



APPENDIX 15-6

**TELECOMMUNICATIONS
IMPACT ASSESSMENT**

 <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Report

Slievegrine Renewable Energy Development Telecommunications Impact Assessment Report

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 Total Broadband Solutions	Procedure: 01	Rev: 4.0
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Executive Summary

Ai Bridges was commissioned to evaluate the possible impacts that the Proposed Wind Farm at Slievegrine, Co Waterford could have on ESB Network's Point-to-point (PTP) and Point-to-Multi-Point (PMP) radio network

During consultations with telecom operators (undertaken by MKO Ireland), it was found that ESB Networks have five microwave PTP radio links and fifteen UHF PMP radio links that cross over/near the Proposed Wind Farm site. The scope of work for this study included field and desktop surveys to assess the possible impact on these radio links.

Using the information obtained during the field survey assessments and consultation responses, a desktop impact analysis was carried out and all of the telecommunication operator networks were analysed using radio planning \ modelling software (2D and 3D).

Results from the impact analysis indicate that one PTP radio link and one PMP radio link would be impacted by the proposed turbine layout. These links are listed below in in Table 1.

To offset the impact on the radio links, indicative mitigation measure solutions been provided in Section 6 of this report. Additional technical analysis and telecom operator consultations are required to determine if the proposed solutions are technically feasible and are acceptable to ESB Networks.

Radio Link ID	Radio Link Description	Impact of Proposed Turbine Layout / Observations	Mitigation Measure Options
ESB_PTP3	PTP microwave radio link between Carrondavderg and Cheek Point	Interference Impact. Mitigation Measures Required. (Radio Link Fresnel Zone obstructed by T05)	Option 1: Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site. Option 2: Re-route connection via Fibre
ESB_PMP12	PMP UHF radio link between Carrondavderg and Cooltubbrid West Solar Farm	Interference Impact. Mitigation Measures Required. (Radio Link Fresnel Zone obstructed by T02)	Option 1: Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site. Option 2: Relay the radio link via an existing ESB Mast-site (e.g. via Kilmacthomas 38KV). Option 3: Re-route connection via Fibre.

Table 1. ESB radio links potentially impacted by proposed turbine layout.

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Section 1 - Wind Farm Site Information

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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 approximately 7 km southwest of Dungarvan, Co Waterford. For the purpose of this study, a 24-turbine layout has been considered. The coordinates of the turbines assessed in this report are provided in Appendix A.

The dimensions of the turbines assessed in this report are provided in Table 2. The location of the Proposed Wind Farm development is shown in Figure 1 below.

Turbine No	Tip Height	Blade Length	Hub Height
1,2,3,4,5,6,13,14,15,16,17,18,19,20,21,22	175	79	96
7,8,9,10,11,12	185	81	106
23,24	170	79	91

Table 2. Wind Turbine Dimensions

Note: The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.

Network analysis presented later in this report indicates that ESB Networks have radio links that could be impacted by T02 and T05. The positions of T02 and T05 have not changed from the original turbine layout received by Ai Bridges in July 2025 (i.e. the subsequent layout changes have no significant impacts to the findings in this report).

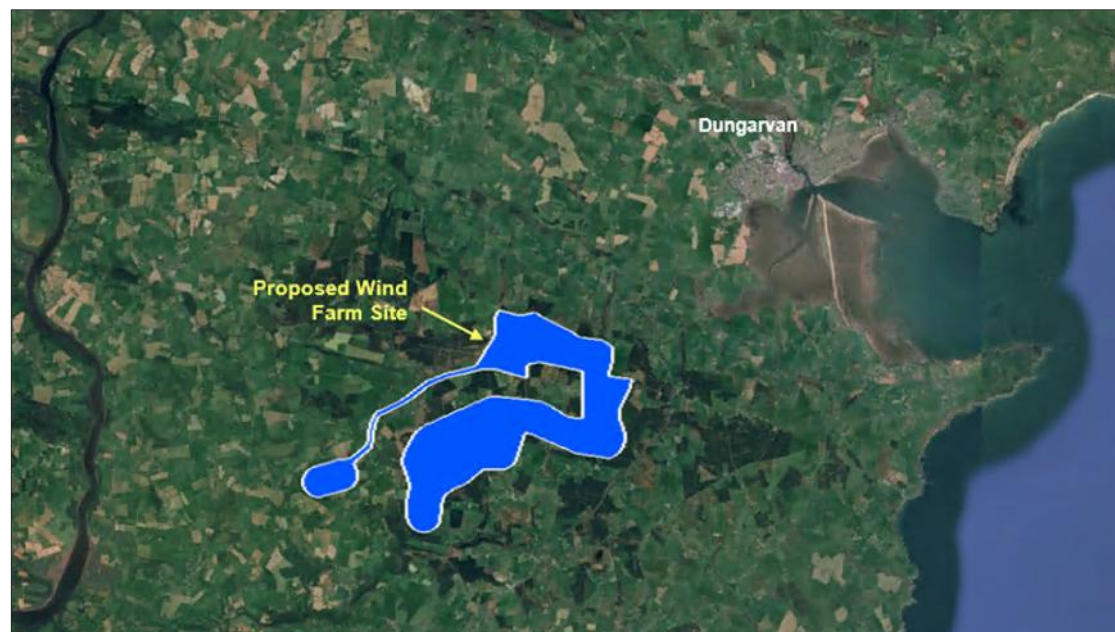


Figure 1. Location of Proposed Wind Farm.

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Section 2 - Methodology

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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 at Slievegrine. Figure 2 below shows the Proposed Wind Farm site boundary plotted in the radio planning tool.

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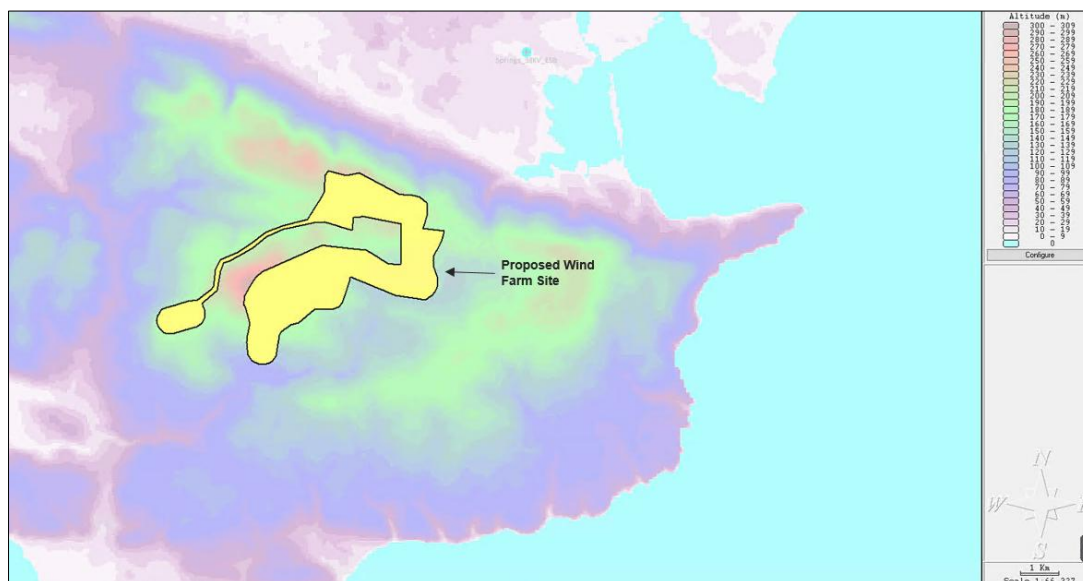


Figure 2. Wind Farm Boundary plotted in Radio Planning Software*

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.

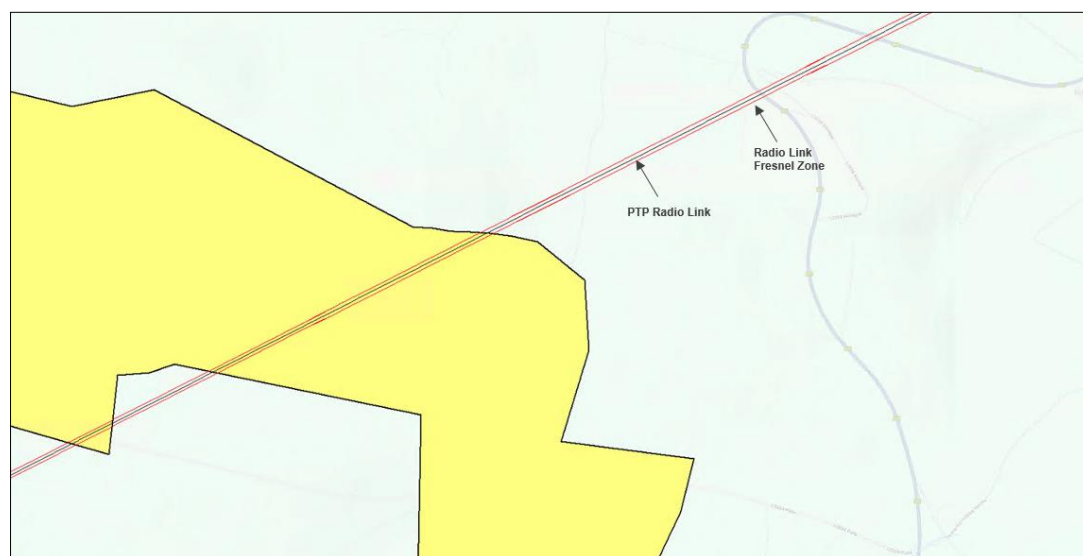


Figure 3. Example of radio link crossing over/near the Proposed Wind Farm boundary modelled in radio planning software.*

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.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

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Section 3 - Telecom Operator Consultations

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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 beginning in January 2025 were undertaken (by MKO) with telecom network operators to identify telecommunication infrastructure that could be impacted by the 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.

During the consultations ESB Networks responded stating that they have a number of Point-to-Point (PTP) and Point-to-Multipoint (PMP) radio links that cross over/near the Proposed Wind Farm development.

ID	Operator	Issues raised by Operator \ Observations.
1	ESB Networks	ESB raised concerns regarding their PTP microwave radio link network and their PMP UHF radio link network.

Table 3. ESB radio links that cross over/near the Proposed Wind Farm

The consultation response received from ESB Networks is provided in Section 3.1.1 that follows.

