APPENDIX 15.2

Civil Aviation Review Statement

Report

Littleton Wind Farm

Civil Aviation Review Statement

Document Number:	001/LN/0226			
Author:	PT\DMG			
Approved for Release:	Rev 3.0	KH	**Date:**	16/02/26

Document Filename: *Littleton Wind Farm – Civil Aviation Review Statement*

Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Littleton. 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 and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- IAA - Aeronautical Obstacle Warning Light Scheme
- Private Airfields (VFR Flying)
- Garda Air Support Unit (GASU)

Annex 14 - Obstacles Limitation Surfaces (OLS)

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

As the proposed wind farm is situated outside the Outer Horizontal Surface and there is no penetration of the take-off or approach surfaces, it is unlikely that there will be any impacts to the OLS surfaces for Waterford 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 Waterford Airport to the boundary of Area 1 of the Annex 15 Aerodrome Surface is 45 km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft. Should the proposed wind farm be permitted, the turbines would be outside 45 km of Waterford Airport’s ARP and would not cause an impact on the Annex 15 Aerodrome Surface. However, the proposed 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 55 km from the BRA surfaces at Waterford Airport. At this distance there will be no impacts to the BRAs due to wind turbines at Littleton.

Minimum Sector Altitudes (MSA)

The Minimum Sector Altitudes (MSA) is the lowest altitude which may be used to provide a minimum obstacle clearance of 1000 ft above all obstacles within a sector of 25 nautical miles (46 km) from the NDB at Waterford Airport. As the proposed wind farm is located outside the MSA Sectors for Waterford Airport, there should be no impact on the published MSA altitudes.

Instrument Flight Procedures

There are 6 published Instrument Flight Procedures for flights to/from Waterford Airport. Due to the distance of the proposed wind farm from the airport, and as there are existing obstacles nearer to the airport than the proposed development, there should be no impacts to these flight procedures.

Communications and Navigation Systems

As the proposed wind farm is approximately 61 km from the Localizer and transmitting antennas at Waterford Airport, it is very unlikely that wind turbines at the proposed development will have any impact on these ATS communications and radio navigational aids.

Radar Surveillance Sensors

For Radar Surveillance Systems, EUROCONTROL Guidelines require a 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 turbines located at the proposed farm would be located at a distance of over 65 km from the radar stations at Shannon, Woodcock Hill and Dublin Airport 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 Waterford 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 that planning consent is granted, all civil aviation stakeholders (IAA, ANSP and Airport Authorities) are likely to request lighting of the proposed wind turbines in the interest of aviation safeguarding as the proposed development would be considered as obstacles in controlled airspace. The developer would agree to a lighting scheme with all stakeholders.

Private Airfields (VFR Flying)

A due-diligence survey was carried out on the private airfields / helipads in the vicinity of Littleton. It was found that there are two private unlicensed air fields within 10 km of the proposed wind farm site, Lickfinn and Moyne. The proposed wind farm is sufficiently far from each aviation installation that there would be no impact due to the proposed wind turbines. Pilots flying to/from these aviation installations would also be required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*. The Rules of the Air state, 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.

Garda Air Support Unit (GASU)

A review of GASU operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Sections

Appendices

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
GASU	Garda Air Support Unit
GP	Glide Path
HLS	Helicopter Landing Site
IAC	Irish Air Corps
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
ILS	Instrument Landing System
OLS	Obstacle Limitation Surface
PSR	Primary Surveillance Radar
RWY	Runway
SID	Standard Instrument Departure Route
STAR	Standard Arrival Route
SSR	Secondary Surveillance Radar
NATS	National Air Traffic Services (UK)
NM	Nautical Miles
DVOR	Doppler VHF Omni-directional Range Station

1. Introduction

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

1.1 Wind Farm Site Information

The proposed wind farm development is located in County Tipperary approximately 61 km northwest of Waterford Airport. Figure 1 shows the proposed wind farm site with respect to Waterford Airport and the IAA radar stations at Shannon Airport and Woodcock Hill.

