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Rooaunalaghta Green Energy Project

Appendix 11-2

TETRA Impact Study

ROOAUNALAGHTA
Green Energy

BUILT ON KNOWLEDGE

Report

Rooaunalaghta Wind Farm

TETRA Impact Study

Document Number:

Author: PT\DM

Approved for Release: Rev 5.0 Kevin Hayes **Date:** 07/10/26

Document Filename: *Rooaunalaghta Wind Farm TETRA Impact Study Report*

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Executive Summary

During consultations as part of the Rooaunalaghta wind farm (Telecommunications Impact Study in 2022, TETRA Ireland raised concerns in relation to the proximity of the proposed turbines to their TETRA Basestation at the telecoms mast-site adjacent to the wind farm. Their concern was that the proposed wind farm development could negatively impact TETRA service coverage in the region.

Ai Bridges was commissioned to carry out this TETRA Impact Study to evaluate the potential impact of any turbine that would be located within a Tetra Ireland specified 500m Exclusion Zone around their basestation at Brodullagh South.

The requirement of this study was to conduct field and desktop surveys to evaluate the existing TETRA service coverage from the basestation stie at Brodullagh South and from neighboring TETRA basestations. The signal levels recorded during the field surveys could then be used to assess the potential impacts of the proposed turbines on TETRA service coverage in the area.

Desktop analysis shows that there is one Turbine (T13) that would be located within the 500m Exclusion Zone of the Tetra Basestation at Brodullagh South. In a worse-case scenario, T13 could cause some degradation to service coverage in an area (Shadow Area) to the southeast of the Basestation. However, field survey readings show that there is sufficient TETRA coverage from neighboring basestations (LACs) to provide good service coverage in the T13 Shadow Area.

The results of TETRA service coverage plots also correlate with the findings of the field surveys and show that the T13 Shadow Area has good service coverage from alternative basestations (e.g. the TETRA basestation at Letir).

From the findings of the field and desktop surveys, any degradation in TETRA service coverage due to turbines at the proposed development, would not be significant and would be offset by coverage from neighboring TETRA basestations.

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Section 1 – Wind Farm Site Information

1. Introduction

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

1.1 Wind Farm Site Information

The wind farm development is located in County Mayo approximately 3 km southwest of Shrule and 4 km northwest of Headford. The proposed turbines dimensions are shown below in Table 1 and the proposed turbine coordinates are provided in Appendix A.

Wind Farm	Number of Turbines	Turbine Hub Height	Turbine Rotor Diameter
Rooaunalaghta	13	82 m	136 m

Table 1. Rooaunalaghta Wind Farm Turbine Details

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



Figure 1. Location of proposed wind farm – Rooaunalaghta, Co Mayo.

Section 2 – Desktop Survey

2. Introduction

During Telecommunication Impact consultations undertaken in September 2022, Tetra Ireland raised concerns regarding the possible impact of the proposed development on Tetra service coverage from their basestation at Brodullagh South:

> *"We have equipment at E125486 / N251532, we specify a 500m exclusion from the location."*

The 500 m Exclusion Zone, as specified by Tetra Ireland, has been plotted and is shown relative to the proposed wind farm site below in Figure 2.

