

Appendix 18 - Telecommunications Impact Assessment



Bullawah Wind Farm Project

Telecommunications Impact Assessment



Client: Umwelt (Australia) Pty Ltd

Revision: 1

Project: Bullawah Wind Farm - Telecommunications Impact Assessment

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FINAL DRAFT



Revision control

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Executive Summary

Middleton Group Engineering (MGE) has been engaged by Umwelt (Australia) Pty Ltd to undertake a Telecommunication Impact Assessment (TIA) desktop study for the Bullawah Wind Farm Project (the Project), located approximately 36 km southeast of Hay, within the southwest Renewable Energy Zone. The Project Area is located within the Hay Shire, Murrumbidgee and Edward River Local Government Areas (LGAs).

The Project will include the installation, operation, maintenance and decommissioning of up to 143 wind turbine generators (WTGs), battery storage, ancillary infrastructure and temporary facilities associated with construction of the Project. The Project design incorporates up to 143 wind turbines, with a maximum blade-tip height of 300 m above ground level, and an installed capacity of up to 815.1 megawatts (MW).

Methodology

The study has been undertaken to address the telecommunications element of the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) for the Project (SSD-50505215), specifically to:

Identify possible effects on telecommunications systems, assess impacts and mitigation measures including undertaking a detailed assessment to examine the potential impacts as well as analysis and agreement on the implementation of suitable options to avoid potential disruptions to radio communication services, which may include the installation and maintenance of alternative sites;

Further, this study has been completed with due regard to the NSW Wind Energy Guidelines [1] and Clean Energy Council Best Practice Guidelines [2], to assess potential impacts of the Project on existing telecommunications and ensure the able of service is maintained.

This study assesses the impact of Bullawah Wind Farm on the following telecommunication services:

- Point-to-point microwave links;
- Meteorological radar;
- Mobile voice-based communications;
- Wireless and satellite internet services;
- Broadcast and digital radio;
- Broadcast, digital and satellite television;
- Trigonometry stations; and
- Global Positioning System (GPS).

MGE conducted an initial review the Australian Communications and Media Authority (ACMA) database for point-to-point links within a 150 km radius of the Project Area, in October 2023, and again in May 2024. One link was identified within two (2) km of the proposed WTGs.

Assessment Overview

The potential electromagnetic interference impact of the Project has been assessed. Based on analysis and consultation with key stakeholders, the Project will have no material impact on the telecommunication services listed above.

As detailed in this report, the Project has been designed, situated, and positioned to prevent, minimize, and address electromagnetic interference that could disrupt the pre-existing television, radar, and radio transmission and reception systems.

Key stakeholders have been contacted regarding potential electromagnetic interference impact on their services. Stakeholder responses have been collated and incorporated in Appendix B of this report.

Recommendations

The Project has been designed to avoid, minimise and mitigate any electromagnetic interference that could disrupt the pre-existing television, radar, and radio services.

Consistent with advice from the Bureau of Meteorology (BoM) regarding the Project, it is recommended that the Proponent:

- Informs the BoM of any changes in the wind farm, including varying the layout of the farm, changing the location of a turbine more than 100 m, or altering turbine height.
- Informs the BoM at least two (2) weeks before any planned shut-down of the wind farm (for maintenance or any other reason) so that the Bureau may calibrate its weather radar system.
- Collaborates with the BoM in the event of severe weather conditions to assist in matters of community safety.

To safeguard against potential future impacts, consultation with key stakeholders should occur and this study should be revised, if any design changes occur that have the potential to generate electromagnetic interference issues or impact telecommunication services.

If impacts were identified as a result of future design changes the following conceptual avoidance, minimisation and/or mitigation options may be considered:

- Modify the design to either relocate and/or remove wind turbines to avoid, minimise and/or mitigate any electromagnetic interference issues and telecommunications impacts.
- Monitoring telecommunications during construction, operational and/or decommissioning phases of the Project to confirm impacts.
- Modify telecommunications transmission paths around wind turbines.
- Modify existing telecommunications infrastructure to improve performance.

Where these options require future investigation, any interaction and/or cumulative impact as a result of the developments listed in this report (or any additional developments that have entered the public domain since) should be considered.

No further recommendations and/or safeguards are provided in this report.

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Abbreviations / Definitions

Table 1: Abbreviations

Abbreviation	Explanation
ACMA	Australian Communications and Media Authority
AM	Amplitude Modulation
BSL	Broadband Service Locator
BoM	Bureau of Meteorology
C/I	Carrier-to-interference ratio
D_a	Diameter of antenna physical aperture (m)
D_{nf}	Near-field clearance distance
DTV	Digital Television
EDM	Electronic Distance Measurement
EMI	Electro-Magnetic Interference
f	Frequency (GHz)
FM	Frequency Modulated
F_n	<i>n</i> th Fresnel Zone; also, F ₁ , F ₂ , etc.
G	Maximum (boresight) antenna gain (dBi)
GHz	Giga-Hertz – 1 billion Hertz
GIS	Geographic Information System
GNSS	Global Navigation Satellite System Networks
GPS	Global Positioning System
ICNIRP	International Commission on Non-Ionizing Radiation Protection
LoS	Line of Sight
MGE	Middleton Group Engineering
MHz	Mega-Hertz – 1 million Hertz
PO3	Performance Outcome 3
RPM	Revolutions per minute
REZ	Renewable Energy Zones
The Project	Bullawah Wind Farm
TIA	Telecommunication Interference Assessment
UHF	Ultra-High Frequency
WMO	World Meteorological Organization

Abbreviation	Explanation
WTG	Wind Turbine Generators
η	Antenna efficiency

1 Introduction

Middleton Group Engineering (MGE) has been engaged by Umwelt (Australia) Pty Ltd to undertake a Telecommunication Impact Assessment (TIA) desktop study for the Bullawah Wind Farm Project (the Project), located approximately 36 km southeast of Hay, within the southwest Renewable Energy Zone. The Project Area is located within the Hay Shire, Murrumbidgee and Edward River Local Government Areas (LGAs).

The Project will include the installation, operation, maintenance and decommissioning of up to 143 wind turbine generators (WTGs), battery storage, ancillary infrastructure and temporary facilities associated with construction of the Project. The Project design incorporates up to 143 wind turbines, with a maximum blade-tip height of 300 m above ground level, and an installed capacity of up to 815.1 megawatts (MW).

This study assesses the impact of Bullawah Wind Farm on the following telecommunication services:

- Point-to-point microwave links;
- Meteorological radar;
- Mobile voice-based communications;
- Wireless and satellite internet services;
- Broadcast and digital radio;
- Broadcast, digital and satellite television;
- Trigonometry stations; and
- Global Positioning System (GPS).

2 Scope

This TIA Study is a desktop study, mapping the WTG locations along with telecommunication services and evaluating the impact of the wind turbines on these services.

The study has been undertaken to address the telecommunications element of the NSW Planning Secretary's Environmental Assessment Requirements (SEARs) for the Project, specifically to:

Identify possible effects on telecommunications systems, assess impacts and mitigation measures including undertaking a detailed assessment to examine the potential impacts as well as analysis and agreement on the implementation of suitable options to avoid potential disruptions to radio communication services, which may include the installation and maintenance of alternative sites;

This TIA supports the overall Environmental Impact Statement (EIS) for the Project that has been prepared to address all matters discussed in the SEARs for the Project (SSD-50505215).