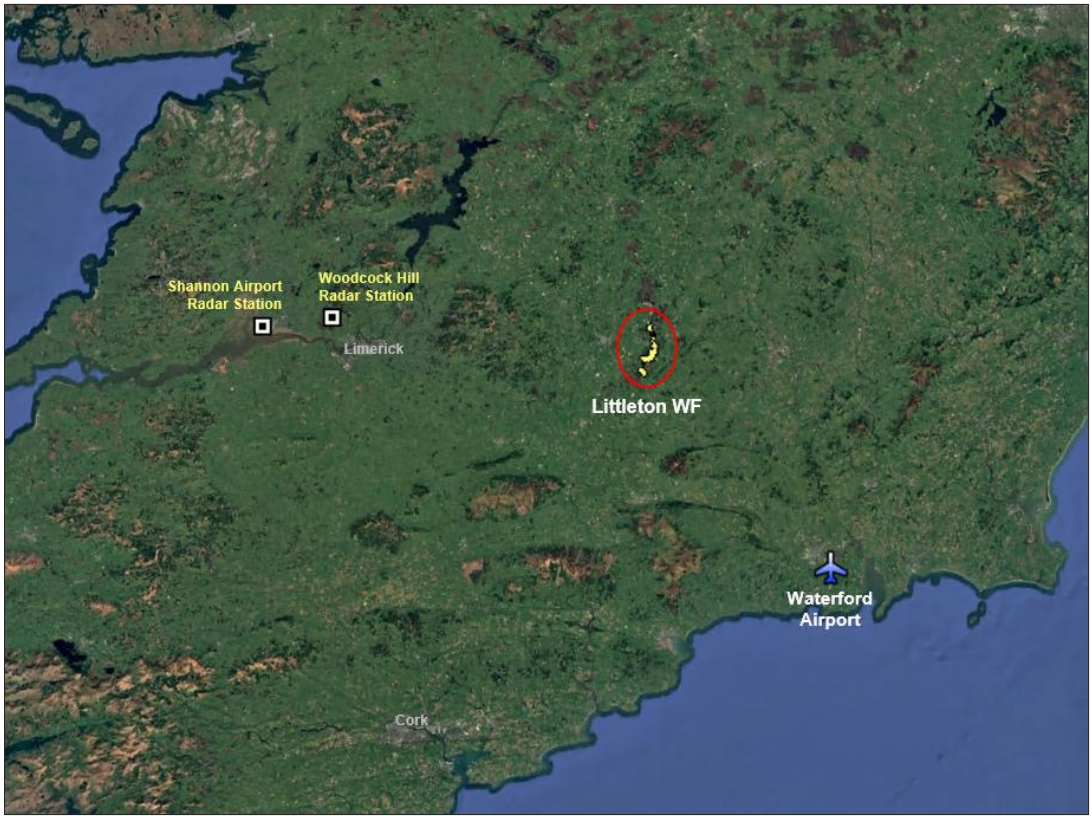

Figure 1. Location of proposed wind farm at Littleton, Co Tipperary

1.2 Waterford Airport

Table 2 below shows the co-ordinates of Waterford Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Waterford 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
Kilowen, Co Waterford	International Airport	Single Asphalt Runway Airspace: Class C	52 11 14 N 07 05 13 W (Mid-point of Runway 03/21).	61.5 km

Table 1. Waterford Airport Details

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

Figure 2. Waterford International Airport

2. Aviation Review

In this section 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 and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- Aeronautical Obstacle Warning Light Scheme
- Private Airfields (VFR Flying)
- Garda Air Support Unit (GASU)

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 Waterford Airport are plotted based on the following:

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

Figure 3 below shows the OLS in relation to the proposed Littleton wind farm. The distance from the ARP at Waterford Airport (i.e. the runway centre-point), to the nearest of the proposed turbines is over 60 km. The analysis of the OLS plots indicates that turbines at the proposed wind farm would not penetrate the Outer Horizontal Surface which extends to 15 km from the Airport Reference Point (ARP) or runway centre-point.

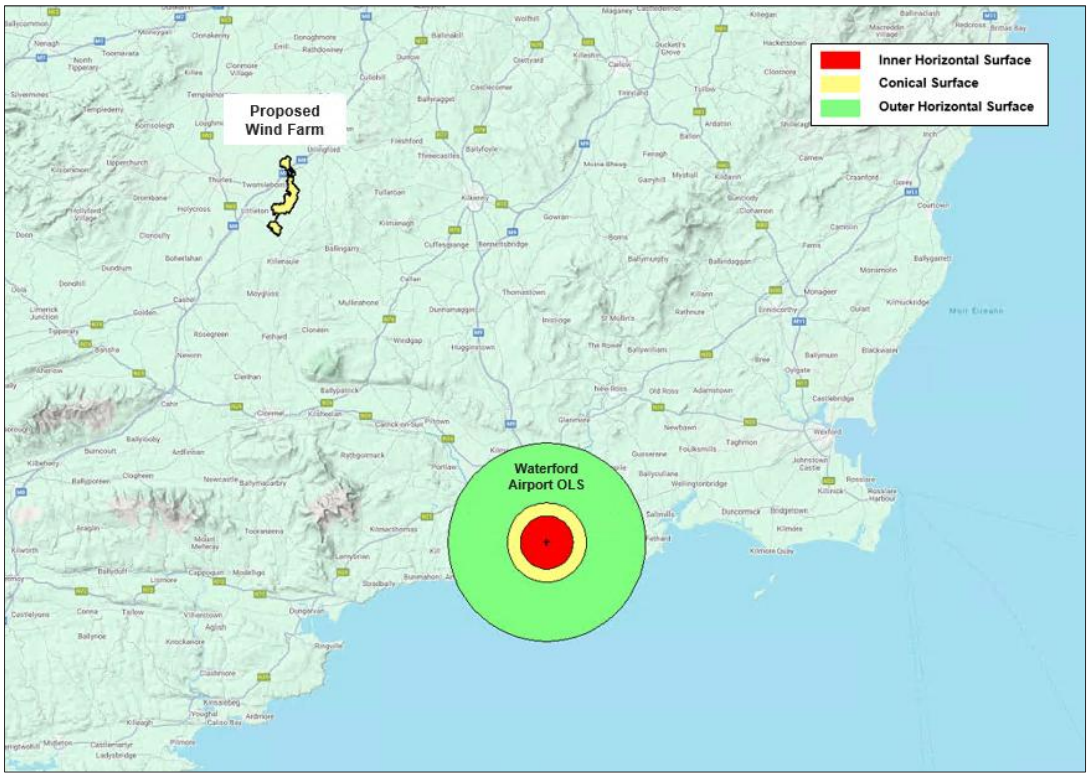

Figure 3. Littleton Wind Farm in relation to Waterford Airport OLS.

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

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

2.2 Annex 15 Aerodrome Surfaces

Turbines at the proposed wind farm would 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 45 km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 and Area 2 Surface is provided in Appendix A).

As the nearest turbine at the proposed wind farm would be more than 45 km from the ARP at Waterford Airport, there will be no penetration of the Annex 15 surface for the Waterford 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 4.

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

It should also be noted that there are other existing tall structures (obstacles) nearer to the airport, e.g. the operational wind farms at Foyle, Ballybay, Ballincurry, An Cnoc, Ballymartin and Rahora.