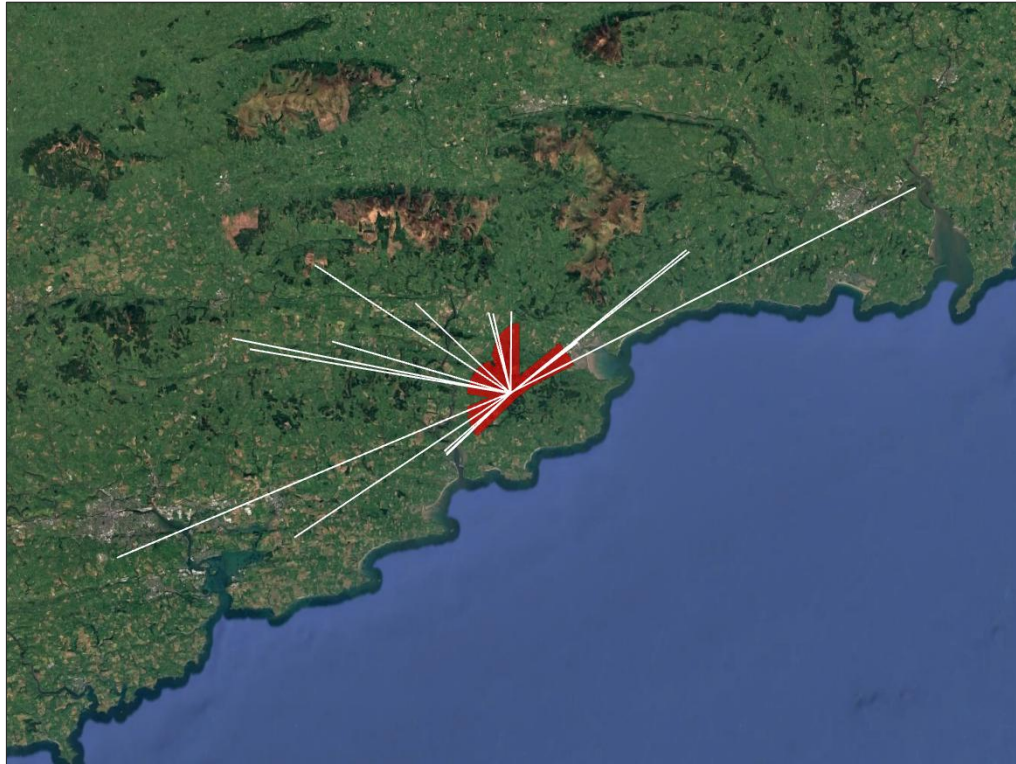
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3.1.1 ESB Response to Consultations

Eir provided the following email response to consultations:

“Please find attached the start and end coordinates for the links located within 5km of the site. Please also find attached a kmz file for the coordination zone boundary – any turbines situated within this area will require coordination.

Coordination zone: Turbines within: 1000m of a link operating below 1GHz; or 500m of a link operating above 1GHz.”



Fixed Links

Link_ID	A_sitename	A_Grid	A_grid_east	A_grid_north	B_sitename	B_grid	B_grid_east	B_grid_north
ESB024	Carronadavderg	NIGR	217362	87148	Midleton	NIGR	190483	68962
ESB198	Farmers Cross (Tower)	NIGR	168304	66322	Carronadavderg	NIGR	217362	87148
ESB188	Cheek Point	NIGR	267994	113048	Carronadavderg	NIGR	217362	87148
ESB230	Carronadavderg	NIGR	217362	87148	Cheek Point	NIGR	267994	113048
ESB194	Carronadavderg	NIGR	217362	87148	Cheek Point	NIGR	267994	113048

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ST Links

ID	a_end_name	agrid	agrideast	agridnorth	b_end_name	bgrid	bgrideast	bgridnorth
JESBAQS1 - JESBAQ007	Carrondavderg Hill	NIGR	217419	87074	Foxhole 38KV	NIGR	209168	79846
JESBAQS1 - JESBAQ008	Carrondavderg Hill	NIGR	217419	87074	Curraghglass 38KV	NIGR	195078	93434
JESBAQS1 - JESBAQ009	Carrondavderg Hill	NIGR	217419	87074	Kilcloher 38KV	NIGR	215168	97029
JESBAQS1 - JESBAQ006	Carrondavderg Hill	NIGR	217419	87074	Colligan 38KV	NIGR	225747	93497
JESBAQS1 - JESBAQ005	Carrondavderg Hill	NIGR	217419	87074	Castletyons 38KV	NIGR	184774	92419
JESBAQS1 - JESBAQ004	Carrondavderg Hill	NIGR	217419	87074	Barrymore 110KV	NIGR	182596	93745
JESBAQS1 - JESBAQ001	Carrondavderg Hill	NIGR	217419	87074	Kilmacthomas 38KV	NIGR	239675	104869
JESBAQS1 - JESBAQ002	Carrondavderg Hill	NIGR	217419	87074	Lismore 38KV	NIGR	205450	98255
JESBAQS1 - JESBAQ010	Carrondavderg Hill	NIGR	217419	87074	Springs 38KV	NIGR	224634	93061
JESBAQS1 - JESBAQ003	Carrondavderg Hill	NIGR	217419	87074	Callee 38KV	NIGR	192892	102918
JESBAQS1 - JESBAQ011	Carrondavderg Hill	NIGR	217419	87074	Foxhall Solar	NIGR	209450	79323
JESBAQS1 - JESBAQ012	Carrondavderg Hill	NIGR	217419	87074	Cooltubbrid West Solar Farm	NIGR	239301	105081
JESBEAK00 - JESBEAK03	Carrondavderg Hill	NIGR	217419	87074	Foxhall PV	NIGR	209409	79496
JESBEAK00 - JESBEAK02	Carrondavderg Hill	NIGR	217419	87074	Drumroe East Solar 2 Cluster	NIGR	214600	97145
JESBEAK00 - JESBEAK01	Carrondavderg Hill	NIGR	217419	87074	Kilcannon Solar	NIGR	217450	97300

Note1: The results of the Field Survey indicate that ESB have only one fixed PTP radio link between Carrondavderg and Cheek Point (i.e. not three as stated in their consultation response above).

Note 2: The results of the Field Survey indicate that the PTP links (Fixed) and the PMP Links (ST) are installed on the same telecommunications mast at Carrondavderg. (i.e. not on two separate masts as indicated by the coordinates provided in the consultation response above.)

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Section 4 - Field Surveys

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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 S) are shown relative to the Proposed Wind Farm site in Figure 4 below. The findings from the field surveys of each of the mast-sites are presented in Appendix B of this report.

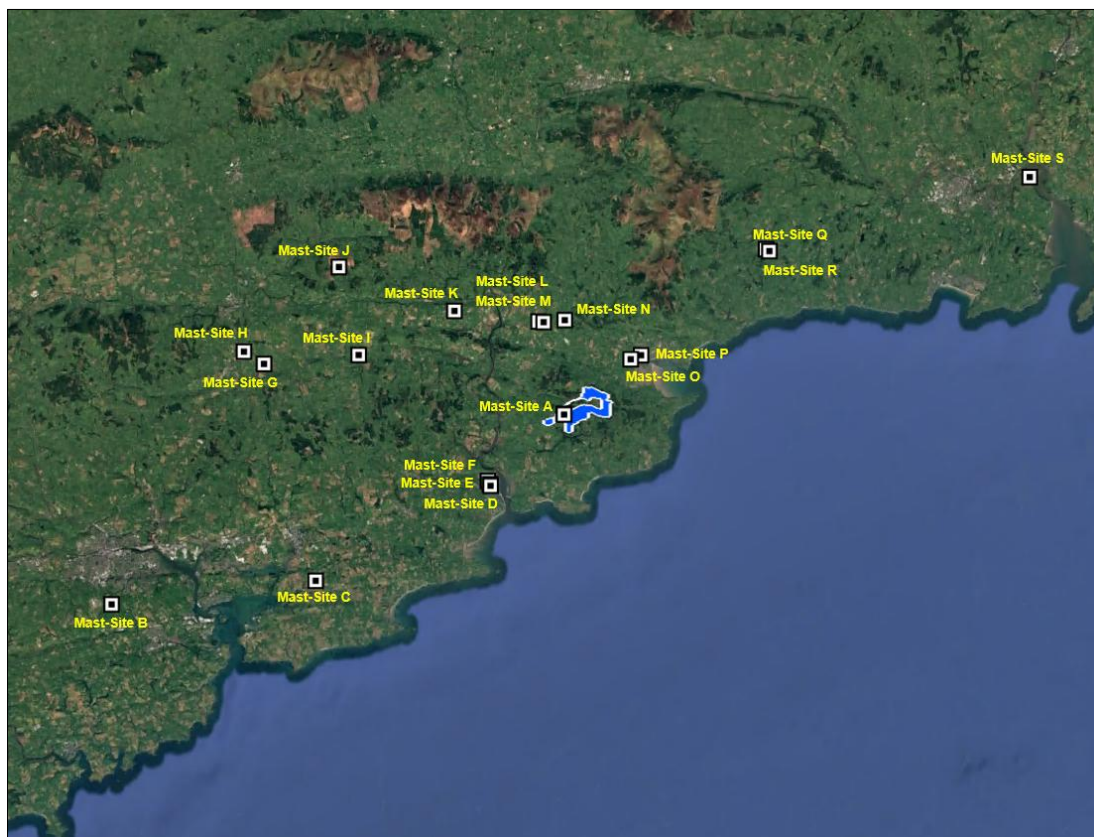


Figure 4. Telecom Mast-Sites Surveyed.*

It should be noted that, at the Carrondavderg mast site there are six telecom mast-structures, as shown below in Figure 5 (labelled in yellow A1 to A6). The site coordinates provided by ESB Networks indicated that their PTP radio links are installed on Mast A4; however, the results from the field survey of Carrondavderg indicate that this is not the case.

The field survey findings indicate that Mast A1 is the actual ESB Networks mast at Carrondavderg, and ESB's PMP *and* PTP radio links are installed on this mast.

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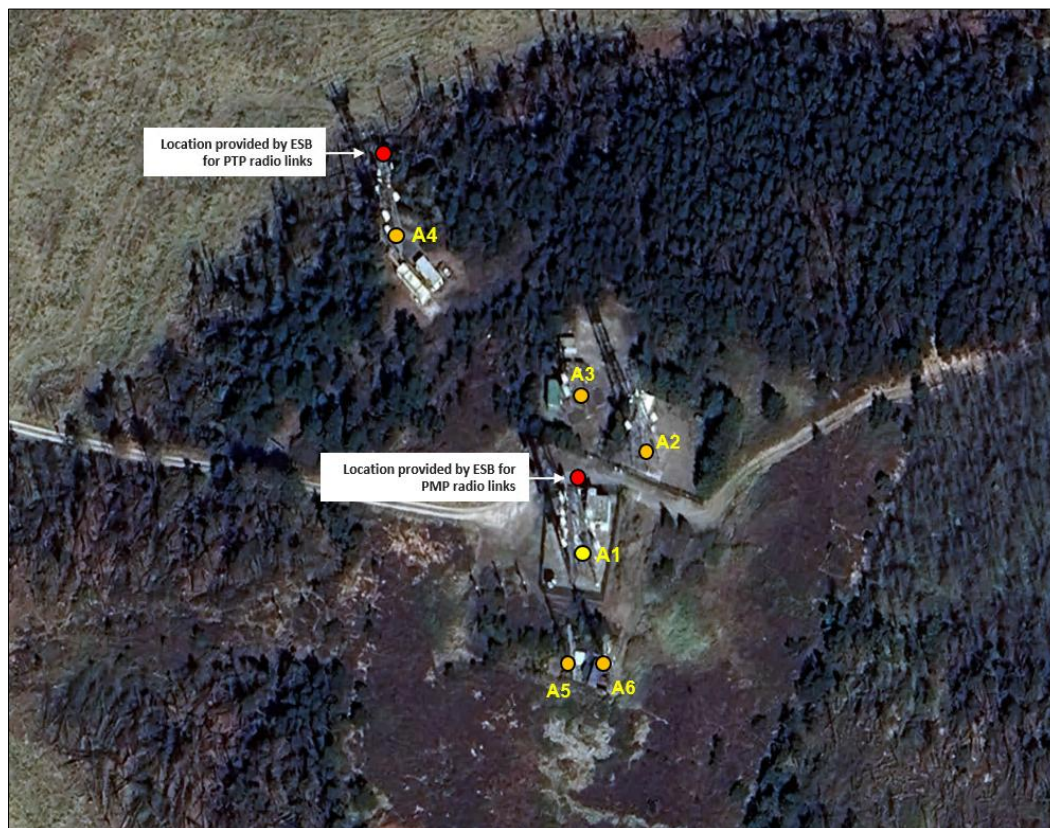


Figure 5. Carrondavderg Telecommunications Mast-Site.