The study is confined to the analysis of publicly available information and consultation with key stakeholders.

2.1 Other Requirements

2.1.1 NSW Wind Energy Guidelines

The former NSW Department of Planning & Environment's Wind Energy Guideline [1] offers guidance to the community, industry and regulators on the planning framework for the assessment of large-scale wind energy development proposals, classed as State significant developments (SSDs). The guideline provides a brief overview of the considerations to be included in a telecommunication impact assessment, as follows:

"the consent authority will give consideration to the risk of electromagnetic interference with telecommunication services in the area, and the adequacy of the measures proposed to ensure the level of service is maintained"

This outline has been considered in MGE's methodology for the following report.

2.1.2 Clean Energy Council Best Practice Guidelines

The Clean Energy Council's Best Practice Guidelines [2] are designed to assist wind farm proponents, owners and operators in the planning, approval and operational phases of onshore wind farm projects. The Clean Energy Council provide an outline for the ideal scope, methodology and stakeholders for an EMI report.

"An assessment of the potential for communication and/or radar interference should be completed and should include discussion with communication system providers."

The Clean Energy Council defines the methodology of an EMI assessment as follows:

1. Identify all stakeholders potentially affected by the wind farm
2. Assess the potential EMI impacts
3. Consult with the relevant stakeholders
4. Mitigate against any potential EMI effects.

The scope of potential impacts of unmitigated electromagnetic interference from a wind farm are summarised as:

- The wind turbine tower may obstruct, reflect or refract the electromagnetic waves used in a range of communications systems for transmission
- The rotating blades may have similar effects, on a time variable basis. In some cases, ghosting of TV receivers close to the wind farm may occur where metal blades (or those with metallic cores or metal components such as the lightning protection system) act as an aerial to on-transmit the communication signal
- The wind turbine's electrical generator can produce electromagnetic interference, which may need to be suppressed by shielding design and maintenance of wind turbines (although in practice, a generator is little different from a typical electrical motor, and it is quite rare for a WTG to present such a problem).

As such the Clean Energy Council has established the following guidelines to determine whether a stakeholder is affected by the wind farm:

- A wind turbine is within two (2) km of a radiocommunications transmission site; or within two (2) km of a radiocommunications receiver and in line with the transmission site.
- A wind turbine is within the maximum second Fresnel zone of a point-to-point radio link.
- Aviation or meteorological radar operation can be affected by wind turbines. Even wind farms within 100 km of a radar installation may impact on its operation and this can depend on a number of factors including the type of radar used, distance from the radar installation, terrain, layout of the wind turbines and the size of the turbines. The owners of radar installations (e.g. the Bureau of Meteorology and Airservices) can generally assist in the assessment of the potential impact if required.

This report utilises these guidelines to analyse of the impact of the Project on the stakeholders and through similar methodology, assesses impacts (incorporating feedback from relevant stakeholders) and recommends mitigation where potential impacts to telecommunication services are identified.

3 Inputs

This assessment is based on stakeholder infrastructure specified in Table 2 and Table 3.

Table 2: Study Inputs – Project Infrastructure

Project Detail	Value
Wind turbine coordinates	Wind turbine layout received from Umwelt.
Wind turbine dimensions	Tip Height: Up to 300 m Hub Height: Up to 200 m Turbine Rotor Diameter: Up to 200 m

Table 3: Study Inputs – Stakeholder Infrastructure

Input	Source	Date Provided/Accessed
Dwellings coordinates	The Proponent	05.09.23
Point-to -point microwave links, mobile voice-based communication, and internet services	ACMA Site Location Map RFNSA Website	21.09.23
AM, FM, Digital Radio, Digital TV broadcasters	List of transmitters with a licence to broadcast	01.06.23
Meteorological Radar	NSW Radar Information	21.09.23
Survey Marks	NSW SCIMS	30.06.23
Trigonometrical Station and GPS	GNSS Network Map	21.09.23

3.1 Assumptions

This study has been developed on the following basis:

- The study is desktop only. No site visit or on-site ground-truthing has been conducted.
- Information, including the spatial location of items, antenna heights, emission frequencies and the like, as sourced from ACMA during October 2023 are correct. These sites were reviewed in May 2024 and there have been no changes to the ACMA inputs since this study was begun.
- While MGE checked information against satellite imagery, MGE has developed the report on the basis that information supplied by/through ACMA is correct, except where updated specifications were provided by a stakeholder.

4 Analysis

4.1 Project Overview

Key features of the Project design and nearby telecommunication services are shown in Figure 1.

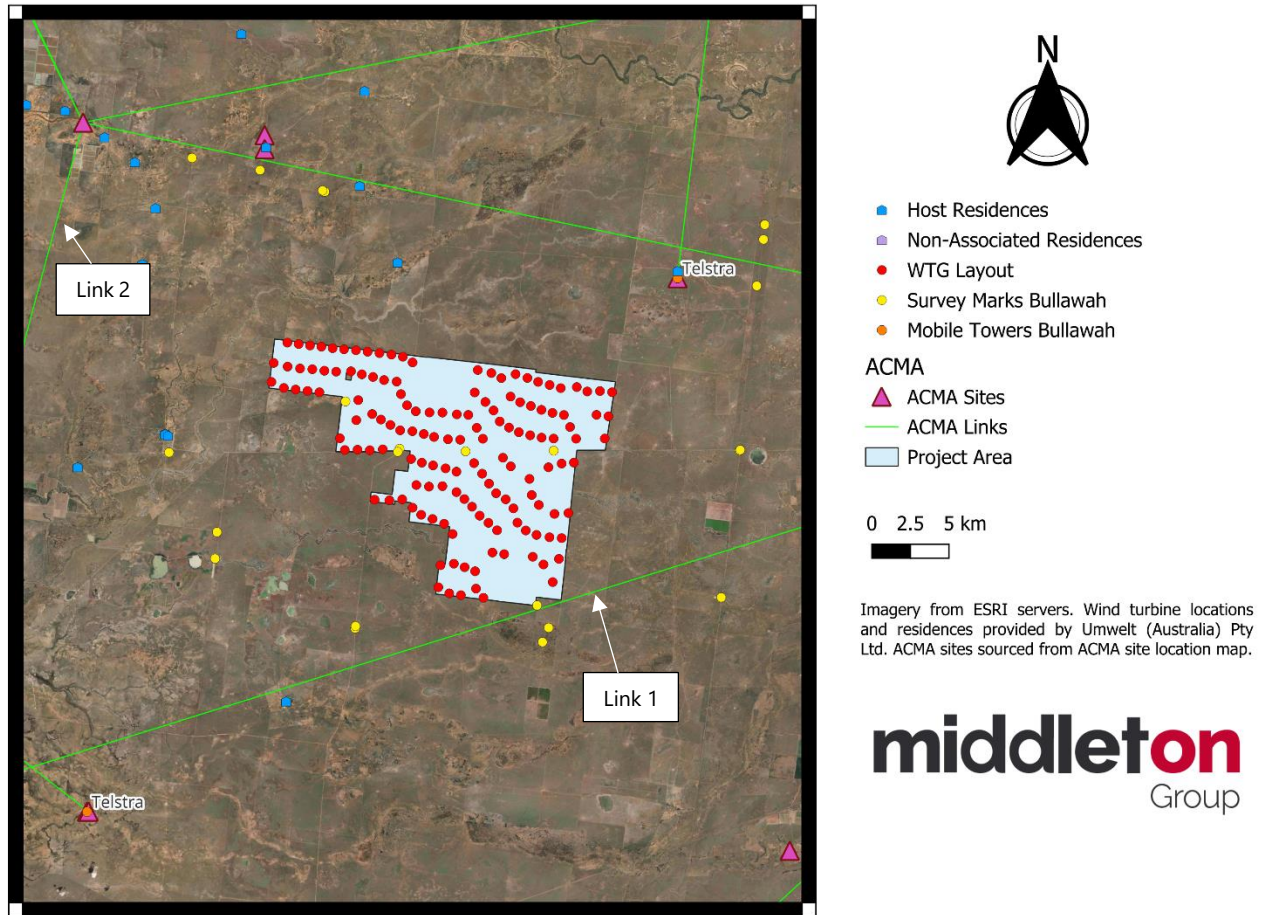


Figure 1: Wind turbine layout overlaid with telecommunication services.