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

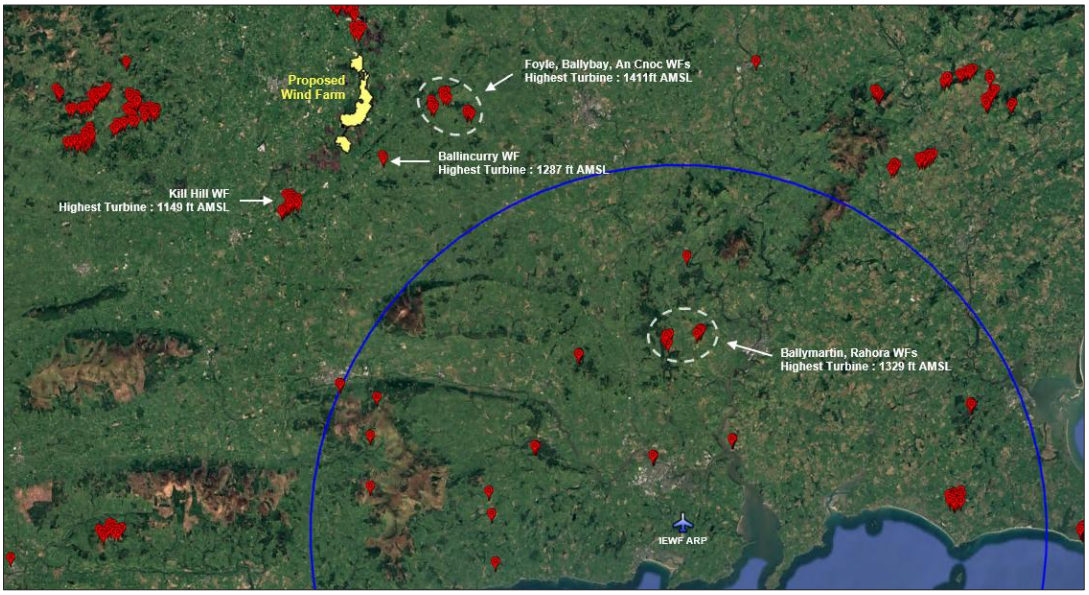

Figure 5. Operational and Permitted Obstacles in vicinity of Littleton Wind Farm

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.

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

Table 3. Aviation Impact Review - Annex 15 Aerodrome Surfaces

2.3 Building Restricted Areas (BRA)

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

The navigation facilities to be considered at Waterford Airport are the ILS Localisers, Glidepaths, NDB and DMEs that provide guidance for aircraft landing on runways 03 and 21. The minimum safeguarded areas for these facilities are defined by the International Civil Aviation Organisation (ICAO) in the document ICAO EUR DOC 015, Section 7. The BRA parameters as specified by the ICAO are provided in Appendix B of this report.

Figure 6 below illustrates that the proposed wind farm at Littleton is over 55 km from the Waterford BRA (safeguarded area for Runways 03 and 21). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Waterford Airport.

Figure 6. Proposed Wind Farm relative to Waterford Airport BRA (RWY 03 and 21)

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

Table 4. Aviation Impact Review - Building Restricted Areas

2.4 Minimum Sector Altitudes

A review of the Minimum Sector Altitudes (MSA) shows that turbines at the proposed wind farm would not be inside 25 nautical miles of the NDB at Waterford Airport. The MSA provides a minimum obstacle clearance of 1000 ft above the highest obstacle within specified sectors.

The proposed wind farm is located outside the MSA Sectors for Waterford Airport as shown in Figure 7. Therefore, there will be no impact on the published MSA altitude figures.

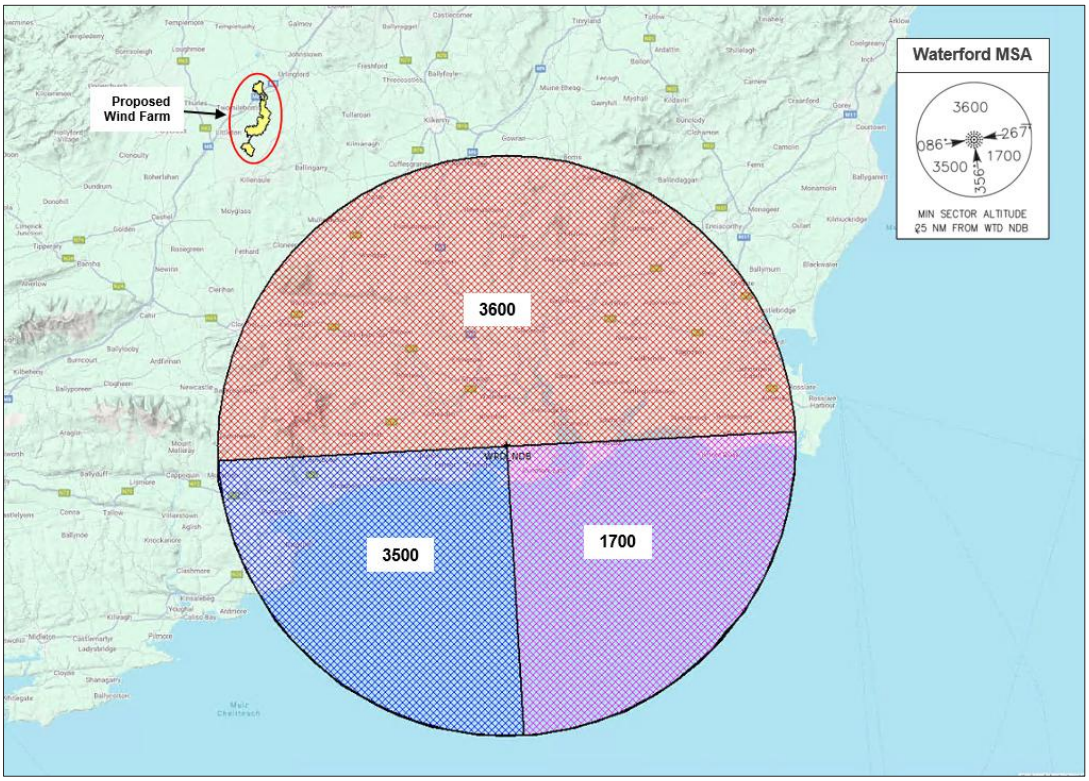

Figure 7. Waterford Airport (EIWF) Minimum Sector Altitudes

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

Table 5. Aviation Impact Review - Minimum Sector Altitudes

2.5 Instrument Flight Procedures

There are 6 published Instrument and Visual Flight Procedures for arrivals to and departures from Waterford Airport.

