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APPENDIX 17

MATERIAL ASSESTS, TELECOMMUNICATIONS AND AVIATION

Appendix 17.1 – Telecommunications Impact Study

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APPENDIX 17.1

Telecommunications Impact Study

Report

Derrynadarragh Wind Farm
Telecommunications Impact Study

Document Number:

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Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the proposed wind farm at Derrynadarragh, on the Kildare-Offaly border could have on existing telecommunications operator networks. The scope of work included field and desktop surveys to determine telecommunications network infrastructure that could be impacted by the proposed development. Consultations with telecom operators were also undertaken to assist in identifying network infrastructure that could be impacted by the proposed wind farm.

Telecommunications mast-sites with network infrastructure that could potentially be impacted by the development were identified and a field survey of each of these sites was carried out. During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded. The findings of the field surveys are provided in Appendix B of this report.

Consultations with telecom network operators first commenced in 2022 when the proposed development was known as "*Wind Farm Ref.: KEOY*". The telecom operators were subsequently contacted in February 2025 and were advised of the most recent site layout and name change to "*Derrynadarragh Wind Farm*". The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed development. The responses received (i.e. the 2022 and 2025 responses) from each of the telecom operators are presented in Section 3 of this report.

Using the information obtained during the field survey assessments and consultation process a desktop impact analysis was carried out and all of the telecommunication operator networks were analysed using radio planning \ modelling software. Results from the impact analysis indicate that there are three PTP microwave radio links in the vicinity of the proposed development (Ref Table 1). The findings of the network analysis (2D and 3D) indicate that the proposed turbines would not obstruct the Imagine Broadband or Three Ireland radio links and there would be no impact to these radio networks due to the proposed development.

In addition to the Imagine Broadband and Three Ireland PTP radio links, CIE have a GSM-R radio network that operates along their rail track between Kildare Town and Portarlington. A GSM-R network assessment beyond the scope of this report and would require a further detailed technical assessment.

Operator	Link / Network Description	Nearest Turbine	Fresnel Zone Clearance Distance	Observations
Imagine Broadband	PTP microwave radio link from Dunmurry Hill to Gracefield GAA, (Link #1)	T01	> 70 m	No impacts.
Imagine Broadband	PTP microwave radio link from Dunmurry Hill to Gracefield GAA, (Link #2)	T01	> 70 m	No impacts.
Three Ireland	PTP microwave radio link from Clonyquin to Rathangan.	T02	25.5 m	No impacts.
CIE	GSM-R network along CIE rail track between Roscommon Town and Castlerea.	T01	Subject to further detailed GSM-R technical assessment.	Subject to further detailed GSM-R technical assessment.

Table 1. Radio links / Networks in vicinity of proposed wind farm.

Sections

Appendix

Section 1 - Wind Farm Site Information

1. Introduction

In this section a brief summary of the wind farm site is provided. Details regarding the site's geographic location and the proposed wind turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed wind farm development is located on the Offaly-Kildare border and is approximately 5 km northeast of Portarlington. The proposed turbine dimensions are shown below in Table 2. The coordinates of the turbines assessed in this report are provided in Appendix A.

Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter
Derrynadarragh	9	105 m	162 m

Table 2. Wind Farm Turbine Details

The location of the proposed wind farm development is shown below in Figure 1.

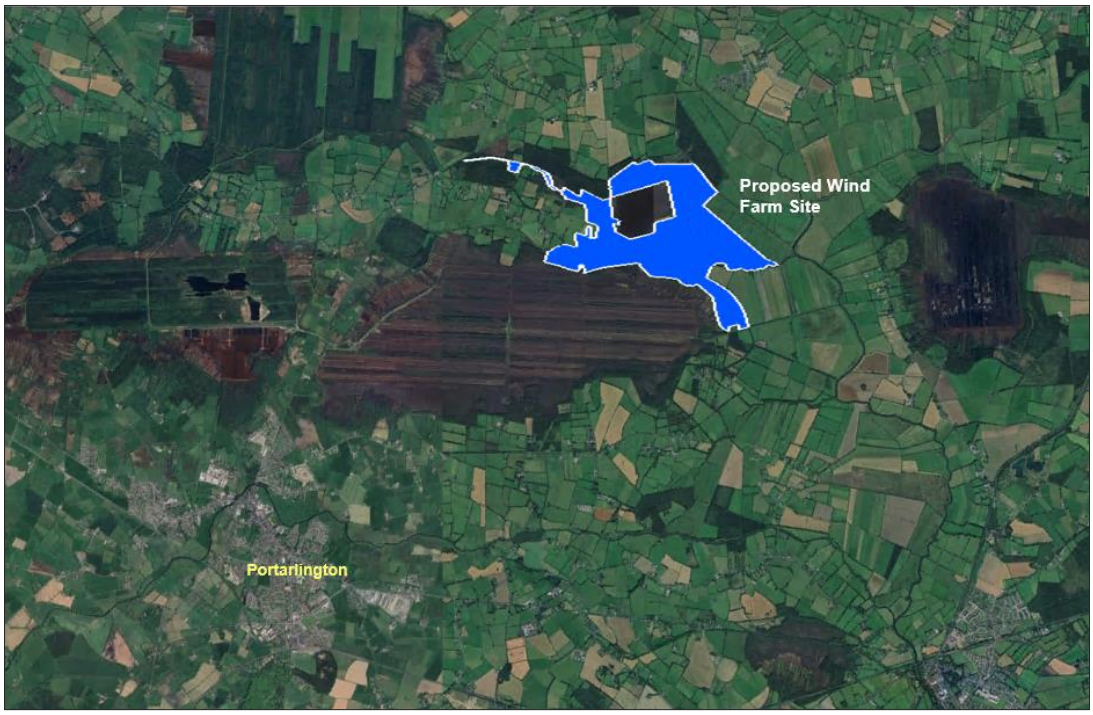


Figure 1. Location of proposed wind farm.

Section 2 - Methodology

2. Introduction

In this section a brief summary of the Telecommunication Impact Study Methodology is provided.

2.1 Methodology

There are four primary stages in preparing and compiling a communication impact study:

- Telecom Operator Consultations
- Field Surveys
- Desktop Survey Network Modelling and Analysis
- Report Generation

A summary of each of these stages is provided below:

Telecom Operator Consultations

Consultations are commenced with telecom operators who are requested to raise any concerns they have regarding the impact of the proposed wind farm on their networks. The consultation process is used to assist in identifying telecoms infrastructure that could be impacted by the proposed wind farm development.

Field Surveys

Field surveys are undertaken and the co-ordinates of communication masts are recorded. During the field surveys of the communication sites, approximations of antenna size, bearing and height are made for the antennas installed on each of the masts surveyed.

Desktop Survey and Analysis

A desktop survey is carried out to plot the wind turbines in a radio planning tool. The radio planning tool uses GIS and terrain mapping databases to enable accurate modelling. A selection of mast-site coordinates is then obtained and inputs from various operators \ service providers are converted from Irish National Grid (Easting and Northing in meters) to degrees minutes seconds format and then imported into the radio planning tool.

This provides a means of graphically showing telecommunications sites in the vicinity relative to the proposed wind farm. Figure 2 below shows the proposed wind farm site boundary plotted in the radio planning tool.

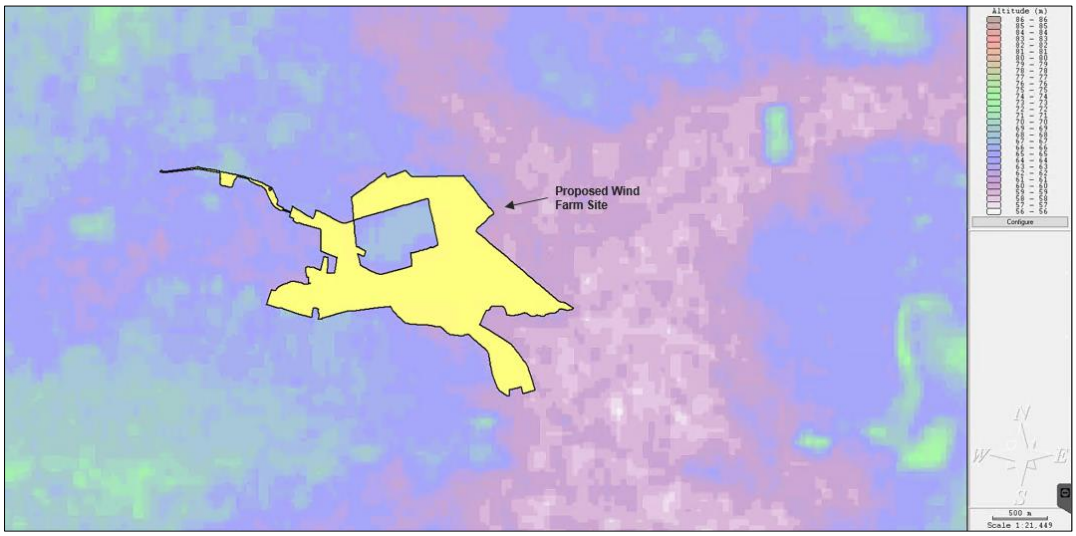


Figure 2. Wind Farm Boundary plotted in Radio Planning Software

The findings from the consultations and field surveys are collated and the communications networks requiring further analysis are identified. Network modeling is used to assess the impact of the turbines on the communications networks. The results from the network modeling are used to determine if mitigation measures are required. Figure 3 below shows an example of a microwave radio link that crosses over/near the wind farm boundary modelled in radio planning software.

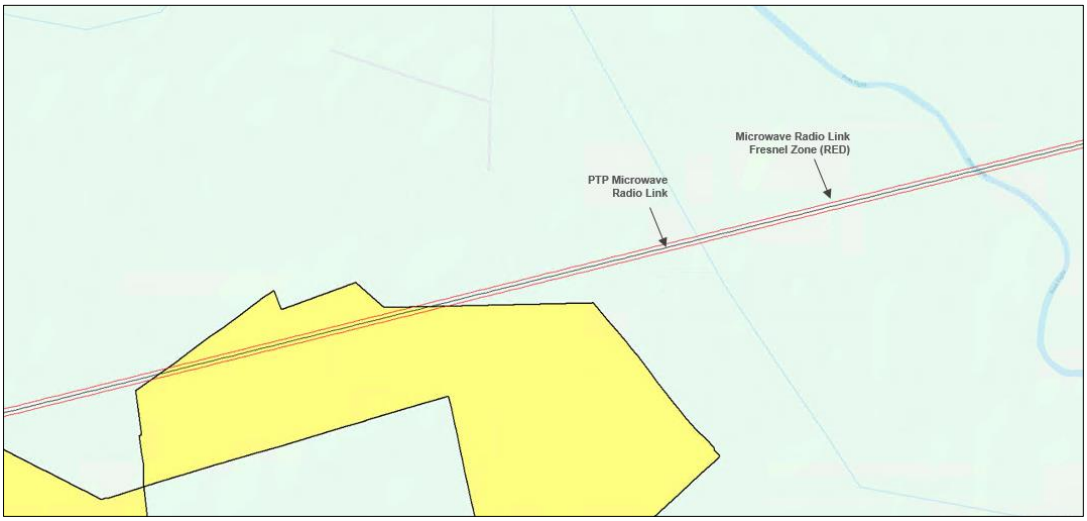


Figure 3. Example of microwave radio link crossing over/near the proposed wind farm boundary modelled in radio planning software.

Report Generation

The final stage of the communications impact study process is to collate the data and present the findings & analysis into a report for submission.

Section 3 - Telecom Operator Consultations

3. Introduction

In this section the consultation process undertaken with telecom operators is described. The response received from each operator is also provided.

3.1 Telecom Operator Consultations

Consultations with telecom network operators first commenced in 2022 when the proposed development was known as "*Wind Farm Ref.: KEOY*". The telecom operators were subsequently contacted in February 2025 and were advised of the updated site layout and name change to "*Derrynadarragh Wind Farm*". The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed development. Table 3 lists the telecom operators contacted and the issues raised by the operators. The responses received from each of the Telecom Operators are provided in Sections 3.1.1 to 3.1.20.

ID	Operator	Issues raised by Operator \ Observations.	
		2022	2025
1	2RN	No issues regarding transmission links; however, 2RN have requested that a protocol document be signed should the wind farm go ahead (regarding the TV broadcast service in the area).	No issues regarding transmission links; however, 2RN have requested that a protocol document be signed should the wind farm go ahead (regarding the TV broadcast service in the area).
2	Airwave	-	No response. (No response expected)
3	An Garda Síochána	No response. (No response expected)	No response. (No response expected)
4	Coimisiún na Meán (formerly the BAI)	No issues.	No issues.
5	BT Ireland	No issues.	No issues.
6	CIE/Irish Rail	-	CIE have stated that the proposed wind farm would be located within the "exclusion zone" of their GSM-R network (Mobile Network for Railways).
7	Dept. of Defence	No issues.	No issues.
8	Eir	No issues.	No issues.
9	Enet	No issues.	No issues.
10	ESB Networks	No issues.	No issues.
11	Imagine Broadband	Imagine Broadband raised a concern regarding two PTP microwave radio links.	Imagine Broadband raised a concern regarding two PTP microwave radio links.
12	IAA / AirNav	No response.	No issues.
13	Uisce Éireann	-	No issues.
14	Kildare County Council	No response. (No response expected)	No response. (No response expected)
15	Offaly County Council	No response. (No response expected)	No response. (No response expected)
16	Tetra Ireland (TI)	No issues.	No response.
17	Three Ireland	No issues.	Three Ireland have raised a concern regarding one PTP microwave radio link.
18	Viatel	No issues.	TBC
19	Virgin Media	No issues.	No issues.
20	Vodafone Ireland	No issues.	No issues.

Table 3. Telecom Operators Consulted

3.1.1 2RN Response to Consultations

2RN did not raise any concerns in relation to transmission links; however, 2RN did have a concern regarding their broadcast service in the area and have requested that a protocol document be signed should the wind farm go ahead. The response received from 2RN is provided below.

2022 Response

"We would also ask that a protocol be signed .. should they go ahead."

2025 Response

"Nothing has changed for us in this area, we would only ask that a Protocol be signed between the 2rn and the Developer should the site go ahead to cover any potential problems with Broadcast coverage."

3.1.2 Airwave Response to Consultations

Airwave provided the following email response(s) to consultations:

2022 Response

No response.

2025 Response

No response.

3.1.3 An Garda Síochána Response to Consultations

An Garda Síochána provided the following email response(s) to consultations:

2022 Response

No response.

2025 Response

No response.

3.1.4 Coimisiún na Meán (formerly the BAI) Response to Consultations

The BAI provided the following email response to consultations:

2022 Response

"The BAI does not perform an in-depth analysis of the effect of wind turbines on FM networks. However, we are not aware of any issues from existing windfarms into existing FM networks. Also, the proposed windfarms are not located close to any existing or planned FM transmission sites."

2025 Response

"*Coimisiún na Meán does not perform an in-depth analysis of the effect of wind turbines or electrical sub stations on FM networks. However, we are not aware of any issues from existing windfarms or electrical sub stations into existing FM networks. Also, the proposed sub station is not located close to any existing or planned FM transmission sites."*

3.1.5 BT Ireland Response to Consultations

BT provided the following email response(s) to consultations:

2022 Response

"BT are in process of winding down our microwave network which will be complete in the coming months. We only have a network presence in Louth and Waterford."

2025 Response

"*BT no longer have a radio microwave network."*

3.1.6 CIE/Irish Rail Response to Consultations

2022 Response

N.A. – Not contacted in 2022

2025 Response

"The extremities of the proposed site lies within the GSM-R (Mobile Network for Railways) exclusion zone and therefore is not permitted. Please see below:

From a study carried out by the ANFR (Agence Nationale des Frequences in France), the output calls for 2 main recommendations by defining 2 main zones as follows:

1- *Exclusion zone: wind farm not less than 5 Km from antenna*
2- *Coordination zone: : 5Km<wind farm <30Km: this area, coordination between operators is required to fix any issue and impact on the signal propagation."*

3.1.7 Department of Defence Response to Consultations

The Department of Defence provided the following email response to consultations:

2022 Response

"Dear Mr. McGrath,

Thank you for your e-mail below, on behalf of Kevin Hayes, in relation to Ai Bridges Telecoms Assessment …Wind Farm Developments

Please note, the attached Word document map with site location cannot be opened on our end.

Is it possible to resend or send in a different format re. pdf?

Please contact me if you have any queries."

13.06.22 – Ai Bridges Response to the Department of Defence:

Dear Mr. Watchorn,

I am just following up with you in relation to your email below.

The document we have attached is a Google Earth format file. Please advise if you would like us to re-send in *.KMZ format which can be easily imported into Google Earth

Please see below the screenshot format of what we have sent you, taken from Google Earth and can be used in place of PDF file format."

2025 Response

"Due to the Departments Firewall we do not have ability to open files in the format attached. Can you please resubmit this in a PDF format."

06.02.25 – Ai Bridges Response to the Department of Defence:

Hello Ruth,

The .kmz file we attached can be imported into Google Earth to view the wind farm site location.

No data is contained in the file, other than the outline of the proposed development.