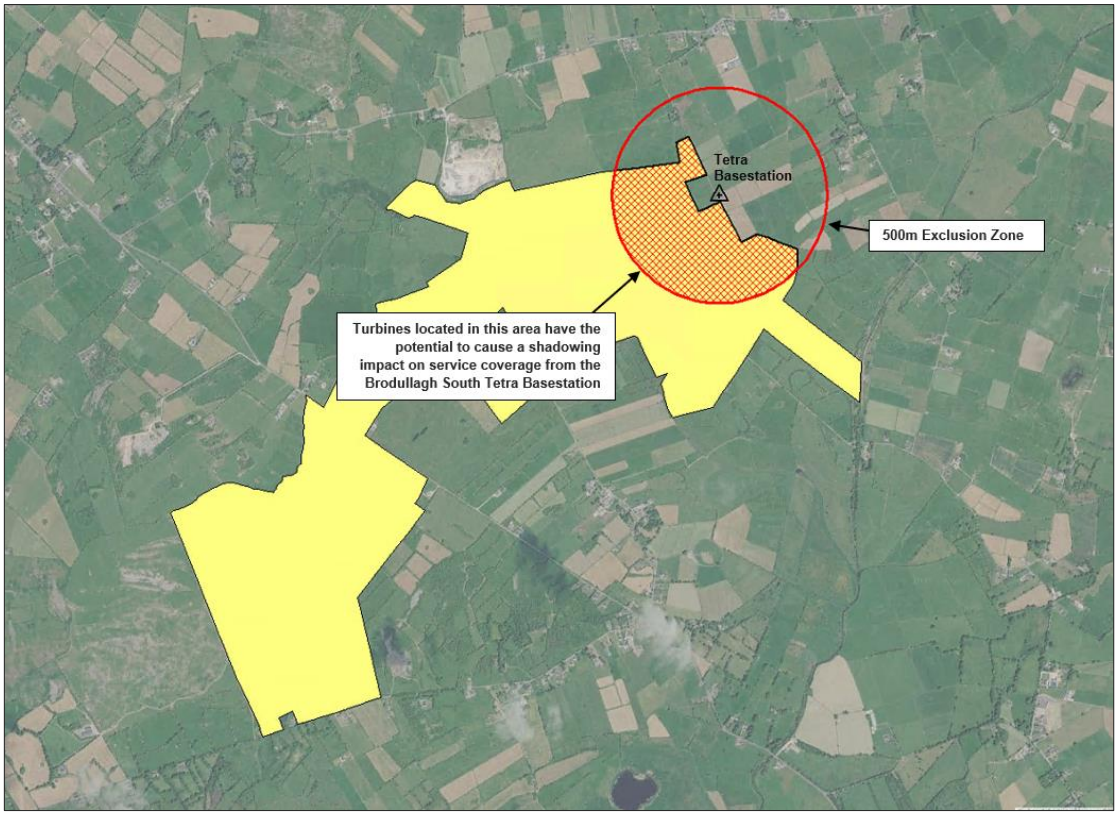


Figure 2. Tetra 500m Exclusion Zone (as specified by Tetra Ireland)

A desktop survey was undertaken to predict the current TETRA service coverage in the Rooaunalaghta area. The predictions could then be used to assess the possible impacts on TETRA service coverage in the area due to turbines at the proposed wind farm development.

2.1 TETRA Service Coverage Prediction – Brodullagh South Transmitter

The current TETRA service coverage has been modelled for the downlink transmission. The radio software model used transmit power settings of the TETRA basestation at 10 Watts on the basis of conversations with RF planners and from previous modelling of TETRA Impact Study Reports.

The Communications Regulator ("ComReg") specify that a transmit power of 40 Watts (46 dBm) can be used for Emergency Services Digital Radio Licences (i.e. TETRA services); however, in this report a transmit power of 10 Watts has been used for predictions as this will provide for a Worse-Case Scenario result.

The predicted service coverage for the TETRA basestation at 10 Watts at the Brodullagh South transmitter site is shown in Figure 3 below.