It should also be noted that in 2022 (from a previous field survey of the site), there were three PTP dish antennas on Mast A1 that were aligned towards Cheek Point. Two of these dishes have since been decommissioned and now there is only one PTP dish aligned towards Cheek Point (i.e. only one remaining PTP radio link from Carrondavderg to Cheek Point).

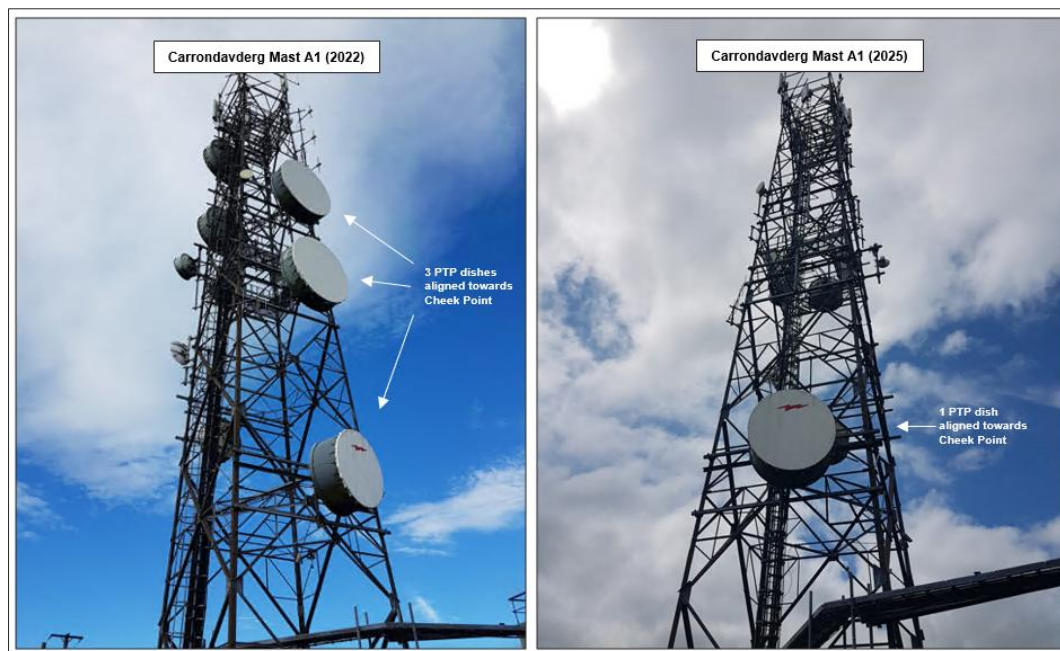


Figure 6. ESB Mast at Carrondavderg (Mast A1) - 2022 and 2025.

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Section 5 - Desktop Survey Analysis

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5. Introduction

Based on the findings of the consultation process, the following Telecom Operators have networks in the vicinity of the proposed development that requires a detailed technical analysis:

- ESB Networks

Section 5.1 below outlines the desktop survey analysis findings* for the Telecom Operator Networks listed above.

5.1 ESB Network Analysis

The ESB network in the vicinity of the Proposed Wind Farm consists of three Point-to-Point (PTP) microwave radio links and fifteen Point-to-Multipoint (PMP) UHF radio links. The radio links are listed below in Table 4 and a Plan View of the ESB network is shown in Figure 7.

Link ID	Link Description
ESB_PTP1	PTP microwave radio link from Carrondavderg to Midleton
ESB_PTP2	PTP microwave radio link from Carrondavderg to Farmers Cross
ESB_PTP3	PTP microwave radio link from Carrondavderg to Cheek Point
ESB_PMP1	PMP UHF radio link from Carrondavderg to Foxhole 38KV
ESB_PMP2	PMP UHF radio link from Carrondavderg to Curraghglass 38KV
ESB_PMP3	PMP UHF radio link from Carrondavderg to Kilcloher 38KV
ESB_PMP4	PMP UHF radio link from Carrondavderg to Colligan 38KV
ESB_PMP5	PMP UHF radio link from Carrondavderg to Castletyons 38KV
ESB_PMP6	PMP UHF radio link from Carrondavderg to Barrymore 110KV
ESB_PMP7	PMP UHF radio link from Carrondavderg to Kilmacthomas 38KV
ESB_PMP8	PMP UHF radio link from Carrondavderg to Lismore 38KV
ESB_PMP9	PMP UHF radio link from Carrondavderg to Springs 38KV
ESB_PMP10	PMP UHF radio link from Carrondavderg to Callee 38KV
ESB_PMP11	PMP UHF radio link from Carrondavderg to Foxhall Solar
ESB_PMP12	PMP UHF radio link from Carrondavderg to Cooltubbrid West Solar Farm
ESB_PMP13	PMP UHF radio link from Carrondavderg to Foxhall PV
ESB_PMP14	PMP UHF radio link from Carrondavderg to Drumroe East Solar 2 Cluster
ESB_PMP15	PMP UHF radio link from Carrondavderg to Kilcannon Solar

Table 4. ESB Radio Links requiring Analysis

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

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To further assess the potential impact of the T05 and T02, the radio links have been modelled in 3D and the Clearance Distance between the applicable Fresnel Zone of each link and the blade-tip of the turbines has been calculated.

Note: For PTP microwave radio links (i.e. links above 1 GHz), the first Fresnel Zone (F1) should be clear to ensure optimal signal propagation and to avoid potential interference.

For PMP UHF links (i.e. links below 1 GHz), 60% clearance of the first Fresnel Zone (0.6F1) should be clear to ensure optimal signal propagation to avoid potential interference.

The 3D view of the ESB radio links relative to the proposed turbines is shown in the Figure below. The PTP microwave radio links are shown in yellow and the PMP UHF radio links are shown in orange.

The 3D view also indicates that the ESB radio link network would be impacted by T05 and T02. (Close-up 3D views of T05 and T02 are provided in Figure 10 and Figure 11 respectively.)

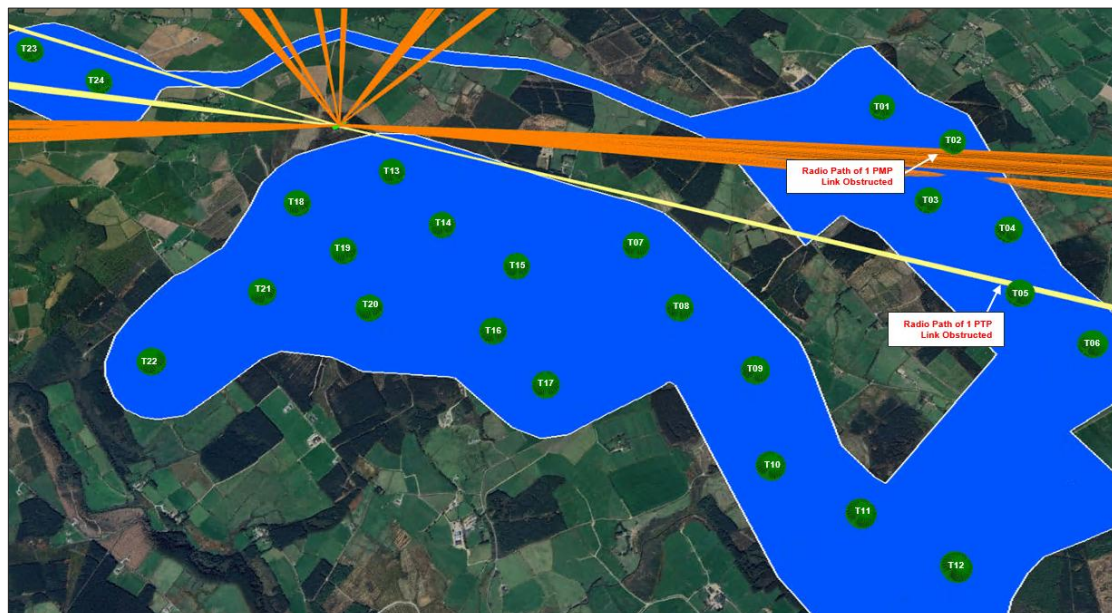


Figure 9. ESB Network – 3D View.*

The results of the 3D analysis (for T05) indicate that:

- T05 would obstruct the Fresnel Zone of the radio link between Carrondavderg and Check Point (ESB_PTP3) and the operation of the link is likely to be impacted.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report*

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Figure 10. Close-up 3D View of T05 and ESB_PTP3*

The results of the 3D analysis (for T02) indicate that:

- There is a clearance distance of over 30 m between the blade-tip of T02 and the Fresnel Zone of ESB_PMP4 (no impact).
- There is a clearance distance of 14.53 m between the blade-tip of T02 and the Fresnel Zone of ESB_PMP7 (no impact).
- There is a clearance distance of over 30 m between the blade-tip of T02 and the Fresnel Zone of ESB_PMP9 (no impact).
- T02 would obstruct the Fresnel Zone of ESB_PMP12 (Carrondavderg to Cooltubbrid West Solar Farm), and the operation of this radio link is likely to be impacted.

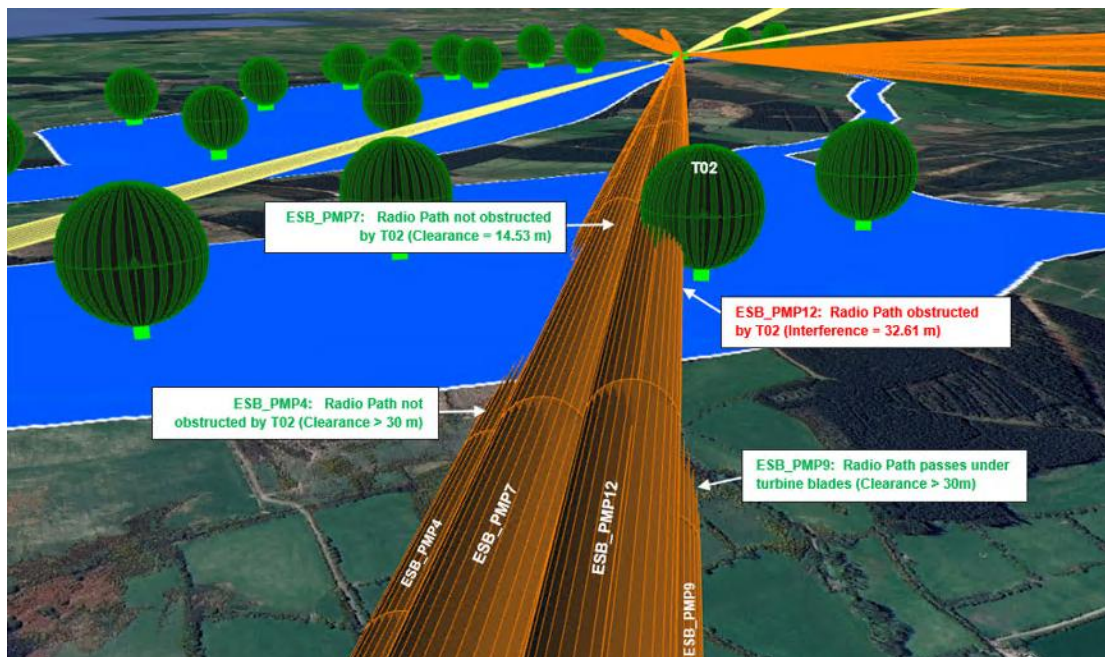


Figure 11. Close-up 3D View of T02 and ESB_PMP4, ESB_PMP7, ESB_PMP9 and ESB_PMP12*

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Table 5 below provides a brief summary of the radio link interference analysis for ESB radio network (PTP and PMP radio links).

