Corps / Department of Defence 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 Ireland West 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

2.1.1 OLS – Ireland West Airport

Figure 3 below shows the proposed wind farm at Shancloon relative to the OLS surfaces for Ireland West Airport. The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surface for the Airport which extend to 15 km from its Airport Reference Point (ARP).

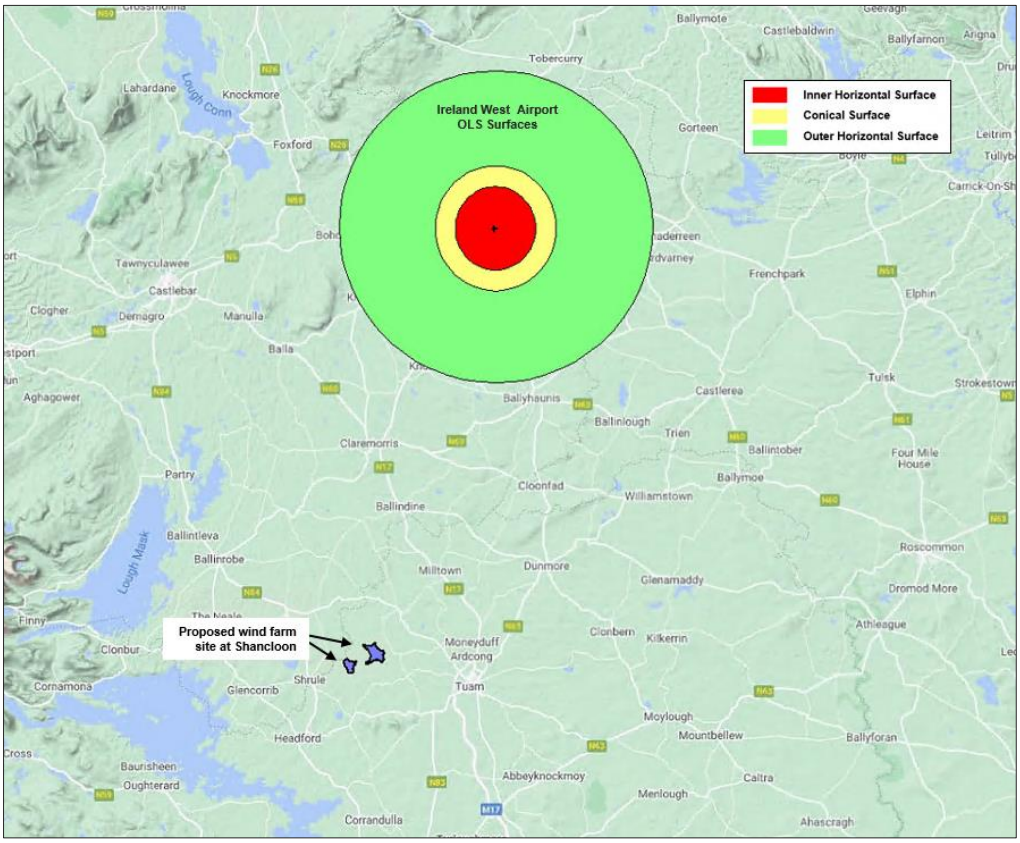


Figure 3. OLS Surfaces - Ireland West Airport.

A summary of the possible impacts of the proposed wind farm on the OLS surfaces for Ireland West Airport is provided in Table 2 below.

Aerodrome	Runway Code	Wind farm Impacts
Ireland West International Airport	Code 4	No impacts

Table 2. Summary of impacts on OLS Surfaces

2.2 Annex 15 Aerodrome Surfaces

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 & Area 2 Surfaces is provided in Appendix B). The Annex 15 Aerodrome Surfaces applies to the Code 4 Runway at Ireland West Airport at Knock.

As the proposed wind farm site is 41.5 km from the ARP at Ireland West Airport, there is penetration of the Annex 15 surface for the aerodrome at Ireland West. All obstacles, if they are more than 100 meters above terrain for a distance of up to 45km 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 4.

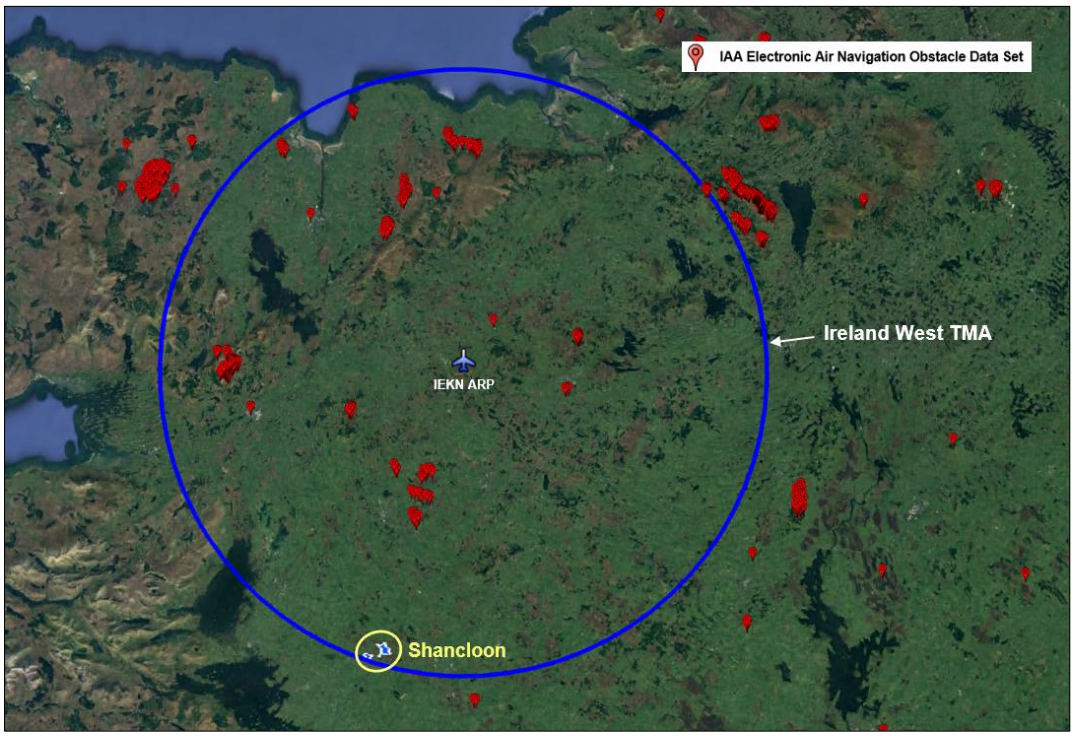


Figure 4. Annex 15 Aerodrome Surfaces and IAA Electronic Air Navigation Obstacle Data Set

It should also be noted that there are other existing obstacles nearer to the airport, e.g. the operational wind farms at Cuillilea, Mace Upper and Magheramore.

These existing obstacles would shield any potential impacts from the proposed wind farm at Shancloon. The IAA Electronic Air Navigation Obstacle Data Set permitted obstacles are shown relative to the proposed wind farm in Figure 5.