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

Aerodrome	Aerodrome Procedure	Chart ID	Likely WF Impacts
Waterford	Instrument Approach Chart ILS/NDB/DME RWY 21 – ICAO	EIWF AD 2.24-3.1	None.
Waterford	Instrument Approach Chart NDB/DME RWY 21 – ICAO	EIWF AD 2.24-5	None.
Waterford	Instrument Approach Chart NDB/DME RWY 03 – ICAO	EIWF AD 2.24-6.1	None.
Waterford	Visual Approach Chart – ICAO	EIWF AD 2.24-7	None.
Waterford	Instrument Approach Chart RNP RWY 02 – ICAO	EIWF AD 2.24-8	None.
Waterford	Instrument Approach Chart RNP RWY 20 – ICAO	EIWF AD 2.24-9	None.

Table 6. Instrument and Visual Flight Procedures – Waterford Airport

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

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

Table 7. Aviation Impact Review - Instrument Flight Procedures

2.6 Operational 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 8. None of these wind farms required a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Status
Lisdowney, Co. Kilkenny	12/172	Operational Wind Farm
Lisheen, Co. Tipperary	14/202	Operational Wind Farm
Bruckana, Co. Laois & Kilkenny	10/145	Operational Wind Farm
Foyle	12/378	Operational Wind Farm
Ballybay	12/533	Operational Wind Farm
An Cnoc, Co. Tipperary	09/781	Operational Wind Farm
Ballincurry, Co. Tipperary	PL92.245874	Operational Wind Farm
Gortahile, Co. Laois	04/935	Operational Wind Farm
Rahora, Co. Kilkenny	03/1117	Operational Wind Farm
Ballymartin, Co. Kilkenny	07/2141	Operational Wind Farm
Pinewood, Co. Laois	16/260	Permitted Wind Farm

Table 8. Operational and Permitted Wind Farms in vicinity of Proposed Wind Farm

2.7 Communications and Navigation Systems

The AIP document EIWD AD 2-18/19 provides the information for communication and navigation facilities for Waterford 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
Waterford	121MHz -130MHz	110KHz – 331MHz	61 km	No impacts

Table 9. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 61 km from the Localizer and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter e.g. less than 500m.

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

Table 10. Aviation Impact Review - Communication and Navigation Systems

2.8 Radar Surveillance Sensors

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

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

Table 11. PSR Zone Arrangements

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

Table 12. SSR Zone Arrangements

The EUROCONTROL Guidelines require a 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.”*

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 Shannon Airport, Woodcock Hill and Dublin Airport. These radar sites are shown relative to the proposed wind farm in Figure 8 below.

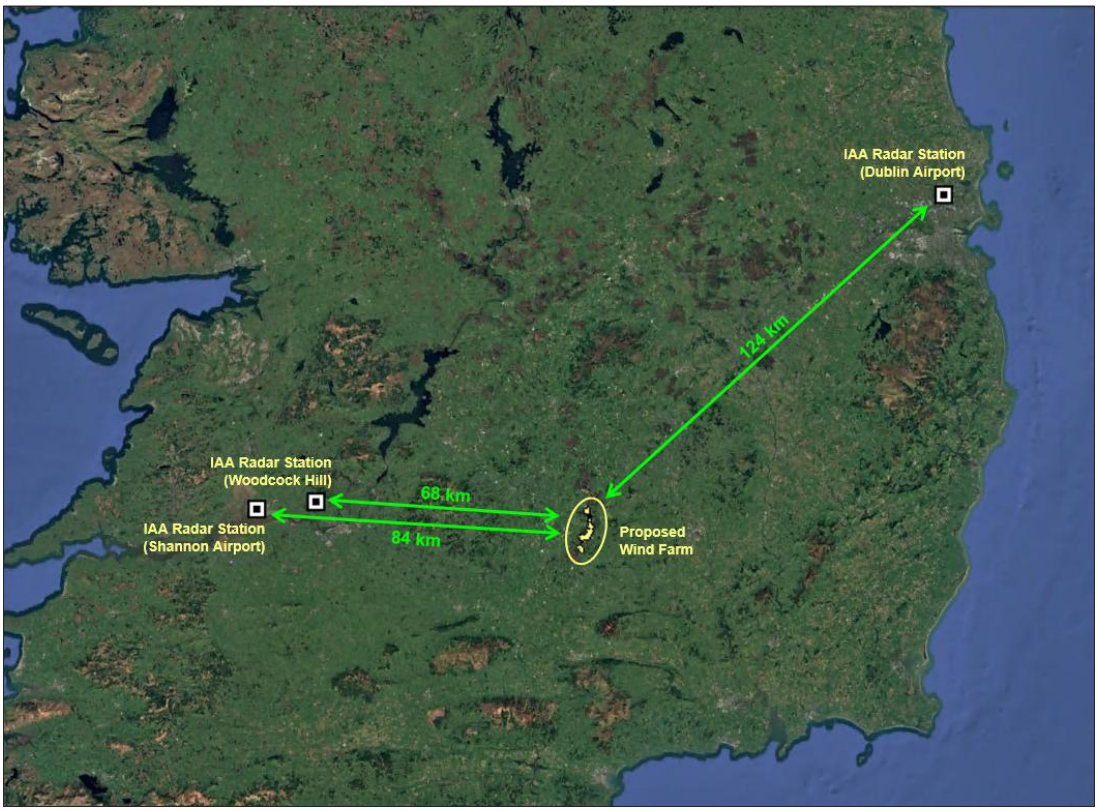

Figure 8. Radar Surveillance Sites relative to Littleton Wind Farm.