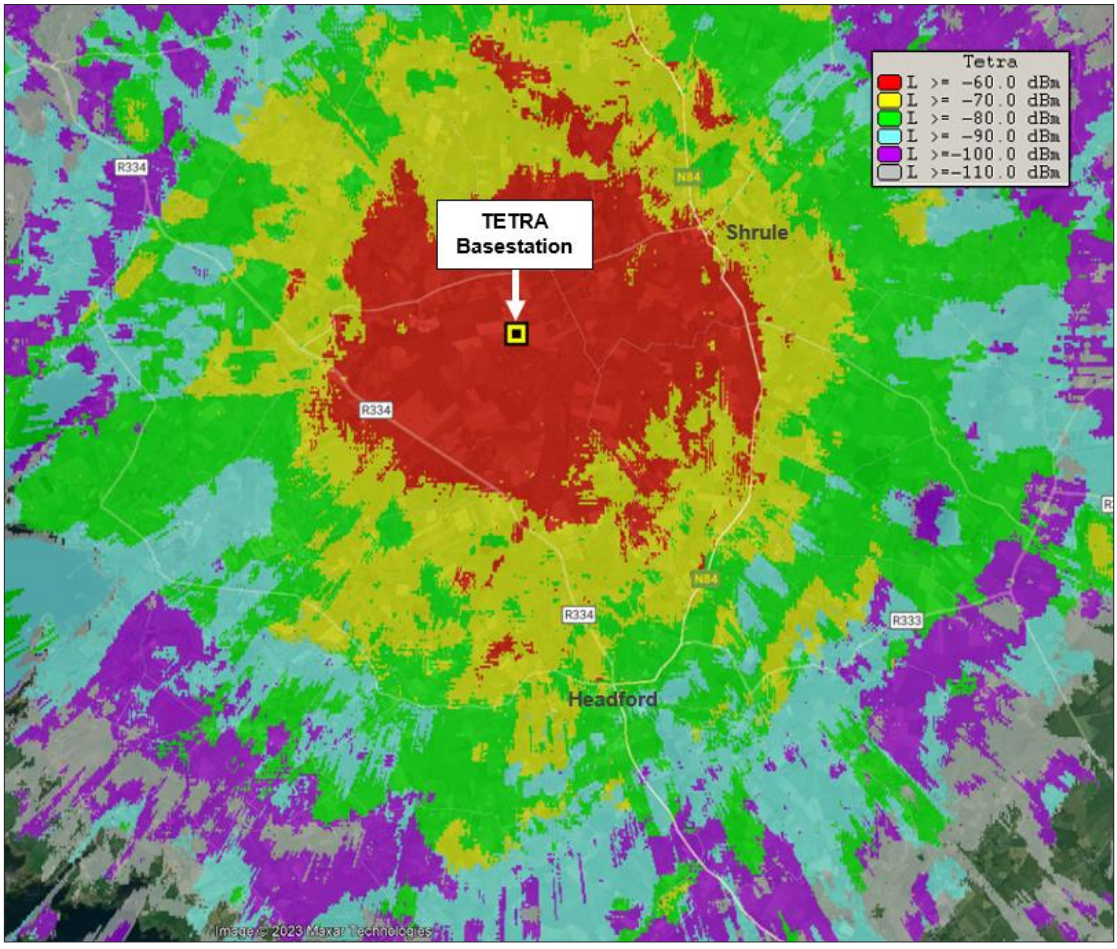


Figure 3. TETRA Coverage from Brodullagh South Transmitter

Section 3 – TETRA Field Surveys

3. Introduction

Extensive drive-thru surveys were conducted in the service coverage area of the Brodullagh South TETRA basestation. A TETRA spectrum analyzer was used to record all of the TETRA signals from the Brodullagh South basestation.

TETRA signals from all other neighboring TETRA basestations were also recorded and plotted based on GPS co-ordinates. The results from the field surveys are presented below in Section 3.1.

3.1 Field Survey Results

Figure 4 below shows the Tetra Signals recorded during the field survey of the area around the Brodullagh South basestation. The data is visualized using a TETRA modelling software application.

Each Tetra cell (Basestation) detected is notated with a LAC (Location Area Code) ID and the associated received signal level is also displayed. The results show relatively good TETRA coverage in the area with recorded signal strength readings of between –43 dBm and -100 dBm. No service coverage blackspot areas were recorded during the field surveys.

The recorded readings show that at any selected location there is service coverage from multiple TETRA service coverage LAC cells.