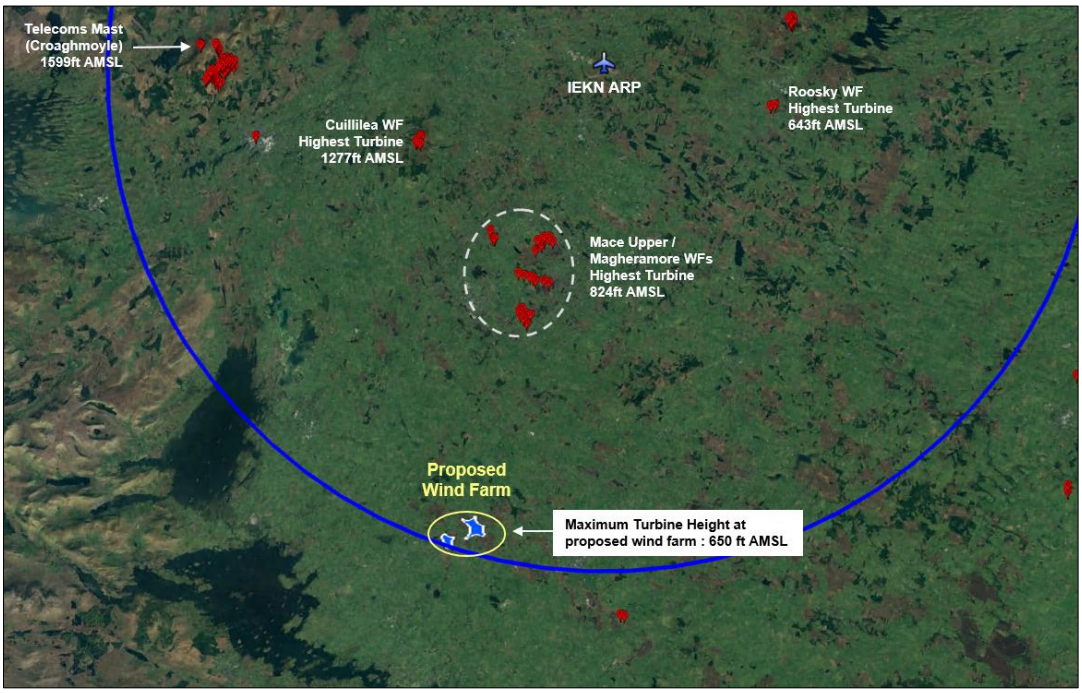


Figure 5. Permitted Obstacles in vicinity of Shancloon Wind Farm

Although there are other obstacles closer to the airports than the proposed wind farm, all new obstacles must be considered and assessed by the IAA 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.

In the event the wind farm is permitted the relevant authorities would include the turbines in their IAA Electronic Air Navigation Obstacle Dataset. As part of the obstacle assessment, the IAA would consider the existing baseline environment of all existing obstacles which includes the existing wind farms at Mace Upper, Magheramore and Cuillalea all of which are nearer to the Ireland West Airport and with higher turbine tip heights. Thus it is highly unlikely that the relevant authorities would highlight any concerns relating to the proposed development, on the Annex 15 Aerodrome Surfaces.

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 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 C of this report.

Figure 6 below illustrates that the proposed wind farm at Shancloon is over 35 km from the Ireland West BRAs (safeguarded areas for Runway 08 and Runway 26). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Ireland West Airport.

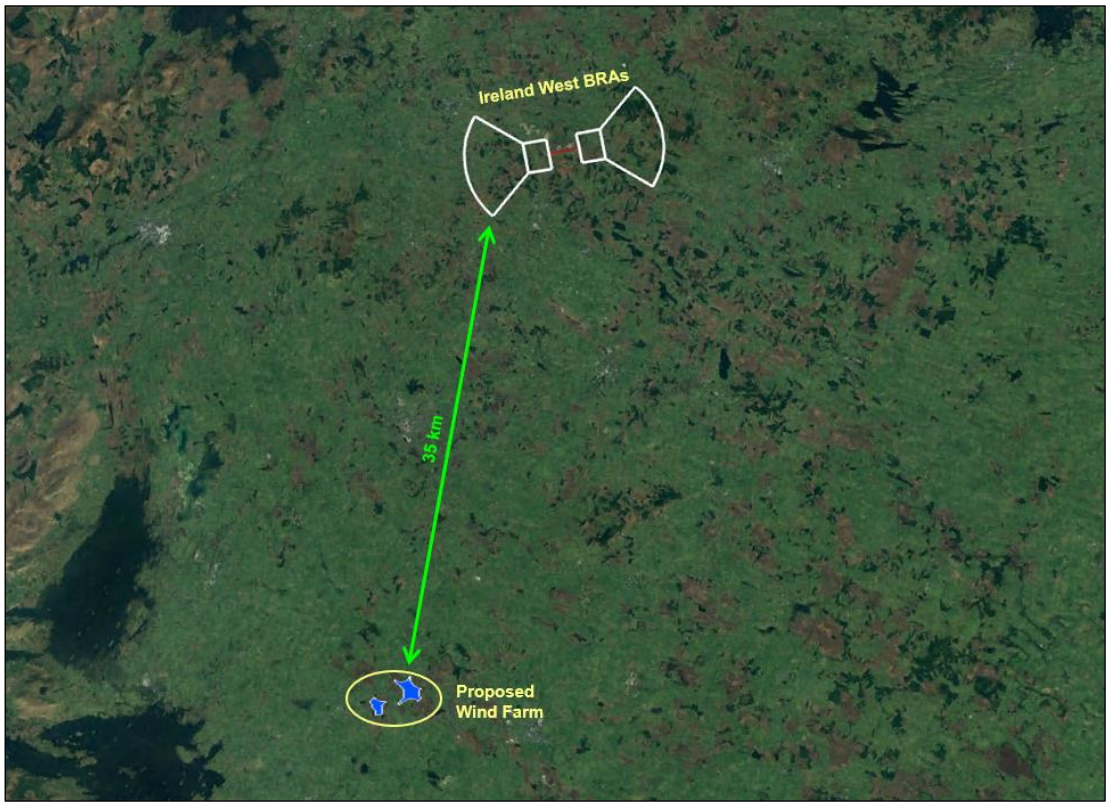


Figure 6. Proposed Wind Farm relative to Ireland West Airport BRAs (RWY 08 and RWY 26)

2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that the proposed wind farm site is located within 25 nautical miles from the VOR/DME at Ireland West 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 southwestern MSA Sector (MSA 3600 ft), as shown in Figure 7.

According to the wind farm location, the maximum construction height for the site would be 2600 ft/792m AMSL (3600 ft MVA minus 1000 ft).

The highest of the proposed turbines is T08 which has a maximum tip-height of less than 750 ft (228m) AMSL. This is below the 2600 ft threshold, therefore the relevant MSA will not be affected and there will be no impact on the published MSA altitude figures for Ireland West Airport.

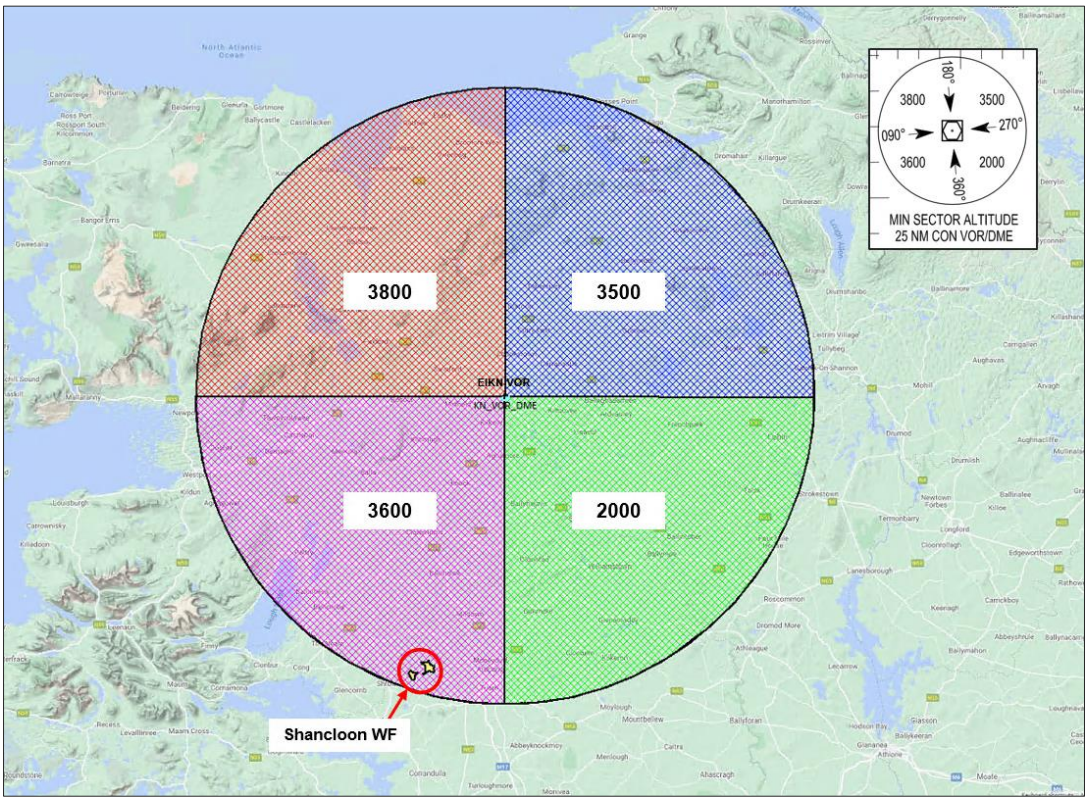


Figure 7. Minimum Sector Altitudes - Ireland West Airport (EIKN)