Radio Link ID	Link Description	Nearest Turbine	Fresnel Zone Clearance / Interference	Wind Farm Impacts
ESB_PTP1	Carrondavderg to Midleton (PTP)	T24	> 30 m	No impacts
ESB_PTP2	Carrondavderg to Farmers Cross (PTP)	T23	> 30 m	No impacts
ESB_PTP3	Carrondavderg to Cheek Point (PTP)	T05	-13.98 m (Infringement into Fresnel Zone (F1))	Interference Impact (Mitigation measures required)
ESB_PMP1	Carrondavderg to Foxhole 38KV (PMP)	T24	> 30 m	No impacts
ESB_PMP2	Carrondavderg to Curraghglass 38KV (PMP)	T13	> 30 m	No impacts
ESB_PMP3	Carrondavderg to Kilcloher 38KV (PMP)	T13	> 30 m	No impacts
ESB_PMP4	Carrondavderg to Colligan 38KV (PMP)	T02	> 30 m	No impacts
ESB_PMP5	Carrondavderg to Castlelyons 38KV (PMP)	T13	> 30 m	No impacts
ESB_PMP6	Carrondavderg to Barrymore 110KV (PMP)	T13	> 30 m	No impacts
ESB_PMP7	Carrondavderg to Kilmacthomas 38KV (PMP)	T02	14.53 m	No impacts
ESB_PMP8	Carrondavderg to Lismore 38KV (PMP)	T13	> 30 m	No impacts
ESB_PMP9	Carrondavderg to Springs 38KV (PMP)	T02	> 30 m	No impacts
ESB_PMP10	Carrondavderg to Callee 38KV (PMP)	T13	> 30 m	No impacts
ESB_PMP11	Carrondavderg to Foxhall Solar (PMP)	T24	> 30 m	No impacts
ESB_PMP12	Carrondavderg to Cooltubbrid West Solar Farm (PMP)	T02	-32.61 m (Infringement into Fresnel Zone (0.6F1))	Interference Impact (Mitigation measures required)
ESB_PMP13	Carrondavderg to Foxhall PV (PMP)	T24	> 30 m	No impacts
ESB_PMP14	Carrondavderg to Drumroe East Solar 2 Cluster (PMP)	T13	> 30 m	No impacts
ESB_PMP15	Carrondavderg to Kilcannon Solar (PMP)	T13	> 30 m	No impacts

Table 5. ESB Network – Analysis Summary

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Section 6 - Mitigation Measures

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6. Mitigation Measures

Section 6.1 and 6.2 that follow, describe the mitigation measures available to the wind farm developer to offset the potential impact of the proposed turbines on the ESB PTP and PMP Networks.

6.1 Mitigation Measure Solutions – ESB PTP Network

To offset the potential impact of T05 on the ESB radio link from Carrondavderg to Cheek Point the following solutions are available:

Option 1 – Re-route the radio link via a relay mast located within the Proposed Wind Farm site.

Option 2 – Re-route connection via Fibre

These mitigation measures are described in Sections 6.1.1 and 6.1.2 that follow.

6.1.1 Option 1 – Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site.

An option to mitigate the potential impact of T05 on the ESB microwave radio link between Carrondavderg and Cheek Point, would be to use a relay mast located within the wind farm site boundary to re-route the impacted link. Figure 12 below illustrates how a relay mast could be deployed to re-route the impacted radio link.



Figure 12. Example of how a relay mast could be used re-route ESB_PTP3.*

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** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

To determine if the selected location could be used for viable relay-mast, radio link path profiles were generated. Radio Link Budgets were also carried out to determine if the proposed links would meet the Radio Link Availability Criteria required by ComReg for licensing of microwave radio links.

The Radio Link Path Profiles and Radio Link Budgets are based on the following ITU-R Recommendations:

- ITU-R P.525-2
- ITU-R P.526-11
- ITU-R P.676-8

The radio Path Profiles are shown below in Section 6.1.1.1 and Section 6.1.1.2. The Radio Link Budgets can be found in Appendix D (Sections C.1 and C.2).

An example of where this mitigation measure was proposed and accepted is provided in Section 6.1.1.3. The Methodology associated with the construction of a Telecoms Mast (i.e. Relay Mast) provided in Appendix D.

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6.1.1.1 Path Profile – Carrondavderg to Relay Mast

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria required by ComReg.

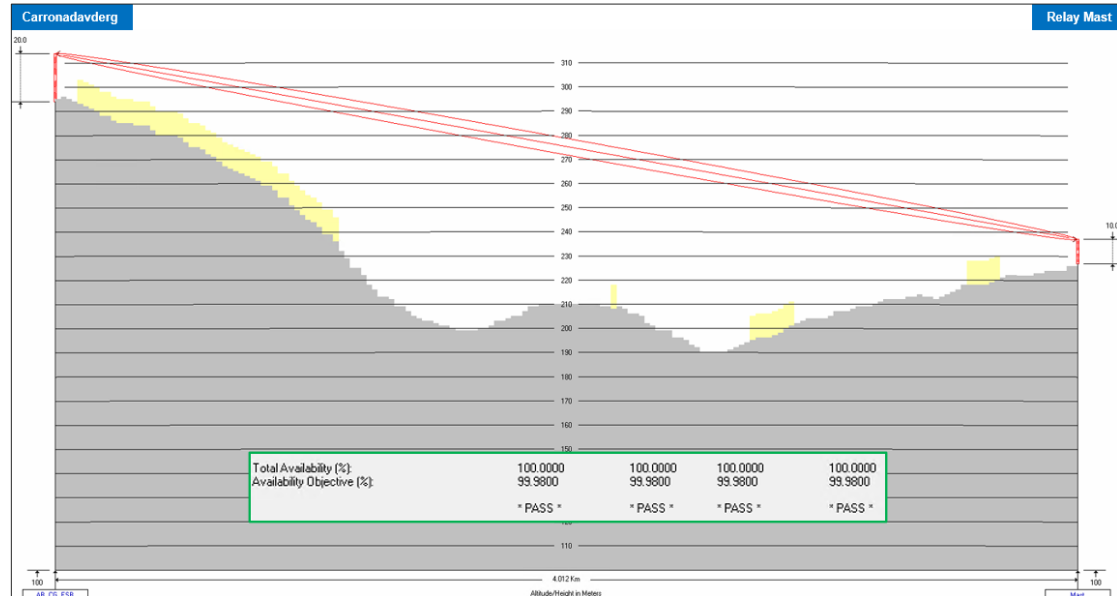


Figure 13. Path Profile – Carrondavderg to Relay Mast

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6.1.1.2 Path Profile – Relay Mast to Cheek Point

The radio link path profile shows clear Line-of-Sight (LOS) and the link budget results would pass the radio availability criteria required by ComReg.

The path profile indicates that a 30-meter mast-structure would be required at the relay location to achieve clear radio LOS conditions.

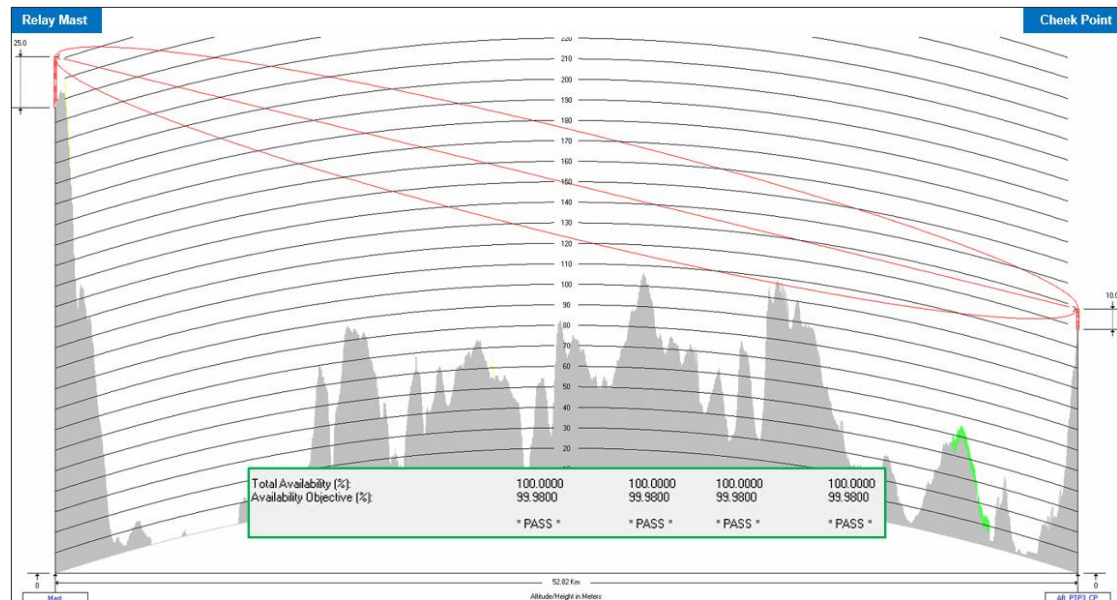


Figure 14. Path Profile – Relay Mast to Cheek Point

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6.1.2 Option 2 – Re-route connection via Fibre

An alternative option to offset the potential impact of T05 on the ESB microwave radio link between Carrondavderg and Cheek Point would be to utilize a fibre link to connect both sites.

For this option, additional surveys would be necessary to determine the fibre availability at both Carrondavderg and Cheek Point, and to determine if new fibre runs would be required. However, preliminary investigations indicate there is existing fibre along the L2024 road and at the roadside entrance to the Carrondavderg Telecoms Mast Site.



Figure 16. Existing Fibre cable along the L2024



Figure 17. Fibre on Pole at Entrance to Carrondavderg Telecoms Mast Site

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6.2 Mitigation Measure Solutions – ESB PMP Network

To offset the potential impact of T02 on the PMP radio link from Carrondavderg to Cooltubbrid West Solar Farm the following mitigation solutions are available:

- Option 1 - Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site
- Option 2 - Relay the PMP radio link via an existing ESB mast-site.
- Option 3 - Re-route connection via Fibre

These mitigation measures are described in more detail in Section 6.2.1 and Section 6.2.3 that follow.

6.2.1 Option 1 – Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site.

An option to mitigate the potential impact of T02 on the ESB UHF radio link between Carrondavderg and Cooltubbrid West Solar Farm, would be to use a relay mast located within the wind farm site boundary to re-route the impacted link.

Figure 18 below illustrates how a relay mast could be deployed to re-route the impacted radio link.