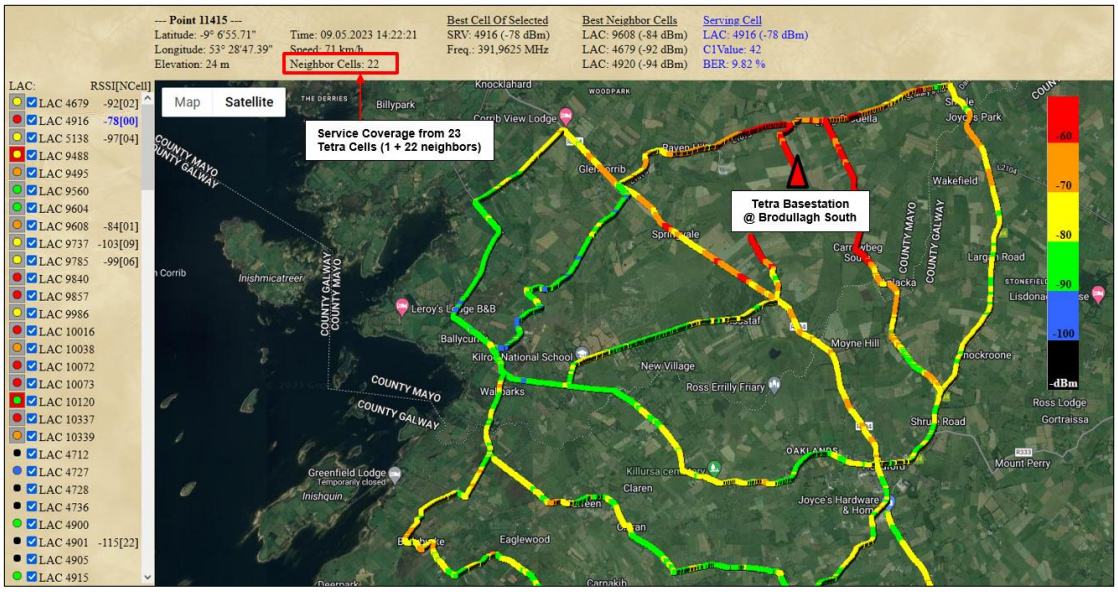


Figure 4. Field Survey Results – TETRA Service Coverage from Brodullagh South and neighbouring cell TETRA basestations

Figure 5 below shows the TETRA Basestation located at the Brodullagh South Mast Site. From the findings of the field and desktop surveys, it has been determined that the LAC associated with this basestation is LAC 4916.



Figure 5. TETRA Basestation (LAC 4916) at Brodullagh South Mast-Site

Section 4 – Desktop and Field Survey Analysis

4. Introduction

In this section an analysis of the Desktop and Field Survey findings are presented.

4.1 Analysis of Desktop and Field Survey Results

As shown below in Figure 6, one of the proposed turbines at Rooaunalaghta would be located within the Tetra Ireland 500m Exclusion Zone. This turbine (T13) could potentially cause some signal level degradation ("*shadowing" impact*") in an area to the southeast of the Tetra basestation.