2.5 Instrument Flight Procedures

There are 16 published Instrument and Visual Flight Procedures for arrivals to and departures from Ireland West 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 Ireland West Airport. Table 3 below lists the Instrument Flight Procedures for Ireland West Airport.

Aerodrome	Aerodrome Procedure	Chart ID	Wind Farm Impacts
Ireland West	Precision Approach Terrain Chart RWY 26– ICAO	EIKN AD 2.24-3	No Impacts.
Ireland West	RNAV Standard Departure Chart Instrument (SID) RWY 26 - ICAO	EIKN AD 2.24-4.1	No Impacts.
Ireland West	RNAV Standard Departure Instrument (SID) Chart RWY 08 - ICAO	EIKN AD 2.24-5.1	No Impacts.
Ireland West	RNAV Standard Arrival Chart Instrument (STAR) RWY 26 - ICAO	EIKN AD 2.24-6.1	No Impacts.
Ireland West	RNAV Standard Arrival Chart Instrument (STAR) RWY 08- ICAO	EIKN AD 2.24-7.1	No Impacts.
Ireland West	Instrument Approach Chart RNP RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-8	No Impacts.
Ireland West	Instrument Approach Chart ILS A CAT 1and CAT 11 or LOC RWY 26 (ACFT CAT A, B, C, D) – ICAO	EIKN AD 2.24-9.1	No Impacts.
Ireland West	Instrument Approach Chart ILS B CAT 1 and 11 RWY 26 (ACFT CAT A, B, C, D) – ICAO	EIKN AD 2.24-10.1	No Impacts.
Ireland West	Instrument Approach Chart VOR RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-11.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-12.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 26 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-13.1	No Impacts.
Ireland West	Instrument Approach Chart RNP RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-14	No Impacts.
Ireland West	Instrument Approach Chart VOR RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-15.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-16.1	No Impacts.
Ireland West	Instrument Approach Chart NDB RWY 08 (ACFT CAT A, B, C, D) - ICAO	EIKN AD 2.24-17.1	No Impacts.
Ireland West	Visual Approach Chart – ICAO	EIKN AD 2.24-19	No Impacts.

Table 3. Instrument and Visual Flight Procedures – Ireland West Airport

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

Wind Farm	Planning Reference	Description
Mace Upper	https://www.eplanning.ie/MayoCC/AppFileRefDetails/0019540/0	Operational Wind Farm
Magheramore	https://www.eplanning.ie/MayoCC/AppFileRefDetails/13631/0	Operational Wind Farm
Cuillalea	https://www.eplanning.ie/MayoCC/AppFileRefDetails/981672/0	Operational Wind Farm

Table 4. 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 aerodrome at Ireland West are assessed.

2.7.1 Communications and Navigation Systems

The AIP documents EIKN AD 2-18/19 provides the information for communication and navigation facilities for Ireland West 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 fam
Ireland West	118 MHz –131 MHz	110 kHz – 330 MHz	41 km	No impacts

Table 5. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 41 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 – 15 km and in radar line of sight	Detailed Assessment
Zone 3	Further than 15 km and in radar line of sight	Simple Assessment
Zone 4	Not in radar line of sight	No Assessment

Table 6. PSR Zone Arrangements

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

Table 7. 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 16 km 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 IAA radar surveillance stations is provided in Sections 2.7.2.1 that follows. The findings of the review indicate that the proposed wind farm is sufficiently far from each of the radar stations that there would be no impacts, and a detailed radar assessment would not be required by the IAA.

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 sites to the proposed wind farm development are at Dooncarton, Shannon Airport and Woodcock Hill.

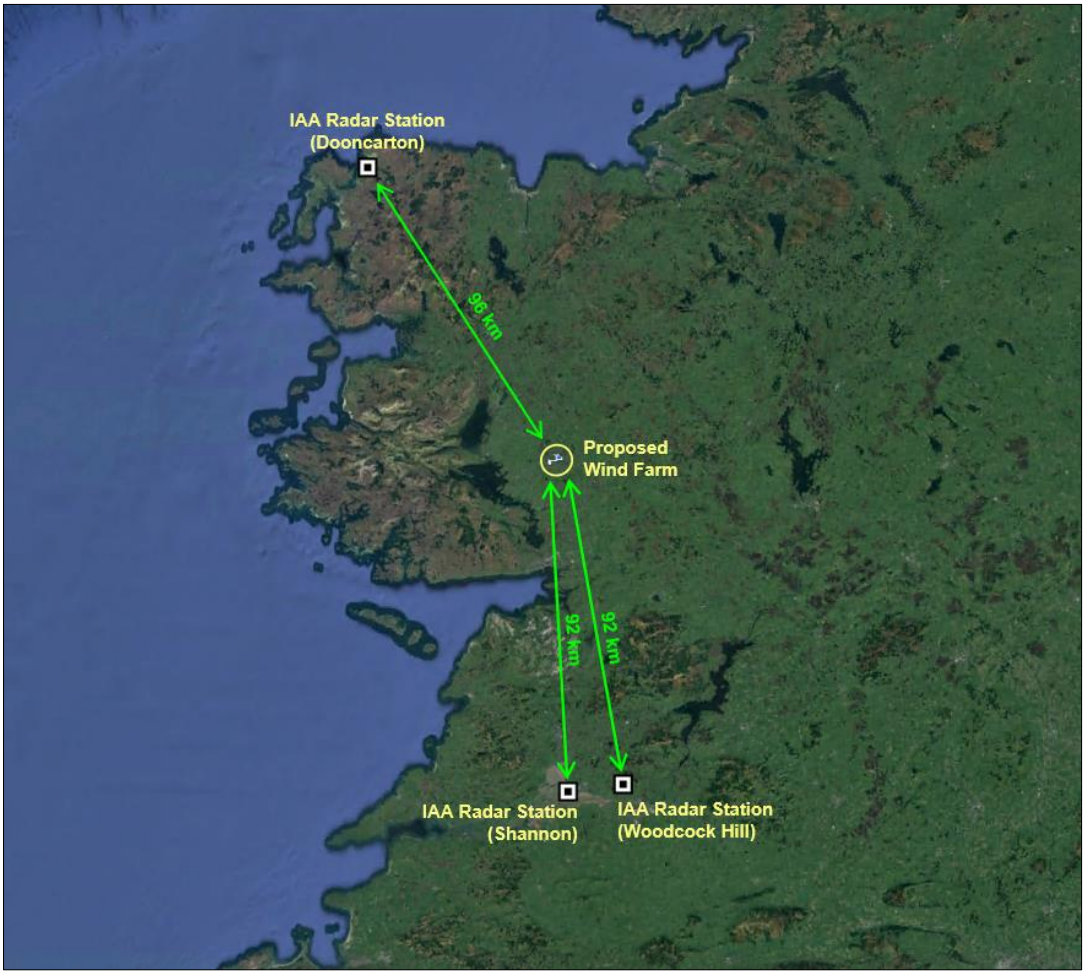


Figure 8. Radar Surveillance Sites relative to Shancloon Wind Farm.