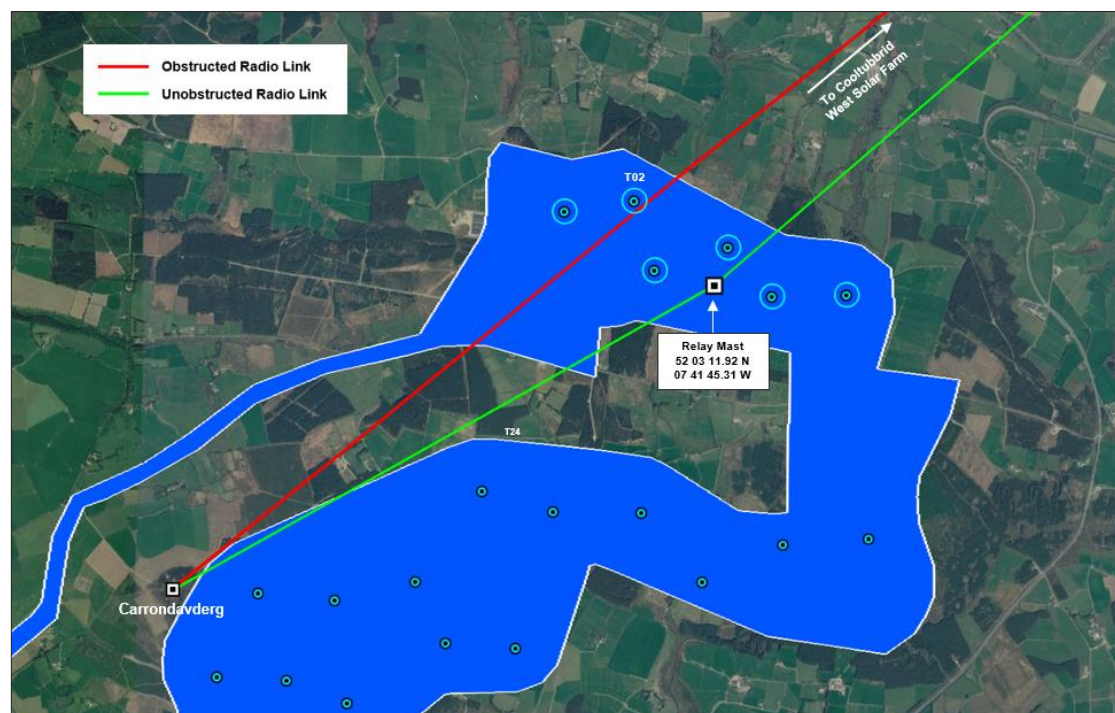


Figure 18. Example of how a relay mast could be used re-route ESB_PMP12.*

An example of where this mitigation measure was proposed and accepted has been provided in Section 6.1.1.3.

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

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6.2.2 Option 2 – Relay the PMP radio link via an existing ESB Mast-site.

An alternative option to mitigate for the impact on the PMP radio link to between Carrondavderg and Cooltubbrid West Solar Farm would be to use an existing ESB mast-site to relay the radio link.

Figure 19 below illustrates how the existing ESB mast-site at Kilmactomas could be used to relay a radio link between Carrondavderg and Cooltubbrid West.



Figure 19. Example of how an existing ESB mast-site could be used to relay the connection between Carrondavderg and Cooltubbrid West Solar Farm.

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6.2.3 Option 3 – Re-route connection via Fibre

An alternative option of offset the potential impact of T02 on the ESB UHF radio link between Carrondavderg and Cooltubbrid West Solar Farm would be to utilize a fibre link to connect both sites.

For this option, additional surveys would be necessary to determine the fibre availability at both Carrondavderg and Cooltubbrid West Solar Farm, and to determine if new fibre runs would be required. However, preliminary investigations indicate there is existing fibre infrastructure at the roadside entrance to the Carrondavderg Telecoms Mast Site (Ref Section 6.1.2) and also on the R677 road, which runs adjacent to the substation at Cooltubbrid West Solar Farm.



Figure 20. Existing fibre infrastructure on R677 relative to Cooltubbrid Substation



Figure 21. Fibre on roadside pole c. 200m from Cooltubbrid Substation

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Section 7 - Conclusions

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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7. Conclusions

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

- Results from the consultations with ESB Networks and from field survey analysis indicate that there are three PTP microwave radio links and fifteen UHF PMP radio links that cross over/near the Proposed Wind Farm site.
- Network analysis indicates that two of the radio links (1 PTP and 1 PMP) would be impacted by the proposed turbine layout and mitigation measure would be required for these two links.
- Table 6 below lists the radio links that would be impacted, along with possible mitigation measures available to the wind farm developer.

Radio Link ID	Radio Link Description	Impacts of Proposed Turbine Layout	Possible Mitigation Measure(s)
ESB_PTP3	PTP microwave radio link between Carrondavderg and Cheek Point	Interference Impact (Radio Link Fresnel Zone obstructed by T05)	Option 1: Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site. Option 2: Re-route connection via Fibre
ESB_PMP12	PMP UHF radio link between Carrondavderg and Cooltubbrid West Solar Farm	Interference Impact (Radio Link Fresnel Zone obstructed by T02)	Option 1: Re-route the impacted radio link via a relay mast located within the Proposed Wind Farm site. Option 2: Relay the radio link via an existing ESB Mast-site (e.g. via Kilmacthomas 38KV). Option 3: Re-route connection via Fibre.

Table 6. Radio Links potentially impacted by Proposed Wind Farm

- Figure 22 has been provided to illustrate the ESB radio links (PTP and PMP) that cross over/near the Proposed Wind Farm site. Two of these radio links could possibly be impacted by the wind farm development (dependent on final wind turbine network layout and turbine dimensions).

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** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

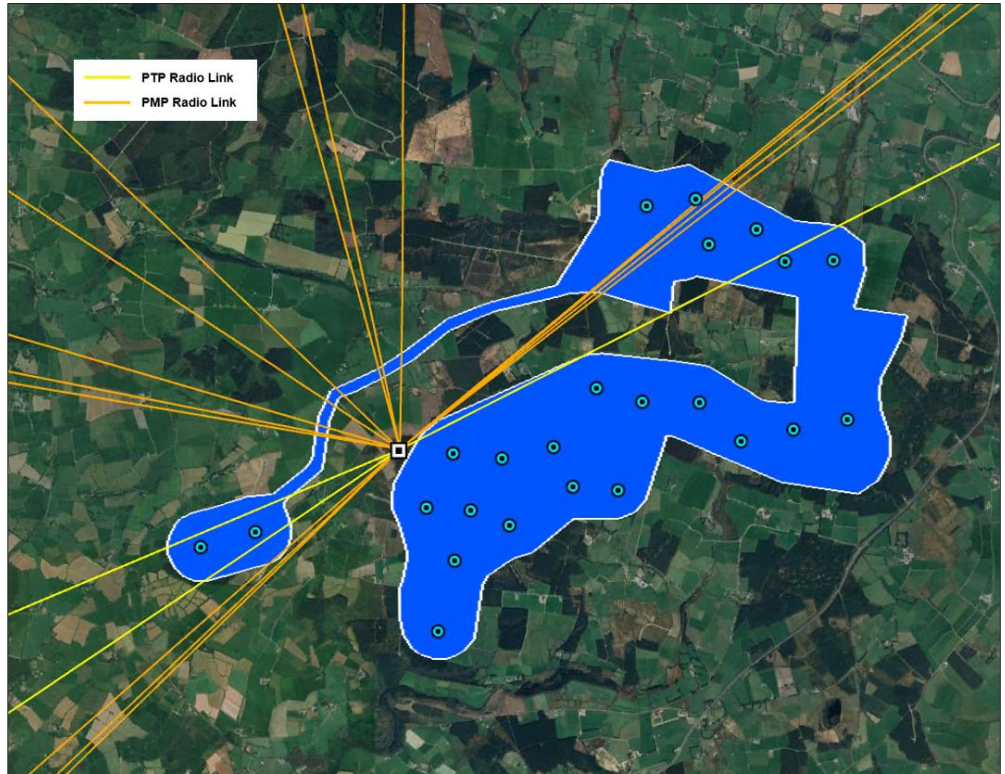


Figure 22. ESB Radio Links (PTP and PMP) crossing over the Proposed Wind Farm site.*

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** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

APPENDIX A – Wind Farm Turbine Coordinates

AiBridges Total Broadband Solutions	Procedure: 01	Rev: 4.0
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Appendix A – Wind Farm Turbine Co-ordinates

The turbine layout considered in this Telecommunications Impact Study is provided below.

Turbine ID	Co-ordinates (WGS 84)	
	Latitude	Longitude
T01	52.05761718956	-7.71079390295
T02	52.05821959175	-7.70361552490
T03	52.05416971436	-7.70168847341
T04	52.05550913315	-7.69469505561
T05	52.05263971399	-7.69050085476
T06	52.05274657804	-7.68335566292
T07	52.04126604932	-7.71810036798
T08	52.04004517579	-7.71134460978
T09	52.03997925626	-7.70290532409
T10	52.03648488625	-7.69676316893
T11	52.03753449735	-7.68906016858
T12	52.03843919219	-7.68113919834
T13	52.03539065845	-7.73908139259
T14	52.03494319802	-7.73195696421
T15	52.03595949725	-7.72440101433
T16	52.03238418474	-7.72155194195
T17	52.03206267325	-7.71490829612
T18	52.03051827129	-7.74300081535
T19	52.03027027109	-7.73653174098
T20	52.02890910038	-7.73085636845
T21	52.02572713905	-7.73890448386
T22	52.01926059545	-7.74140439736
T23	52.02693635584	-7.77612916015
T24	52.02830519791	-7.76813657182

Table 7. Wind Farm Layout - Turbine Co-ordinates*

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

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APPENDIX B – Field Survey Findings

 Total Broadband Solutions	Procedure: 01	Rev: 4.0
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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 23 below.