A review of each radar station is provided in Sections 2.8.1 to 2.8.3 that follow. The findings of the review indicate that the proposed wind farm is sufficiently far from the radar stations that there would be no impacts, and a detailed radar assessment would not be required by the IAA.

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

Table 13. Aviation Impact Review - Radar Surveillance Sensors

2.8.1 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 9).

Figure 9. Shannon Airport Radar Station

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

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Littleton	84 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 14. 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.

2.8.2 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 10.

Figure 10. Woodcock Hill Radar Station

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

Wind Farm ID	Distance to PSR/SSR Radar Station	Radar LOS Assessment (EuroControl Guidelines)	Radar LOS Assessment (NATS Guidelines – UK)
Littleton	68 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 15. 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.

2.8.3 Dublin Airport Radar Assessment

The radar surveillance site at Dublin Airport consists of two PSR/SSR (MSSR) radar stations as shown below in Figure 11 and Figure 12.

Figure 11. Dublin Airport MSSR Radar Station #1

Figure 12. Dublin Airport MSSR Radar Station #2

Table 16 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)
Littleton	124 km	Detailed Assessment Not Required	Detailed Assessment Not Required

Table 16. EuroControl / UK Safeguarding Guidelines – Dublin Airport Radar (Station #1 and #2)

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 at Dublin Airport.

2.9 Flight Inspection and Calibration

Flight checks are conducted annually to ensure that flight procedures and associated navigational aids are safe and accurate. These flight checks are carried out by an IAA approved Flight Inspection Service Provider. The checks are carried out during annual inspections consisting of radial and orbital test flights around Waterford 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).

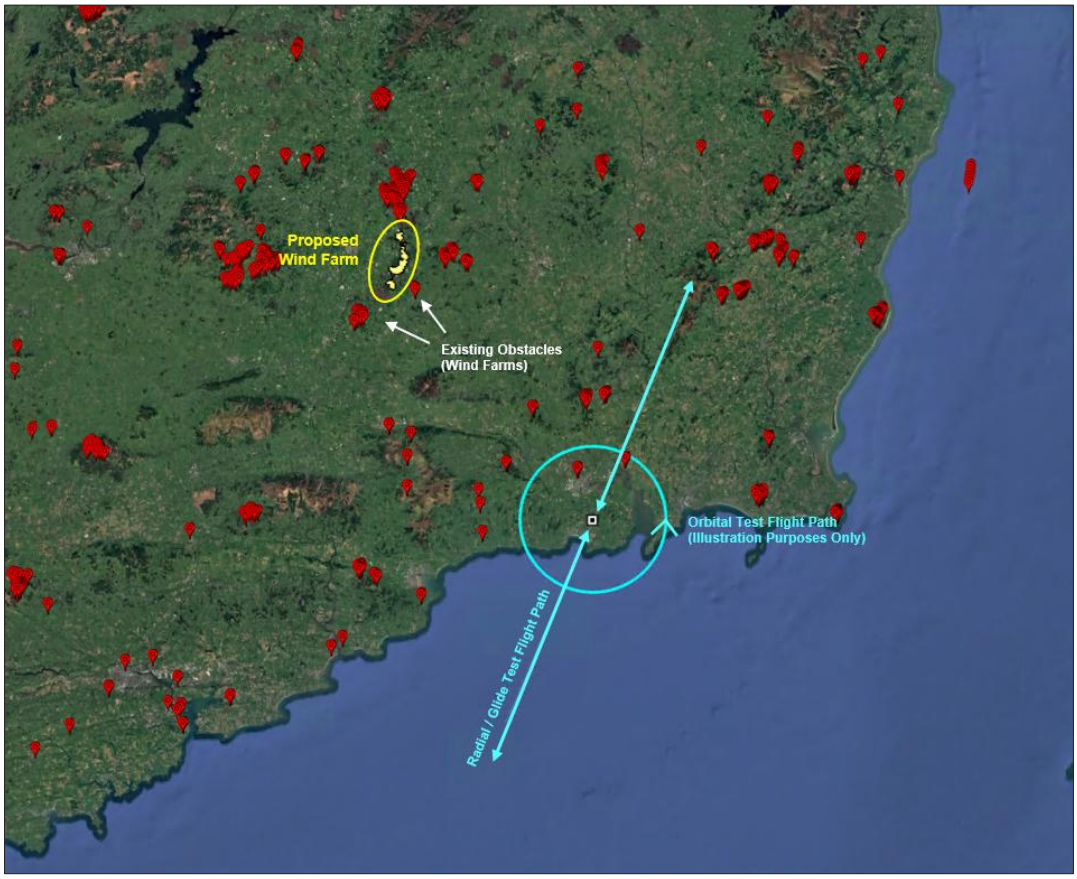

Figure 13. Flight Inspection and Calibration Test Procedures should account for existing obstacles (e.g. terrain and existing wind farms)

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

Table 17. Aviation Impact Review - Flight Inspection and Calibration

2.10 Aeronautical Obstacle Warning Light Scheme

In the event of planning consent being granted, all civil aviation stakeholders (IAA, ANSP and Airport Authorities) would require the lighting of the proposed wind turbines in the interest of aviation safeguarding as the proposed wind turbine development would be considered as obstacles in controlled airspace. The developers of the proposed turbines would agree to implement an aeronautical obstacle warning lighting scheme with all affected aviation stakeholders.