2.7.2.1.1 Dooncarton Radar Assessment

The radar surveillance site at Dooncarton consists of a SSR system located in the six-story circular reinforced concrete communications tower shown in Figure 9. The SSR antennas are housed in the dome-shaped structure at the top of the tower.

Figure 9. Dooncarton Radar Station

Table 8 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)
Shancloon	96 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 8. EuroControl / UK Safeguarding Guidelines – Dooncarton 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 SSR radar station at Dooncarton.

2.7.2.1.2 Shannon Airport 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. Shannon Airport 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)
Shancloon	92 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 9. EuroControl / UK Safeguarding Guidelines – Shannon Airport 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 PSR/SSR radar station at Shannon Airport.

2.7.2.1.3 Woodcock Hill Radar Assessment

The radar surveillance site at Woodcock Hill consists of a SSR system housed in the dome-shaped structure shown in Figure 11.

Figure 11. Woodcock Hill Radar Station

Table 10 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)
Shancloon	92 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 10. EuroControl / UK Safeguarding Guidelines – Woodcock Hill 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 SSR radar station at Woodcock Hill.

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 airports for calibration of instrument landing systems.

It is highly unlikely that the Flight Inspection Procedures will be impacted as the proposed wind farm is sufficiently far from the airport as shown in Figure 12 below. This demonstrates the flight inspection routes for the orbital and radio flight patterns and neither flight pattern occurs above the proposed wind farm development. In addition the flight inspection procedures would already account for the existing baseline wind turbines obstacles at Mace Upper, Magheramore and Cuillilea

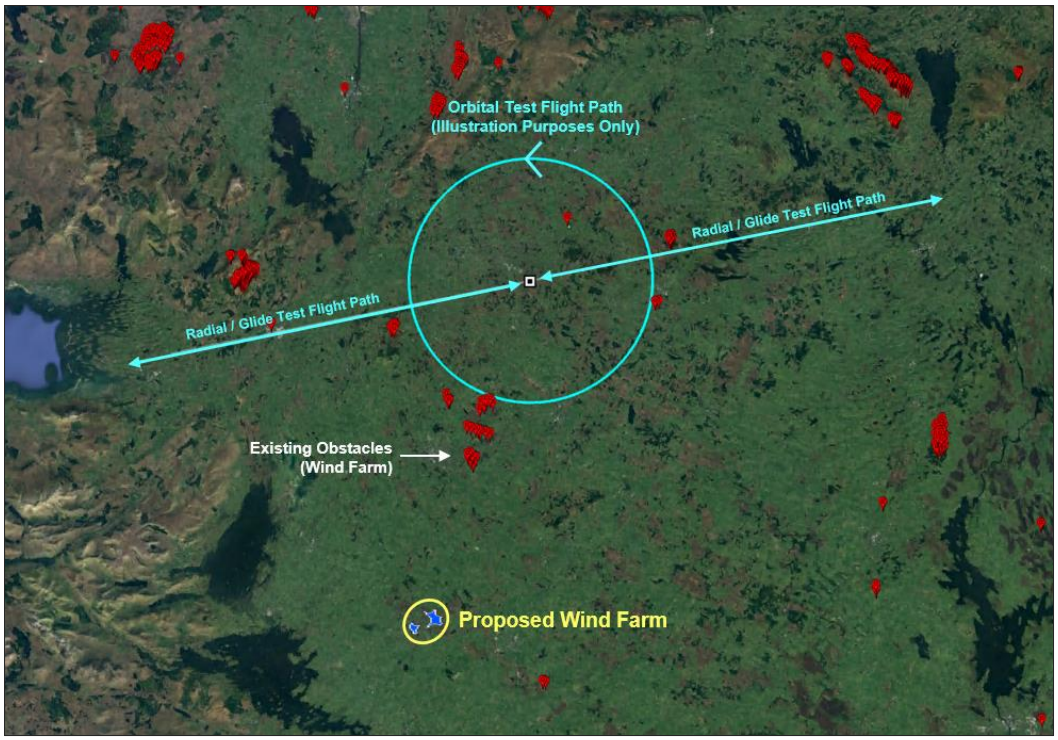


Figure 12. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

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 will 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 Private Airfields (VFR Flying)

For due diligence purposes, private airfields in the vicinity of Shancloon have been considered and it was found that there are two private unlicensed airfields within 5 km of the proposed wind farm site: Kilconly Airfield and Castlehacket Airfield. These airfields are not licensed by the IAA and they operate in un-controlled Class G airspace. The due diligence process did not identify any license or permission on which these airfields operate, their presence was identified through reviews of aerial imaging data and field surveys of the area.

Location	Installation	Description
Kilconly, Co Galway.	Private Unlicensed Airfield.	Single grass-strip airstrip located in private agricultural land.
Castlehacket House, Belclare, Co Galway.	Private Unlicensed Airfield.	Single grass-strip airstrip located in private agricultural land.

Table 11. Private Airfield Details

An aerial view of the airfield at Kilconly is shown in Figure 13 below and shows that the airstrip is located in agricultural land. Field surveys, undertaken in October 2023, of the airfield site also confirmed that the airstrip is located in agricultural land. There was no sign of recent aviation activity indicating that the site it is not a currently active airfield.

Figure 13. Aerial View of Private Airfield – Kilconly

Figures 14 and 15 below show that the field at Kilconly is currently fenced and used for agricultural activity (grassland for cattle). The fence that runs through the grass-strip runway and the close proximity of electricity poles indicates that the airfield is not currently operational.

Figure 14. Kilconly Airfield – Roadside View (Airfield currently fenced and not operational)

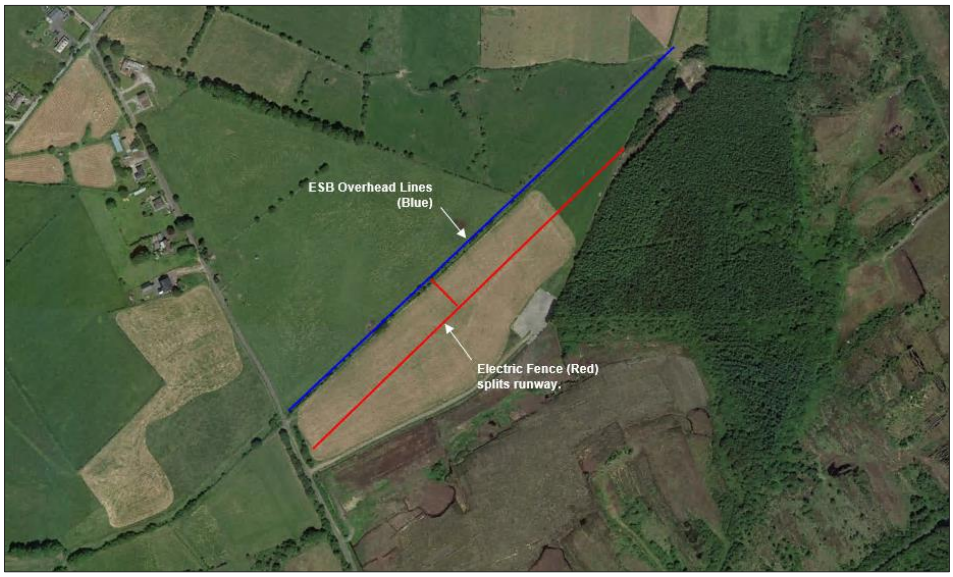


Figure 15. Kilconly Airfield – Aerial View (Airfield currently fenced and not operational)

An aerial view of Castlehacket airfield is shown in Figure 16 below. Access to the airfield was not possible on the day of survey, as the site is located within the Castlehacket estate. However, the location of the grass-strip runway is clearly visible in the aerial view shown below. It is not known whether Castlehacket airfield is currently in use.