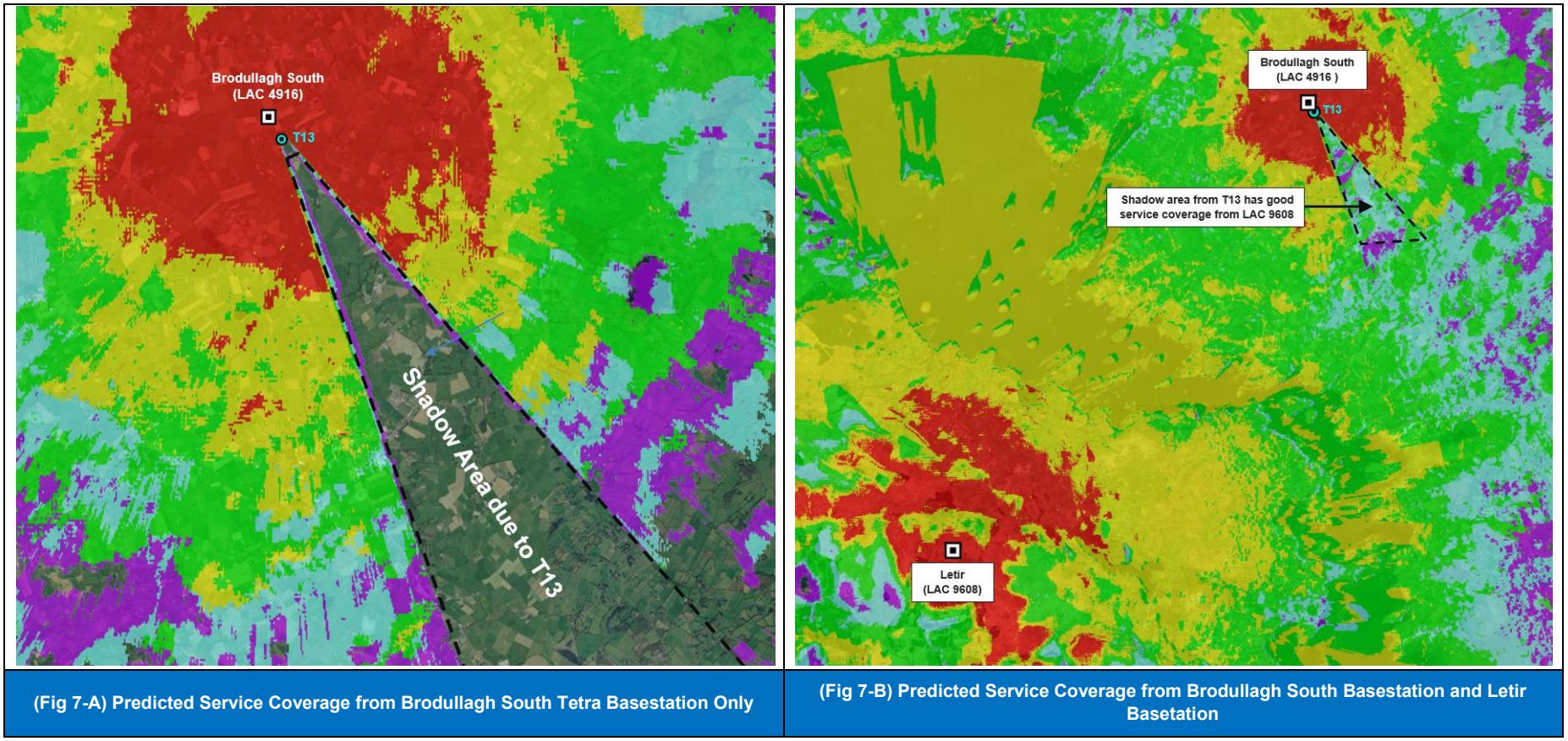


Figure 6. Turbine T13 would be located with the Tetra Ireland 500m Exclusion Zone

The potential impact of T13 (i.e. worse-case scenario, where the turbine blade rotor-span is considered as an obstacle that extends to ground level) is illustrated in the coverage plot shown below in Figure 7-A.

It is important to note that the service coverage prediction shown in Figure 7-A only considers the Brodullagh South basestation, it does not show service coverage from any of the neighboring TETRA cells.

Figure 7-B shows the predicted service coverage in the Rooaunalaghta area when the Tetra Basestation at Brodullagh South (LAC 4916) and the Tetra Basestation at Letir (LAC 9608) are both considered.



(Fig 7-A) Predicted Service Coverage from Brodullagh South Tetra Basestation Only

(Fig 7-B) Predicted Service Coverage from Brodullagh South Basestation and Letir Basetation

Figure 7. TETRA Service Coverage Plots – Brodullagh South Basestation and Letir Basestation

Note: The Coverage Prediction Plot (above Fig 7-A) is for a worse-case scenario where the turbine blade rotor-span is considered as an obstacle that extends to ground level. In reality, there would be a distance of 14 m between the ground and the lowest point of the turbine rotor-span and much of the TETRA signal will pass underneath the turbine blades un-obstructed.