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."*

In the event of planning consent being granted, the IAA would also request AirNav Ireland and any affected Airport Authorities would be informed by the developer of the intention to commence crane operations with at least 30 days prior notification of their erection in accordance with S.I 215 of 2005 IAA (Obstacles to Aircraft in Flight) Order.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Aeronautical Obstacle Warning Light Scheme	It is likely that all civil aviation stakeholders would request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. Subject to further consultation with the IAA.	None, subject to agreement of a lighting scheme
Crane Operations	Any affected Airport Authorities would be informed by the developer of the intention to commence crane operations with at least 30 days prior notification of their erection in accordance with S.I 215 of 2005 IAA (Obstacles to Aircraft in Flight) Order.	None, subject to 30 days notification of intention to commence crane operations.

Table 18. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

2.11 Private Airfields (VFR Flying)

For due diligence purposes, private airfields and heliports in the vicinity of Littleton have been considered and it was found that there are two private airfields within 10 km of the proposed wind farm site: Lickfinn Airfield, and Moyne Airfield.

These aviation installations operate in un-controlled Class G airspace and flights in and out of these airfields are required by law to fly by Visual Flight Rules (VFR) and in accordance with the IAA *Rules of The Air*.

ID	Location	Installation Type	Description
Lickfinn Airfield	Lickfinn, Glengoole, Co. Tipperay.	Private Unlicensed Airfield.	Airfield with single grass-strip runway.
Moyne Airfield	Moyne, Co Tipperary	Private Unlicensed Airfield.	Airfield with single grass-strip runway.

Table 19. Private Airfield / Heliport Details

A review of the possible impacts of the proposed wind farm on both of the above-listed airfields is provided in Section 2.11.1 and Section 2.11.2. The findings of the review indicate that the proposed wind farm would have no impact on these airfields.

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Private Airfields (VFR Flying)	No action.	None

Table 20. Aviation Impact Review - Private Airfields (VFR Flying)

2.11.1 Lickfinn Airfield

This airfield is located in the townland of Lickfinn, Co Tipperary and is 3.4 km from the nearest of the proposed turbines at Littleton. The location of the airfield relative to the proposed wind farm is shown below in Figure 14 and a close-up aerial view of the airfield is shown in Figure 15. The airfield is used for light aircraft only (i.e. small airplanes, helicopters, microlights, etc.) and flights in and out of this airfield are required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, 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 be achieved by prudent flight planning by the VFR pilot prior to flight. It should also be noted that the existing turbines at Ballincurry wind farm are located much nearer to the airfield than the proposed turbines at Littleton.

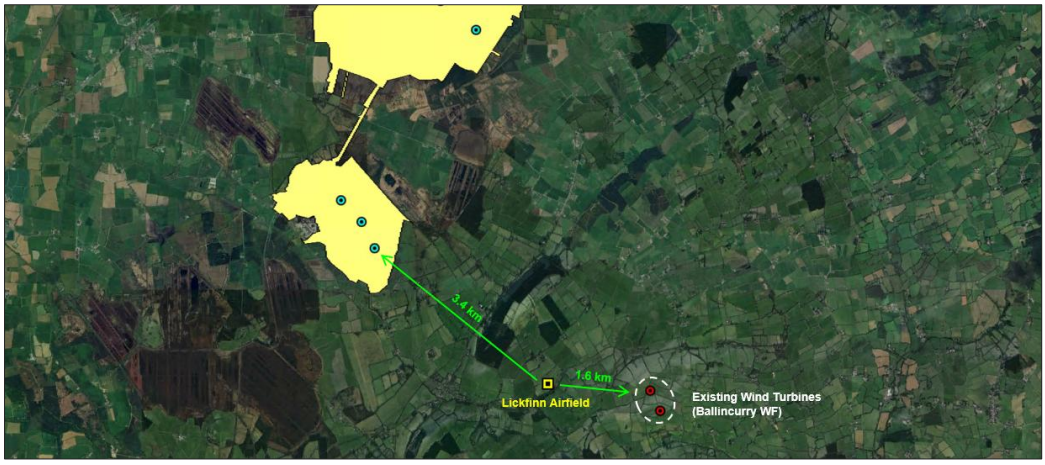

Figure 14. Location of Lickfinn Airfield

Figure 15. Close-up Aerial View – Lickfinn Airfield

As the proposed turbines are 3.4 km from the airfield and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to Lickfinn Airfield due to the proposed development at Littleton.

Airfield / Helipad	Description	Wind Farm Impacts
Lickfinn Airfield	Private grass-strip airfield, 3.4 km southeast of proposed wind farm.	No Impacts.

Table 21. Impacts of proposed wind farm on Lickfinn Airfield.

2.11.2 Moyne Airfield

This airfield is located in the townland of Moyne, Co Tipperary and is 5.9 km from the nearest of the proposed turbines at Littleton. The location of the airfield relative to the proposed wind farm is shown below in Figure 16 and a close-up aerial view of the airfield is shown in Figure 17. Although the airfield is listed in some aeronautical material, investigations indicate that the airfield has not been operational since 2016. The aerial view of the site also indicates there is no existing runway at Moyne.

The airfield would have previously been used for light aircraft only (i.e. small airplanes, helicopters, microlights, etc.) and any flights in and out of the airfield would have been required by law to fly by Visual Flight Rules (VFR) and in accordance with the *IAA Rules of The Air*.

The Rules of the Air state, 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 be achieved by prudent flight planning by the VFR pilot prior to flight.