Figure 16. Aerial View of Private Airfield - Castlehacket

The private airfields at Kilconly and Castlehacket are both unlicensed and neither are licensed or registered with the IAA. As both airfields are in Class G airspace any pilots flying to/from these airfields are obliged to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

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.

In the event that planning permission is granted for the proposed wind farm development, the wind turbine locations will be added to aviation flight charts and clearly marked as en-route obstacles. The wind turbines will also be fitted suitable aviation obstacle lighting, as approved

by the IAA. This will ensure that, in the event that Kilconly and/or Castlehacket airfields are operational, any VRF pilots using these airfields will be able to plan their flight routes to avoid the turbines. This will ensure that there are no impacts on Kilconly or Castlehacket airfield as a result of the proposed windfarm.

2.11 Irish Air Corps / Department of Defence Safeguarding

The Irish Air Corps Position Paper "*Air Corps Wind Farm / Tall Structures Position Paper*" published on 08th August 2014, 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; Blessignton, 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 in support of Air Corps operation requirements,* as described in Figure 20 below.

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 17. Irish Air Corps – Critical Low-Level Routes

The nearest of the Air Corps restricted areas to the proposed wind farm is the 5 NM restricted Zone around the Army Barracks at Renmore, Co Galway.

The proposed wind farm site is 19 km from the restricted area around Renmore Barracks. As the proposed wind farm is located outside the restricted area, there will be no impacts on Irish Air Corps activities.

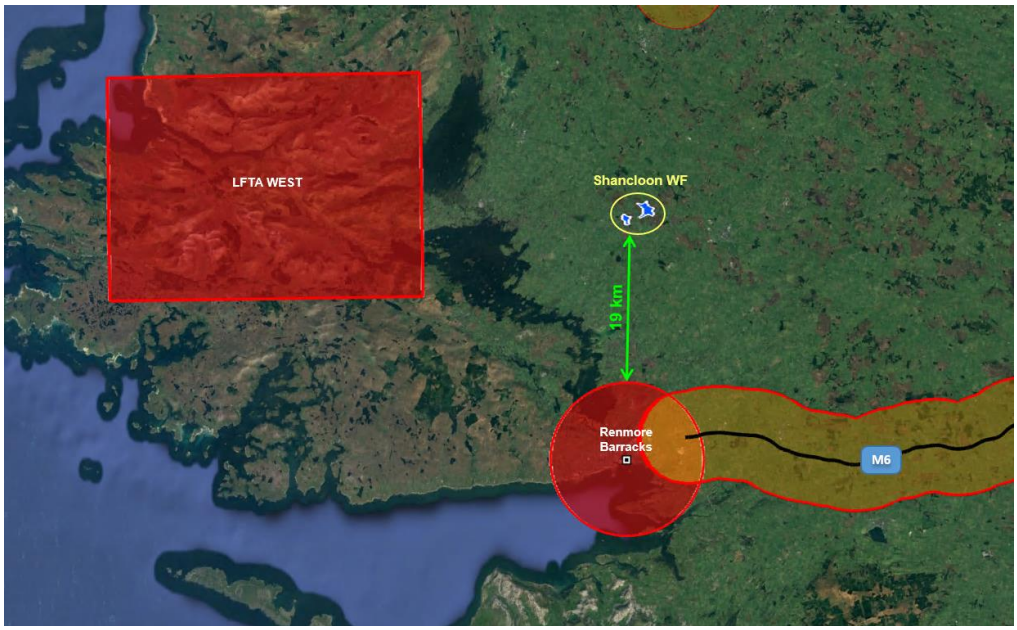


Figure 18. Irish Air Corps – Restricted Areas

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

Figure 20. GASU - Eurocopter EC135 T2

It is unlikely that a fixed-wing aircraft would be used in a low-level flight capacity over the Shancloon region. In the unlikely event that that a fixed-wing aircraft is flying in the Shancloon 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 at Shancloon be permitted the turbine locations will be submitted to the IAA and aviation charts and GNSS databases will be updated accordingly.

GASU helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines). Also, in good weather conditions, a wind farm at Shancloon could potentially be used as a visual landmark to aid Visual Flight Rules (VFR) navigation which would actually make it easier for pilots to identify their flight position.

If a helicopter is required to land in Shancloon area, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects and is relatively clear of obstacles. The chosen HLS should also have good road access. A good example of a HLS would be a local football field. As the proposed wind farm is located on unpopulated / bogland, it is highly unlikely that the wind farm site location would ever be considered as a HLS due to its terrain and road access.

The sports fields at Shrule, Caherlistrane or Kilconly (as marked in Figure 21) would be a much more suitable HLS for any such emergency landings in subject area.

Figure 21. Possible Helicopter Landing Sites – Ballymote or Coolaney GAA

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 will be fitted with aeronautical lighting and will be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	Low – The aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines will be fitted with aeronautical lighting and will be clearly marked in aviation charts. Should an emergency helicopter landing be required in the subject area, one of the sports fields at Shrule, Caherlistrane or Kilconly is likely to be used as a HLS.

Table 12. Impact of proposed wind farm on GASU Operations

2.12.2 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 22 below shows the flying times from the EAS base at Athlone.