While the worse-case prediction plot (Fig-7A) indicates that there would be a shadow area to the southeast due to T13, there would be coverage in this area from neighboring Tetra cells. The Prediction Plot shown in Figure 7-B indicates that the Tetra Basestation at Letir, Co Galway provides good service coverage in the T13 Shadow Area and there would be no service blackspots due to T13.

This correlates with the findings of the field survey, which show that in areas southeast of Rooaunatlaghta there is Service Coverage from multiple Tetra basestation cells.

Figure 8 below shows field survey results, *excluding the TETRA signals received from the Brodullagh South Mast* (LAC 4916). As shown in the coverage map, there is good TETRA coverage in the area southeast of Roouanalaghta, even when service from Brodullagh South is excluded. This indicates that there is adequate signal from the other neighboring cells even if T13 causes some degradation of service from the Brodullagh South basestation.

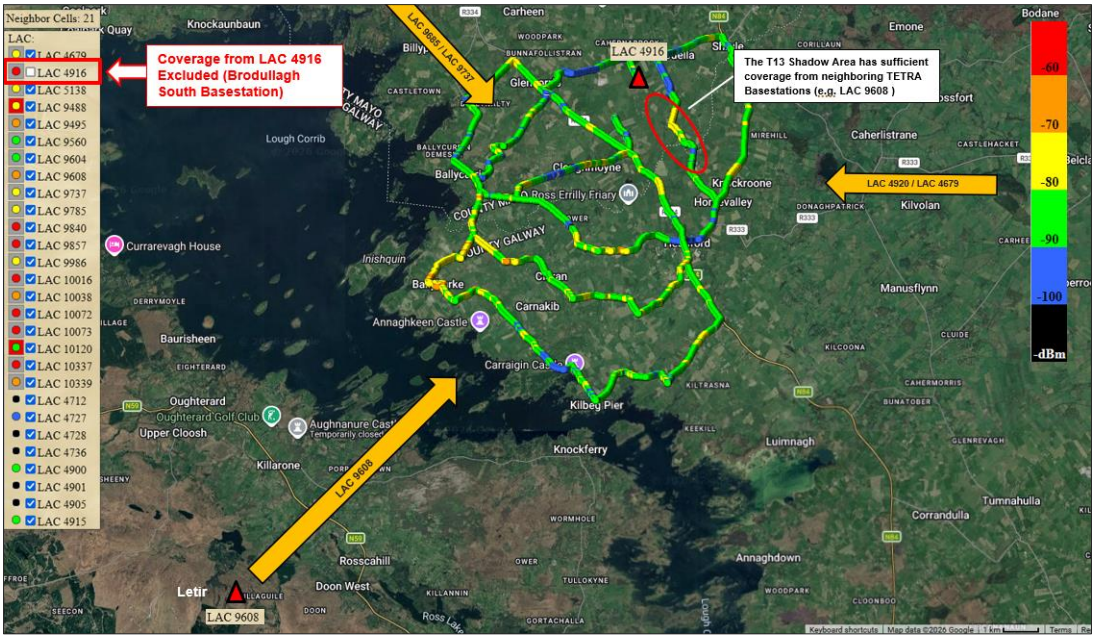


Figure 8. TETRA Service Coverage from neighboring cells excluding Brodullagh South Basestation Coverage.

Note: When service from Brodullagh South is excluded, LAC 9608 (Letir) is the main basestation providing service coverage in the Rooaunalaghta region.