The outline of the proposed development is also shown in the figure below.

3.1.8 Eir Response to Consultations

Eir provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"No change or impact for Eir with the proposed location at Derrynadarragh."

3.1.9 Enet Response to Consultations

Enet provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"This windfarm still won't affect our current network."

3.1.10 ESB Networks Response to Consultations

ESB provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"I am writing to inform you that we have successfully assessed your windfarm proposal. We are pleased to advise that the proposed wind farm has been reviewed and cleared."

3.1.11 Imagine Broadband Response to Consultations

Imagine Broadband provided the following email response to consultations:

2022 Response

"We have two links across the same path on the boundary of KEOY".

Link Name / ID	Band MHz\GHz	Link Length (km)	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height (m)	Lat	Long	Easting	Northing	Ant Height (m)
KE013 to OY020 Master	6	19.21	53.1986	6.9336	671252	716993	14.2	53.168314	-7.216373	652396	713379	23.4
KE013 to OY020 Slave	6	19.21	53.1986	6.9336	671252	716993	14.2	53.168314	-7.216373	652396	713379	23.4

2025 Response

"There has been no change. The two MW links are still in place."

3.1.12 IAA / AirNav Response to Consultations

IAA / AirNav provided the following email response to consultations:

2022 Response

No response

2025 Response

"*No issue for Airnav navaids*."

3.1.13 Uisce Éireann Response to Consultations

Uisce Éireann provided the following email response to consultations:

2022 Response

N.A. – Not contacted in 2022

2025 Response

"I can confirm that Uisce Éireann have no communications links traversing the proposed wind farm development."

3.1.14 Kildare County Council Response to Consultations

Kildare County Council provided the following email response to consultations:

2022 Response

No response.

2025 Response

To date no response has been received.

3.1.15 Offaly County Council Response to Consultations

Offaly County Council provided the following email response to consultations:

2022 Response

No response.

2025 Response

To date no response has been received.

3.1.16 Tetra Ireland (TI) Response to Consultations

Tetra Ireland provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

To date no response has been received.

3.1.17 Three Ireland Response to Consultations

Three Ireland provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"We now have one link that passes through this area. Please see the details below."

Link Name / ID	Band MHz\GHz	Link Length	Site A					Site B				
			Lat	Long	Easting	Northing	Ant Height	Lat	Long	Easting	Northing	Ant Height
ML021549	18	17.95km	53.1773	-7.25698	249733	214315	24	53.2162	-6.99639	267096	218867	15m

3.1.18 Viatel Response to Consultations

Viatel provided the following email response to consultations:

2022 Response

No response.

2025 Response

To date no response has been received.

3.1.19 Virgin Media Response to Consultations

Virgin Media provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"Virgin Media Ireland DO NOT have any radio links in this area."

3.1.20 Vodafone Ireland Response to Consultations

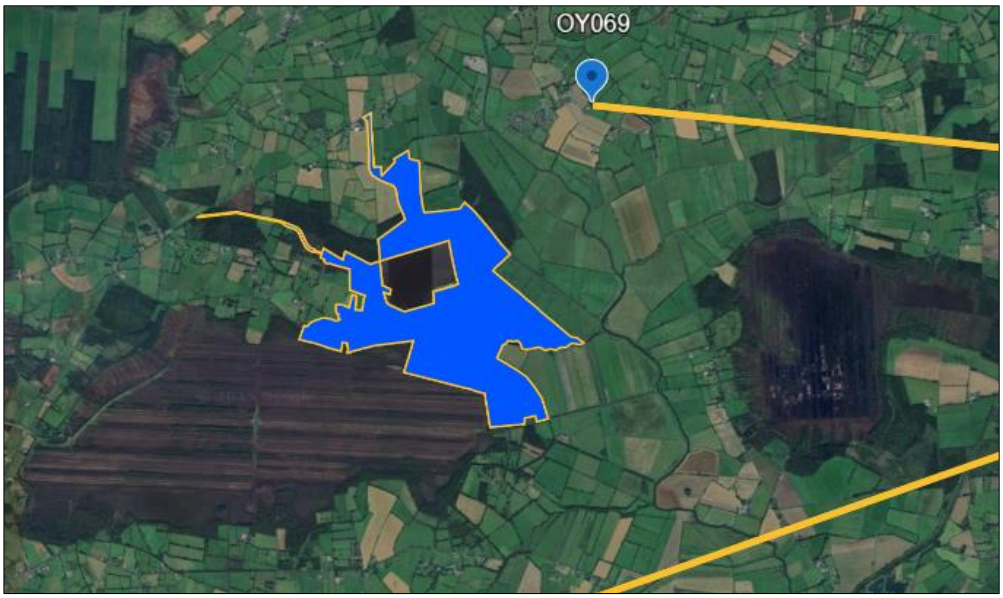
Vodafone provided the following email response to consultations:

2022 Response

Site No.	Wind Farm Site	Potential Impact (Y \ N)
1	Wind Farm Ref. : KEOY *[Derrynadarragh]*	No

2025 Response

"Vodafone does not have any transmission in the area. See screen shot below."



Section 4 - Field Surveys

4. Introduction

To assess the accuracy of the network information (radio link co-ordinates, antenna heights etc.) provided by the telecom operators, field surveys of the telecom-mast sites in the vicinity of the proposed wind farm were carried out.

During the field surveys, radio antennas with bearings in the direction of the wind farm were recorded. The telecom mast-sites surveyed for this study (labelled Mast-Site A to Mast-Site D) are shown relative to the proposed wind farm site in Figure 4 below. The findings from the field surveys of the mast-sites are presented in Appendix B of this report.

Figure 4. Telecom Mast-Sites Surveyed.

Section 5 - Desktop Survey Analysis

5. Introduction

Based on the findings of the consultation process, there is one Telecom Operator with a network in the vicinity of the proposed wind farm that require a detailed technical analysis:

- Imagine Broadband Network
- Three Ireland Network

Sections 5.1 and 5.2 below outlines the desktop survey analysis findings* for each of the Telecom Operator networks listed above.

5.1 Imagine Broadband Network Analysis

The Imagine Broadband network in the vicinity of the proposed wind farm consists of two Point-to-Point (PTP) microwave radio links. The radio links are listed below in Table 4 and a Plan view of the Imagine network is shown in Figure 5.

Link	Operator	Link Description
1	Imagine	PTP microwave radio link from Dunmurry Hill to Gracefield GAA, Portarlington (Link #1)
2	Imagine	PTP microwave radio link from Dunmurry Hill to Gracefield GAA, Portarlington (Link #2)

Table 4. Imagine Broadband Radio Links requiring Analysis

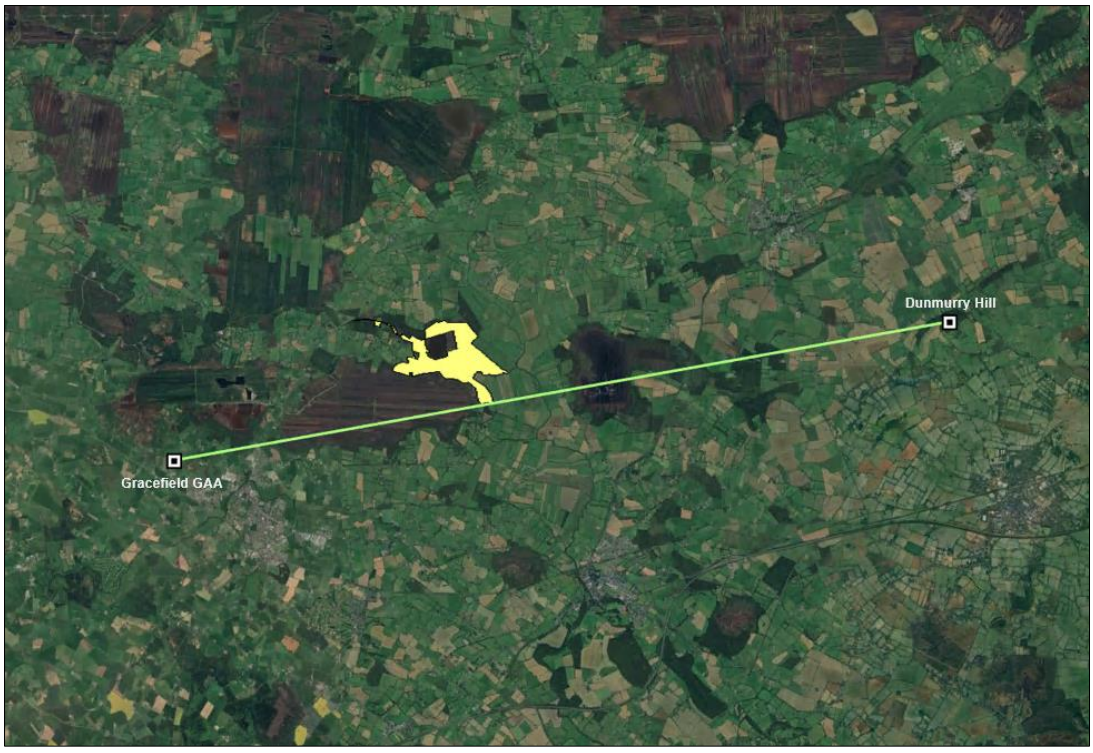


Figure 5. Imagine Broadband Radio Network – Plan View

** The Desktop Survey Analysis findings are subject to accuracy of the information (GPS co-ordinates, turbine dimensions, etc.) provided to Ai Bridges.*

Figure 6 shows a close-up view of the Imagine Broadband radio link network relative to the proposed wind turbines. The plan view indicates that there is a clearance distance of over 70 m between the Fresnel Zone (F1) of the radio links and the blade-tip if the nearest turbine (T01). At this distance there would be no impact to either of the Imagine Broadband radio links.

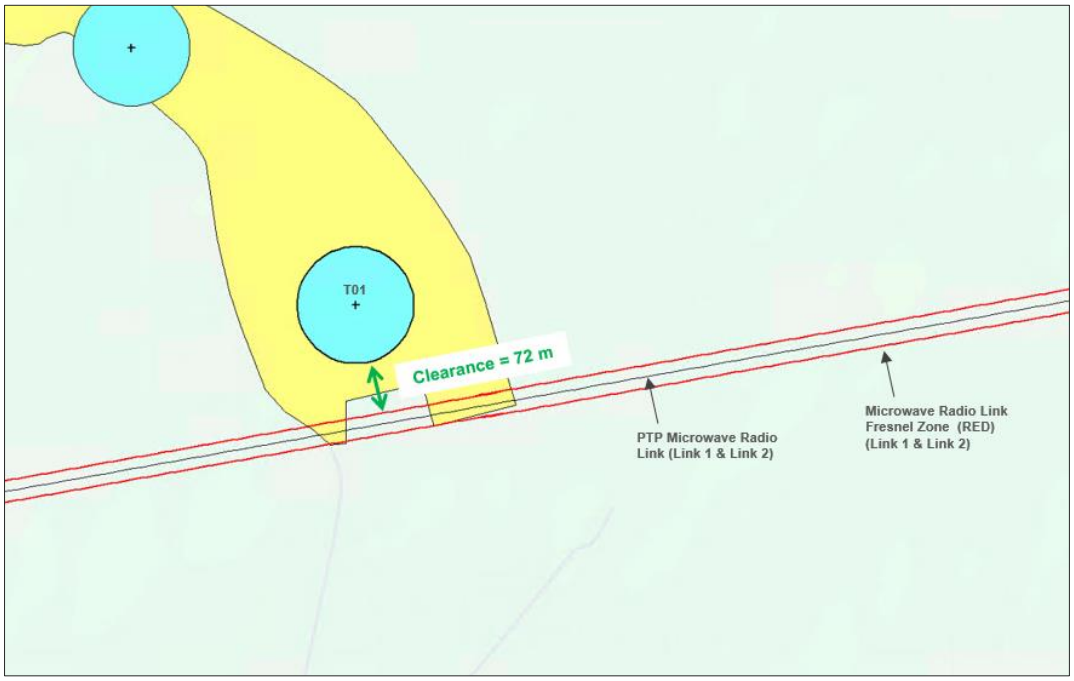


Figure 6. Imagine Broadband Network – Close-up Plan View.

Table 5 below provides a brief summary of the network analysis for the Imagine Broadband network in the vicinity of the proposed wind farm.

Radio Link ID	Link Description	Nearest Turbine	Fresnel Zone (F1) Clearance / Interference	Observations
IMG_L1	Dunmurry Hill to Gracefield GAA (Link #1)	T01	> 70 m	No impacts
IMG_L2	Dunmurry Hill to Gracefield GAA (Link #2)	T01	> 70 m	No impacts

Table 5. Imagine Broadband Network – Analysis Summary

5.2 Three Ireland Network Analysis

The Three Ireland network in the vicinity of the proposed wind farm consists of one Point-to-Point (PTP) microwave radio link. The radio link is listed below in Table 6 and a Plan View of the Three Ireland network is shown in Figure 7.

Link ID	Operator	Link Description
1	Three Ireland	PTP microwave radio link from Clonyquin to Rathangan.

Table 6. Three Ireland Radio Links requiring Analysis

Figure 7. Three Ireland Radio Network – Plan View

Figure 8 below shows a close-up plan view of the Three Ireland microwave radio link relative to the proposed wind farm site. The plan view indicates that the radio link is potentially obstructed by Turbine T02.

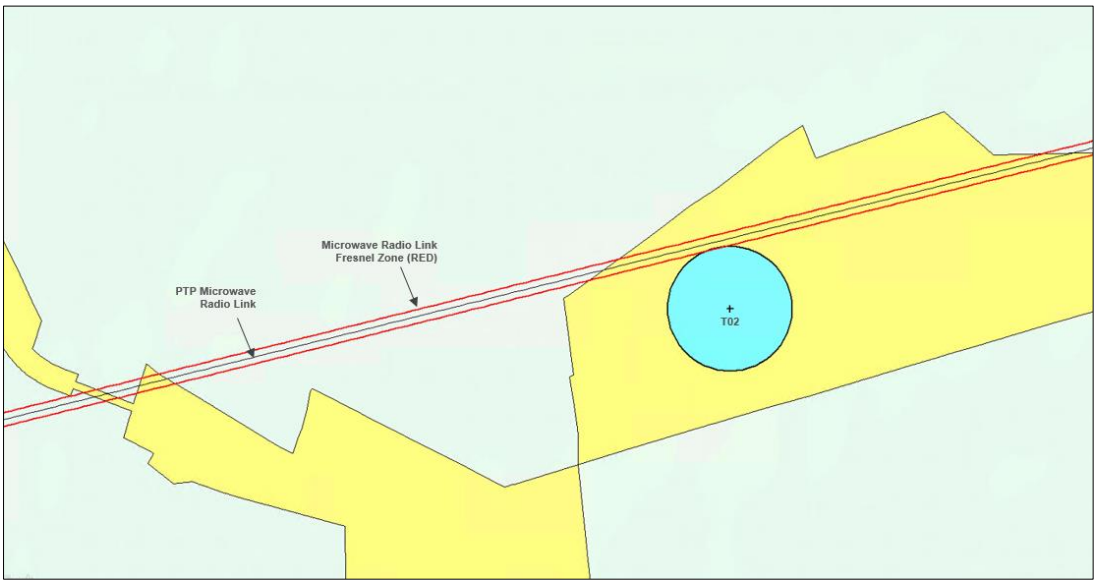


Figure 8. Three Ireland Network – Close-up Plan View.

To further assess the potential impacts, the radio link has been modelled in 3D and the Clearance Distances between the Fresnel Zone (F1) and the blade-tip of the T02 has been calculated. A 3D view of the microwave radio link relative to the proposed turbine is shown below in Figure 9.

The 3D model indicates that there is a clearance distance of 25.5 m between the Fresnel Zone (F1) of the radio link and the blade-tip if the nearest turbine (T02). At this distance there would be no impact to the Three Ireland radio link.