4.2 Point-to-Point Links

WTGs have the potential to impact on point-to-point communication links through three mechanisms [3]:

1. Near field effects;
2. Diffraction; and
3. Reflection or scattering effects.

As can be seen in Figure 2, there is one (1) communication link (Link 1) found within a two (2) km buffer around the WTGs. Detailed information for this link is outlined in Table 4. In depth analysis of the link will be presented in the following subsections.

Stakeholder engagement with the New South Wales Telecommunications Authority was also conducted in relation to Link 2 at the request of Umwelt, though it is located outside the two (2) km buffer. The results of this engagement has been tabulated in Appendix O.

Through consultation with Telstra, however, a telephony link to a single customer was identified within the Project Area, and in close proximity to the proposed WTGs (i.e. within 150 m). This link is not registered with ACMA. While two (2) of the proposed WTGs encroach on this link, BWF has subsequently confirmed that this private link is a disused phone line servicing one (1) of the Project's Host landholders. The Host landholder has agreed to the cancellation of this service. On this basis, Telstra has confirmed it has no objection to the location of the proposed WTGs (refer to Appendix B.3). Accordingly, impacts to this link have not been assessed further in this report.

Discussion of near-field and reflection/scattering effects are presented in section 4.2.1 and section 4.2.2 respectively, with diffraction effects assessed in section 4.2.3 of this report.



Figure 2: WTGs, Project Area and ACMA communication sites with link assignments.

Table 4: Point-to-point link details.

Point-to-Point link number	BSL / Licence No	Site 1	Site 2	Length (km)	Frequency (MHz)	Owner
1	1207619/1	Murrumbidgee Shire Council 76.6 m Guyed Mast Argoon, off Kidman Way COLEAMBALLY ID: 402871	Essential Energy 35 m Lattice Tower 75 Warwillah Rd WANGANELLA ID: 35605	101	404.28	NSW Rural Fire Service
2	11300366/1	Transgrid 80 m Guyed Mast off 1494 Jerilderie Rd HAY SOUTH ID: 35103	NSWTA 100 m Guyed Mast 75 Warwillah Road WANGANELLA ID:10026558	46.3	7435	New South Wales Telecommunications Authority

4.2.1 Near-field effects

Near-field effects occur in the vicinity of the transmitter and receiver, typically being impacted by objects with inductive fields up to several hundred metres from the transmitter/receiver – though the precise impact is difficult to calculate.

As per Bacon [3] the near-field clearance distance, D_{nf} (m) can be calculated as follows:

For a dish or horn type of antenna:

$$D_{nf} = 10 \times \eta \times D_a^2 \times f$$

For any other type of antenna:

$$D_{nf} = 0.1 \times 10^{0.1G} / f$$

Where:

η = antenna efficiency

D_a = diameter of antenna physical aperture (m)

f = frequency (GHz)

G = maximum (boresight) antenna gain (dBi)

No WTGs are proposed or close to the ACMA (Australian Communications and Media Authority) towers at this time that could result in near-field effects.

4.2.2 Reflection/scattering effects

Reflection and scattering relate to the interference by an object that reflects the signal from the transmitter to the receiver. This process creates a longer path between the transmitter and receiver, which can cause undesirable temporal modulation. However, where the carrier to interference ratio, which is the ratio of the strength of the intended signal to the interference signal is sufficiently high, the performance will be unaffected. This threshold varies from site to site. Generally, impacts on signal will be negligible beyond two (2) km from a transmitter/receiver.

There are currently no transmitters/receivers within two (2) km of WTGs. Therefore, it is unlikely that the Project will cause any reflection and scattering effects on a communication site.

4.2.3 Diffraction effects

Diffraction is where an object modifies a wave, by obstructing its path of travel. Fresnel zones define an envelope of influence along the length of the ray line, whereby a rotating wind turbine could adversely impact the signal.

The radius of the n-th Fresnel Zone, F_n , of a point-to-point link of length D , at a distance d_1 from the transmitter (or receiver) is given by the following equation:

$$F_n = \sqrt{\frac{n\lambda d_1(D - d_1)}{D}}$$

The wavelength of the transmittal signal, λ , is calculated as c/f , where c is the speed of light in air and f is the frequency of the transmittal signal.

Obstacles within the 1st Fresnel Zone will adversely impact the signal, whereas, beyond the 1st Fresnel Zone the impact is reduced. More specifically, for odd values of n the Fresnel Zone is a region of constructive interference, whereas for even values of n the Fresnel Zone is a region of destructive interference [4].

In calculating the paths of the links and the relative impact of obstacles, it is important to account for the curvature of the earth and the height of any antennae, as available.

Some sources recommend a clearance threshold of 60% of the 1st Fresnel Zone Radius – in particular for ground clearance and the like [3]; this advice typically relates to 400 MHz links. However, a more conservative approach for wind turbines is often preferred – that is, maintaining a clearance of the full 1st Fresnel Zone, or, as recommended by Bacon [3], clearance of the full 2nd Fresnel Zone. The latter is typically required for GHz (higher frequency) links. In particular, for sub-GHz links, the impact of a wind turbine on the link will be a function of the carrier to interference ratio, C/I. In some instances, the presence of a wind turbine penetrating the 1st Fresnel Zone will have no material impact on the link; in other instances, the presence of the wind turbine may have an impact, and mitigation strategies may be required.

The maximum radii of the 1st and 2nd Fresnel Zones of the communication link is summarised in Table 5 for the link that passes through the proposed site.

As the second Fresnel zone of link 2 is over five (5) km from the turbine layout, the likelihood of any interference is considered to be very low. Consequently, only link 1 will be analysed in depth in this section.

Table 5: Fresnel zone for the point-to-point links.

Point to Point Link number	BSL/ Licence No	F ₁ Max (m)	F ₂ Max (m)
1	1207619/1	136.82	193.49

4.2.3.1 Link 1

NSW Rural Fire Service manages licence 1207619/1 which connects Site 1 (Murrumbidgee Shire Council 76.6m Guyed Mast Argoon, off Kidman Way COLEAMBALLY ID: 402871) to Site 2 (Essential Energy 35m Lattice Tower 75 Warwillah Rd WANGANELLA ID: 35605). The lowest frequency signal, 404.275 MHz, has been applied in this analysis.