4.2 Analysis Summary

A brief summary of the analysis findings are provided below:

- In the proposed turbine layout, there is one Turbine (T13) that would be located in the within the 500 m Exclusion Zone (as specified by TETRA Ireland).
- In a worse-case scenario, T13 could cause some degradation to service coverage in an area (Shadow Area) to the southeast of the Tetra Basestation at Brodullagh South.
- Field Survey findings show that there are multiple neighbouring Tetra basestations (22 LACs detected) that provide additional coverage in the area to the southeast of Brodullagh South.
- Service Coverage Plots indicate that the Tetra Basestation at Letir, Co Galway provides good service coverage in the T13 Shadow Area and there would be no service blackspots due to T13.
- Field Survey findings also show that when signal reception from Brodullagh South is excluded, there is still adequate service coverage (in the T13 Shadow Area) from neighbouring TETRA basestations.
- The analysis findings indicate that it is highly unlikely that there would any blackspot areas in TETRA coverage in the Rooaunalghta area due to the proposed wind farm development.
- It should also be noted that there are existing precedents where turbines have been built and are operating within 500m of a TETRA Ireland basestation. Figure 9 below shows an example of a wind farm in County Tipperary, where a turbine is operating within 250m of a TETRA basestation.

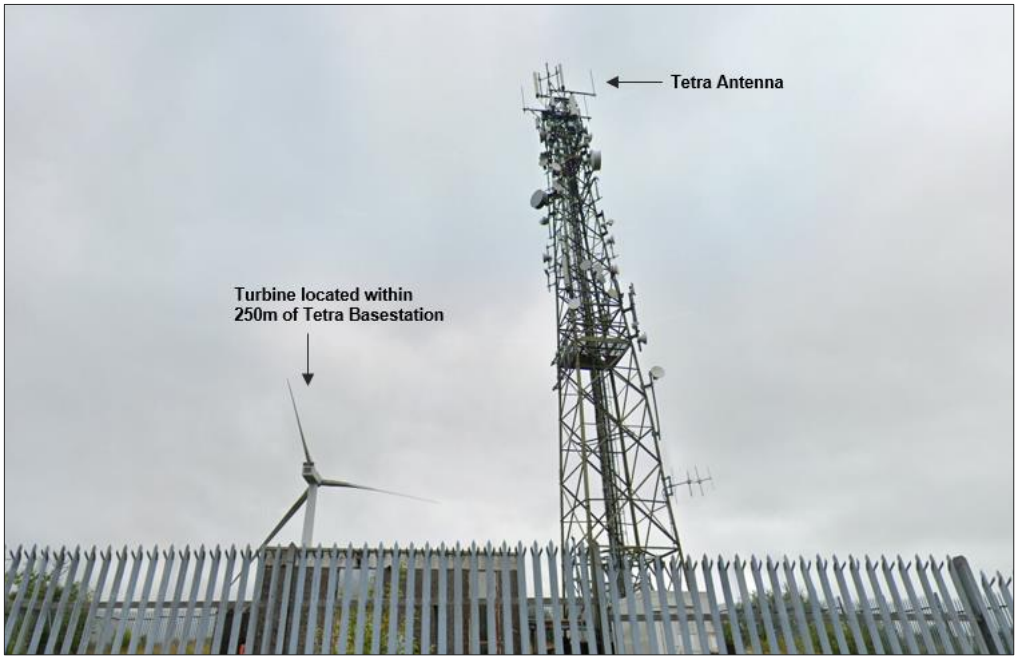


Figure 9. Example of Turbine located within 250m of TETRA Ireland Basestation

Section 5 – Mitigation Measures

5. Introduction

The findings of the field and desktop survey indicate that the proposed turbines are unlikely to have a significant impact on Tetra service coverage in the Rooaunalaghta area; however, should coverage issues arise during the operation of the wind farm, there are technically viable mutation measure solutions available as set out below.

The costs of such mitigation measures will be covered by the operator of the wind farm, should they be required.

5.1 Mitigation Measure Solutions

To offset the potential impact of T13 on the Tetra Ireland Service Coverage, the following mitigation solutions are available:

Option 1 – Relocate Existing Tetra Basestation.

Option 2 – Install a Secondary Tetra Transmitter.

These mitigation measures are outlined in Sections 5.1.1 and 5.1.2 that follow.

5.1.1 Option 1 – Relocate Existing Tetra Basestation.

As TETRA Ireland have specified that turbines should not be located within 500m of their Tetra Transmitter / Basestation, a technically viable mitigation measure option would be to re-locate the basestation to an area within the wind farm site boundary, to ensure that this minimum distance is achieved.