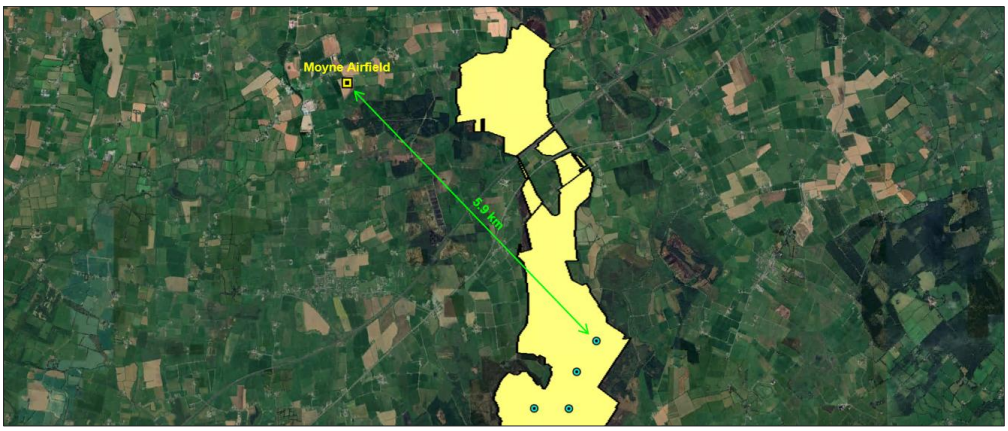

Figure 16. Location of Moyne Airfield

Figure 17. Close-up Aerial View – Moyne Airfield (showing no evidence of existing runway)

As the proposed turbines are more than 5 km from the airfield site and as pilots are required to fly by VFR rules and in accordance with the rules of the air, there would be no impact to the Moyne Airfield due to the proposed development at Littleton.

Airfield / Helipad	Description	Wind Farm Impacts
Moyne Airfield	Private grass airfield, 5.9 km north of proposed wind farm. (Airfield has not been operational since 2016)	No Impacts.

Table 22. Impacts of proposed wind farm on Moyne Airfield.

2.12 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 de Havilland Canada-6 Twin Otter Guardian 400 aircraft) and two helicopters (Eurocopter EC 135 T2).

Figure 18. GASU - Pilatus Britten-Norman BN 2T-4S Defender 4000

Figure 19. GASU - Eurocopter EC135 T2

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

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

GASU Aircraft	Impact of proposed wind farms - Opinion
Fixed-wing Airplane (Pilatus Britten-Norman BN 2T-4S Defender 4000)	Low – Fixed-wing aircraft are unlikely to be deployed in low level activity in the subject areas. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.
Helicopter (Eurocopter EC135 T2)	Low – Helicopter landings in the subject area would not occur as the proposed wind farm located in boggy 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 23. Impact of proposed wind farm on GASU Operations

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Garda Air Support Unit (GASU)	No action.	None

Table 24. Aviation Impact Review - GASU

3. Summary

A summary of the aviation review for the proposed wind farm at Littleton is provided in Table 25 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	The proposed turbines are located outside the OLS Surfaces for Waterford Airport.
Annex 15 - Aerodrome Surfaces	None	Turbines at the proposed wind farm would not penetrate the ICAO Annex 15 Aerodrome Surface for Waterford Airport. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Waterford 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 Waterford Airport (e.g. existing turbines at Foyle, Ballybay, An Cnoc, Ballincurry, Kill Hill, Ballymartin and Rahora 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	None	A review shows that Littleton is over 55 km from the BRAs for Waterford 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 outside 25 nautical miles from the NDB at Waterford Airport. 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 is sufficiently far from Waterford Airport that it is highly unlikely that there would be any impacts to instrument flight procedures for flights to/from the airport for precision aircraft.
Communications and Navigation Systems	None	As the proposed wind farm is approximately 61 km from the Localizer and transmitting antenna at Waterford Airport, it is very unlikely that the proposed development will have any impact on these ATS communications and radio navigational aids.
Radar Surveillance Sensors	None	The proposed wind turbines would be located in Assessment Zone 4 (EuroControl guidelines) for SSR and PSR instruments and a detailed Impact Assessment will not be required
Flight Inspection and Calibration	None	A review of the Flight Inspection Procedures indicates that there will be no impact due to the proposed wind farm development.
Aeronautical Obstacle Warning Light Scheme	None	It is likely that all civil aviation stakeholders (IAA, ANSP and Airport Authorities) would request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance with industry standards. The developer would agree to implement an aviation lighting scheme.
Private Airfields	None	An assessment of private airfields in the vicinity of Littleton indicates that there will be no impact due to the proposed development.
Garda Air Support Unit	None	An assessment of GASU operations indicates that they are unlikely to be impacted by the proposed wind farm development.