Figure 3, below, shows Link 1 passing through the two (2) km buffer. No turbine contacts the link's maximum second Fresnel zone, with the closest turbine, 135, being 1.2 kilometres from the maximum 2nd Fresnel Zone.

Consequently, this assessment finds that the proposed WTGs are unlikely to cause telecommunication interference with Link 1.

Consultation with NSW Rural Fire Service (RFS) has confirmed this analysis. The RFS also confirmed that this link is no longer used (refer to Appendix B.5)



Figure 3: Link 1 passing through the Project Area.

4.3 Meteorological Radar

Meteorological radars detect rain and thunderstorm events, as well as other phenomena such as flocks of birds, smoke, or ash, which cause echoes to be visible. The Bureau of Meteorology's (BoM's) radars typically detect rain between 2.5 km to 3.5 km above the ground within a radius of 250 km, and in some instances, beyond. Some wind farms are visible to meteorological radars, registering as static echoes.

Details of specific radars and corresponding coverage maps are available online from <http://www.bom.gov.au/australia/radar/index.shtml>.

The World Meteorological Organisation (WMO) recommends that wind turbines are sited, at a minimum, beyond five (5) km from meteorological radars, and preferably beyond 20 km [5]. The Operational Programme for the Exchange of Weather Radar Information (OPERA), the radar programme of European Meteorological Services Network (EUMETNET) state that no wind turbine should be deployed within five (5) km radius of C-band radars and ten (10) km radius of S-band radars. An impact study should be submitted if the wind turbines are sited within 20 km radius of C-band radars and 30 km radius of S-band radars [6].

Figure 4 demonstrates the location of the Meteorological radars in relation to the Project Area. The details of the closest three (3) weather radars are outlined in Table 6.



Figure 4: Meteorological Radar

Table 6: Meteorological Radar Information

Weather Radar Name	Coordinate	Radar type	Distance to Bullawah Wind Farm Project Area
Yarrawonga	36.03° S, 146.03° E	WSR 81C C-Band	139.69 km
Hillston	33.55° S, 145.52°E	Meteor 735CDP C-Band	141.58 km
Wagga Wagga	35.17° S, 147.47° E	WF 100 C-Band	199.46 km

The Project complies with WMO standards based on distance setbacks from the various meteorological radars in the region. Furthermore, there is excellent coverage from the three (3) radars within 250 km of the wind farm, giving good visibility of weather events in that region. As such, the Project is unlikely to cause adverse performance of the radars during extreme weather events.

Consistent with BoM advice regarding the Project, it is recommended that the Proponent:

- Informs the BoM of any changes in the wind farm, including varying the layout of the farm, changing the location of a turbine more than 100 m, or altering turbine height
- Informs the BoM at least two (2) weeks before any planned shut-down of the wind farm (for maintenance or any other reason) so that the Bureau may calibrate its weather radar system
- Collaborates with the BoM in the event of severe weather conditions to assist in matters of community safety.

4.4 Mobile Voice-Based Communications

4.4.1 Mobile Coverage – Nearby Towers

There are no mobile phone base stations located within the five (5) km buffer of the WTGs as shown in Figure 5. Typically, the signal will not be significantly impacted where the towers are located more than one (1) km from WTGs.

It is unlikely that the Project will cause any significant impact on the operation of mobile phone base stations. Consultation and engagement with Telstra with respect to the impact on their mobile telemetry services is currently under way.

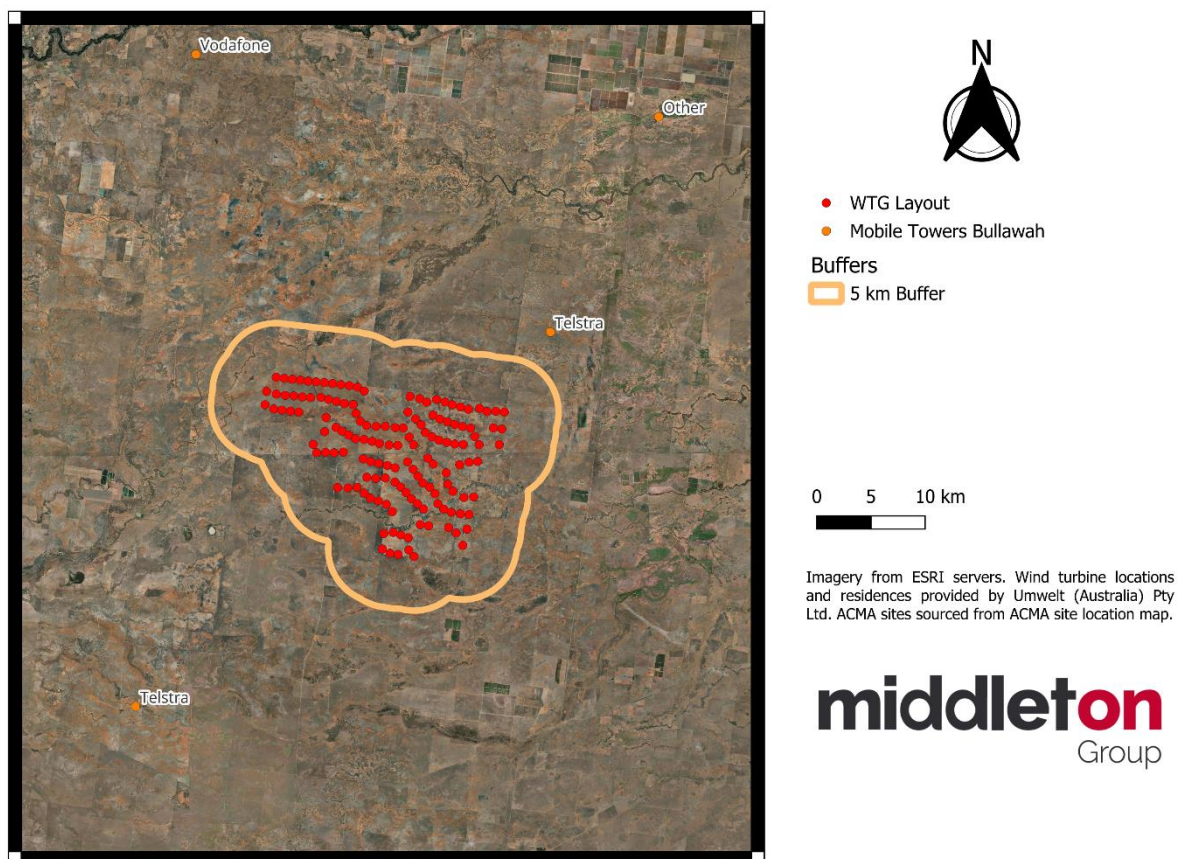


Figure 5: Proximity of the Project to mobile phone base stations.

4.4.2 Mobile Coverage – General

The mobile network coverage maps of Optus and Telstra within the region are shown in Figure 6 and Figure 7 respectively. It is noted that there are some mobile network services provided by Telstra and Optus in the vicinity of the Project.

In the immediate vicinity of the WTGs, some reduction in signal may occur. However, this can be mitigated by relocating the mobile phone receiver in the order of tens of metres. Beyond the Project Area, there will not be any significant impact on the signal.