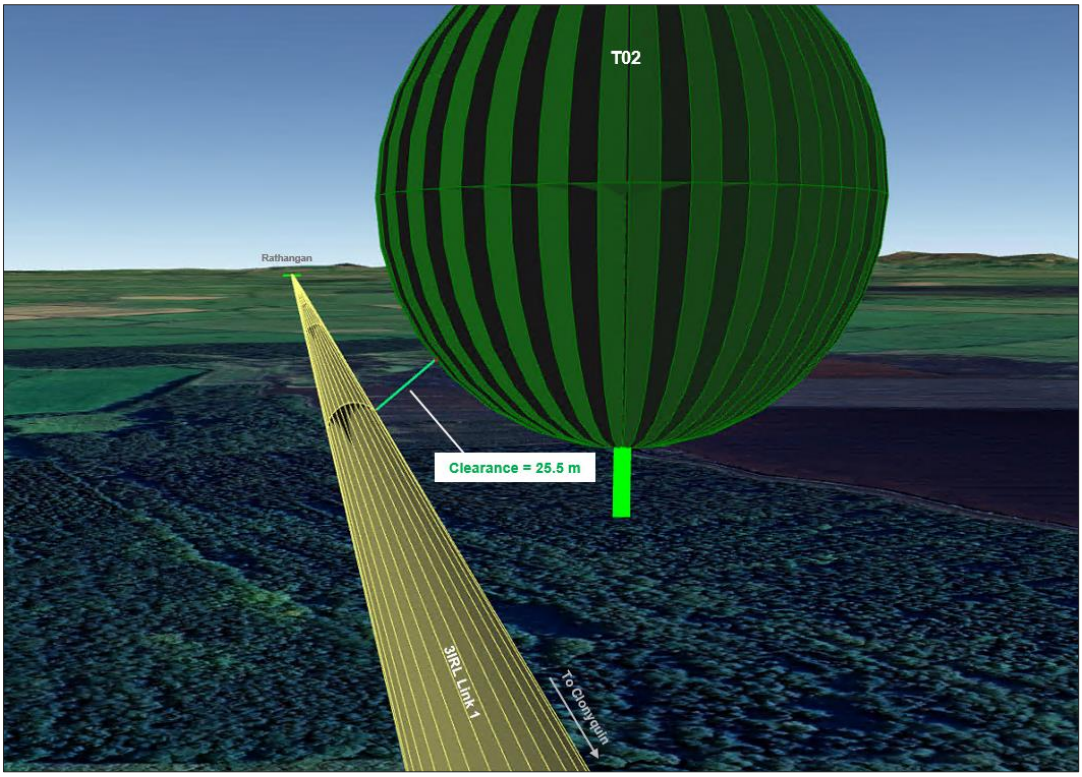


Figure 9. Three Ireland Network – 3D View.

Table 7 below provides a brief summary of the network analysis for the Three Ireland network in the vicinity of the proposed wind farm.

Radio Link ID	Link Description	Nearest Turbine	Fresnel Zone (F1) Clearance / Interference	Observations
3IRL Link 1	Clonyquin to Rathangan	T02	25.5 m	No impacts

Table 7. Three Ireland Network – Analysis Summary

5.3 CIE Network Analysis

Throughout Ireland CIE operate a GSM-R radio network along their rail tracks. The GSM-R network is used by rail operators for communication between trains, signalers and rail control centres.

Radio coverage along the rail tracks are provided by GSM-R basestations which are installed at various locations along the rail route. Panel antennas are used to provide directional signal coverage in the direction of the rail lines. An example of a GSM-R basestation is shown below in Figure 10.

Figure 10. Example of a CIE GSM-R Basestation

A detailed assessment of the GSM-R radio network in the vicinity of the proposed wind farm is beyond the scope of this report. However, as the proposed wind farm development is located 4.4 km from the CIE rail line between Kildare Town and Portalington, and within the Exclusion Zone as specified by CIE (i.e. < 5 km), a GSM-R Impact Assessment Study would be

recommended. A GSM-R Impact Assessment Study would involve a field survey of the rail line network in the vicinity of the proposed wind farm development which would be used to identify any GSM-R basestations along the rail track. A GSM-R Impact Assessment Study report would also include a detailed software model of the predicted GSM-R network service coverage i.e. to predict the radio coverage from the basestations and to assess the potential impact of the proposed wind farm development.

Figure 11. CIE Rail Line – Kildare Town to Portarlington

Table 8 below provides a summary of the network analysis for the CIE network in the vicinity of the proposed wind farm development.

ID	Network Description	Comments	Wind Farm Impacts
CIE NW 1	GSM-R Train Radio network along CIE rail tracks	At the nearest point, the proposed wind farm is 4.4 m from the CIE rail line between Kildare Town and Portarlington.	Subject to further/detailed GSM-R field survey and network assessment.

Table 8. CIE Network – Analysis Summary

Section 6 - Conclusions

6. Conclusions

From the findings made in this report the following conclusions have been made:

- Results from the telecom operator consultations and desktop survey analysis indicate that there are three radio links that cross over/near the proposed wind farm. The radio links are listed below in Table 9.
- In addition to the Imagine Broadband and Three Ireland radio links, CIE have a GSM-R radio network that operates along the rail track between Kildare Town and Portarlington. A GSM-R network assessment beyond the scope of this report and would require a further detailed technical assessment.

Operator	Radio Link / Network Description	Impact of Wind Farm / Observations
Imagine Broadband	PTP microwave radio link from Dunmurry Hill to Gracefield GAA (Link #1)	No Impacts
Imagine Broadband	PTP microwave radio link from Dunmurry Hill to Gracefield GAA. (Link #2)	No Impacts
Three Ireland	PTP microwave radio link from Clonyquin to Rathangan	No Impacts
CIE	GSM-R network along CIE rail track between Kildare Town and Portarlington.	Subject to further detailed GSM-R technical assessment.

Table 9. Radio Links in vicinity of proposed wind farm development

- Figure 12 has been provided to illustrate the Radio Links in vicinity of proposed wind farm development.

Figure 12. Plan View of radio links in vicinity of proposed wind farm development.

APPENDIX A – Wind Farm Turbine Coordinates

Appendix A – Wind Farm Turbine Co-ordinates

The coordinates of the turbines considered in this Telecommunications Impact Study are provided in the Table below.

Turbine ID	Co-ordinates (ITM)	
	Easting	Northing
T01	659937.442	714994.472
T02	658662.340	716607.338
T03	659623.315	716517.908
T04	659621.766	715347.287
T05	659128.367	716060.192
T06	658384.219	715670.327
T07	659267.991	715518.374
T08	659680.419	715968.055
T09	660136.311	715708.847

Table 10. Wind Farm Layout - Turbine Co-ordinates (ITM)

APPENDIX B – Field Survey Findings

Appendix B – Field Survey Findings

The telecom mast-sites surveyed for this Telecoms Impact Study are shown relative to the proposed wind farm site in Figure 13 below.

Figure 13. Telecom Mast-Sites shown relative to proposed wind farm.

The findings from the field surveys of each of the mast-sites are presented below.

Mast-Site A (Dunmurry Hill)

Telecommunications Mast-Site A is located at Dunmurry Hill, Co Kildare and is approximately 11 km east of the proposed wind farm. A photo of the mast at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 11.

Figure 14. Mast A1

Mast ID	Telecom Operators with radio links in direction of proposed wind farm
Mast A1	Imagine Broadband

Table 11. Field Survey Summary – Mast-site A

Mast-Site B (Gracefield GAA)

Telecommunications Mast-Site B is located in the grounds of Gracefield GAA, Portarlington, Co Laois and is approximately 6 km southwest of the proposed wind farm. A photo of the mast at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the wind farm are listed in Table 12.

Figure 15. Mast B1

Mast ID	Telecom Operators with radio links in direction of proposed wind farm
Mast B1	Imagine Broadband

Table 12. Field Survey Summary – Mast-site B

Mast-Site C (Clonyquin)

Telecommunications Mast-Site C is located in the townland of Clonyquin, and is approximately 8 km west of the proposed wind farm site. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the proposed wind farm are listed in Table 13.

Figure 16. Mast C1

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast C	Three Ireland

Table 13. Field Survey Summary – Mast-site C

Mast-Site D (Rathangan)

Telecommunications Mast-Site D is located in the town of Rathangan, and is approximately 8 km northeast of the proposed wind farm site. A photo of the mast-structure at this location is shown in the figure below. The Telecom Operators who have radio links operating from this mast-site in the direction of the proposed wind farm are listed in Table 14.

Figure 17. Mast D1

Mast ID	Telecom operators with radio links in direction of proposed wind farm
Mast D	Three Ireland

Table 14. Field Survey Summary – Mast-site D

APPENDIX 17.2

Irish Rail Telecommunications Impact Study

Report

Derrynadarragh Wind Farm
Irish Rail Telecommunications Impact Assessment Report

Document Number:

Author: DMG/PT

Approved for Release: Rev 1.0 KH **Date:** 24/07/2025

Document Filename: *Derrynadarragh Wind Farm Irish Rail Network Impact Assessment.*

Executive Summary

During Telecom Operator Consultations in February 2025, Irish Rail (IR) were contacted to determine if they had any concerns in relation to the proposed wind farm at Derrynadarragh, on the Offaly-Kildare border. In the respond received from Irish Rail, it was stated that they operate a GSM-R Train Radio communications system in the vicinity of Derrynadarragh. Irish Rail also requested a 5km Exclusion Zone around their transmitting radio antennas.

Ai Bridges Ltd were subsequently commissioned to evaluate the Irish Rail communications network and to assess the possible impacts that the proposed wind farm at Derrynadarragh could have on the Irish Rail radio network. Field and desktop surveys of the Irish Rail network in the vicinity of Derrynadarragh were carried for the telecommunications assessment.

GSM-R Train Radio is an international standard used by rail operators and operates in the UHF band of frequencies. Obstacles generally do not interfere with radio signals in this band of frequencies unless the obstacle (e.g. wind turbine) is very near to the transmitting antenna (e.g. less than 500m) when it can inhibit the radio signals ability to “launch” correctly.

Results from the field survey found that there are GSM-R radio basestations at three mast locations (in the vicinity of Derrynadarragh) along the rail line between Kildare Town and Portarlington. GSM-R radio antennas are aligned in the direction of the rail lines to provide targeted signal coverage along the rail network. The nearest of the GSM-R basestations to the proposed wind farm is in the townland of Cloonafearagh, Co Kildare. This basestation is 4.5 km from the nearest point of the proposed wind farm development. At this distance, there would be no impact to the Irish Rail GSM-R radio network.

The results of the desktop surveys indicate that the 5 km Exclusion Zone requested by Irish Rail is excessive. Other state operators (Emergency Services, Garda Síochána, etc) and commercial operators (Vodafone, Three Ireland and Eir), only raise concerns when proposed turbines are very close to their transmitters (i.e. less than 500m).

It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish Rail tracks. These existing wind farms have no detrimental impact on the Irish Rail telecommunications network.

For the reasons outlined above, the proposed wind farm development at Derrynadarragh is expected to have no impacts on the Irish Rail communications network.

Network Description	Comments	Wind Farm Impacts
GSM-R Train Radio	The nearest IR GSM-R basestation to the proposed wind farm is in the townland of Cloonafearagh. This basestation is 4.5 km from the nearest point of the proposed development. At this distance, it is highly unlikely that there would be any impacts on the Irish Rail communications network, due to turbines at the proposed development. It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish rail tracks. These wind farms appear to have had no detrimental impact to the Irish Rail communications network.	No impacts

Table 1. Irish Rail Network Impact Summary.

Sections

Appendix

Section 1 - Wind Farm Site Information

1. Introduction

In this section a brief summary of the wind farm site is provided. Details regarding the site's geographic location and the proposed wind turbine dimensions are presented.

1.1 Wind Farm Site Information

The proposed wind farm development is located on the Offaly-Kildare border and is approximately 5 km northeast of Portarlington. The proposed turbine dimensions are shown below in Table 2. The coordinates of the turbines assessed in this report are provided in Appendix A.

Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter
Derrynadarragh	9	105 m	162 m

Table 2. Wind Farm Turbine Details

The location of the proposed wind farm development is shown below in Figure 1.

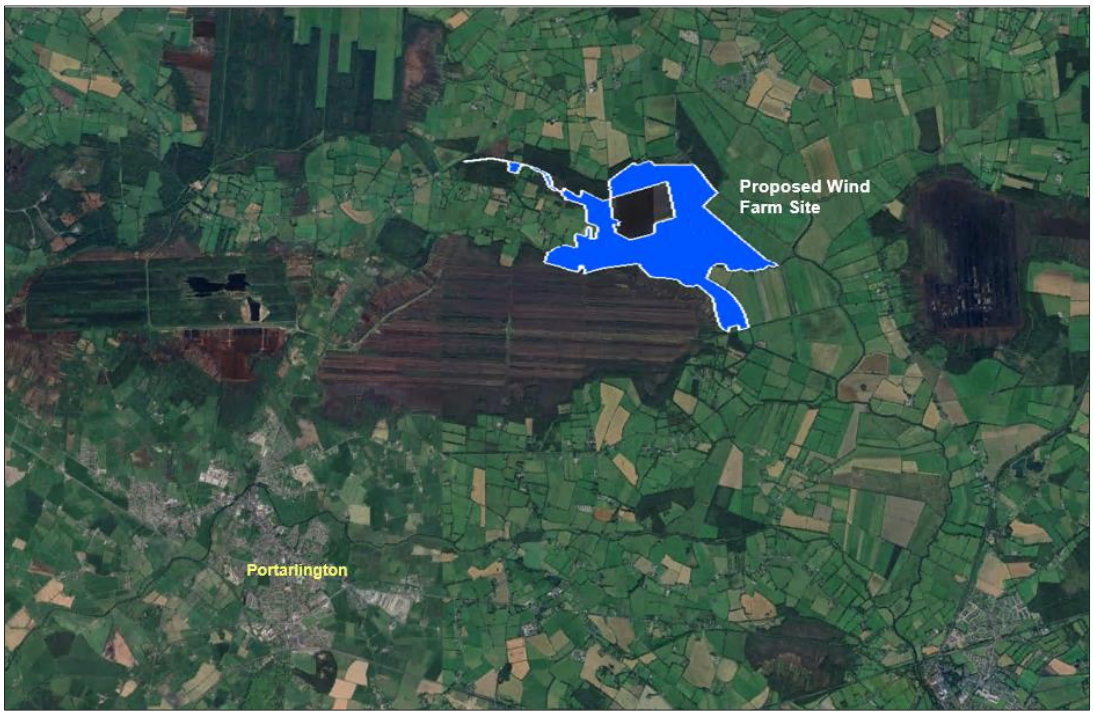


Figure 1. Location of proposed wind farm.

Section 2 - Irish Rail Communications Network

2. Introduction

Irish Rail operate a communications network along their rail tracks to facilitate communications between drivers and signallers. This communications network is used to increase safety, reduce delays and improve the general performance of the rail network. For their communications network Irish Rail use the following technologies:

- Analogue Train Radio
- GSM-R Train Radio

A description of each of these technologies is provided below in Section 2.1 and Section 2.2.

2.1 Analogue Train Radio

Analogue Train Radio operates in the UHF band of radio frequencies and is the older of the two technologies currently used by Irish Rail. Radio antennas, installed adjacent to the tracks, are used provide targeted radio coverage along the rail network.

Figure 2 below shows an example of a UHF antenna installed at an Irish Rail control building.

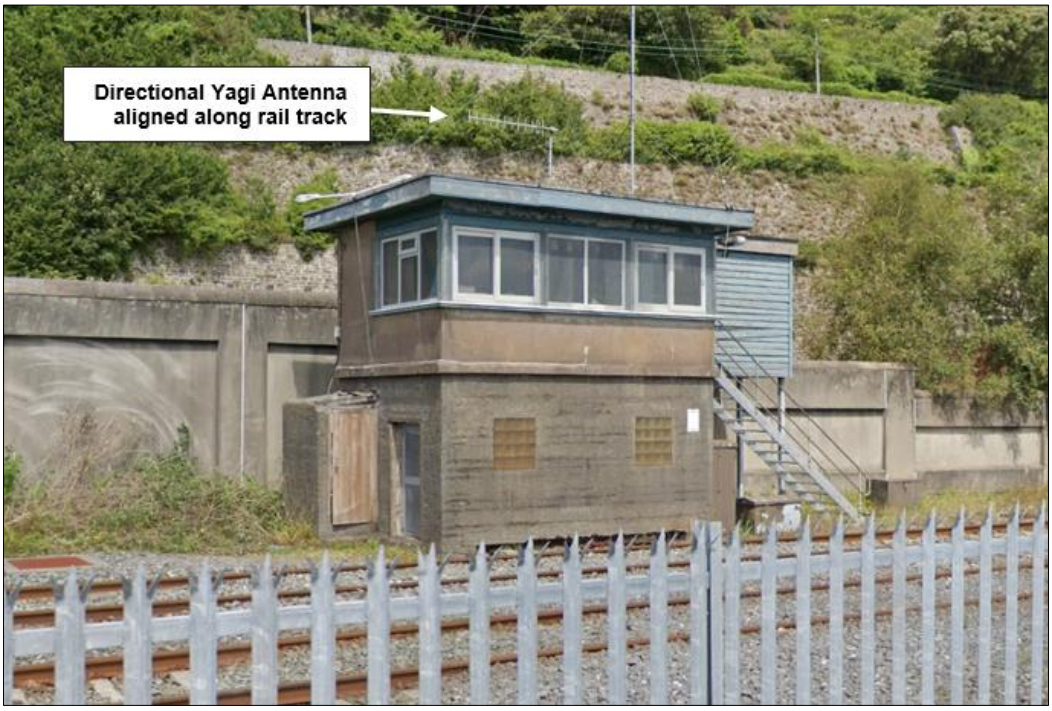


Figure 2. Example of Analogue Train Radio installation using a Yagi Directional Antenna

These analogue radio networks have limited functionality and had become increasingly expensive to maintain. As with other telecommunication networks, in recent years, there has been a move away from analogue systems in favour of digital systems which provide increased functionality and reliability. Irish Rail are currently phasing out their Analogue Train Radio system and migrating to the newer GSM-R radio technology.