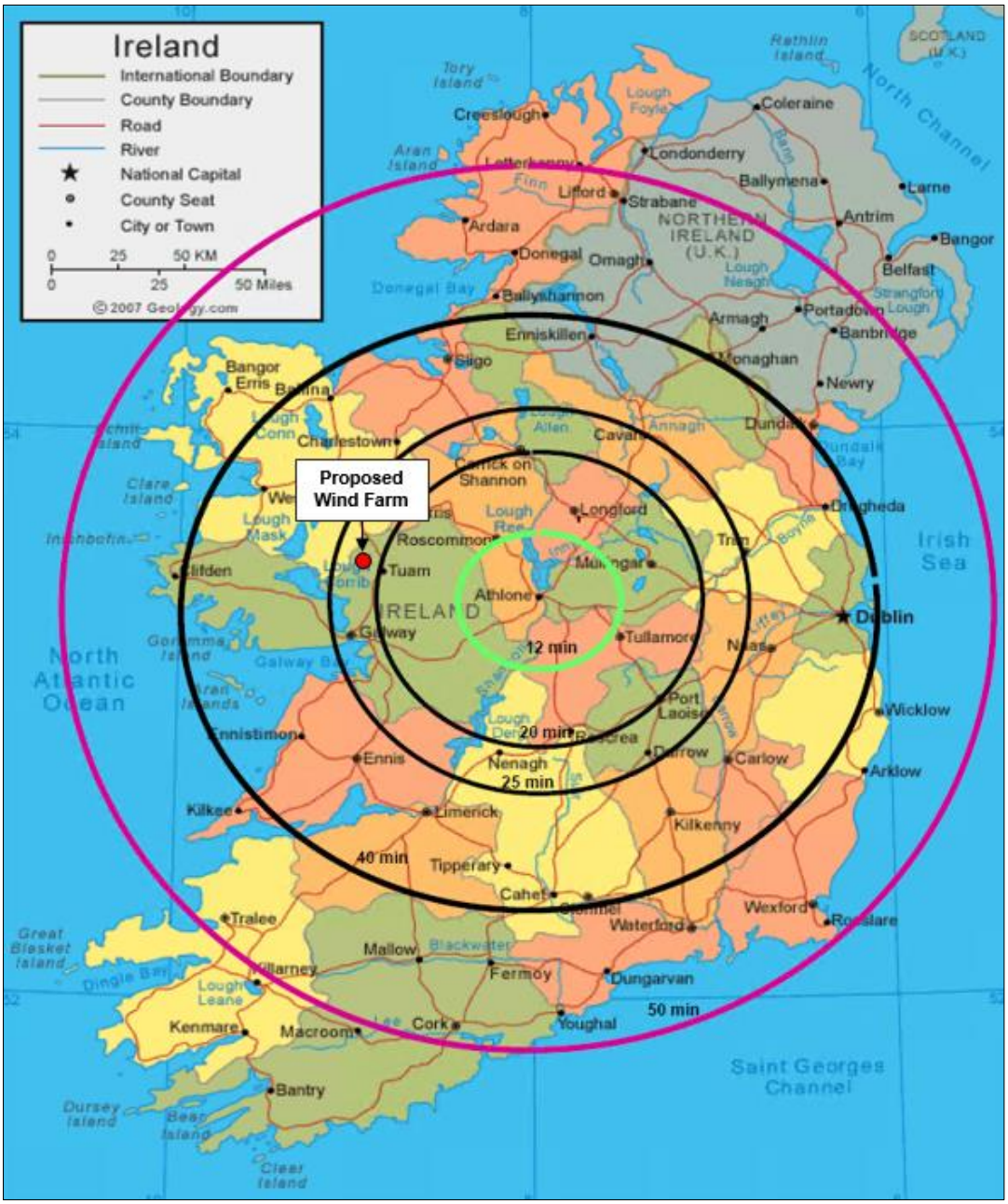


Figure 22. EAS – Flying Times from Athlone

The proposed wind farm is located between Tuam, Co Galway and Shrule, Co Mayo and in an area that is relatively sparsely populated. Helicopter landings are highly unlikely to occur at the proposed wind farm site as it is largely rural and has relatively poor road access.

Also, should the proposed wind farm at Shancloon be permitted the turbine locations will be submitted to the IAA and aviation charts and GNSS databases will 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 the unlikely event of EAS operations in the general area, the pilot would seek a Helicopter Landing Site (HLS) that is clear of wires, loose objects and is relatively clear of obstacles (e.g. trees). The chosen HLS should also have good road access to link up with the local ambulance service. The sports fields at Shrule, Caherlistrane or Kilconly would be a much more suitable HLS for any such emergency landings in Shancloon area.

EAS Aircraft	Impact of proposed wind farm – Opinion
Helicopter (Eurocopter EC135)	Low – The aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines will be fitted with aeronautical lighting and would be clearly marked in aviation charts. Should an EAS landing be required in the subject area, one of the sports fields at Shrule, Caherlistrane or Kilconly is likely to be used as a HLS. .

Table 13. Impact of proposed wind farm on EAS Operations

3. IAA / AirNav Consultations

Consultations beginning in October 2023 were undertaken with AirNav Ireland to determine if the IAA/ AirNav have any concerns in relation to the proposed wind farm development. To date, there has been no response from AirNav Ireland. The consultation emails that were sent to AirNav Ireland are provided below.

16.10.23 - Email sent by Ai Bridges Ltd to AirNav Ireland

Hello Fergal,

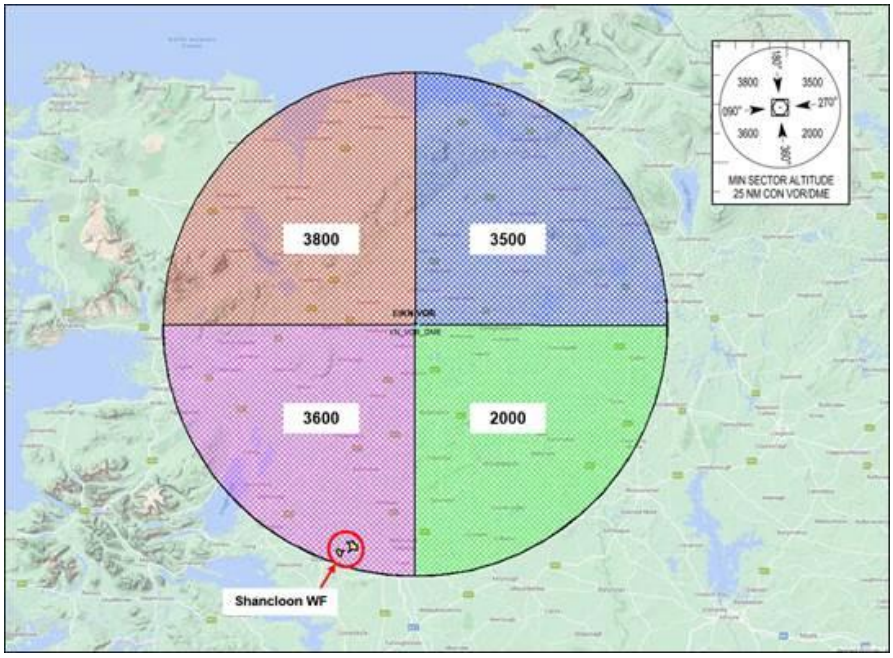
We are looking to conclude our Telecoms and Aviation Assessment Statement for the proposed wind farm at Shancloon, Co. Galway.
We would we be grateful if you could confirm that AirNav have no issues with the proposed wind farm development.

If you do have any concerns regarding the development, we would be grateful if you could let us know as soon as possible.
Thank you for your assistance with this matter.

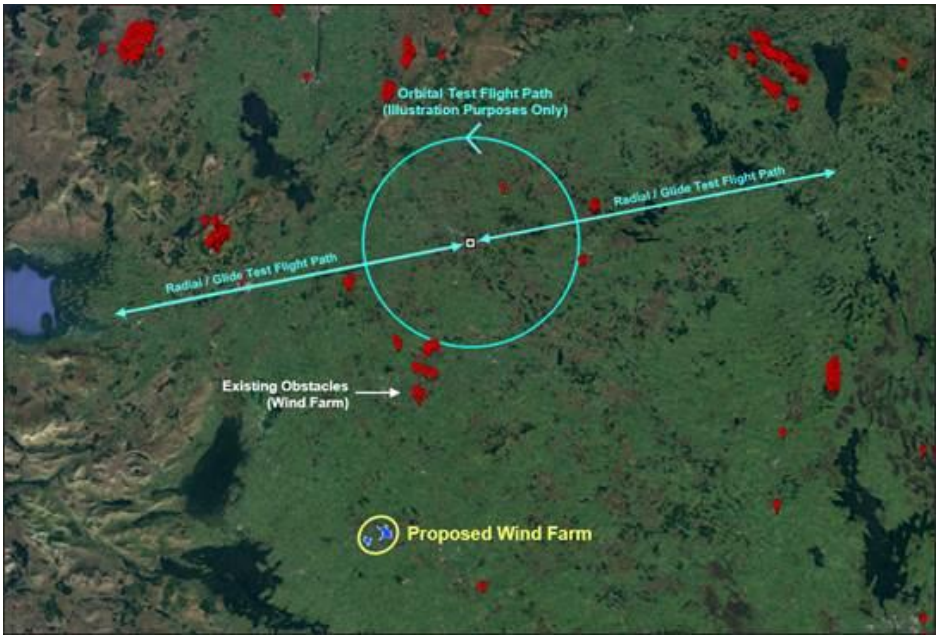
For you reference, we have included herein, a brief summary of our aviation review.