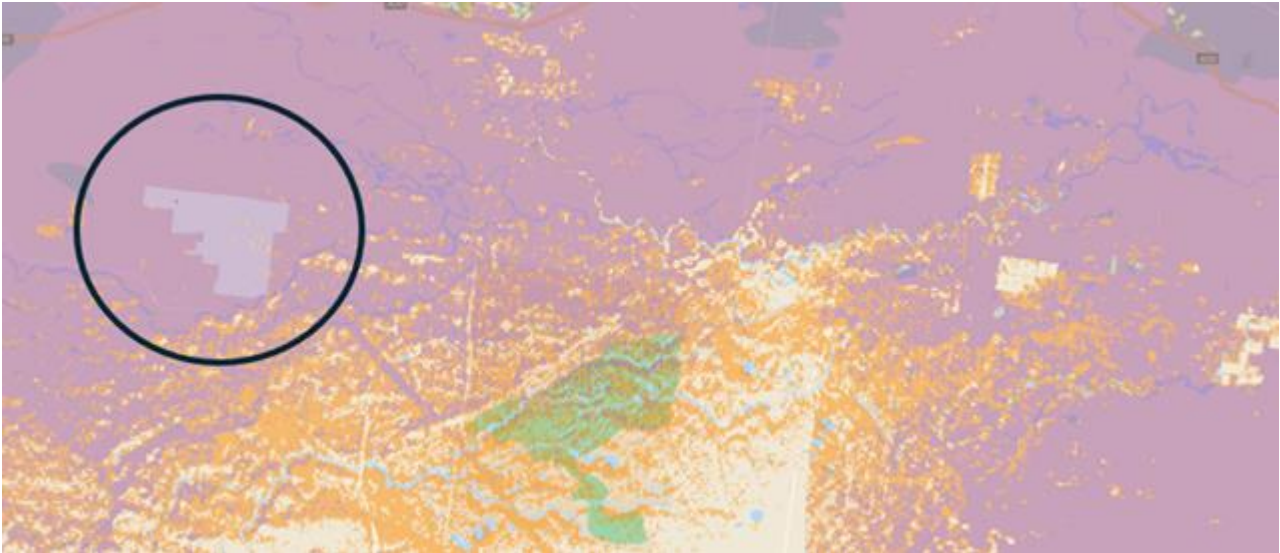


Figure 6: Optus network coverage map of Bullawah Wind Farm.

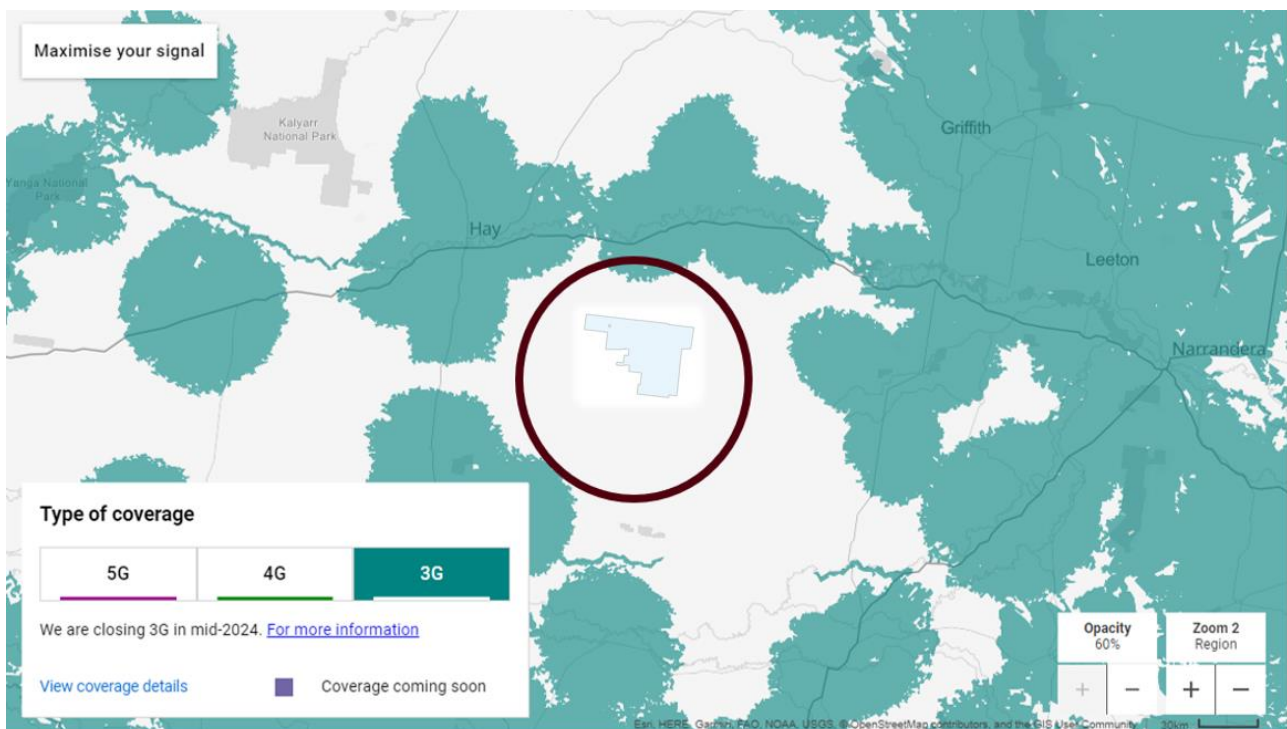


Figure 7: Telstra network coverage map of Bullawah Wind Farm.

4.5 Wireless and Satellite Services

Satellite services will only be impacted where receivers are sited in extremely close proximity to turbines, impeding their view of the sky. These satellites typically provide pay-tv, wireless internet, and satellite phone coverage, as well as TV coverage where there is no terrestrial service available.

As shown in Figure 8 there are four (4) residences within two (2) km of WTGs. Of these, three (3) are Host residences (being R1, R2 and R3), and as such, any potential impacts to their satellite services are addressed by agreements with the involved landholders.

The fourth residence, R4 is an associated residence which is currently uninhabited, and it is understood that there are no plans to re-occupy the residence in the foreseeable future. As such, there is no anticipated need for satellite services at this location. However, should this change, BWF has committed to investigate reasonable and feasible options to provide or boost satellite services to the residence. This would occur in consultation with the landowner and at BWF's cost. Alternatively, BWF would seek to update the private agreement with this associated residence to reflect any impacts to satellite services.