2.2 GSM-R Train Radio

GSM-R is an international standard used by rail operators for communication between trains, signallers and rail control centres. As previously mentioned, Irish Rail are currently migrating their communications network away from the older Analogue Train Radio system to this newer GSM-R Train Radio system. The benefits of GSM-R include:

- Digitally enabled.
- Increased safety features
- Improved performance
- Voice and data services over circuit switching
- Based on GSM technology
- Can roam onto public GSM networks

Figure 3 below shows an example of a GSM-R Train Radio installation in which directional sector antennas are used. The antennas are aligned in the direction of the rail line to provide targeted coverage and range along the rail line.

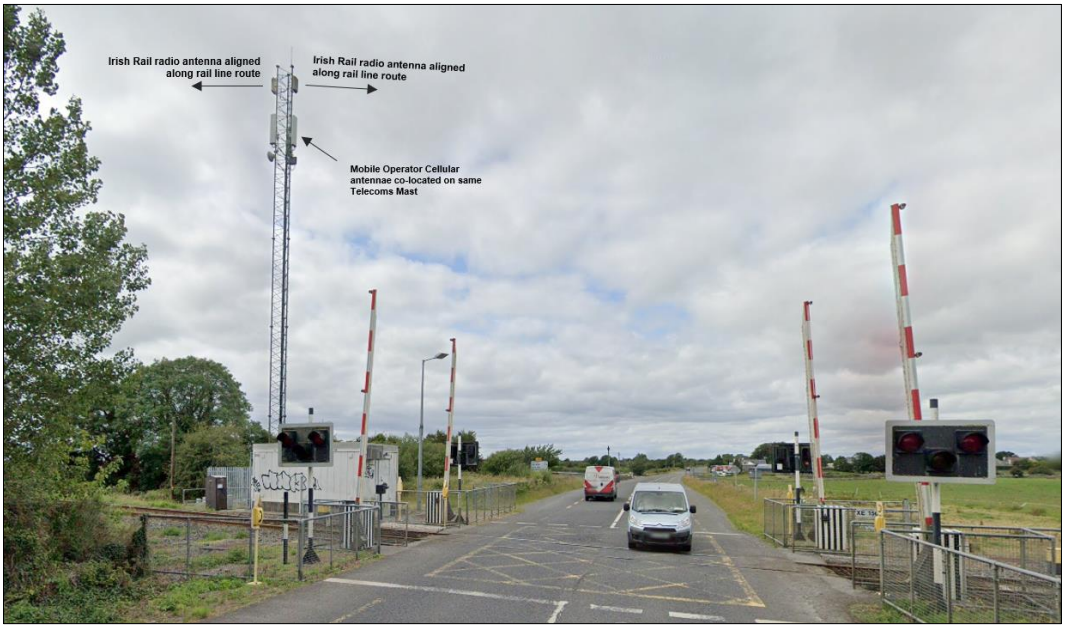


Figure 3. Example of GSM-R Train Radio installation using Directional Sector Antennas

Section 3 - Irish Rail Consultations

3. Introduction

Consultations beginning in February 2025 were undertaken with telecom network operators to assist in identifying telecommunication infrastructure that could be impacted by proposed wind farm. The operators were requested to raise any concerns they may have regarding impacts to their networks due to the proposed wind farm development.

Irish Rail responded to their consultation request stating that they operate a GSM-R Train Radio network in the Derrynadarragh area. The Irish Rail response to consultations is presented below in Section 3.1 .

3.1 Irish Rail Response to Consultations

The consultation response received from Irish Rail is provided below:

06.02.25 - Email sent by Irish Rail (CIE) to AiBridges Ltd

"The extremities of the proposed site lies within the GSM-R (Mobile Network for Railways) exclusion zone and therefore is not permitted. Please see below:

From a study carried out by the ANFR (Agence Nationale des Frequences in France), the output calls for 2 main recommendations by defining 2 main zones as follows:

1- *Exclusion zone: wind farm not less than 5 Km from antenna*
2- *Coordination zone: : 5Km<wind farm <30Km: this area, coordination between operators is required to fix any issue and impact on the signal propagation."*

Section 4 - Field Surveys

4. Introduction

To assess the Irish Rail communication network in the Derrynadarragh area, field surveys were undertaken at locations along the rail track adjacent to the proposed wind farm. The field survey map and survey results are presented in Section 4.1 that follows.

4.1 Field Survey

Figure 4 below shows the proposed wind farm site relative to the Irish Rail track which runs between Kildare Town and Portarlington. The rail line was surveyed for the presence of telecommunications equipment (i.e. telecoms mast and/or radio antenna).

During the field survey of the rail line in the vicinity of Derrynadarragh, Irish Rail GSM-R basestations were identified at three locations: Cherryville, Coolnafearagh, and Portarlington.

Figure 4. Irish Rail Network - Field Survey Map.

A survey of all three GSM-R mast-sites (Survey Point 1, Survey Point 2, and Survey Point 3) was carried out, the results of which are presented below in Sections 4.1.1 to 4.1.3.

4.1.1 Survey Point 1 (Cherryville)

Survey Point 1 is located in the townland of Cherryville, Co Kildare. A photograph of the telecoms mast at this location is shown in the figure below. A summary of the field survey findings at this location are provided in Table 3.

Figure 5. Survey Point 1 – Cherryville

Survey Point ID	IR Network Type	Observations
SP 1 – Cherryville	GSM-R	GSM-R Basestation 3.5 km west of Kildare Town. Directional panel antennas aligned in direction of the rail lines.

Table 3. Field Survey Summary – SP1

4.1.2 Survey Point 2 (Coolnafearagh)

Survey Point 2 is located in the townland of Coolnafearagh, Co Kildare. A photograph of the telecoms mast at this location is shown in the figure below. A summary of the field survey findings at this location are provided in Table 4.

Figure 6. Survey Point 2 – Coolnafeargh

Survey Point ID	IR Network Type	Observations
SP 2 – Coolnafearagh	GSM-R	GSM-R Basestation 1 km west of Monasterevein. Directional panel antennas aligned in direction of the rail lines.

Table 4. Field Survey Summary – SP2

4.1.3 Survey Point 3 (Portarlington)

Survey Point 3 is located at the Train Station in Portarlington, Co Laois . A photograph of the telecoms mast at this location is shown in the figure below. A summary of the field survey findings at this location are provided in Table 5.

Figure 7. Survey Point 3 – Portarlington

Survey Point ID	IR Network Type	Observations
SP 3 – Portarlington	GSM-R	GSM-R Basestation located at Portarlington Train Station. Directional antennas aligned in direction of the rail lines.

Table 5. Field Survey Summary – SP3

Section 5 - Desktop Survey Analysis

5. Introduction

Based on the consultation responses received from Irish Rail, there is one communication network type that require a detailed technical analysis:

- GSM-R Train Radio

Section 5.1 below outlines the desktop survey analysis findings for the communication networks listed above.

5.1 GSM-R Train Radio Analysis

From the findings of field surveys, the antennas used by CIE for their GSM-R rail network are directional sector panel antennas which are aligned in the direction of the rail tracks. From a Freedom of Information (FOI) request which was made to CIE, the make and model of the antennas used for GSM-R in the Republic of Ireland have been determined to be a Kathrein K80010456V02. The antenna specification can be found in Appendix B.

Once the antenna characteristics were determined (make, model, bearing, etc.), Radio Planning software was used to plot the network service coverage from the GSM-R basestations at Cheryville, Coolnafeargh, and Portarlington.

The GSM-R network coverage plot is shown below in Figure 8. As the plot shows, targeted GSM-R radio coverage extends from each basestation along the rail tracks. The strength of any RF signals from the GSM-R basestations at Derrynadarragh would be negligible, and it is highly unlikely that turbines at Derrynadarragh would have any impact on the GSM-R network.

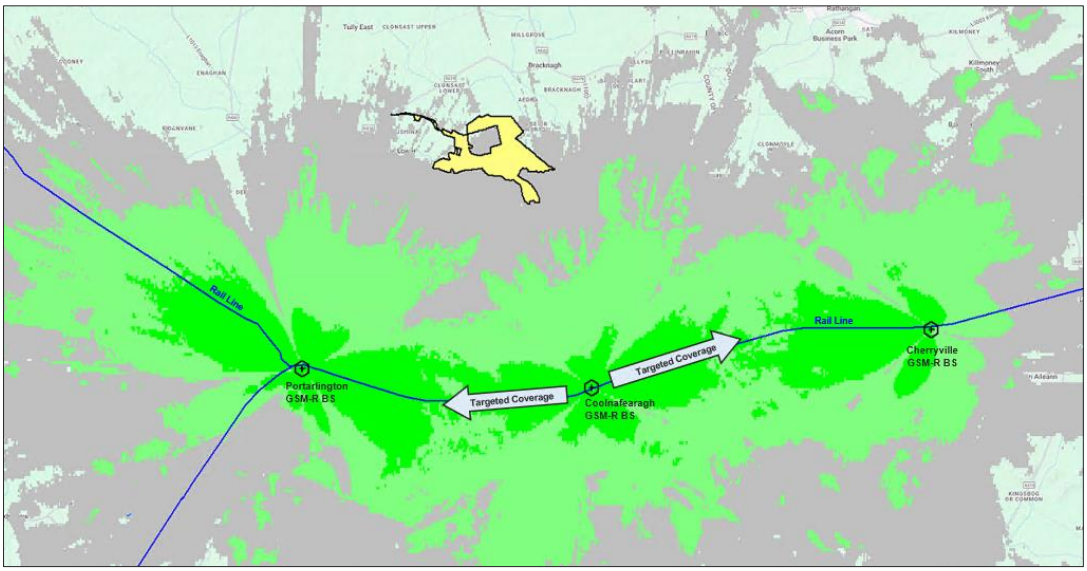


Figure 8. Irish Rail Network – Predicted Service Coverage from GSM-R Network

In their response to consultations CIE referenced recommendations from the ANFR, which is a government agency that manages radio frequencies in France. This agency (which has no authority in the Republic of Ireland), recommends an Exclusion Zone of 5 km from GSM-R antennas. However, wind turbines generally do not interference with GSM /GSM-R radio signals unless they are in close proximity to the transmitter.

Commercial service operators do not raise any concerns regarding GSM access networks unless proposed turbines are very near their transmitters (e.g. less than 500m). Figure 9 below shows that the proposed development is 4.5 km from the nearest IR GSM-R basestation. At this distance, it is highly unlikely that there would be any impact on the GSM-R radio network.

Figure 9. Nearest turbine to Irish Rail GSM-R Basestaion

In addition, a search of the online ANFR database of documents / studies found no reference to a 5 km Exclusion Zone for GSM-R networks. In France there are numerous wind farms that are located well within 5 km of rail lines. Figure 10 below shows an example of a wind turbine in northern France that is less than 200m from a rail line.

Figure 10. Example of a wind tubrine shown relative to a French rail track

In Ireland too, there are numerous examples of existing wind farms that are less than 5 km to Irish Rail lines. These operational wind farms in the Republic of Ireland (e.g. Ballymartin, Monaincha, Richfield, Cloontooa, etc.) appear to have had no detrimental impact to the Irish

Rail communications network. Figure 11 below shows wind turbines at Cloontoa wind farm which are less than 1 km from the adjacent Irish Rail track.

Figure 11. Cloontooa wind turbines shown relative to Irish Rail track

Table 6 below provides a brief summary of the network analysis for the Irish Rail network in the vicinity of the proposed wind farm.

Network Type	Comments	Wind Farm Impacts
GSM-R Train Radio	Turbines at the proposed development would be at least 4.5 km from the nearest Irish Rail GSM-R basestation (located at Coolnafearagh). At this distance, it is highly unlikely that the proposed wind farm would have any impacts on the Irish Rail communications network. It should also be noted that there are existing wind farms throughout Ireland with turbines that are less than 5 km from Irish rail tracks. These wind farms appear to have had no detrimental impact to the Irish Rail communications network.	No impacts.

Table 6. GSM-R Train Radio – Analysis Summary

Section 6 - Conclusions

6. Conclusions

From the findings made in this report the following conclusions have been made:

- Results from the field survey indicate that Irish Rail operate a GSM-R network along the rail line between the train stations at Kildare Town and Portalington.
- GSM-R Radio operates in the UHF band of frequencies. Wind turbines generally do not cause interference to radio signals in this band, unless they are in close proximity to the transmitter (e.g. less than 500m).
- The precedent that the Irish Rail refer to is that of the ANFR (Agence Nationale des Frequences) in France, which is not applicable within Irish an Irish legislative context under the Wireless Telegraphy Act. This Act is part of a broader framework of legislation, including the Broadcasting and Wireless Telegraphy Act, 1988, as noted on the Irish Statute Book. The statement by Irish Rail in their consultation response is not applicable on this legislative basis.
- In addition, a search of the online ANFR database of documents / studies found no reference to a 5 km Exclusion Zone for GSM-R networks. In France there are wind farms that are located well within 5 km of rail lines. An example of a wind turbine in northern France that is less than 200m from a rail line has been cited.
- As turbines at the proposed development would be at least 4.5 km from the nearest Irish Rail GSM-R basestation (located at Coolnafearagh), it is highly unlikely that there would be any impacts on the Irish Rail communications network. A software prediction of the service coverage from the Irish Rail basestation has been generated and shows that there would be no impacts from the proposed wind farm
- It should also be noted that there are existing wind farms in Ireland with turbines that are located within 5 km of Irish Rail tracks (e.g. Ballymartin, Monaincha, Richfield, Cloontooa, etc.). These wind farms are operational for many years and there are no reports to\from the wind farm operators of any impact to the Irish Rail communications network.

Network Description	Comments	Wind Farm Impacts
GSM-R	GSM-R Train Radio operates in the UHF band of frequencies. Transmitters in this band are generally not impacted by obstacles (e.g. wind turbine) unless the obstacle is less than 500m from the transmitter. Turbines at the proposed development would be at least 4.5 km from the nearest Irish Rail GSM-R basestation (located at Coolnafearagh). At this distance, it is highly unlikely that the proposed wind farm would have any impacts on the Irish Rail communications network.	No impacts

Table 7. Irish Rail Network Impact Summary.

APPENDIX A – Wind Farm Turbine Coordinates

Appendix A – Wind Farm Turbine Co-ordinates

The coordinates of the turbines considered in this Telecommunications Impact Study are provided in the Table below.

Turbine ID	Co-ordinates (ITM)	
	Easting	Northing
T01	659937.442	714994.472
T02	658662.340	716607.338
T03	659623.315	716517.908
T04	659621.766	715347.287
T05	659128.367	716060.192
T06	658384.219	715670.327
T07	659267.991	715518.374
T08	659680.419	715968.055
T09	660136.311	715708.847

Table 8. Wind Farm Layout - Turbine Co-ordinates (ITM)

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APPENDIX B – GSM-R Antenna Specification

Appendix B – GSM-R Antenna Specification

The antenna used by CIE for GSM-R networks in the republic of Ireland is manufactured by Kathrein (Model K80010456V02). The antenna specification is shown below.

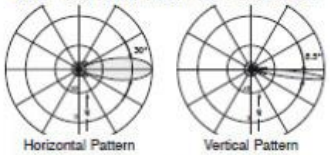
Panel 790–960
Dual Polarization X
Half-power Beam Width 30°
Adjust. Electrical Downtilt 0°–10°
set by hand or by optional RCU (Remote Control Unit)

KATHREIN
Antennen · Electronic

XPol Panel 790–960 30° 20.5dBi 0°–10°T

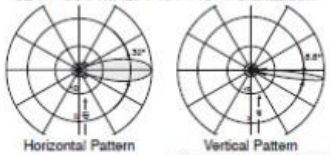
Type No.	80010456V02		
Frequency range	790 – 862 MHz	790–960 824 – 894 MHz	880 – 960 MHz
Polarization	+45°, –45°	+45°, –45°	+45°, –45°
Gain at 0° T	2 x 20.0 dBi	2 x 20.2 dBi	2 x 20.5 dBi
Horizontal Pattern:			
Half-power beam width	33°	32°	30°
Front-to-back ratio, copolar	> 28 dB	> 29 dB	> 30 dB
Cross polar ratio Maindirection 0°	Typically: 25 dB	Typically: 23 dB	Typically: 20 dB
Tracking, Avg.	2.5 dB		
Squint	±2.0°		
Vertical Pattern:			
Half-power beam width	9.1°	8.8°	8.5°
Electrical tilt	0.5°–10°, continuously adjustable		
Sidelobe suppression for first sidelobe above main beam	0° ... 5° ... 10° T > 16 ... 13 ... 13 dB	0° ... 5° ... 10° T > 18 ... 18 ... 17 dB	0° ... 5° ... 10° T > 18 ... 16 ... 15 dB
Impedance	50 Ω		
VSWR	< 1.5		
Isolation, between ports	> 30 dB		
Intermodulation IM3	< –150 dBc (2 x 43 dBm carrier)		
Max. power per input	500 W (at 50 °C ambient temperature)		

880 – 960 MHz: +45°/–45° Polarization



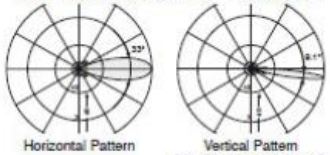
Horizontal Pattern — Vertical Pattern 0°–10° electrical downtilt

824 – 894 MHz: +45°/–45° Polarization

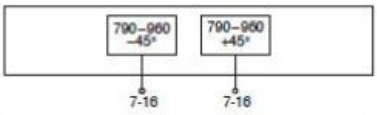


Horizontal Pattern — Vertical Pattern 0°–10° electrical downtilt

790 – 866 MHz: +45°/–45° Polarization



Horizontal Pattern — Vertical Pattern 0°–10° electrical downtilt



Mechanical specifications	
Input	2x 7-16 female
Connector position	Rearside
Adjustment mechanism	1x, Position bottom continuously adjustable
Wind load	Frontal: 1760 N (at 150 km/h) Lateral: 330 N (at 150 km/h) Rearside: 2040 N (at 150 km/h)
Max. wind velocity	200 km/h
Height/width/depth	2254 / 576 / 99 mm
Category of mounting hardware	H (Heavy)
Weight	22 kg / 24 kg (clamps incl.)
Packing size	2500 x 600 x 150 mm
Scope of supply	Panel and 2 units of clamps for 50 – 115 mm diameter

Subject to alteration.
906 39076

Internet: www.kathrein.de
80010456v02 Page 1 of 2

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APPENDIX 17.3

Aviation Review Statement

Report

Derrynadarragh Wind Farm

Aviation Review Statement

Document Number:	001/BH2025			
Author:	PT\DMG\BC			
Approved for Release:	Rev 1.0	KH	**Date:**	21/02/2025

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

Executive Summary

Ai Bridges Ltd have been commissioned to review the possible impacts of the proposed wind farm on aviation systems in the vicinity of the proposed wind farm development at Derrynadarragh. 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)
- Department of Defence Aeronautical Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

Annex 14 - Obstacles Limitation Surfaces (OLS)

A review shows that the proposed wind farm would be located outside the Outer Horizontal Surface of the Dublin 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 Dublin Airport.