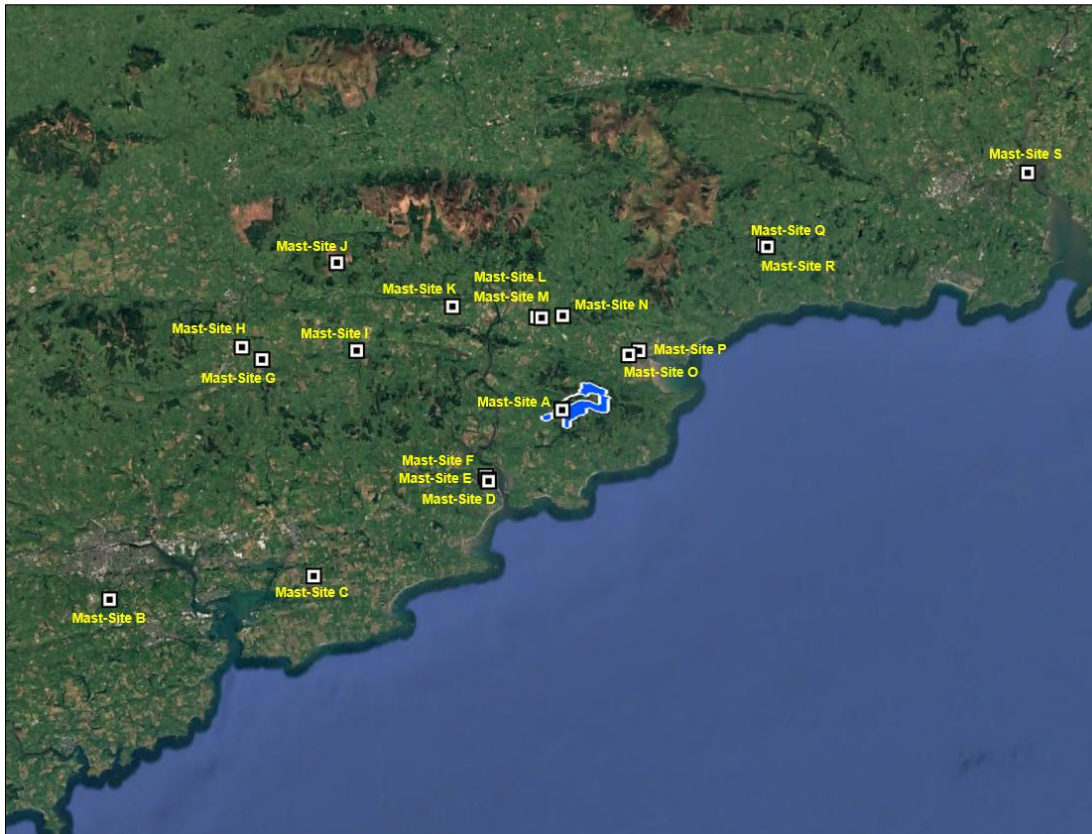


Figure 23. Telecom Mast-Sites shown relative to Proposed Wind Farm.*

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

** The analysis presented in this report is based on the turbine layout and site boundary provided to Ai Bridges in July 2025. While there have been some changes to the proposed turbine layout and site boundary since July 2025, these changes do not have any significant impacts to the overall findings of this report.*

AiBridges Total Broadband Solutions	Procedure: 01	Rev: 4.0
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Mast-Site A (Carrondavderg)

Telecommunications Mast-Site A is located at Carrondavderg and is less than 1 km from the Proposed Wind Farm. There are six telecom mast-structures at this mast site. From the field survey of this site, it was determined that all of the ESB links (PTP and PMP) radio links are installed on the mast-structure shown in the figure below. The number/type of ESB radio links operating from this mast are shown in Table 8.



Figure 24. Mast A1

Mast ID	ESB Radio links to/from Mast
Mast A1	1 x 1.4 GHz PTP radio link
	2 x 6 GHz PTP radio links
	15 x PMP UHF radio links

Table 8. Field Survey Summary – Mast-Site A

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site B (Farmers Cross)

Telecommunications Mast-Site B is located at Farmers Cross, Co Cork and is approximately 51 km southwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 9.



Figure 25. Mast B

Mast ID	ESB Radio Links to/from Mast (towards Carrondaverg)
Mast B	1 PTP microwave radio link

Table 9. Field Survey Summary – Mast-Site B

 <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site C (Midleton)

Telecommunications Mast-Site C is located in the townland of Kilva, Midleton, Co Cork and is approximately 30 km southwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 10.



Figure 26. Mast C

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast C	1 PTP microwave radio link

Table 10. Field Survey Summary – Mast-Site C

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site D (Foxhall Solar)

Telecommunications Mast-Site D is located at the proposed Solar Farm at Foxhall, Co Cork and is approximately 9 km southwest of the Proposed Wind Farm at Slievegrine. The location of the mast-site as specified by ESB Networks is shown in the figure below.



Figure 27. Mast-Site D

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast D	1 PMP UHF radio link (when Solar Farm is constructed)

Table 11. Field Survey Summary – Mast-Site D

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Mast-Site E (Foxhall PV)

Telecommunications Mast-Site E is located at the proposed Foxhall PV Site, Co Cork and is approximately 9 km southwest of the Proposed Wind Farm at Slievegrine. The location of the mast-site as specified by ESB Networks is shown in the figure below.



Figure 28. Mast E

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast E	1 PMP UHF radio link (when Solar PV is constructed)

Table 12. Field Survey Summary – Mast E

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site F (Foxhole 38KV)

Telecommunications Mast-Site F is located at Foxhole 38KV Substation Co Cork and is approximately 9 km southwest of the Proposed Wind Farm. The location of the ESB radio antenna can be seen in the aerial view of the substation site below. The number/type of ESB radio links operating from this mast is shown in Table 13



Figure 29. Mast F

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast F	1 PMP UHF radio link

Table 13. Field Survey Summary – Mast-Site F

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site G (Castlelyons 38KV)

Telecommunications Mast-Site G is located at Castlelyons 38KV substation, Co Cork and is approximately 31 km northwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 14.



Figure 30. Mast G

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast G	1 PMP UHF radio link

Table 14. Field Survey Summary – Mast-Site G

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site H (Ballymore 110 KV)

Telecommunications Mast-Site G is located at Ballymore 110KV substation, Co Cork and is approximately 33 km northwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 15.



Figure 31. Mast H

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast H	1 PMP UHF radio link

Table 15. Field Survey Summary – Mast H

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site I (Curraghglass 38KV)

Telecommunications Mast-Site I is located at Curraghglass 38KV substation, Co Cork and is approximately 21 km northwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 16.



Figure 32. Mast-Site I

Mast ID	ESB Radio Links to/from Mast (towards Carrondaverg)
Mast I	1 PMP UHF radio link

Table 16. Field Survey Summary – Mast I

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Mast-Site J (Callee 38KV)

Telecommunications Mast-Site J is located at Callee 38KV substation, Co Cork and is approximately 28 km northwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 17.



Figure 33. Mast J

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast J	1 PMP UHF radio link

Table 17. Field Survey Summary – Mast-Site J

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site K (Lismore 38KV)

Telecommunications Mast-Site K is located at Lismore 38KV substation, Co Waterford and is approximately 15 km northwest of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 18.



Figure 34. Mast K

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast K	1 PMP UHF radio link

Table 18. Field Survey Summary – Mast-Site K

AiBridges Total Broadband Solutions	Procedure: 01	Rev: 4.0
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Mast-Site L (Drumroe East Solar 2 Cluster)

Telecommunications Mast-Site L is located at the proposed Drumroe_East_Solar_2_Cluster, Co Waterford and is approximately 9 km north of the Proposed Wind Farm at Slievegrine. The location of the mast-site as specified by ESB Networks is shown in the figure below.



Figure 35. Mast L

Mast ID	ESB Radio Links to/from Mast (towards Carrondaverg)
Mast L	1 PMP UHF radio link

Table 19. Field Survey Summary – Mast-Site L

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Mast-Site M (Kilcloher 38KV)

Telecommunications Mast-Site M is located at Kilcloher 38KV substation, Co Waterford and is approximately 8 km north of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 20.



Figure 36. Mast M

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast M	1 PMP UHF radio link

Table 20. Field Survey Summary – Mast-Site M

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site N (Kilcannon Solar)

Telecommunications Mast-Site N is located at the proposed Kilcannon Solar site, Co Waterford and is approximately 8 km north of the Proposed Wind Farm at Slievegrine. The location of the mast-site as specified by ESB Networks is shown in the figure below.



Figure 37. Mast N

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast N	1 PMP UHF radio link

Table 21. Field Survey Summary – Mast-Site N

	Procedure: 01	Rev: 4.0
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Mast-Site O (Springs 38KV)

Telecommunications Mast-Site O is located at Springs 38KV substation, Co Waterford and is approximately 5 km northeast of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 22.



Figure 38. Mast O

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast O	1 PMP UHF radio link

Table 22. Field Survey Summary – Mast-Site O

 <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Mast-Site P (Colligan 38KV)

Telecommunications Mast-Site O is located at Springs 38KV substation, Co Waterford and is approximately 5 km northeast of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 23.



Figure 39. Mast P

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast P	1 PMP UHF radio link

Table 23. Field Survey Summary – Mast-Site P

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site Q (Cooltubbrid West Solar Farm)

Telecommunications Mast-Site Q is located at the Cooltubbrid West Solar Farm, Co Waterford and is approximately 23 km northeast of the Proposed Wind Farm at Slievegrine. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 24.



Figure 40. Mast Q

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast Q	1 PMP UHF radio link

Table 24. Field Survey Summary – Mast-Site Q

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Mast-Site R (Kilmacthomas 38KV)

Telecommunications Mast-Site R is located at Kilmacthomas 38KV substation, Co Waterford and is approximately 24 km northeast of the Proposed Wind Farm. A photo of the mast-structure at this location is shown below. The number/type of ESB radio links operating from this mast is shown in Table 25.



Figure 41. Mast R

Mast ID	ESB Radio Links to/from Mast (towards Carrondavderg)
Mast R	1 PMP UHF radio link

Table 25. Field Survey Summary – Mast-Site R

AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Mast-Site S (Cheek Point)

Telecommunications Mast-Site S is located on Minaun Hill, Cheek Point, Co Waterford and is approximately 52 km northeast of the Proposed Wind Farm. A photo of the mast-structure at this location is shown in the figure below. The number/type of ESB radio links operating from this mast-structure is shown in Table 26.



Figure 42. Mast S

Mast ID	ESB Radio Links to/from Mast (towards Carrondaverg)
Mast S	3 PTP Microwave radio link

Table 26. Field Survey Summary – Mast-Site S

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APPENDIX C – Radio Link Budget Reports

	Procedure: 01	Rev: 4.0
Title: Slievegrine Renewable Energy Development Telecommunications Impact Assessment	Approved: KH	Date: 16/09/26

Appendix C – Radio Link Budget Reports

C.1 Radio Link Budget Report (Carrondavderg - Relay Mast)

Link Budget Report

Site: AB_CG_ESB (Carrondavderg) Mast
 Name:
 Type: Cell Cell
 Latitude: 52°02'08.3"N 52°03'11.9"N
 Longitude: 7°44'49.0"W 7°41'45.3"W
 Altitude (m): 294.0 227.0
 UserData1: User Data
 Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link	
Transmission Site:	AB_CG_ESB		Mast
Reception Site:	Mast	AB_CG_ESB	
Radio Type:	NetRadio0001		NetRadio0001
Modulation Scheme:	4-QAM		4-QAM
Bandwidth (MHz):	2	2	
Roll-Off Factor:	0.2	0.2	
Coding Gain (dB):	0	0	
System Gains (dB):	0	0	
Channel Overhead (%):	20	20	
FEC Overhead (%):	0	0	
Reference Temperature (°K):	290	290	
Receiver Noise Figure (dB):	5	5	
Maximum Data Rate (Mbps):	2.667	2.667	
Maximum Bit Rate (Mbps):	3.333	3.333	
Required Bit Error Rate:	BER 10-3 BER 10-6	BER 10-3 BER 10-6	
Service Threshold (dBm):	-91 -90	-91 -90	
Carrier to Noise Ratio (dB):	14.965 15.965	14.965 15.965	
Cross Polarization Improvement Factor (dB):	20	20	20 20
Rx Equalization Sig Norm Parameter (Kn,M):	0.1	0.1	0.1 0.1
Rx Equalization Sig Norm Parameter (Kn,NM):	0.1	0.1	0.1 0.1
UserData1:	User Data	User Data	
Center Frequency (MHz):	26000	26000	
Channel Bandwidth (MHz):	28	28	
Transmission Power (dBm):	30	30	
Transmission Gains (dB):	0	0	
Transmission System Loss (dB):	0	0	
Transmission Line Loss (dB/100 m):	4	4	
Transmission Line Length (m):	10	10	
Transmission Connection Loss (dB):	0.3	0.3	
Transmission Number of Connections:	2	2	
Transmission Additional Loss (dB):	0	0	
Transmission Losses (dB):	1	1	
Transmission Antenna:	HP2-26	HP2-26	
Transmission Antenna Size (m):	0.6	0.6	
Transmission Antenna Height (m):	20	10	
Transmission Antenna Gain (dBd):	38.96	38.96	
Transmission Antenna Gain (dBi):	41.1	41.1	
Transmission Power EIRP (dBm):	70.1	70.1	
Reception Gains (dB):	0	0	
Reception System Loss (dB):	0	0	
Reception Line Loss (dB/100 m):	4	4	
Reception Line Length (m):	10	10	
Reception Connection Loss (dB):	0.3	0.3	
Reception Number of Connections:	2	2	
Reception Additional Loss (dB):	0	0	
Reception Losses (dB):	1	1	