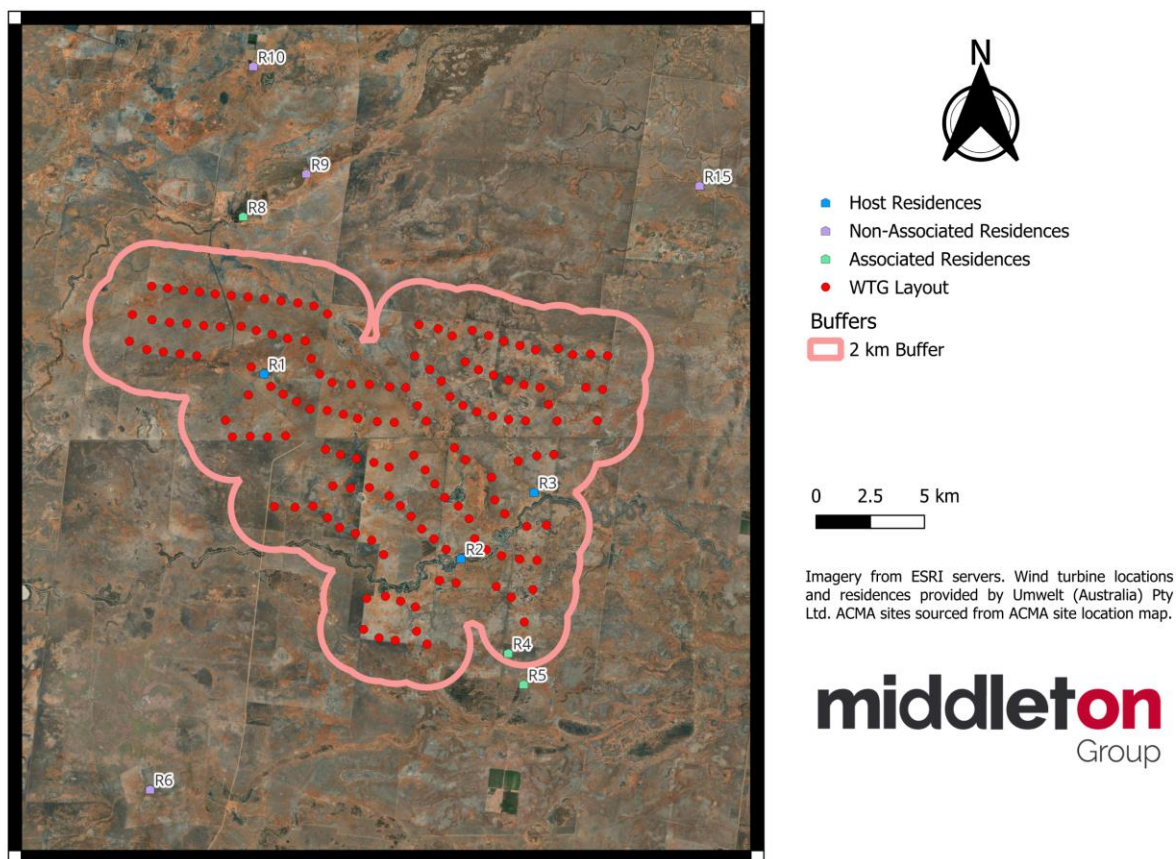


Figure 8: Residences located nearby the Project.

4.6 Trigonometrical Stations and GPS

4.6.1 Survey Marks

Trigonometrical stations and survey marks are observation marks used for surveying or distance measuring purposes. GPS antennas and Electronic Distance Measuring (EDM) devices may be installed at some Trigonometrical stations.

The performance of the EDM devices depends on the type of wavelength bands used. The current EDM devices operate by using three (3) different electromagnetic wavelengths: microwave, infrared, and the visible light spectrum. Microwave systems have a measurement range of up to 150 km and are not limited to line of sight or visibility. The infrared systems and light wave systems can measure a range of three (3) to five (5) km, but accuracy may be limited by the line of sight or visibility [6]. If a line-of-sight blockage occurs, moving laterally one (1) to two (2) metres will typically alleviate the line-of-sight blockage. In addition, the presence of WTGs will typically assist with sight navigation, providing fixed reference points.



Figure 9: Survey marks within the Project Area.

A review of the location of all survey marks has been completed, and the findings are summarised as follows:

- There is no proposed WTG location that shares the same location as a survey mark.
- The closest distance between a survey mark and a WTG (WTG 38) is approximately 407 m, as shown in Figure 9. Site works will need to be designed to avoid the survey mark, or, alternatively, seek assistance from a registered surveyor to move or remove the survey marks.

Project construction may physically impact these survey marks. If this is likely to occur the project Proponent should consult with the New South Wales Government via the following website:

<https://www.spatial.nsw.gov.au/contact-us/head-office>.

As stated above, assistance from a registered surveyor may be required.

4.6.2 GNSS Stations

Global Navigation Satellite System (GNSS) networks are operated and maintained across the Australian region and the South Pacific. This includes the Australian Regional GNSS Network (ARGN), the South Pacific Regional GNSS Network (SPRGN) and the AuScope Network. GNSS networks provide the geodetic framework for the spatial data infrastructure in Australia and its territories. Data from the GNSS Network also contributes to the International GNSS Service (IGS).

Based on the GNSS network map provided by Geoscience Australia [7], the electromagnetic interference impact of the Project to the GNSS stations has been analysed. Figure 10 demonstrates that there is no GNSS stations within 30 km of the proposed WTGs. The closest GNSS station, HAY1 is 39 km away from the nearest wind turbine. The next closest GNSS stations, COLE and JERI are 51 km and 63 km away from the nearest wind turbines, respectively.

As all the GNSS stations are outside the 30 km buffer, it is highly unlikely that the Project will impact on the GNSS networks.

Consultation with Geoscience Australia is currently under way to ensure no impact is expected on their services.

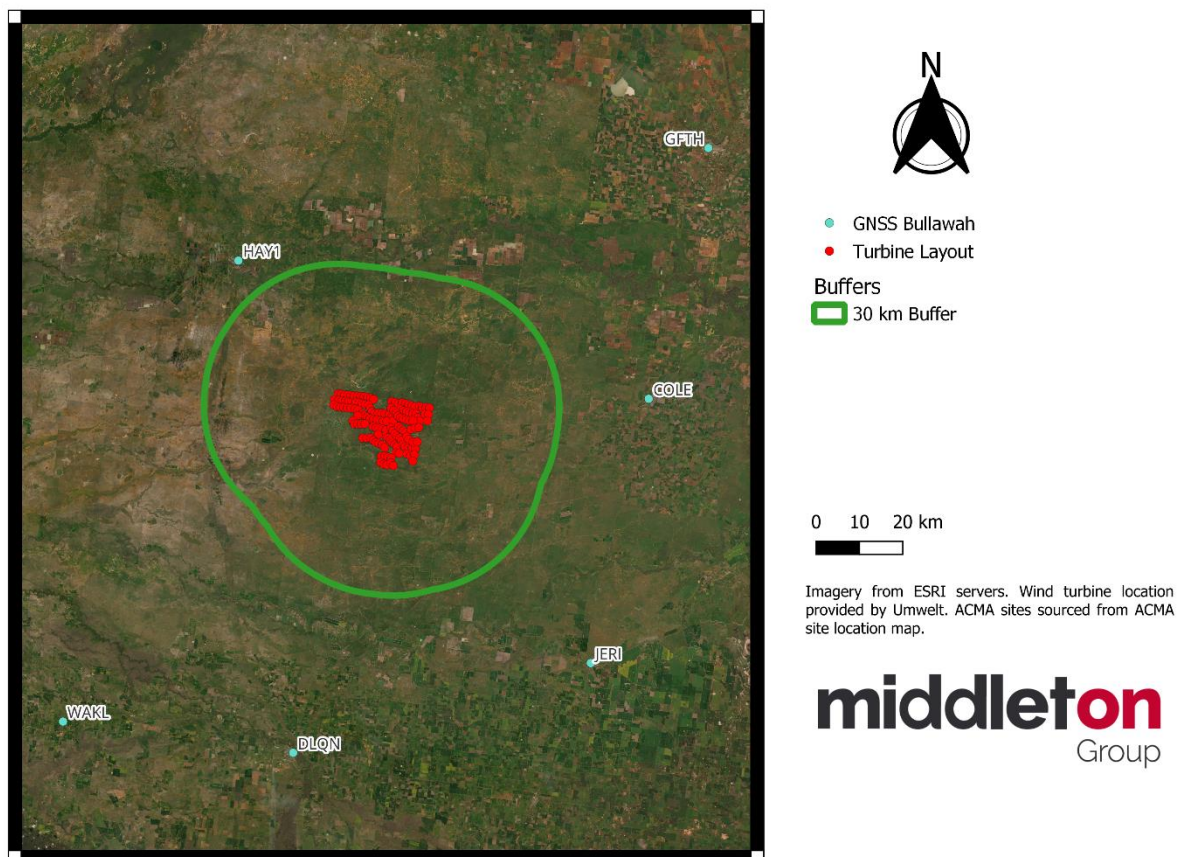


Figure 10: GNSS station locations relative to WTG layout.