Annex 15 - Aerodrome Surfaces

Following a review of ”Terrain and obstacle requirements Area 1” as defined in ICAO Annex 15, the proposed wind turbines need to be registered if they are more than 100 meters above terrain. From the centre point (ARP – Airport Reference Point) of Dublin Airport to the boundary of the Area 1 of the Annex 15 Aerodrome Surface is 45 km. This area encloses the TMA area i.e. Total Maneuvering Area and this is used for circling and maneuvering by aircraft. Should the proposed windfarm be permitted, the turbines would be outside 45km of Dublin 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 50 km from the BRA surfaces at Dublin Airport. At this distance there will be no impacts to the BRAs due to the proposed wind turbines at Derrynadarragh.

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 VOR/DME at Dublin Airport. As the proposed wind farm is located outside the MSA Sectors for Dublin Airport there will be no impact on the published MSA altitude figures.

Instrument Flight Procedures

There are 38 published Instrument Flight Procedures for flights to/from Dublin 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 60 km from the Localizer and transmitting antennas at Dublin 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 minimum distance of 62 km from the radar station at 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 Dublin Airport for calibration of instrument

landing systems. A desk-top analysis review indicates that the Flight Inspection and Calibration Procedures are unlikely to be impacted by the proposed wind farm development.

IAA - Aeronautical Obstacle Warning Light Scheme

In the event of a grant of planning consent the IAA are likely to request lighting of the proposed wind turbines in the interest of aviation safe-guarding as the proposed development would be considered as an en-route obstacle.

Private Airfields (VFR Flying)

A due-diligence survey was carried out of private airfields within 10 km of the proposed wind farm development. The survey identified one private airfield i.e, Clonbullogue Airfield. This private airfield is located in Class G (uncontrolled) airspace and any flights to/from the airfield are obliged to fly in accordance to Visual Flight Rules (VFR). Turbines at the proposed wind farm would be sufficiently far (>5.0 km), that there would be no impact to aviation activities at the private airfield. However, it should be noted that the IAA have requested that the airfield licensee, The Irish Parachute Club, be notified of the proposed wind farm development. It should also be noted that turbines at the existing wind farm at Clonkreen are located less than 3 km from the provide airfield.

Department of Defence (DoD) Aeronautical Safeguarding

The Irish Air Corps position on wind farms / tall structures are outlined in the paper which was published in 2014: “Air Corps Wind Farm/ Tall Structures Position Paper”. In the position paper the Irish Air Corps (IAC) outlines restricted areas where they would object to the installation of wind turbines / tall structures. The areas defined by the Air Corps have been mapped and analysis shows that proposed wind farm site is located outside the restricted areas. As the proposed wind farm is not located in a restricted area it should have no impacts on the Irish Air Corps activities. However, the DoD have made specific observations regarding an Aeronautical Obstacle Warning Light Scheme for the IAC. A review of the specified IAC Aeronautical Obstacle Warning Light Scheme may require a further detailed assessment to demonstrate that there will be no residual impacts.

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

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

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
EAS	Emergency Aeromedical Service
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
VOR	VHF Omni-directional Range Station

1. Introduction

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

1.1 Wind Farm Site Information

The proposed wind farm development is located on the Offaly-Kildare border and is approximately 5 km northeast of Portarlington. Figure 1 below shows the location of the proposed wind farm site with respect to Dublin Airport.

Figure 1. Location of proposed wind farm at Derrynadarragh

1.2 Dublin Airport

Table 1 below shows the co-ordinates of Dublin Airport and the distance from the Airport reference Point (ARP) to the proposed wind farm site. Dublin 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
Santry, Co Dublin	International Airport	Three Asphalt Runway Surfaces Airspace: Class C	53 25 17 N 06 16 12 W (Mid-point of Runway 10R/28L).	60.8 km

Table 1. Dublin Airport Details

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

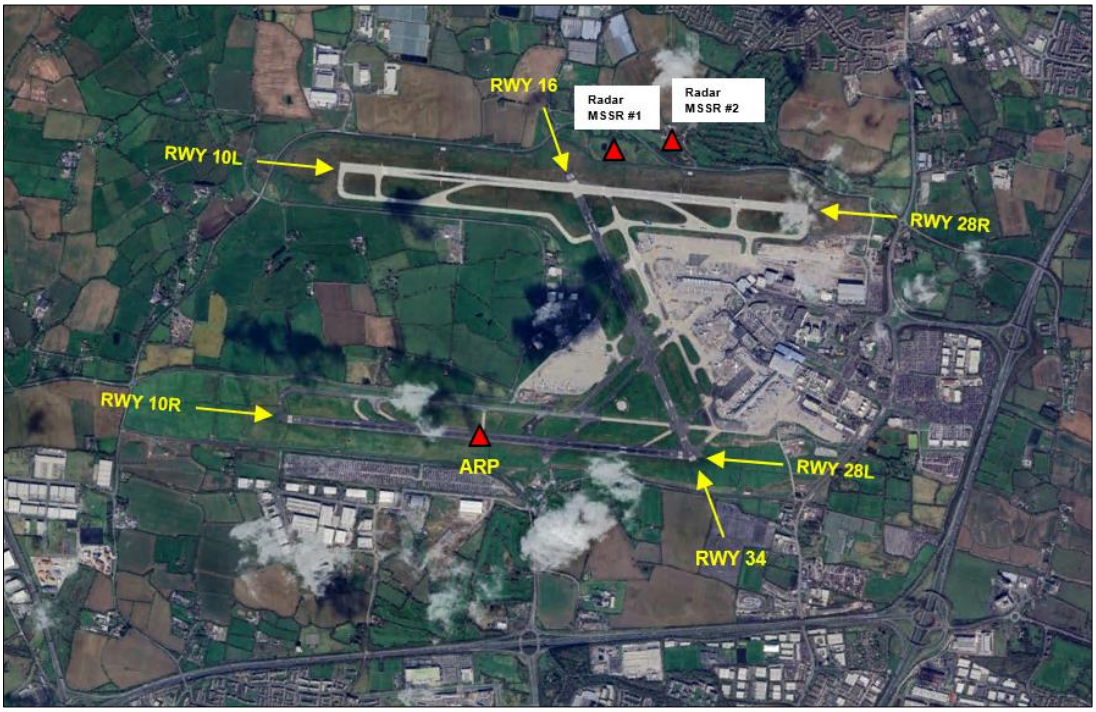


Figure 2. Dublin International Airport

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 and Navigation Systems
- Radar Surveillance Sensors
- Flight Inspection and Calibration
- IAA - Aeronautical Obstacle Warning Light Scheme
- Private Airfields (VFR Flying)
- Department of Defence Aeronautical Safeguarding
- Garda Air Support Unit (GASU) and Emergency Aeromedical Service (EAS)

2.1 Annex 14 Obstacle Limitation Surfaces (OLS)

A review of the Annex 14 Obstacles Limitation Surfaces (OLS) was first was carried out by first plotting the proposed turbines and the airport obstacle surfaces. The obstacle limitation surfaces for Dublin 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 Derrynadarragh wind farm. The distance from the ARP at Dublin Airport (i.e the runway centre-point), to the nearest point of the proposed wind farm is 60.8 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 Dublin Airport Reference Point (ARP) or runway centre-point.

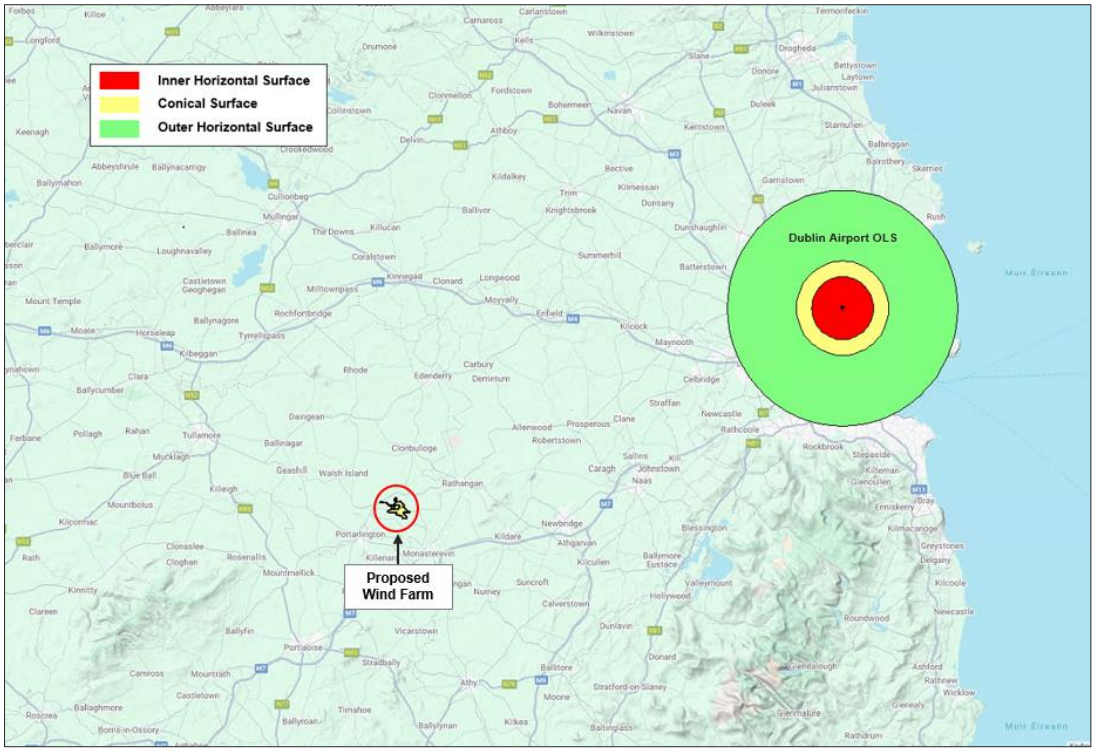


Figure 3. Derrynadarragh Wind Farm in relation to Dublin Airport OLS.

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 1” is defined in ICAO Annex 15 as an area of 45 km from the Aerodrome ARP. (An illustration of ICAO Annex 15 Area 1 Surface is provided in Appendix A).

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

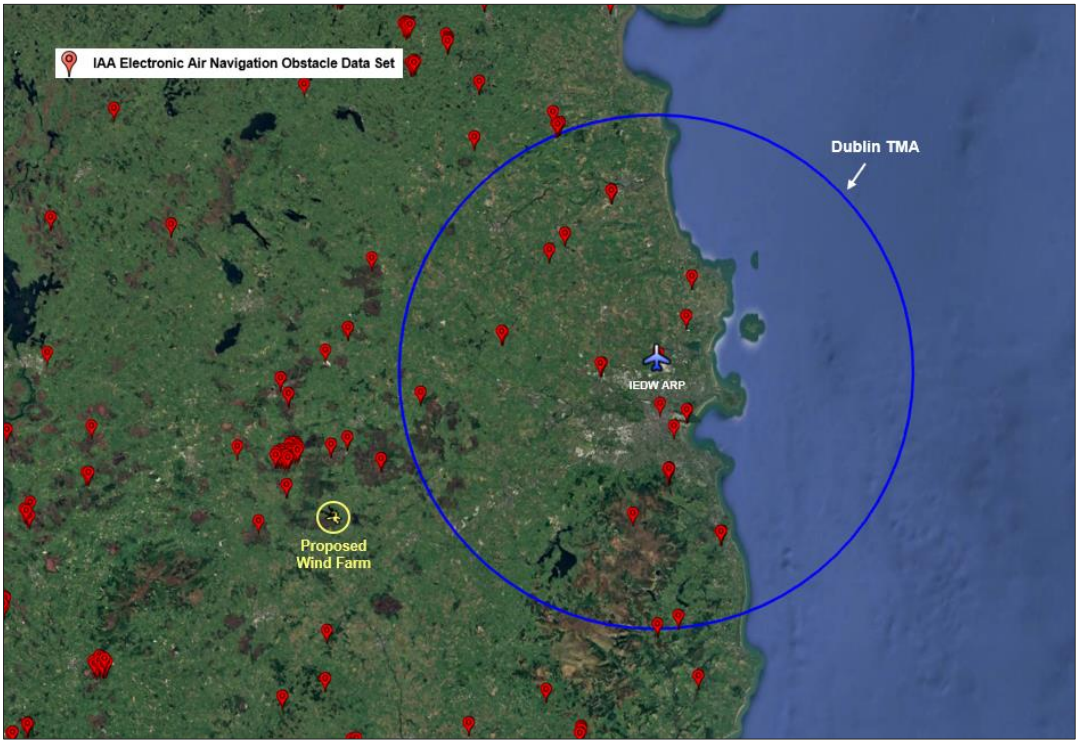


Figure 4. Annex 15 Aerodrome Surface and IAA Electronic Air Navigation Obstacle Data Set

There are other existing tall structures (obstacles) nearer to Dublin Airport than the proposed wind farm, notably the 2RN telecommunications masts at Kippure, Three Rock and Clarkstown. The existing wind farms at Mount Lucas and Cloncreen, are also located at a similar distance from Dublin Airport as the proposed wind farm at Derrynadarragh. These existing obstacles would shield any potential impacts from the proposed wind farm at Derrynadarragh. The existing obstacles, which are included in the IAA Electronic Air Navigation Obstacle Data Set, are shown relative to the proposed wind farm in Figure 5.

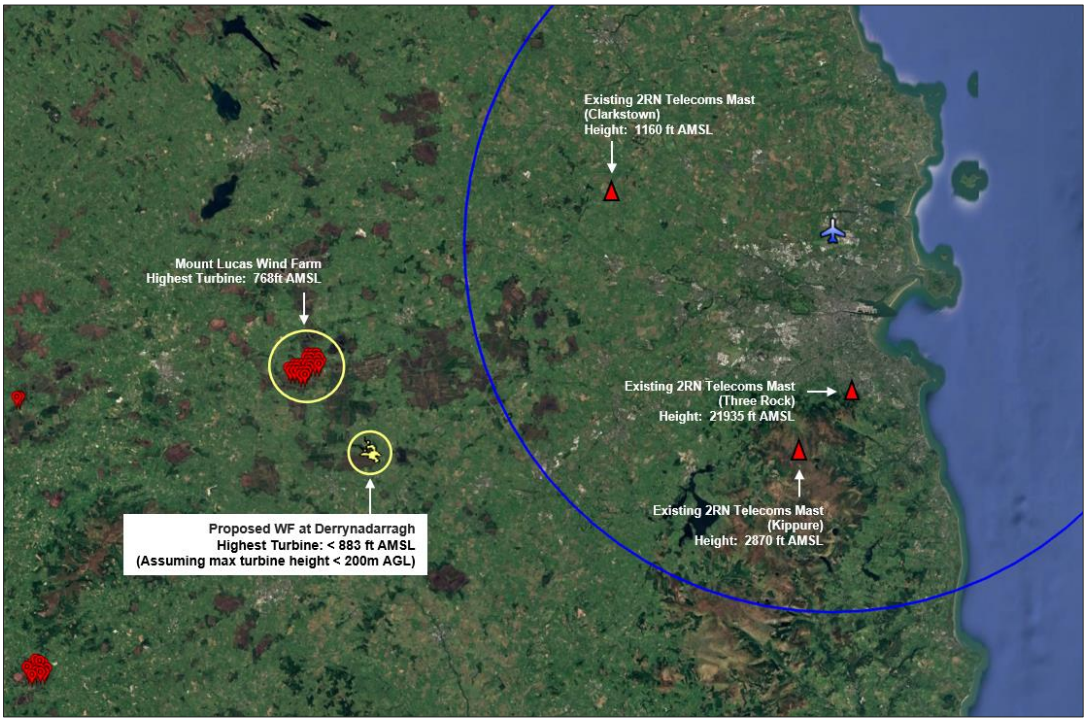


Figure 5. Permitted Obstacles in vicinity of Derrynadarragh Wind Farm

Although there are other obstacles closer to Dublin Airport that 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 Dublin Airport are the ILS Localisers, Glidepaths and DMEs that provide guidance for aircraft landing on its runways. 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 Derrynadarragh is over 50 km from the Dublin Airport BRAs (safeguarded areas for Runways 10 L/R and 28 L/R). At this distance turbines at the proposed wind farm will have no impact on the navigation facilities associated with the Building Restricted Areas for Dublin Airport.