Table 25. Littleton Wind Farm – Aviation Review Summary

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

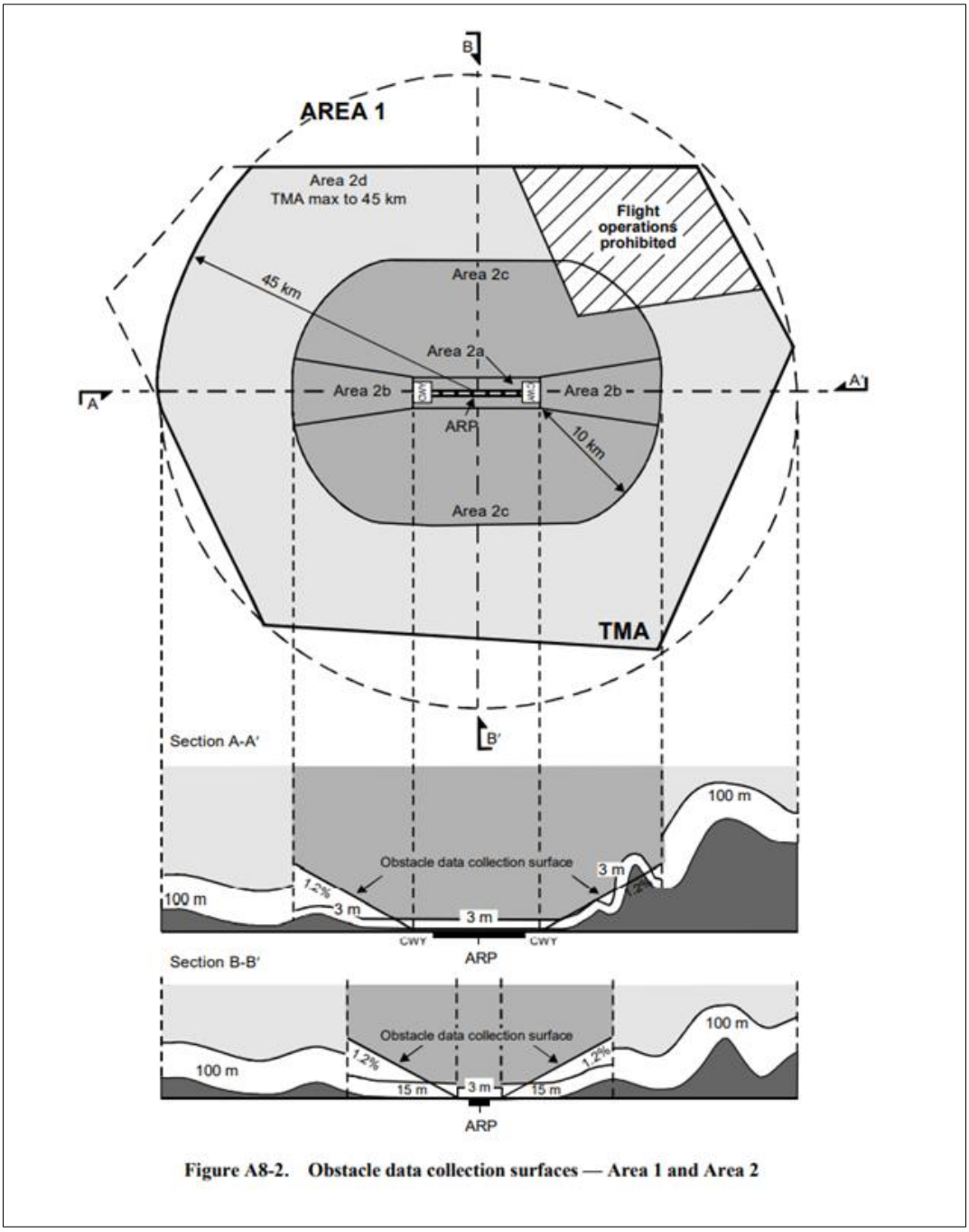

Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

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

APPENDIX B - ICAO Building Restricted Areas.

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

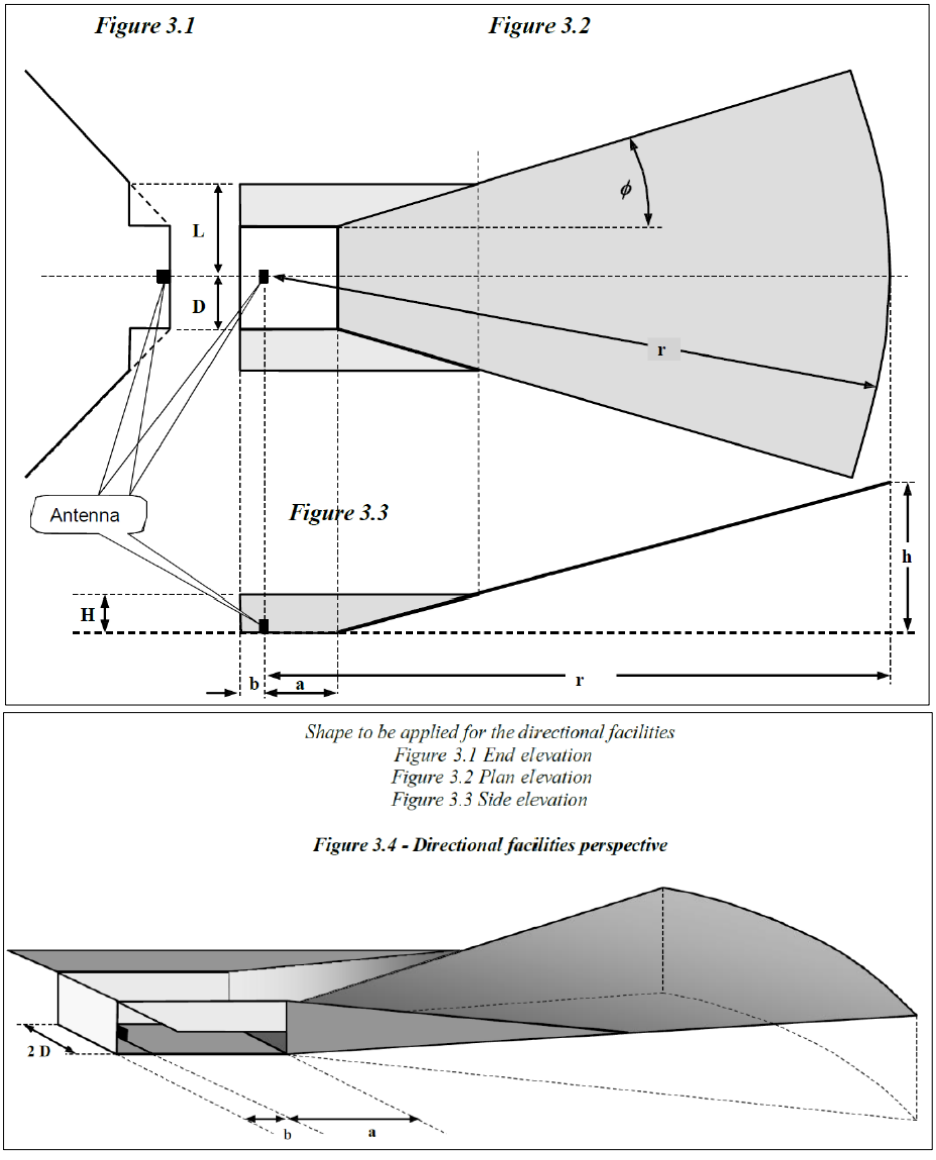

Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

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

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