4.7 Broadcast, Digital Radio and Television

Amplitude Modulation (AM) signals are long wave radio signals. Operating WTGs can influence the radiating patterns, with the potential to result in reduced signal quality and strength, as well as causing interference at neighbouring frequencies. A two (2) km radius consultation zone exists around AM transmitters. The field of influence from the receiver's perspective is in the order of tens of metres.

Frequency modulated (FM) signals tend to be more robust around obstructions such as buildings and wind farms. At the edge of their transmission range, where the signal to noise ratio is already quite low, wind turbines can have an adverse influence on the signal. A one (1) km radius consultation zone exists around FM radio transmitters.

Digital signals tend to be more robust than analogue signals. A two (2) km radius is generally desirable around transmitters – for both digital radio and Digital Television (DTV). Digital signals are more robust against ghosting, though wind turbine rotor pass can cause signal frequency variation.

As can be seen in Figure 11, no AM, FM, DTV, or Temporary Licence transmitters are located within 30 km of a WTG. No digital radio transmitters were identified in the vicinity of the Project Area.

If issues are encountered with television reception, this is most readily mitigated by readjusting the receptor, to capture signal from an alternative transmitter.

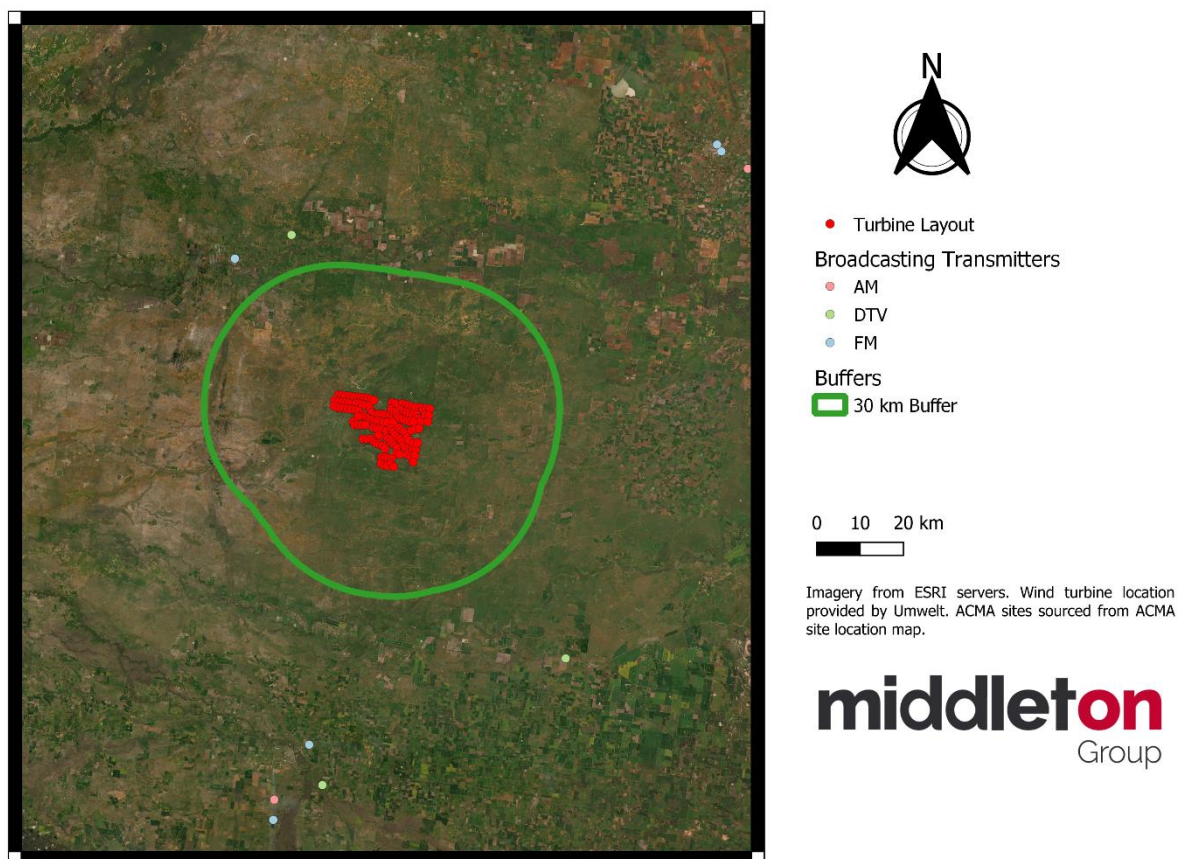


Figure 11: Location of broadcast transmitters relative to the WTG layout.

4.8 Cumulative Impacts

NSW Government – EnergyCo seeks to maximise opportunities created by the transformation of the NSW electricity system by coordinating investment in Renewable Energy Zones (REZs) across NSW. A REZ is the equivalent of modern-day power stations, combining new renewable energy infrastructure, including generators (such as solar and wind farms), storage (such as batteries and pumped hydro) and then high-voltage transmission infrastructure. Five (5) dedicated REZs have already been identified in NSW.

The Project is located wholly within the southwest REZ.

Because of this, and the REZ benefits anticipated by NSW Government – EnergyCo, the southwest REZ has the potential to see strong interest for renewable energy development.

Based on information available within the public domain, specifically the NSW Government – Major Projects website, the following developments are identified in the vicinity of the Project:

- Pottinger Solar Farm (SSD-59254709)
- Pottinger Wind Farm (SSD-59235464)
- Dinawan Wind Farm (SSD-50725708)
- Dinawan Solar Farm (SSD-50725959)
- Argoon Wind Farm (SSD-64935522)
- Yanco Delta Wind Farm (SSD-41743746)
- The Plains Wind Farm (SSD-50629707)
- The Plains Solar Farm (SSD-51219280)
- Romani Solar Farm (SSD-67105475)
- Hay Solar Farm (SSD-8113)
- Tchelery Wind Farm (SSD-59701722).

Based on the proximity of the above-mentioned developments to the Project, and the limited potential for interactions to occur with respect to electromagnetic interference to telecommunication services, cumulative impacts are considered highly unlikely to occur.

It is noted that because of the development activity in the southwest REZ the above list may not address all potential site being privately developed and not yet in the public domain. Information pertaining to any developments not yet in the public domain is therefore unavailable and excluded for this study.