Figure 6. Proposed Wind Farm relative to Dublin Airport BRAs (RWY 10 L/R and RWT 28 L/R)

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 VOR/DME at Dublin 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 Dublin Airport as shown in Figure 7. Therefore there will be no impact on the published MSA altitude figures.

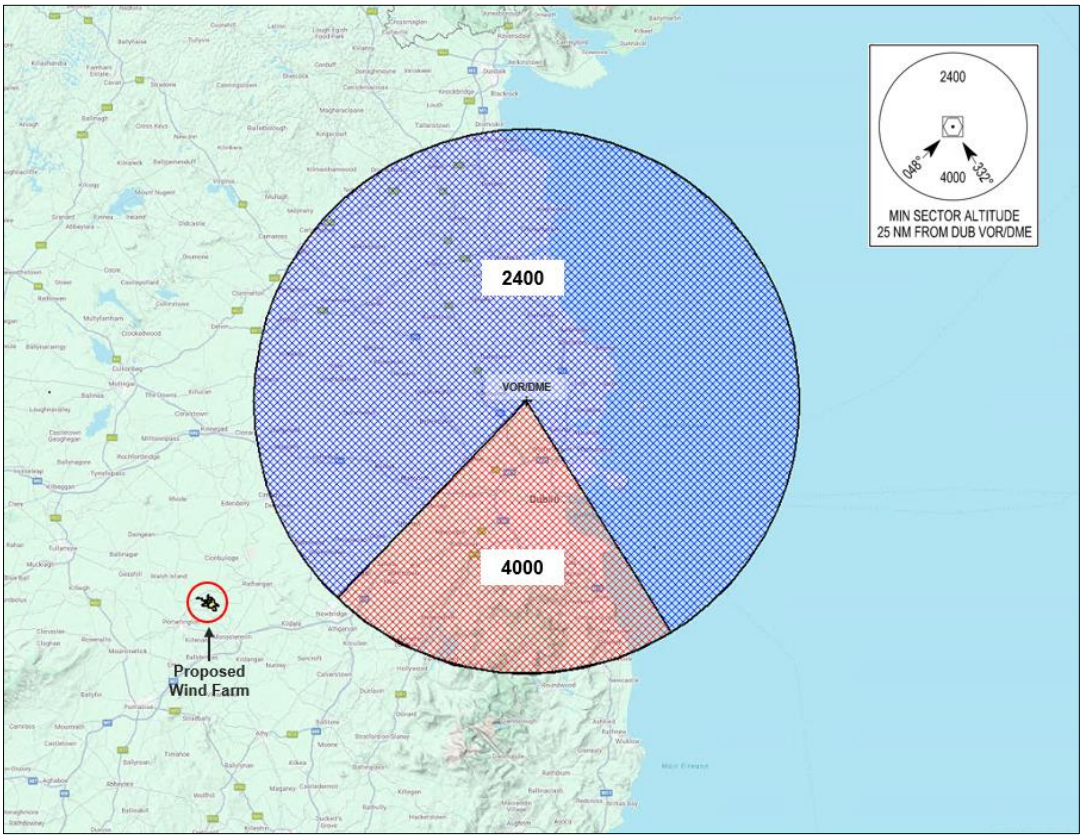


Figure 7. Dublin Airport (EIDW) Minimum Sector Altitudes

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 38 published Instrument and Visual Flight Procedures for arrivals to and departures from Dublin Airport. These flight procedures are listed below in Table 6.

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

Aerodrome	Aerodrome Procedure	Chart ID	Likely WF Impacts
Dublin	Precision Approach Terrain Chart RWY 28L - ICAO	EIDW AD 2.24-6	None.
Dublin	Precision Approach Terrain Chart RWY 28R - ICAO	EIDW AD 2.24-7	None.
Dublin	Precision Approach Terrain Chart RWY 10L - ICAO	EIDW AD 2.24-8	None.
Dublin	Precision Approach Terrain Chart RWY 10R - ICAO	EIDW AD 2.24-9	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 28L CAT A, B - ICAO	EIDW AD 2.24-10.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 28L CAT C, D - ICAO	EIDW AD 2.24-11	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 28R CAT A, B - ICAO	EIDW AD 2.24-12	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 28R CAT C, D – ICAO	EIDW AD 2.24-13.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 10L CAT A, B - ICAO	EIDW AD 2.24-14.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 10L CAT C, D - ICAO	EIDW AD 2.24-15	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 10R CAT A, B - ICAO	EIDW AD 2.24-16.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 10R CAT C, D – ICAO	EIDW AD 2.24-17	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 16 CAT A, B – ICAO	EIDW AD 2.24-18.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 16 CAT C, D - ICAO	EIDW AD 2.24-19	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 34 CAT A, B - ICAO	EIDW AD 2.24-20.1	None.
Dublin	Standard Departure Chart – Instrument RNAV RWY 34 CAT C, D - ICAO	EIDW AD 2.24-21	None.
Dublin	Standard Arrival Chart - Instrument RNAV RWY 28 L/R - ICAO	EIDW AD 2.24-22	None.
Dublin	Standard Arrival Chart - Instrument RNAV RWY 10 L/R - ICAO	EIDW AD 2.24-23	None.
Dublin	Standard Arrival Chart - Instrument RNAV RWY 16 - ICAO	EIDW AD 2.24-24	None.
Dublin	Standard Arrival Chart - Instrument RNAV RWY 34 - ICAO	EIDW AD 2.24-25	None.
Dublin	Instrument Approach Chart - RNP RWY 28L - ICAO	EIDW AD 2.24-26.1	None.
Dublin	Instrument Approach Chart - ILS CAT I & II or LOC RWY 28L CAT A, B, C, D - ICAO	EIDW AD 2.24-27	None.
Dublin	Instrument Approach Chart - VOR RWY 28L - ICAO	EIDW AD 2.24-28	None.
Dublin	Instrument Approach Chart - RNP RWY 28R CAT A, B, C, D - ICAO	EIDW AD 2.24-29.1	None.

Dublin	Instrument Approach Chart – ILS CAT I & II or LOC RWY 28R CAT A, B, C, D - ICAO	EIDW AD 2.24-30.1	None.
Dublin	Instrument Approach Chart RNP RWY 10L - ICAO	EIDW AD 2.24-32.1	None.
Dublin	Instrument Approach Chart ILS CAT I & II or LOC RWY 10L CAT A, B, C, D - ICAO	EIDW AD 2.24-33	None.
Dublin	Instrument Approach Chart – RNP RWY 10R CAT A, B, C, D - ICAO	EIDW AD 2.24-35.1	None.
Dublin	Instrument Approach Chart - ILS CAT I & II or LOC RWY 10R CAT A, B, C, D- ICAO	EIDW AD 2.24-36	None.
Dublin	Instrument Approach Chart VOR RWY 10R CAT A, B, C, D - ICAO	EIDW AD 2.24-37	None.
Dublin	Instrument Approach Chart RNP RWY 16 CAT A, B, C, D - ICAO	EIDW AD 2.24-38	None.
Dublin	Instrument Approach Chart - ILS CAT I or LOC RWY 16 CAT A, B, C, D - ICAO	EIDW AD 2.24-39	None.
Dublin	Instrument Approach Chart VOR RWY 16 CAT A, B, C, D - ICAO	EIDW AD 2.24-40	None.
Dublin	Instrument Approach Chart RNP RWY 34 - ICAO	EIDW AD 2.24-41	None.
Dublin	Instrument Approach Chart VOR RWY 34 CAT A, B, C, D - ICAO	EIDW AD 2.24-42	None.
Dublin	ATC Surveillance Minimum Altitude Chart - ICAO	EIDW AD 2.24-43.1	None.
Dublin	Visual Approach Chart– ICAO	EIDW AD 2.24-44	None.
Dublin	Instrument Approach Chart VOR T RWY 28L CAT A, B, C, D – ICAO	EIDW AD 2.24-45.1	None.

Table 6. Instrument and Visual Flight Procedures – Dublin 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 Dublin Airport will require a detailed assessment on the possible impact of the proposed wind farm on flight procedures.

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

Table 7. Aviation Impact Review - Instrument Flight Procedures

2.6 Permitted Wind Farms in vicinity of Proposed Wind Farm

The Planning References for the permitted wind farms in the vicinity of the proposed wind farm are shown below in Table 8. This wind farm did not require a Full Assessment of Instrument Flight Procedures.

Wind Farm	Planning Reference	Description
Mount Lucas	https://www.eplanning.ie/OffalyCC/	Operational Wind Farm
Clonkreen	https://www.eplanning.ie/OffalyCC/	Operational Wind Farm

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

2.7 Communication and Navigation Systems

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

Aerodrome	ATS Communications Facilities Channel Frequency	Radio Navigation and Landing Aids Channel Frequency	Approximate Distance to Localizer and Transmitting antennas	Impacts of Wind Farm
Dublin Airport	118 MHz –135 MHz	316 KHz – 1575 MHz	60 km	No impacts

Table 9. Impacts on Communications and Navigation Systems

As the proposed wind farm is approximately 60 km from the Localizers and transmitting antennas, it is very unlikely that turbines at the proposed wind farm will have any impact on these ATS communications and radio navigational aids. Typically, interference to VHF communications systems will only occur when obstacles are in close proximity to the VHF transmitter. e.g. less than 500m.

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

Table 10. Aviation Impact Review - Communication and Navigation Systems

2.8 Radar Surveillance Sensors

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

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

Table 11. PSR Zone Arrangements

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

Table 12. SSR Zone Arrangements

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

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

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

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

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

Table 13. Aviation Impact Review - Radar Surveillance Sensors

2.8.1 Irish Aviation Authority (IAA) Radar Surveillance Sensors

To determine which PSR/MSR Assessment Zones are applicable to the proposed wind farm, a desktop assessment was carried out. The nearest radar surveillance site(s) to the proposed wind farm development is the IAA radar station at Dublin Airport.

An assessment of the potential impact due to the proposed wind farm on this radar installation is provided in Section 2.8.1.1.

Figure 8. IAA Radar Surveillance Site(s) relative to Derrynadarragh Wind Farm.

2.8.1.1 Dublin Airport Radar Assessment

The radar surveillance site at Dublin Airport consists of two PSR/SSR (MSSR) radar stations as shown below in Figure 9 and Figure 10.

Figure 9. Dublin Airport MSSR Radar Station #1

Figure 10. Dublin Airport MSSR Radar Station #2

Table 14 below shows the (EuroControl) 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)
Derrynadarragh	62 km	Detailed Assessment Not Required

Table 14. EuroControl 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 (FCSL). The checks are carried out during annual inspections consisting of radial and orbital test flights around Dublin Airport for calibration of instrument landing systems. The flight paths of the latest publicly available FCSL Inspection/Calibration flights for Dublin Airport are shown in Figures 11 and 12 below.

Figure 11. FCSL Flight Route - 10th June 2023

Figure 12. FCSL Flight Route - 11th June 2023

As Figure 11 and Figure 12 show, the inspection / calibration flights do not fly over Derrynadarragh, and turbines at the proposed development would have no impact on the Inspection/Calibration flight procedures for Dublin Airport.

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

Table 15. Aviation Impact Review - Flight Inspection and Calibration

2.10 IAA - Aeronautical Obstacle Warning Light Scheme

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

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

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

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

Table 16. Aviation Impact Review - Aeronautical Obstacle Warning Light Scheme

2.11 Private Airfields (VFR Flying)

For due diligence purposes, private airfields in the vicinity of Derrynadarragh have been considered and it was found that there is one private airfield within 10 km of the proposed wind farm site, i.e. Clonbullogue Airfield. Figure 13 below shows the location of this airfield relative to the proposed wind farm site.

Airfield	Description	Airspace	Published Flight Procedures	Permitted Air Traffic Type (IFR/VFR)
Clonbullogue	Single grass-strip airstrip	Class G (Uncontrolled)	None	VFR Only

Table 17. Private Airfields within 10 km of proposed wind farm

Figure 13. Private Airfields within 10 km of proposed wind farm

This airfield is located in Class G uncontrolled airspace any pilots flying to/from the airfield 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.

Should the proposed wind farm be permitted, the turbine locations would be added to aviation flight charts and clearly marked as en-route obstacles. This would enable VFR pilots to plan their flight routes accordingly.

There should be no impact on aviation activities at the private airfield as turbines at the proposed wind farm development would be at least 5 km away, (i.e. sufficiently far that VFR flying to/from this airfield would not be impacted.)

It should also be noted that turbines at the existing wind farm at Clonkreen are 2.8 km from Clonbullogue Airfield. Turbines at the proposed wind farm at Derrynadarragh would be twice as far away from Clonbullogue Airfield as the existing turbines at Clonkreen.

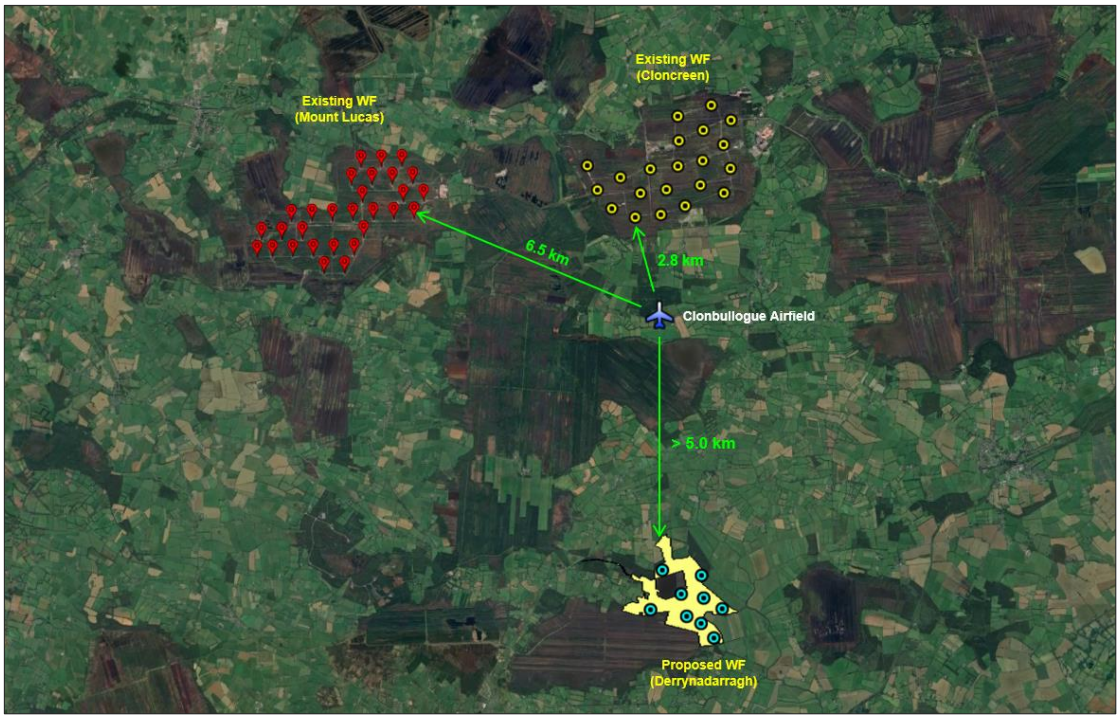


Figure 14. Existing wind farms in proximity to Clonbullogue Airfield

The review of Clonbullogue Airfield indicates that there will be no impact to the aviation activities at the airfield; however, during consultations with the IAA, it was requested that the aerodrome licensee, the Irish Parachute Club be made aware of the proposed development. The consultation response from the IAA regarding Clonbullogue Airfield is shown below.