Should coverage issues arise during the operational phase of the wind farm, a suitable location within the wind farm site boundary could be selected for a Tetra basestation, that would maintain existing TETRA service coverage, while ensuring a clearance distance of 500m from all of the Rooaunalaghta wind turbines.

5.1.2 Option 2 – Install a Secondary Tetra Transmitter

An alternative option to offset any potential impact due to T13, would be to install a second Tetra transmitter (i.e. in addition to the existing Basestation), to serve the area to the southeast of the proposed development.

Should coverage issues arise during the operational phase of the wind farm, a suitable location within the wind farm site boundary could be selected for a secondary transmitter.

The Secondary Tetra transmitter (e.g. monopole, with electrical power supply, etc.) could be sited adjacent to one of the Rooaunalaghta turbines and would be positioned to provide optimal service coverage to the area southeast of the proposed development.

Section 6 – Conclusions

6. Conclusions

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

- One of the proposed turbines (T13) would be located within the 500 m Exclusion Zone (as specified by TETRA Ireland) of the existing TETRA basestation at Brodullagh South.

- Worst Case Scenario TETRA service coverage predictions indicate that there could be some degradation in TETRA signals in an area to the southeast of the proposed wind farm development, due to T13.

- Service Coverage predictions indicate that the impact of T13 is not expected to have any significant impact on TETRA service coverage in the area, as there are neighbouring basestations (e.g. Letir, LAC 9608) that provide good service coverage in the area.

- Field Survey findings also show that when signal reception from the Brodullagh South Basestation is excluded, there is still adequate TETRA coverage in the affected area from neighbouring basestations (LACs).

- From the findings of the field and desktop surveys, any degradation in TETRA service coverage due to turbines at the proposed development, would not be significant and would be offset by coverage from neighboring TETRA basestations.

In the unlikely event that T13 does impact TETRA service coverage in the Rooaunalaghta area, there are technically viable mitigation solutions available. These mitigation measures are described in Section 5 of this report and are based on previous experience and precedents of similar mitigation proposals being proposed and accepted. A suitable location for a relocated basestation (or secondary Tetra transmitter) can agreed at a post planning consent stage.

In the unlikely event that mitigation is required, the Applicant will be responsible for all costs associated with the mitigation measures set out. A protocol agreement will be put in place between the Applicant and TETRA Ireland, prior to the construction of the proposed wind farm to agree terms such as estate management, operator access, electricity supply etc.

Based on the implementation of either of the proposed mitigation measures outlined in this report it is considered that there will be no residual adverse effects on the existing Tetra infrastructure network as a result of the proposed wind farm.

APPENDIX

APPENDIX A – Rooaunalaghta Turbine Co-ordinates

The co-ordinates of the turbines considered in this TETRA Impact Study are provided in Table A-1 below.

Turbine ID	Co-ordinates (WGS 84)	
	Latitude	Longitude
T01	53° 29' 40.380"N	9° 9' 02.488"W
T02	53° 29' 45.267"N	9° 9' 26.926"W
T03	53° 29' 37.258"N	9° 9' 38.942"W
T04	53° 29' 47.509"N	9° 9' 44.517"W
T05	53° 30' 12.849"N	9° 8' 30.787"W
T06	53° 30' 20.076"N	9° 8' 45.110"W
T07	53° 30' 34.546"N	9° 8' 16.271"W
T08	53° 30' 29.243"N	9° 8' 01.861"W
T09	53° 30' 18.549"N	9° 8' 07.726"W
T10	53° 30' 15.548"N	9° 7' 48.673"W
T11	53° 30' 07.895"N	9° 7' 34.241"W
T12	53° 30' 17.579"N	9° 7' 17.256"W
T13	53° 30' 26.186"N	9° 7' 22.393"W

Table A-1 Rooaunalaghta Turbine Co-ordinates