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Reception Antenna: HP2-26	HP2-26		
Reception Antenna Size (m):	0.6	0.6	
Reception Antenna Height (m):	10	20	
Reception Antenna Gain (dBd):	38.96	38.96	
Reception Antenna Gain (dBi):	41.1	41.1	
Link Polarization:	Vertical	Vertical	
Cross Polarization Factor (dB):	30	30	
Link Distance (m):	4011.722	4011.722	
Azimuth - True (°):	60.629	240.669	
Azimuth - Magnetic (°):	62.068	242.092	
Transmission Inclination (°):	1.1	-1.1	
Reception Inclination (°):	1.1	-1.1	
ITU Recommendation:	ITU-R P.525-2		
Free Space Distance (m):	4012.461	4012.461	
Center Frequency (MHz):	26000	26000	
Free Space Loss (dB):	132.808	132.808	
Max Fresnel Radius (m):	3.402	3.402	
Max 2nd Fresnel Radius (m):	4.811	4.811	
Earth Radius Factor (K):	4/3		
Effective Radius (m):	8502056.000		
ITU Recommendation:	ITU-R P.526-11		
Diffraction Model:	Cascade Knife Edge		
Diffraction:	No LOS Diffraction	No LOS Diffraction	
Diffraction Loss (dB):	0	0	
Clearance Target (%):	60		
Minimum Clearance (m):	8.464	8.464	
Minimum Clearance Point (m):	98.113	98.113	
Terrain Reflection Dispersion (°):	0.5		
Reflection Area 1 (m):	207.127	207.127	
Reflection Area 2 (m):	2976 - 2997.9	2976 - 2997.9	
Reflection Area 3 (m):	3085.102	3085.102	
Reflection Area 4 (m):	3172.313	3172.313	
Reflection Area 5 (m):	3281.3 - 3303.1	3281.3 - 3303.1	
Reflection Area 6 (m):	3390.341	3390.341	
Reflection Area 7 (m):	3608.4 - 3630.2	3608.4 - 3630.2	
ITU Recommendation:	ITU-R P.676-8		
Atmospheric Pressure (hPa):	1013	1013	
Standard Temperature (°C):	15	15	
Water Vapor Density (g/m³):	7.5	7.5	
Atmospheric Gases Loss (dB):	0.531	0.531	
Total Path Loss (dB):	133.339	133.339	
Reception Signal Level (dBm):	-23.139	-23.139	
BER 10-3 BER 10-6 BER 10-3 BER 10-6			
Service Threshold (dBm):	-91	-90	-91
Link Gross Margin (dB):	67.861	66.861	67.861
ITU Recommendation:	ITU-R F.1703-0 / ITU-T G.827		
Objective ITU Quality Grade:	Short Haul SDH Networks		
Unavailability Objective (%):	2.00E-02		
Availability Objective (%):	99.9800		
ITU Recommendation:	ITU-R F.1668-1 / ITU-T G.826		
Error Performance Objective BBER (%):	1.60E-05	1.60E-05	
Error Performance Objective BBER (s/Month):	0.42	0.42	
SESR ESR SESR ESR			
Error Performance Objective (%):	1.60E-04	3.20E-03	1.60E-04
Error Performance Objective (s/Month):	4.205	84.096	4.205
ITU Recommendation:	ITU-R F.1668-1 / ITU-T G.828		
Error Performance Objective BBER (%):	4.00E-06	4.00E-06	

 AiBridges <i>Total Broadband Solutions</i>	Procedure: 01	Rev: 4.0
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Error Performance Objective BBER (s/Month): 0.105 0.105
SESr SESr SESr SESr
Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04
Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
Multipath Planning Type: Quick Planning
Multipath Time Frame: Average annual distribution
ITU Recommendation: ITU-R P.453-9
Point Refractivity Gradient (dN1): -76.7
Geoclimatic Factor: 4.05E-05 4.05E-05
Multipath Occurrence Factor (%): 5.19E-04 5.19E-04

Precipitation Model: ITU-R P.530-15
ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
Precipitation Time Frame: Average annual distribution
Precipitation Rate @ 0.01% (mm/h): 22
ITU Recommendation: ITU-R P.838-3
Specific Attenuation (dB/km): 3.06958 3.06958
Rainfall Attenuation (dB): 10.699 10.699

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Fading Outage (%): 5.53E-12 6.96E-12 5.53E-12 6.96E-12
Selective Fading Outage (%): 1.80E-12 1.80E-12 1.80E-12 1.80E-12
Composite Fading Outage (%): 7.34E-12 8.77E-12 7.34E-12 8.77E-12

Fading Outage (s/Month): 0 0 0 0
Selective Fading Outage (s/Month): 0 0 0 0
Composite Fading Outage (s/Month): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
Unavailability due to Fading (%): 7.34E-12 8.77E-12 7.34E-12 8.77E-12
Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
Total Unavailability (%): 7.34E-12 8.77E-12 7.34E-12 8.77E-12
Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 0 0 0 0
Unavailability due to Rain (s/Year): 0 0 0 0
Total Unavailability (s/Year): 0 0 0 0
Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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C.2 Radio Link Budget Report (Relay Mast – Cheek Point)

Link Budget Report

Site: Mast AB_PTP3_CP (Cheek Point)
 Name:
 Type: Cell Cell
 Latitude: 52°03'11.9"N 52°15'54.8"N
 Longitude: 7°41'45.3"W 7°00'16.6"W
 Altitude (m): 227.0 119.0

UserData1: User Data

Datum: World Geodetic System 1984 (WGS 84)

Forward Link		Reverse Link	
Transmission Site:	Mast	AB_PTP3_CP	
Reception Site:	AB_PTP3_CP	Mast	
Radio Type:	NetRadio0001	NetRadio0001	
Modulation Scheme:	4-QAM	4-QAM	
Bandwidth (MHz):	2	2	
Roll-Off Factor:	0.2	0.2	
Coding Gain (dB):	0	0	
System Gains (dB):	0	0	
Channel Overhead (%):	20	20	
FEC Overhead (%):	0	0	
Reference Temperature (°K):	290	290	
Receiver Noise Figure (dB):	5	5	
Maximum Data Rate (Mbps):	2.667	2.667	
Maximum Bit Rate (Mbps):	3.333	3.333	
Required Bit Error Rate:	BER 10-3 BER 10-6	BER 10-3 BER 10-6	
Service Threshold (dBm):	-91 -90	-91 -90	
Carrier to Noise Ratio (dB):	14.965 15.965	14.965 15.965	
Cross Polarization Improvement Factor (dB):	20	20	20
Rx Equalization Sig Norm Parameter (Kn,M):	0.1	0.1	0.1
Rx Equalization Sig Norm Parameter (Kn,NM):	0.1	0.1	0.1
UserData1:	User Data	User Data	
Center Frequency (MHz):	6000	6000	
Channel Bandwidth (MHz):	28	28	
Transmission Power (dBm):	30	30	
Transmission Gains (dB):	0	0	
Transmission System Loss (dB):	0	0	
Transmission Line Loss (dB/100 m):	4	4	
Transmission Line Length (m):	10	10	
Transmission Connection Loss (dB):	0.3	0.3	
Transmission Number of Connections:	2	2	
Transmission Additional Loss (dB):	0	0	
Transmission Losses (dB):	1	1	
Transmission Antenna:	HP4-59-NSMA	HP4-59-NSMA	
Transmission Antenna Size (m):	1.2	1.2	
Transmission Antenna Height (m):	25	10	
Transmission Antenna Gain (dBd):	32.86	32.86	
Transmission Antenna Gain (dBi):	35	35	
Transmission Power EIRP (dBm):	64	64	
Reception Gains (dB):	0	0	
Reception System Loss (dB):	0	0	
Reception Line Loss (dB/100 m):	4	4	
Reception Line Length (m):	10	10	
Reception Connection Loss (dB):	0.3	0.3	
Reception Number of Connections:	2	2	
Reception Additional Loss (dB):	0	0	
Reception Losses (dB):	1	1	
Reception Antenna:	HP4-59-NSMA	HP4-59-NSMA	
Reception Antenna Size (m):	1.2	1.2	
Reception Antenna Height (m):	10	25	

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Reception Antenna Gain (dBd):	32.86	32.86		
Reception Antenna Gain (dBi):	35	35		
Link Polarization:	Vertical	Vertical		
Cross Polarization Factor (dB):	26	26		
Link Distance (m):	52817.648	52817.648		
Azimuth - True (°):	63.176	243.722		
Azimuth - Magnetic (°):	64.599	244.914		
Transmission Inclination (°):	0.133	-0.133		
Reception Inclination (°):	0.133	-0.133		
ITU Recommendation:	ITU-R P.525-2			
Free Space Distance (m):	52817.793	52817.793		
Center Frequency (MHz):	6000	6000		
Free Space Loss (dB):	142.459	142.459		
Max Fresnel Radius (m):	25.695	25.695		
Max 2nd Fresnel Radius (m):	36.338	36.338		
Earth Radius Factor (K):	4/3			
Effective Radius (m):	8502056.000			
ITU Recommendation:	ITU-R P.526-11			
Diffraction Model:	Cascade Knife Edge			
Diffraction:	No LOS Diffraction	No LOS Diffraction		
Diffraction Loss (dB):	0	0		
Clearance Target (%):	60			
Minimum Clearance (m):	4.322	4.322		
Minimum Clearance Point (m):	498.68	498.68		
Terrain Reflection Dispersion (°):	0.5			
Reflection Area 1 (m):	604.782	604.782		
Reflection Area 2 (m):	4382 - 4403.2	4382 - 4403.2		
Reflection Area 3 (m):	4551.8 - 4615.4	4551.8 - 4615.4		
Reflection Area 4 (m):	4657.9 - 4679.1	4657.9 - 4679.1		
Reflection Area 5 (m):	4721.5 - 4742.8	4721.5 - 4742.8		
Reflection Area 6 (m):	4891.3 - 4912.5	4891.3 - 4912.5		
Reflection Area 7 (m):	19788.05	19788.05		
Reflection Area 8 (m):	19851.7 - 19872.9	19851.7 - 19872.9		
Reflection Area 9 (m):	20233.7 - 20339.8	20233.7 - 20339.8		
Reflection Area 10 (m):	20679.309	20679.309		
Reflection Area 11 (m):	20743.0 - 20785.4	20743.0 - 20785.4		
Reflection Area 12 (m):	20849 - 20997.6	20849 - 20997.6		
Reflection Area 13 (m):	21061.277	21061.277		
Reflection Area 14 (m):	21231 - 21273.5	21231 - 21273.5		
Reflection Area 15 (m):	21337.143	21337.143		
Reflection Area 16 (m):	21379.582	21379.582		
ITU Recommendation:	ITU-R P.676-8			
Atmospheric Pressure (hPa):	1013	1013		
Standard Temperature (°C):	15	15		
Water Vapor Density (g/m³):	7.5	7.5		
Atmospheric Gases Loss (dB):	0.503	0.503		
Total Path Loss (dB):	142.961	142.961		
Reception Signal Level (dBm):	-44.961	-44.961		
BER 10-3	BER 10-6	BER 10-3	BER 10-6	
Service Threshold (dBm):	-91	-90	-91	-90
Link Gross Margin (dB):	46.039	45.039	46.039	45.039
ITU Recommendation:	ITU-R F.1703-0 / ITU-T G.827			
Objective ITU Quality Grade:	Short Haul SDH Networks			
Unavailability Objective (%):	2.00E-02			
Availability Objective (%):	99.9800			
ITU Recommendation:	ITU-R F.1668-1 / ITU-T G.826			
Error Performance Objective BBER (%):	1.60E-05	1.60E-05		
Error Performance Objective BBER (s/Month):	0.42	0.42		0.42