13.12.24 - Email Response from the IAA regarding Clonbullogue Airfield:

> *"Thank you for your email and scoping report in relation to the proposed Darrynadarragh Wind Farm.*
>
> *The proposed wind farm is proximate to the licenced Aerodrome – Clonbullogue Co. Offaly.*
>
> *Please engage directly with the aerodrome licensee, Irish Parachute Club to make them aware of the Derrynadarragh Wind Farm proposal.*
>
> *Mr. Tony Donnelly*
> *Irish Parachute Club,*
> *Clonbullogue Airfield,*
> *Co.Offaly*
> *Tel: - 046 97 30103*
> *Email: shop@skydive.ie and info@skydive.ie*
>
> *Based on the licensee's observations, it may be necessary to undertake an aeronautical safety assessment to consider the potential impact of the wind farm on the safety of aircraft operations at Clonbullogue Airfield.*
>
> *In any case, it is likely that the following general observations would be proffered by the Authority during a formal planning process: In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to:*
>
> > *(1) agree an aeronautical obstacle warning light scheme for the wind farm development,*
> >
> > *(2) provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and*
> >
> > *(3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection."*

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Private Airfields (VFR Flying)	Notify the Clonbullogue Airfield licensee (i.e. the Irish Parachute Club)	None

Table 18. Aviation Impact Review - Private Airfields (VFR Flying)

2.12 Department of Defence Aeronautical Safeguarding

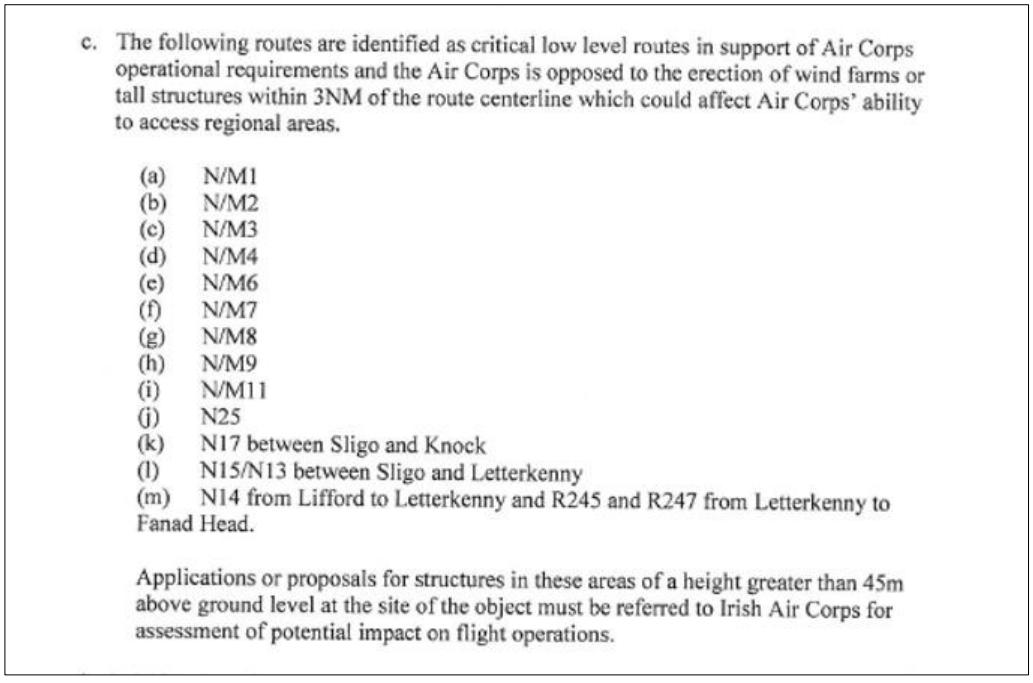
The standard concerns that are being raised by the Department of Defence, relate to the potential impact of wind turbines on the aviation activities of the Irish Air Corps (IAC). The Department of Defence highlights IAC Restricted Areas (for wind farms/ tall structures). They also request a specific Aeronautical Obstacle Warning Light Scheme for turbines that are permitted.

An assessment of the IAC Restricted Areas is provided in Section 2.12.1, and a review of the IAC Aeronautical Obstacle Warning Light Scheme is provided in Section 2.12.2.

2.12.1 Department of Defence – IAC Restricted Areas

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

- Lands underlying military airspace for flying activity. (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 15 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 15. Irish Air Corps – Critical Low Level Routes

The nearest of the Air Corps restricted areas to the proposed wind farm sites is the 3 NM restricted area around the M7 motorway, as shown in Figure 16 below. As the proposed wind farm at Derrynadarragh is located outside the restricted area, there should be no impacts on Irish Air Corps activities.

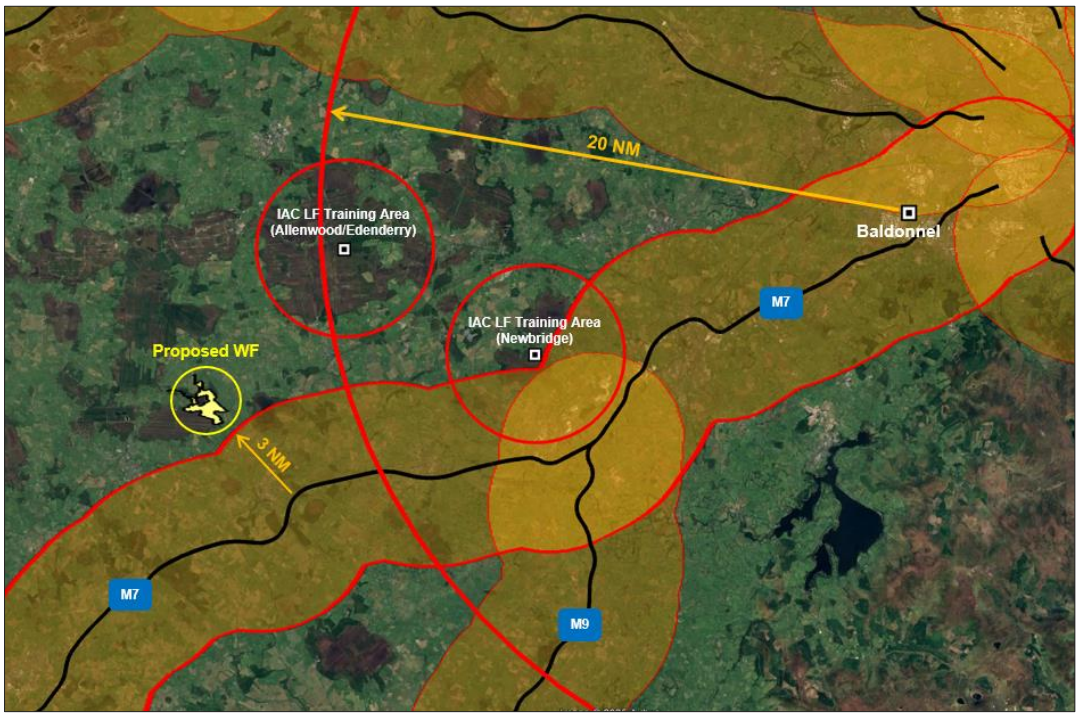


Figure 16. Proposed Wind Farm site shown relative to IAC Restricted Areas

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Irish Air Corps / DoD Safeguarding	No action	None

Table 19. Aviation Impact Review - Irish Air Corps / DoD Safeguarding

2.12.2 Department of Defence – IAC Aeronautical Obstacle Warning Light Scheme

The Department of Defence observations regarding the IAC Aeronautical Obstacle Warning Light Scheme, is described in the response provided below.

> *"I wish to advise at the outset that any determination in relation to a planning consent is solely a matter for the planning authorities and/or ABP, as appropriate. Therefore, the following observations are made on a non-prejudicial basis, and are not intended to be used to rely on for a prospective planning application, nor are these observations to be relied on in the event of any commercial transaction pertaining to such lands and they are not to be relied on in the event of any contract exchange pertaining to same.*
>
> *As a matter of practice, the Department of Defence does not provide observations or advice in the scoping process, except where the relevant parties have been directed by a planning authority to seek the Department's views.*
>
> *Having consulted with the Military authorities, the Department of Defence wishes to make the following observations:*
>
> - *The Minister for Defence is responsible for the regulation of military aviation, whereas the Irish Aviation Authority (IAA) is responsible for the safety regulation of civil aviation including aerodromes. The IAA does not have remit for military aviation or installations. Safeguarding of military flight operations and installations is intended to protect both current and future aircraft operations and also to take account of the security requirements associated with some of those operations.*
> - *All turbines should be illuminated by Type C, Medium intensity, Fixed Red obstacle lighting with a minimum output of 2,000 candela to be visible in all directions of azimuth and to be operational H24/7 days a week.*
> - *Obstacle lighting should be incandescent or, if LED or other types are used, of a type visible to Night Vision equipment. Obstacle lighting used must emit light at the near Infra-Red (IR) range of the electromagnetic spectrum, specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light*
> - *Any Irish Air Corps (IAC) requirements for are separate to Irish Aviation Authority (IAA) requirements.*
>
> *Nothing in the above observations shall be taken as a binding response by the Minister for Defence in the event that a planning application is made. The Minister reserves the right to comment on an actual planning application as and when it is submitted in accordance with the provisions of the planning regulatory code."*

The Department of Defense have issue a standard consultation response with a request for a Lighting Scheme that would require all turbines to be illuminated at all times, day and night.

This would require a detailed assessment of the IAC Aeronautical Obstacle Warning Light Scheme which is beyond the scope of this report. However, the appropriate lighting scheme for Derrynadarragh would depend on; the existing obstacle environment, airspace class (i.e. Class G for Derrynadarragh) and existing Irish/ EU lighting standards and regulations.

A further detailed technical assessment may be required to determine the appropriate aeronautical lighting scheme. This is outside of the scope of this Aviation Review Statement.

However it has been shown in Section 2.12.1 that the proposed development is outside the Military restricted flight areas. It is not anticipated that there would be impacts to Military flight paths and IAC lighting is unlikely to be required

Aviation Impact Review	Mitigation Measure Action	Residual Impact
Department of Defence - IAC Aeronautical Obstacle Warning Light Scheme	As the proposed development is outside the Military restricted areas it is not anticipated that there would be impacts to Military flight paths and IAC lighting is unlikely to be required	None.

Table 20. Aviation Impact Review - IAC Aeronautical Obstacle Warning Light Scheme

2.13 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 2.13.1 and 2.13.2 that follow.

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

Figure 18. GASU - Eurocopter EC135 T2

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

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

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

Table 21. Impact of proposed wind farm on GASU Operations

2.13.2 The Emergency Aeromedical Service (EAS)

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

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

The two helicopter borne emergency air ambulances consist of an Air Corps operated aircraft based at Custume Barracks in Athlone, and an aircraft located at Rathcoole Aerodrome in North County Cork. The nearest EAS base to the proposed wind farm at Derrynadarragh is the base in Athlone. The flight times from the EAS base at Athlone are sown in Figure 19.

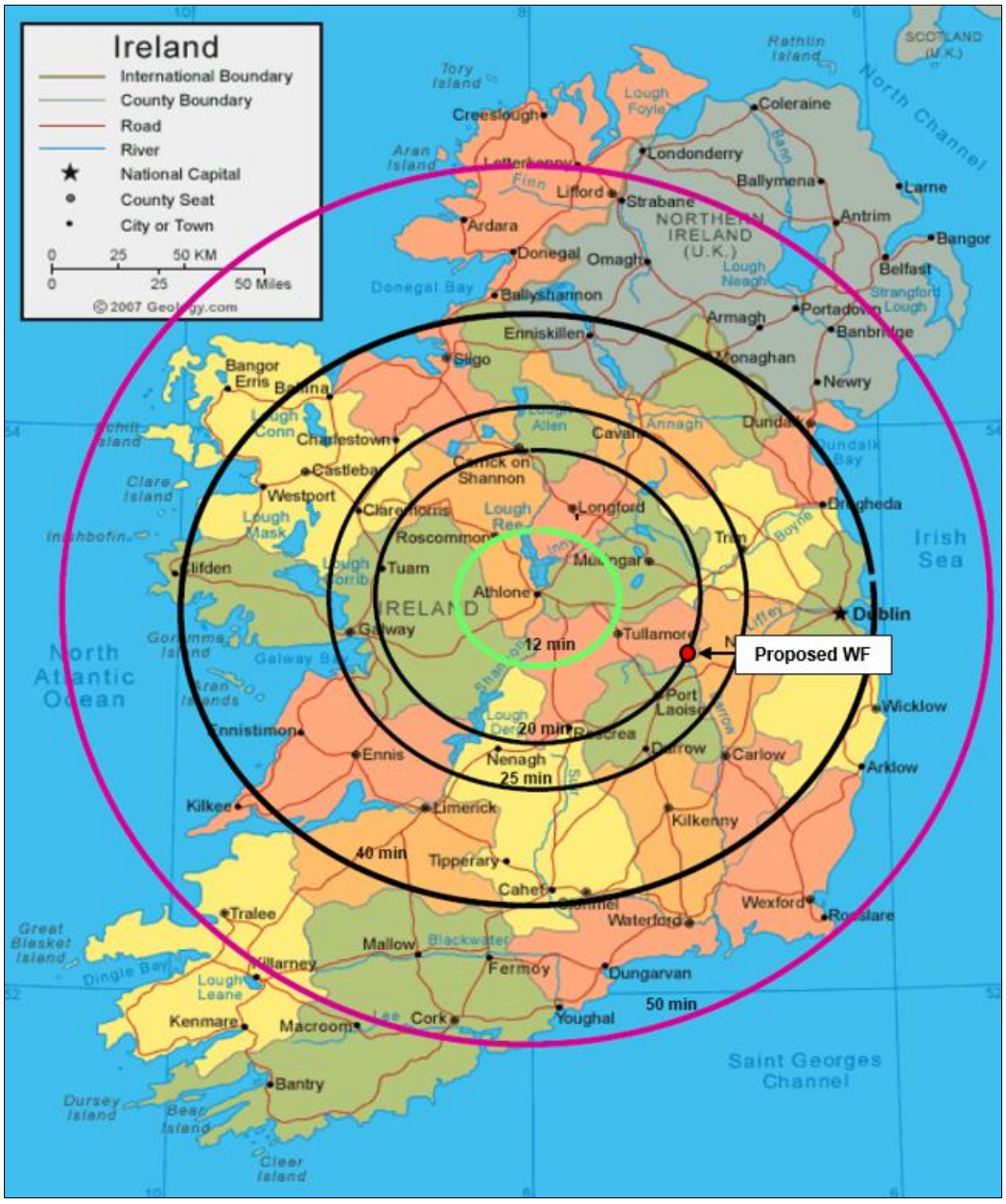


Figure 19. EAS – Flying Times from Athlone

The proposed wind farm site is located in an area that is sparely populated. Helicopter landings are highly unlikely to occur in the subject area due to the boggy /agricultural terrain of the proposed site.

Also, 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. EAS helicopters would also be fitted with GNSS systems which would clearly identify any potential objects in the operational area (e.g. wind turbines).

In addition, the footprint of the proposed wind farm development is small and any flight diversions for EAS operations would have negligible time impacts. For these reasons, turbines at the proposed wind farm should have no impact on EAS flights from Athlone.

EAS Aircraft	Impact of proposed wind farms – Opinion
Helicopter (Eurocopter EC135)	Low – Helicopter landings at the subject area are highly unlikely to occur as the proposed wind farm site is in an area that is sparely populated and is located on boggy / agricultural terrain. In addition, the aircraft would be equipped with modern communications systems and navigational equipment. Should the wind farm be permitted, the turbines would be fitted with aeronautical lighting and would be clearly marked in aviation charts.

Table 22. Impact of proposed wind farm on EAS Operations

3. Summary

A summary of the aviation review for the proposed wind farm at Derrynadarragh is provided in Table 23 below.

Item	Impact	Summary
Annex 14 - Obstacle Limitation Surfaces (OLS)	None	The proposed turbines are located outside the OLS Surfaces for Dublin Airport.
Annex 15 - Aerodrome Surfaces	None	The proposed wind turbines would not penetrate the ICAO Annex 15 Aerodrome Surface. All obstacles, if more than 100 meters above terrain for a distance of 45km from center point of Dublin 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 there are existing tall structures nearer to Dublin Airport than the proposed development (e.g. existing telecoms masts at Clarkstown, Kippure and Three Rock) which are already listed in the IAA Aeronautical Electronic Obstacle Data Sets.
Building Restricted Areas	None	A review shows that Derrynadarragh is more than 50 km from the BRA for Dublin 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 VOR/DME at Dublin 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 Dublin Airport that it is highly unlikely that there would be any impacts to instrument flight procedures for flights to/from Dublin Airport for precision aircraft.
Communication and Navigation Systems	None	As the proposed wind farm is approximately 60 km from the Localizer and transmitting antenna at Dublin 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 impacts due to the proposed wind farm development.
IAA - Aeronautical Obstacle Warning Light Scheme	None	It is possible that the IAA may request that the wind farm, if permitted, would be fitted with Aeronautical Obstacle Warning Lights in accordance to industry standards. Subject to further consultation with the IAA.
Private Airfields (VFR Flying)	None	The proposed wind farm is sufficiently far (>5 km), that there would be no impact to aviation activities at the private airfield at Clonbullogue. However, the IAA have requested that the airfield operator (The Irish Parachute Club be notified of the proposed wind farm development.
DoD Aeronautical Safeguarding	Subject to further review.	The proposed wind farm is not located in an IAC restricted area and it is highly unlikely that turbines at the proposed site would have any impact on IAC aviation activity. However, the DoD have made specific observations regarding an Aeronautical Obstacle Warning Light Scheme for the IAC. A review of the specified IAC Aeronautical Obstacle Warning Light Scheme may require a further detailed assessment to demonstrate that there will be no residual impacts.
Garda Air Support Unit and Emergency Aeromedical Service	None	An assessment of GASU and EAS operations indicate that they are unlikely to be impacted by the proposed wind farm development.