Aerodrome	Review Item	Comment	Impacts due to proposed wind farm
Ireland West	Annex 14 - Obstacle Limitation Surfaces (OLS)	> 25 km from Outer Horizontal Surface	None
	Annex 15 – Aerodrome Surfaces	> 40 km from Airport Reference Point	None
	Building Restricted Areas (BRA)	> 30 km from Building Restricted Areas	None
	Minimum Sector Altitudes (MSA)	MSA = 3600 ft (Ref Screengrab below) Max Turbine Height = 650 ft AMSL	None
	Instrument Flight Procedures	> 40 km from Airport Reference Point	None
	Communications, Navigation and Radar Surveillance Systems Safeguarding	> 90km from nearest IAA Radar Station	None
	Flight inspection and Calibration	Proposed wind turbines will are not in Orbital or Radial Test Flight Paths. (Ref Screengrab below)	None

Minimum Sector Altitudes (MSA) – Ireland West Airport



Flight Inspection and Calibration – Ireland West Airport



26.10.23 - Email sent by Ai Bridges Ltd to AirNav Ireland

Hello,

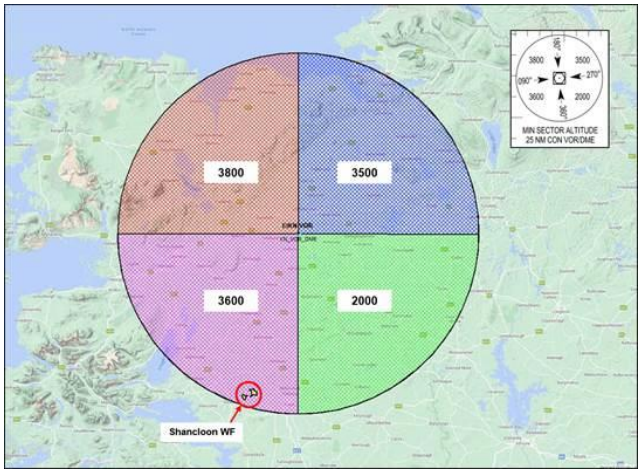
We are looking to conclude our Telecoms and Aviation Review Statement (Navigational Aids, Aeronautical Surveillance & Communications, Instrument Flight Procedures and ILS Calibration Procedures) for the proposed wind farm development at Shancloon, Co. Galway.

We would we be grateful if the IAA / AirNav could confirm if there are any concerns in relation to the proposed wind farm development.

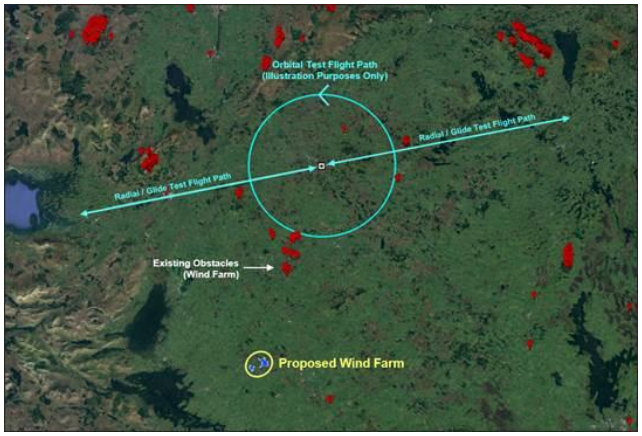
For you reference please find a brief summary of our review findings below :

Aerodrome	Review Item	Comment	Impacts due to proposed wind farm
Ireland West	Annex 14 - Obstacle Limitation Surfaces (OLS)	> 25 km from Outer Horizontal Surface	None
	Annex 15 – Aerodrome Surfaces	> 40 km from Airport Reference Point	None
	Building Restricted Areas (BRA)	> 30 km from Building Restricted Areas	None
	Minimum Sector Altitudes (MSA)	MSA = 3600 ft (Ref Screengrab below) Max Turbine Height = 650 ft AMSL	None
	Instrument Flight Procedures	> 40 km from Airport Reference Point	None
	Communications, Navigation and Radar Surveillance Systems Safeguarding	> 90km from nearest IAA Radar Station	None
	Flight inspection and Calibration	Proposed wind turbines will are not in Orbital or Radial Test Flight Paths. (Ref Screengrab below)	None

Minimum Sector Altitudes (MSA) – Ireland West Airport



Flight Inspection and Calibration – Ireland West Airport



IAA Radar Station Sites

4. Summary

A summary of the aviation review for the proposed wind farm at Shancloon is provided in Table 14 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None.	Turbines at the proposed wind farm site would be located outside the OLS surfaces for Ireland West Airport
Annex 15 - Aerodrome Surfaces	None.	Turbines at the proposed wind farm would penetrate the ICAO Annex 15 Aerodrome Surface for Ireland West Airport. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Ireland West 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 Airports (e.g. Cuillilea, Mace Upper and Magheramore 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 Shancloon is over 35 km from the BRAs for Ireland West 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 Ireland West Airport. The maximum allowable structure in the applicable sector is 2600ft (AMSL). Turbines at the proposed wind farm would not exceed the 2600ft 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 standard instrument flight procedures for Ireland West Airport are unlikely to be impacted for precision aircraft.
Communication and Navigation Systems	None	As the proposed wind farm is over 41 km from the Localizer and transmitting antenna at Ireland West Airport, 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 ARP at Ireland West 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	An aeronautical obstacle lighting scheme for the proposed turbines will be agreed between the developer and the IAA and put in place during the construction of the proposed turbines.
Private Airfields	None	Pilots flying to private unlicensed airfields in Class G Airspace are obliged by law to fly by Visual Flight Rules and in accordance to the Irish Rules of the Air. The rules stipulate that it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and all pilots should have 5km visibility under VMC conditions at all times. In the event that planning permission is granted for the proposed wind farm development, the wind turbine locations will be added to aviation flight charts and clearly marked as en-route obstacles. The wind turbines will also be fitted suitable aviation obstacle lighting, as approved by the IAA. This will ensure that, in the event that any nearby private airfields including Kilconly and/or Castlehacket are operational, any VRF pilots using these airfields will be able to plan their flight routes to avoid the turbines. This will ensure that there are no impacts on Kilconly or Castlehacket airfield as a result of the proposed windfarm, or any other private airfield in the vicinity
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 GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Table 14. Shancloon Wind Farm – Aviation Review Summary

5. Conclusions

From the findings made in this Aviation Review Statement the following conclusions have been made :

- The proposed wind turbines at Shancloon are sufficiently far from all IAA licensed aerodromes and radar installations that there would be no significant impacts to IAA activities.

- There are two private unlicensed airfields (Kilconly and Castlehacket) within 5 km of the proposed wind farm. Any pilots flying to/from these unlicensed airfields are obliged by law to fly by the Irish Rules of the Air. These rules require pilots to adhere to strict flying conditions and to remain clear of cloud and in sight of the surface at all times, with a minimum flight visibility of 5 km. The rules specify that, it is the pilot's legal responsibility to be aware of and avoid any obstacles in his/her flight path and be familiar with the surrounding area. All pilots flying under VFR rules should make prudent flight plans for flight to/from private airfields.

  In the event that planning permission is granted for the proposed wind farm development, the wind turbine locations will be added to aviation flight charts and clearly marked as en-route obstacles. The wind turbines will also be fitted suitable aviation obstacle lighting, as approved by the IAA. This will ensure that, in the event that Kilconly and/or Castlehacket airfields are operational, any VRF pilots using these airfields will be able to plan their flight routes to avoid the turbines. This will ensure that there are no impacts on Kilconly or Castlehacket airfield as a result of the proposed wind farm.

- The proposed wind turbines at Shancloon are sufficiently far from all Irish Air Corps (IAC) Aviation Exclusion Zones that they would have no impact on IAC operations.

- A review of the Garda Air Support Unit and Emergency Aeromedical Services has shown that it unlikely to be impacted by the proposed wind farm development.

- In the event that the wind farm is permitted, the turbine locations will be submitted to the IAA so that they are included in the IAA Air Navigation Obstacle Data Set.

- In the event that the wind farm is permitted, an aeronautical obstacle lighting scheme for the proposed turbines will be agreed between the developer and the IAA and put in place during the construction of the proposed turbines.