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SESR ESR SESR ESR
 Error Performance Objective (%): 1.60E-04 3.20E-03 1.60E-04 3.20E-03
 Error Performance Objective (s/Month): 4.205 84.096 4.205 84.096

ITU Recommendation: ITU-R F.1668-1 / ITU-T G.828
 Error Performance Objective BBER (%): 4.00E-06 4.00E-06
 Error Performance Objective BBER (s/Month): 0.105 0.105
 SESR ESR SESR ESR
 Error Performance Objective (%): 1.60E-04 8.00E-04 1.60E-04 8.00E-04
 Error Performance Objective (s/Month): 4.205 21.024 4.205 21.024

Multipath Model: ITU-R P.530-15
 Multipath Planning Type: Quick Planning
 Multipath Time Frame: Average annual distribution
 ITU Recommendation: ITU-R P.453-9
 Point Refractivity Gradient (dN1): -76.7
 Geoclimatic Factor: 4.05E-05 4.05E-05
 Multipath Occurrence Factor (%): 6.05E+00 6.05E+00

Precipitation Model: ITU-R P.530-15
 ITU Recommendation: ITU-R P.837-5 / ITU-R P.841-4
 Precipitation Time Frame: Average annual distribution
 Precipitation Rate @ 0.01% (mm/h): 22
 ITU Recommendation: ITU-R P.838-3
 Specific Attenuation (dB/km): 0.063033 0.063033
 Rainfall Attenuation (dB): 1.171 1.171

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Fading Outage (%): 2.66E-05 3.35E-05 2.66E-05 3.35E-05
 Selective Fading Outage (%): 1.63E-06 1.63E-06 1.63E-06 1.63E-06
 Composite Fading Outage (%): 2.83E-05 3.52E-05 2.83E-05 3.52E-05

Fading Outage (s/Month): 0.7 0.881 0.7 0.881
 Selective Fading Outage (s/Month): 0.043 0.043 0.043 0.043
 Composite Fading Outage (s/Month): 0.743 0.924 0.743 0.924

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 Unavailability due to Rain (s/Year): 0 0 0 0

BER 10-3 BER 10-6 BER 10-3 BER 10-6
 Unavailability due to Fading (%): 2.83E-05 3.52E-05 2.83E-05 3.52E-05
 Unavailability due to Rain (%): 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 Total Unavailability (%): 2.83E-05 3.52E-05 2.83E-05 3.52E-05
 Unavailability Objective (%): 2.00E-02 2.00E-02 2.00E-02 2.00E-02

Unavailability due to Fading (s/Year): 8.915 11.091 8.915 11.091
 Unavailability due to Rain (s/Year): 0 0 0 0
 Total Unavailability (s/Year): 8.915 11.091 8.915 11.091
 Unavailability Objective (s/Year): 6307.2 6307.2 6307.2 6307.2

Total Availability (%): 100.0000 100.0000 100.0000 100.0000
 Availability Objective (%): 99.9800 99.9800 99.9800 99.9800

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APPENDIX D – Telecommunication Mast Construction Methodology

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1. Purpose

This Construction Methodology Plan is developed for the proposed works on Slievegrine Mast Site has been adapted to meet the requirements of the Works Information, in particular the following documents:

1. Client – Quality Requirements for Contractors.
2. Client – Quality Control for Suppliers & Supplies
3. Client – Quality Procedures
4. Project- Scope and Description

The following are the key documents to assess quality of the project:

1. Specifications and Drawings
2. Method Statements
3. Inspection and Test Plans
4. Quality Records
5. Safety File
6. Contractor Quality Management System

2. Goals and Objectives

2.1 Health, Safety & Environmental Excellence:

1. Establish a zero-accident, zero-injury workplace through rigorous training and safety protocols.
2. Implement a "Safe Plan of Action" and conduct regular safety training.
3. Ensure compliance with Regulatory and Statutory requirements.
4. Provide constant inspection to ensure conformity to plans and specifications

2.2 Client Satisfaction:

1. Deliver a high-quality, fully functional project to the client.
2. Complete milestones, such as structural completion, on time.
3. Complete the project in compliance with the Client and project specific requirements

2.3 Project Management

1. Complete the Project on time and in budget
2. Complete the project in compliance with the Client and project specific requirements
3. Ensure the Program of Works is achieved Maintained and implemented for the duration of the Works
4. Use KPIs to track performance on a weekly or monthly basis

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2.4 Communication:

1. Adopt digital tools to enhance communication and document sharing for better project monitoring
2. Hold daily / weekly meetings to align all subcontractors and operatives with safety and scheduling goals.

3. Construction Methodology

3.1 Pre Construction Planning

Prior to commencing any works, the following Site-specific documentation will be prepared to ensure Project, Quality, Health, Safety and Environmental Management expectations and standards are achieved.

1. Site Specific Program of works
2. Quality Management Plan
3. Construction Stage Health and Safety Plan
4. Site Setup Plan
5. Traffic and Logistics Management Plan
6. Site Specific RAMS
7. Overhead Line Management Plans (as required)
8. Inspection and Test Plans
9. Management of materials including Identification of Long lead items
10. Waste Management plan
11. Appointment letters issued by Client

3.2 Commencement on Site

1. Health and Safety inductions completed
2. Daily Risk assessments communicated and signed off by Site Team
3. Plant and Equipment Inspections completed, and certificates checked
4. Site Setup Completed including fencing and signage

3.3 Delivery and handling of Materials

1. All materials coming to Site will follow a dedicated Logistics Management plan
2. Set down areas will be identified to ensure any material are safely stored and secure
3. On receipt of materials, delivery will be checked and signed off by PICW.
4. Deliveries will be coordinated to ensure only materials on site required will be delivered

3.4 Foundations

1. Prior to commencement of Excavation works “dial before you dig” will be requested from the respected service providers

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2. Area scanned and where applicable services identified to ensure there is no services in the vicinity of the foundations
3. Area around services will be Hand dug to expose services
4. Foundation will be set out by surveyor as per construction drawings.
5. Area excavated to Formation Level and material removed off site to permitted waste facility
6. Subbase installed and compacted
7. Formwork & Reinforcement installed as per steel schedule
8. Tower Base Template Installed
9. Holding down bolts installed
10. Concrete design mix submitted for approval
11. Pre-pour inspection completed and signed off
12. Concrete pour commences and Concrete samples (cubes) taken.
13. Concrete vibrated to ensure compaction
1. Concrete finished off as per design detail
2. Concrete results checked after 7 & 28 days
3. Installation of Service ducts

3.5 Erection methodology

1. Tower Sections preassembled in yard and QA check completed
2. Tower sections loaded on lorry for delivery to site.
3. Crane base installed as required.
4. A Site-Specific Lift Plan will be developed for the Installation of the Tower. Lift Plan will determine size and location of Crane.
5. Site Rigging Team deployed to Site and the Person in Charge of the Works (PICW) will coordinate the installation of the tower.
6. As per lift plan sections of Tower will be installed on the Foundation, once concrete has achieved optimum strength.
7. Slinger / Signaller will guide sections in place
8. Sections bolted together and torqued, and QA inspection completed
9. Process continues until all sections are in place
10. Access Ladder will be installed with each section and certified once installation is completed

3.6 Accessory mounting / climbing

1. Certified Rigging Team with Climbing and rescue training will be appointed to carry out installation of equipment on Tower.
2. PICW will coordinate the installation of accessories, Antennas, Cabling, Mounting brackets etc.
3. A Hauling Plan will develop to install equipment
4. A rope and pulley system will be used to lift the equipment in place.
5. Mounting brackets and bolts will be installed following Antenna and associated equipment

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3.7 Connection of services

1. Where required the Contractor will engage with the relevant Services providers, including the utility providers such as ESB etc.
2. For Power, if Required, the Contractor will submit relevant certification including Recertificate application
3. Appropriate service ducting, chambers and units will be installed as per the relevant service providers specifications.

3.8 Inspection Testing and Commissioning

3.8.1 A Tower Foundation/ Base

- 1 backfill, compaction and site dressing as per specification
- 2 no signs of erosion around tower base and foundations
- 3 make good all non-structural damage to concrete
- 4 ensure there is no standing water or erosion
- 5 unblock/ fix weep holes
- 6 non-shrink grouting correct thickness (at least 30mm)
- 7 correct number of anchor bolt nuts
- 8 anchor bolts torqued to correct specification
- 9 anchor bolts protrusions correct. (2 threads minimum)
- 10 tower legs properly bonded to ground ring
- 11 grounding connections securely fastened

3.8.2 Tower Structure

- 1 tower drawings available on site for acceptance
- 2 all tower members present/ no missing members
- 3 check member sizes/markings correlate with structural & construction report / BOM
- 4 all connection/ backing plates present/ no missing plates
- 5 all connector plates installed correctly
- 6 all bolts and nuts installed/ no missing bolts or nuts
- 7 all bolts and nuts installed correct sizes and grades
- 8 all bolts and nuts torqued as per specifications
- 9 minimum threads protruding from any bolt should be 2mm
- 10 check all newly installed members/plates/ bolts galvanising
- 11 lightning spikes installed
- 12 all antenna mounting brackets securely installed
- 13 tower members are straight
- 14 no twist or yaw visible in the tower
- 15 legs levelled and tower vertically aligned (visual or theodolite?)
- 16 tower is level and plumb
- 17 all members comply with the structural analysis report
- 18 all bolts comply with the structural analysis report

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3.8.3 Tower Finish

- 1 inspect galvanising for damage. All chips/ cracks treated.
- 2 checks for signs of rust or corrosion
- 3 towers painted according to specifications
- 4 all nicks and scratches touched up

3.8.4 Lightning protection

- 1 check condition of lightning spike and arrestor
- 2 check that all lightning components are present
- 3 lightning system is correctly grounded

3.8.5 Commissioning

1. Operator Sweeps Test Onsite Post Installation Fiber Test (Low/Middle/High band)
2. Complete Electrical Work and Installation of PSU and Rectifiers
3. Commission PSU & Configure alarms
4. Prep & Install Headrail + fit all cables
5. Complete labelling
6. Earth Testing, Electrical Certs

Full photos Pre & Post Install