Table 23. Derrynadarragh Wind Farm – Aviation Review Summary

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

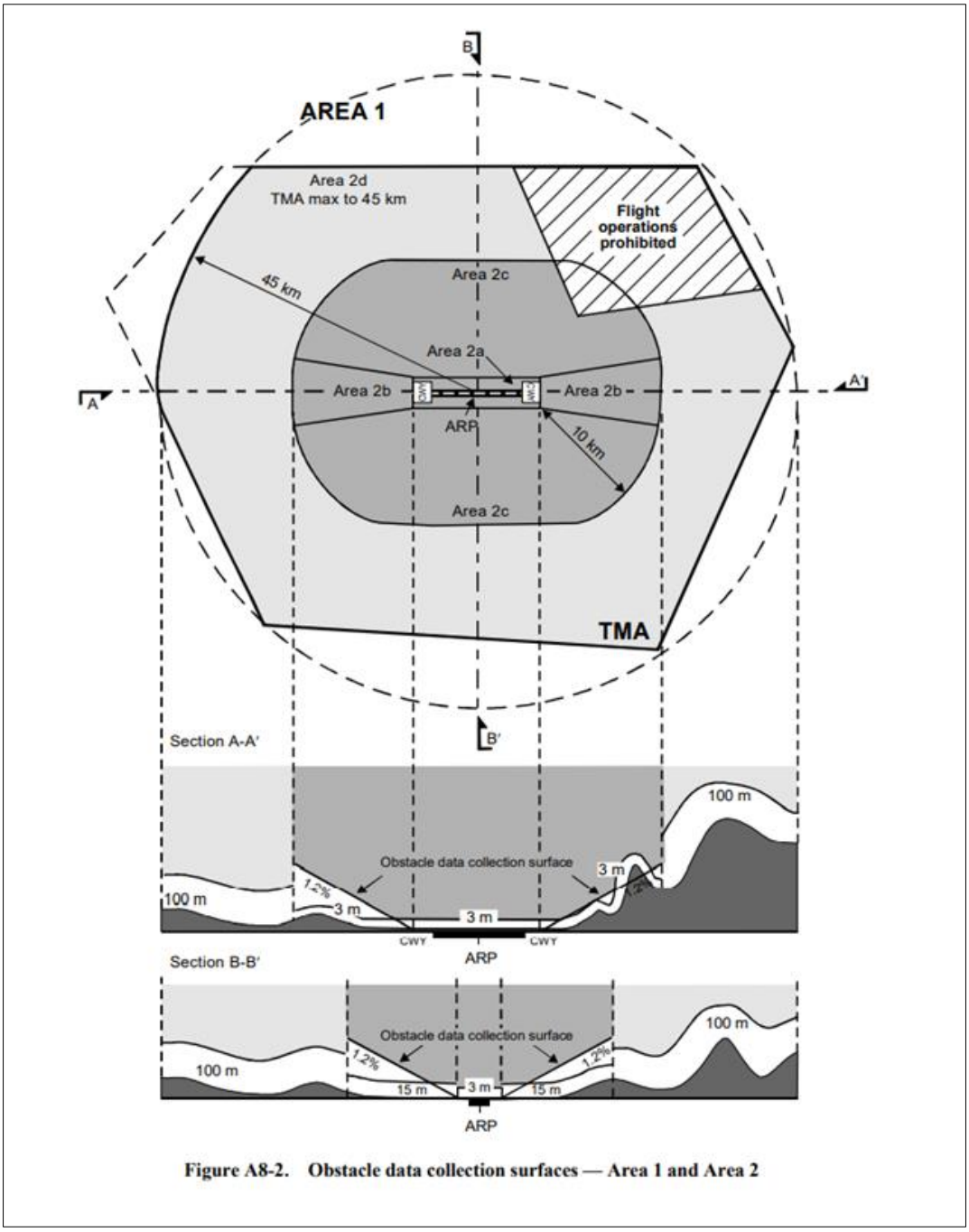


Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

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

APPENDIX B - ICAO Building Restricted Areas.

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

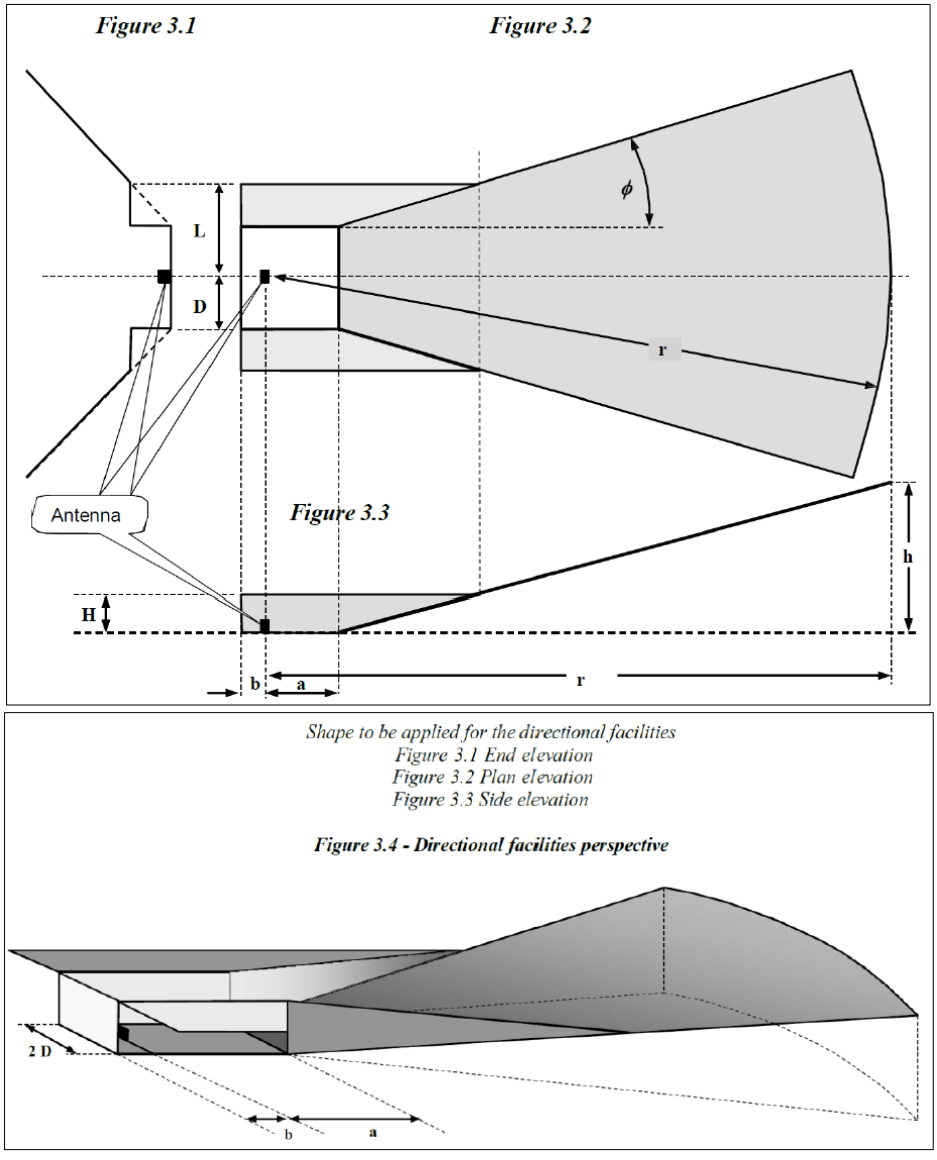


Figure B1 - Example BRA shape for directional facilities (ICAO EUR DOC 015 Figures 3.1-3.4)

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

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

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

Óglaigh na hÉireann
DEFENCE FORCES IRELAND

Ceanncheatru an Aer Chor
Air Corps Headquarters

08 August 14

GOC AC

Air Corps Wind Farm/Tall Structures Position Paper

Sir,

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

Raymond Martin, Lt Col
CATSO

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

Óglaigh na hÉireann
DEFENCE FORCES IRELAND

Ceanncheatru an Aer Chor
Air Corps Headquarters

Air Corps Wind farm/Tall Structures Position Paper.

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

2. **Statement of position.**

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

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

   (1) Lands underlying military airspace used for flying activity

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

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

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

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

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

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

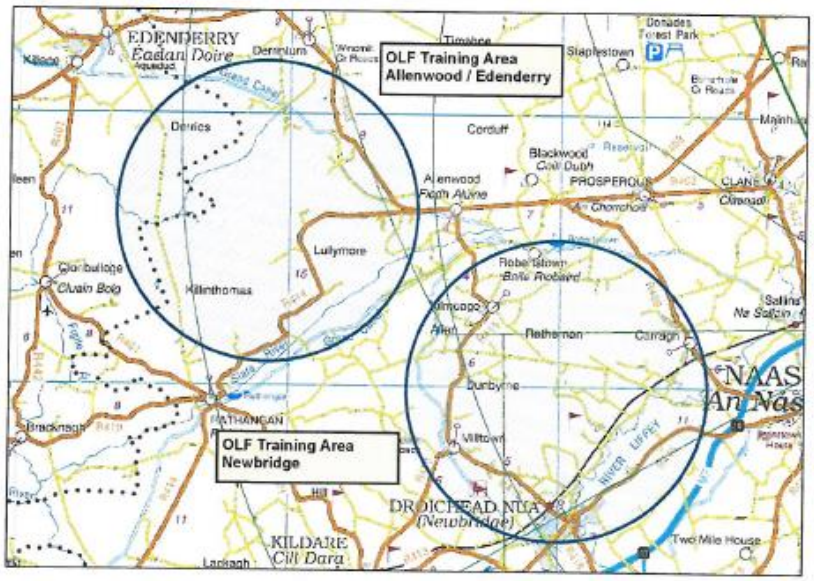
Applications or proposals for structures in these areas of a height greater than 45m above ground level at the site of the object must be referred to Irish Air Corps for assessment of potential impact on flight operations.

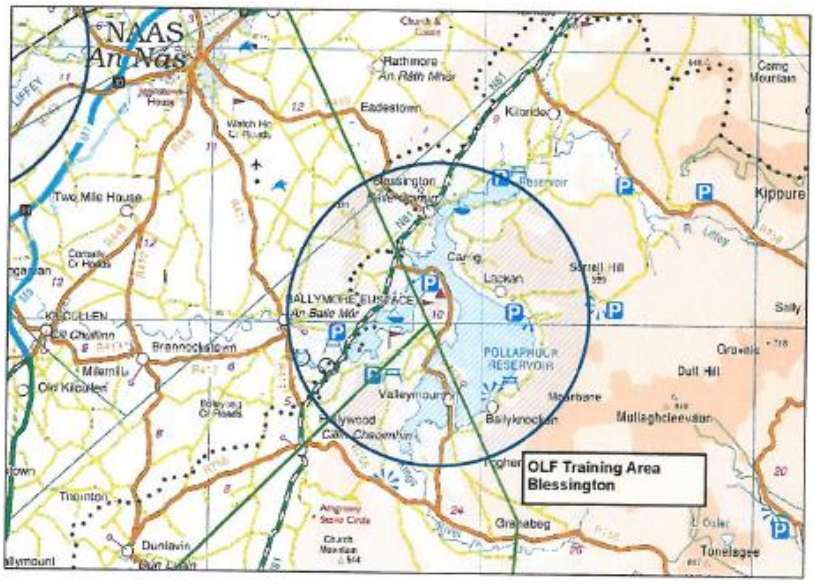
d. In MOA 4 outside of the areas identified in b.(1) (2) and (3), and in MOA 5, applications or proposals for objects of a height greater than 45m above ground level at the site of the object must be referred to the Irish Air Corps for assessment of potential impact on flight operations.

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

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

Annex A
Low Flying Areas - MOA 4





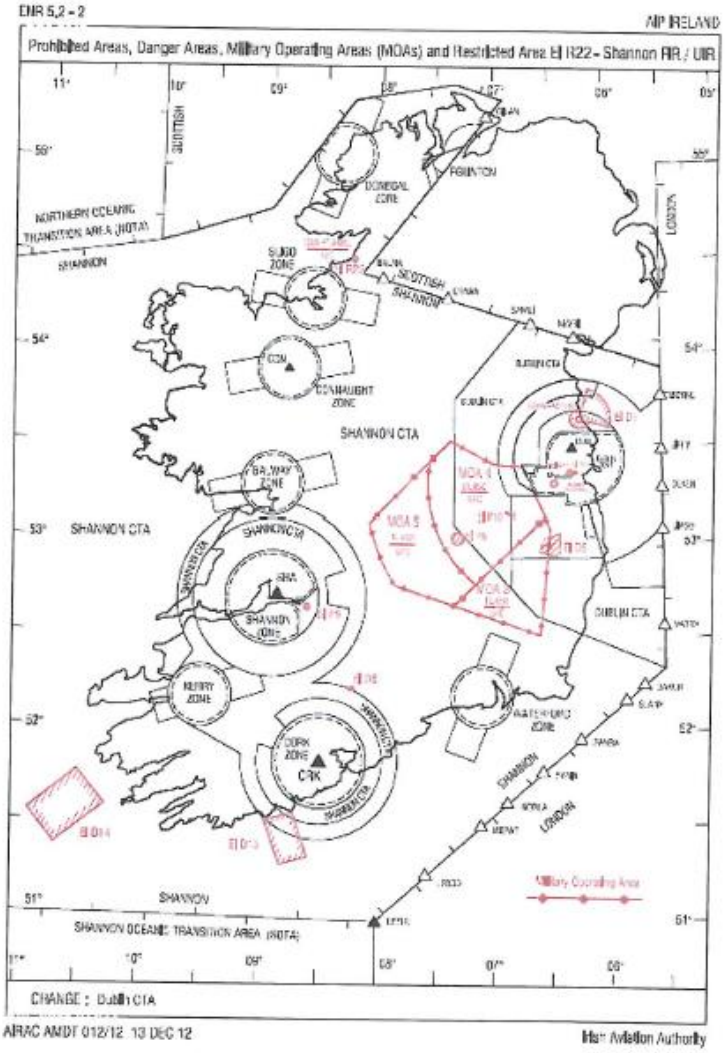
Annex B

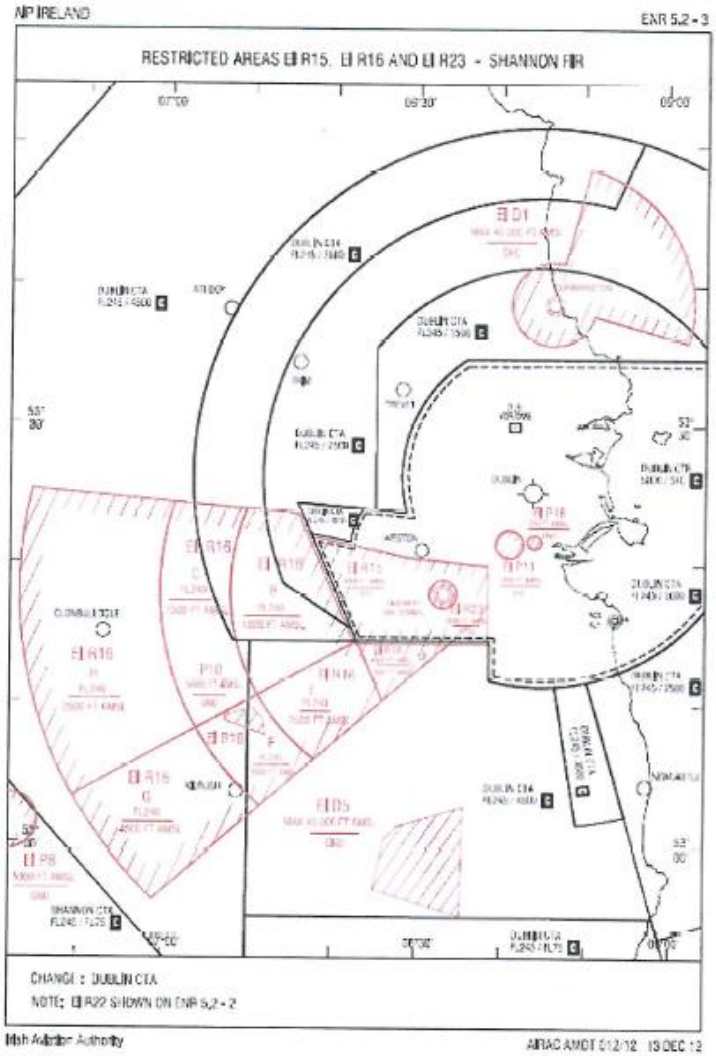
Low Flying Area – LFTA WEST

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

Annex C

Designated Airspace
Restricted Areas, Danger Areas and Military Operating Areas





Annex D

Low Level Routes

FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

www.fehilytimoney.ie