APPENDIX A - References

Information from the following documents were referenced in this report:

- *Irish Aviation Authority (IAA) Statutory Instruments, S.I 215 of 2005; Obstacles to Aircraft in Flight Order*
- *Irish Aviation Authority (IAA) Statutory Instruments, S.I 423 of1999; En-route Obstacles to Air Navigation*
- *Irish Integrated Aeronautical Information Publication (Irish IAIP)*
- *Irish Aviation Authority (IAA) Statutory Instruments, S.I 72 of 2004; Rules of The Air Order, 2004*
- *EASA Easy Access Rules for Aerodromes (Reg (EU) No. 139/2014)*
- *EuroControl Guidelines -How to Assess the Potential Impact of Wind Turbines Surveillance Sensors*
- *CAP 764: Chapter 2: Impact of wind turbines on aviation*

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

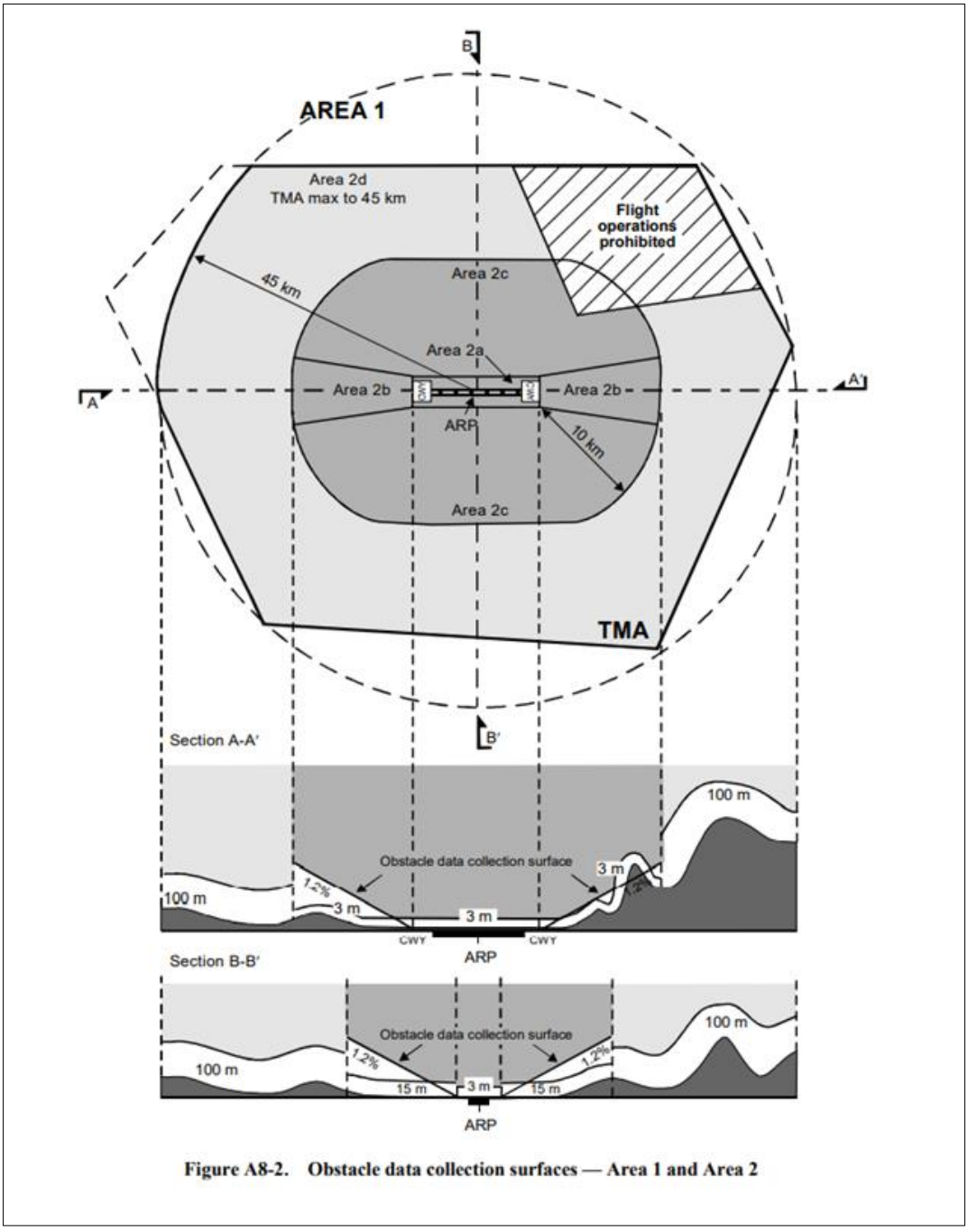


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

Figure B1 - ICAO Annex 15 Area 1 and Area 2 Surfaces.

APPENDIX C - ICAO Building Restricted Areas.

Figure C1 below shows an example BRA shape for directional facilities. Table B1 provides harmonized guidance figures for the directional navigational facilities in accordance with Figure C1.

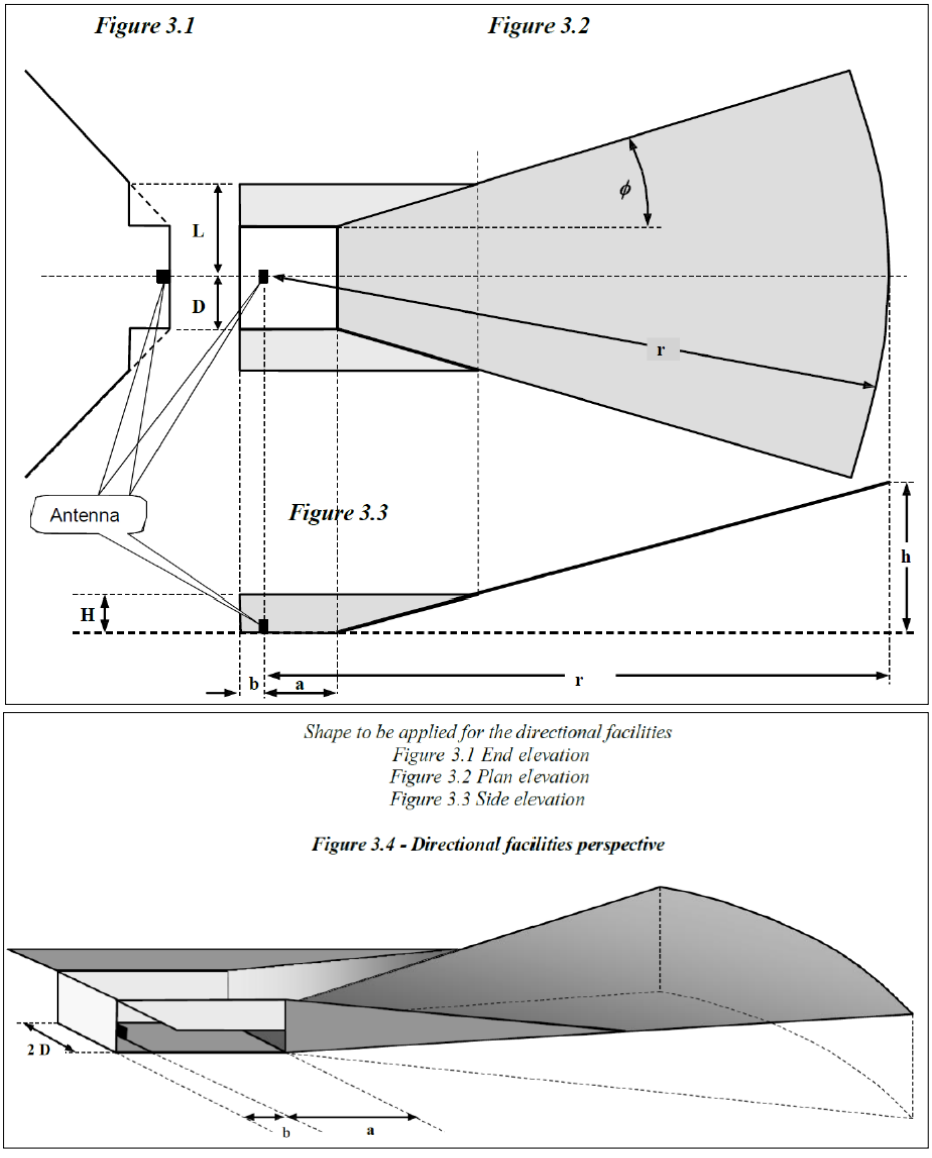


Figure C1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

*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 C1 - Harmonized guidance figures for the directional navigational facilities (ICAO EUR DOC 015 Table 2)