5 Stakeholder Engagement

Consultation and engagement with stakeholders have been initiated by MGE or the Proponent. A list of key stakeholders is presented in Table 7. Responses from these stakeholders have been provided in Appendix B.

Geoscience Australia have not provided a response.

A summary of the stakeholder engagement is listed below:

Table 7: List of stakeholder engagement

Stakeholder	Impact	Responses
Bureau of Meteorology	Meteorological radar operations	No impact with conditions to mitigate
Geoscience Australia	Survey Marks, GNSS Towers and Trigonometrical infrastructure	Waiting for response
Telstra	Mobile service operation	No impact
Optus	Mobile service operation	No impact
NSW Rural Fire Service	ACMA Link	No impact
New South Wales Government Telecommunications Authority	ACMA Link	No impact

6 Recommendations

The Project design has avoided, minimised and mitigated electromagnetic interference that could disrupt the pre-existing television, radar, and radio transmission and reception systems, and electromagnetic interference to pre-existing television, radar and radio transmission and reception.

Consistent with BoM advice regarding the Project, it is recommended that the Proponent:

- informs the BoM of any changes in the wind farm, including varying the layout of the farm, changing the location of a turbine more than 100 m, or altering turbine height
- informs the BoM at least two (2) weeks before any planned shut-down of the wind farm (for maintenance or any other reason) so that the Bureau may calibrate its weather radar system
- collaborates with the BoM in the event of severe weather conditions to assist in matters of community safety.

To safeguard against potential future impacts, consultation with key stakeholders should occur, and this study should be revised, if any design changes occur that have the potential to generate electromagnetic interference issues or telecommunications impacts.

If impacts were identified as a result of any future design changes the following conceptual avoidance, minimisation and/or mitigation options may be considered:

- Modify the design to either relocate and/or remove wind turbines to avoid, minimise and/or mitigate any electromagnetic interference issues and telecommunications impacts.
- Monitoring telecommunications during construction, operational and/or decommissioning phases of the Project to confirm impacts.
- Modify telecommunications transmission paths around wind turbines.
- Modify existing telecommunications infrastructure to improve performance.

Where these options require future investigation, any interaction and/or cumulative impact as a result of the developments listed in section 4.8 (or any additional developments that have entered the public domain since) should be considered.

No further recommendations and/or safeguards are provided in this report.

7 Conclusion

The potential electromagnetic interference impact of the Project has been assessed in this report.

Based on analysis and consultation with key stakeholders, the Project will have no material impact on:

- Point-to-point microwave links;
- Meteorological radar;
- Mobile voice-based communications;
- Wireless and satellite internet services;
- Broadcast and digital radio;
- Broadcast, digital and satellite television;
- Trigonometry stations; and
- Global Positioning System (GPS).

According to MGE's assessments, the Project is strategically designed and positioned to prevent or mitigate electromagnetic interference that may disrupt existing television, radar, and radio transmission and reception systems.

Key stakeholders have been contacted regarding potential electromagnetic interference impact on their services. Stakeholder correspondence is being steadily collated and will be incorporated in later revisions of this report.

Appendix A References

- [1] NSW Government : Planning and Environment, "Wind Energy Guideline," December 2016. [Online]. Available: https://www.energy.nsw.gov.au/sites/default/files/2022-08/2016_12_NSW_WindEnergyGuideline_StateSignificantWindEnergyDevelopment.pdf.
- [2] Clean Energy Council, "Best Practice Guidelines," June 2018. [Online]. Available: <https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/wind-best-practice-implementation-guidelines.pdf>.
- [3] D. Bacon, "Fixed-link wind-turbine exclusion zone method," Radiocommunications Agency UK, 2002.
- [4] G. Durgin, "The Practical Behavior of Various Edge-Diffraction Formulas," *IEEE Antennas and Propagation Magazine*, vol. 51, no. 3, pp. 24-35, 2009.
- [5] Commission for Instruments and Methods of Observation, "WMO Guidance Paper on Weather Radar/Wind Turbine Siting," World Meteorological Organisation, Helsinki, 2010.
- [6] Satheesh Gopi, R. Sathikumar, N. Madhu, "8.3 EDM Instrument Characteristics," in *Advanced Surveying: Total Station, Gis and Remote Sensing*, Pearson, 2006.
- [7] G. Australia, "GNSS Network Map," Geoscience Australia, [Online]. Available: <https://gnss.ga.gov.au/network>. [Accessed 25 05 2021].
- [9] O. Il, "Impact of Wind Turbines on Weather Radars," 2006.

Appendix B Stakeholder Correspondence

B.1 Geoscience Australia Correspondence

Geoscience Australia have not provided a response.

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Friday, May 3, 2024 11:18 AM
To: Client Services <ClientServices@ga.gov.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>; Ryan Ruddick <Ryan.Ruddick@ga.gov.au>; Amy Peterson <Amy.Peterson@ga.gov.au>
Subject: RE: Bullawah Wind Farm - Geoscience Australia Consultation

Hi All,

Just following up to see when we can expect to receive a response to this enquiry.

Warm Regards,
Ebony Apps | middleton Group
M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au
Level 4, 59 Goulburn St, Haymarket NSW 2000



From: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Sent: Friday, April 12, 2024 7:58 AM
To: Ebony Apps <Ebony.apps@middletongroup.com.au>; Client Services <ClientServices@ga.gov.au>
Subject: RE: Bullawah Wind Farm - Geoscience Australia Consultation

Hi,

Can we please get an update on the below request as soon as possible.

Thank you

Ramez Barakat
Electrical Engineer
M: +61 488 088 605 | **E:** ramez.barakat@middletongroup.com.au
Level 4, 59 Goulburn St, Haymarket NSW 2000 **W:** www.middletongroup.com.au

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 11:57 AM
To: Client Services <ClientServices@ga.gov.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: Bullawah Wind Farm - Geoscience Australia Consultation

To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith. Our consultation particularly relates to potential impact on survey marks and GNSS stations.

We note that all installations on the wind farm will comply with the Radiocommunications Act (1992) and associated notices.

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv, .kml and .shp format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If Geoscience Australia have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards,

Ebony Apps | middleton Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000

B.2 Optus Correspondence

From: EME Enquiries <emeenquiries@optus.com.au>
Sent: Thursday, February 15, 2024 9:20 AM
To: Ebony Apps <Ebony.apps@middletongroup.com.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: RE: Bullawah Wind Farm - Optus Consultation

Hi Ebony,

Thanks for your email. Our technical team has reviewed this proposal and advised not interference issues with Optus equipment.

Kind regards,

Yadira Narvaez

Community Manager | Mobile Deployment | Networks | Optus

M: 0411286005

727 Collins Street, Melbourne 3000, Australia

Yadira.Narvaez@optus.com.au



OPTUS

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Optus acknowledges the Traditional Owners and Custodians of the lands on which we live, work, and serve. We celebrate the oldest living culture and its unbroken history of storytelling and communication. We pay our respect to Elders – past, present, and future – and we strive together to embrace an optimistic outlook for our future in harmony, across all of Australia and for all of its people

This email may be confidential. If you received it accidentally, please do not send it to anyone else, delete it and let the sender know straight away.

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 11:57 AM
To: EME Enquiries <emeenquiries@optus.com.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: Bullawah Wind Farm - Optus Consultation

Document name: Bullawah Wind Farm Project
Document no: 23048-E-RPT-0001
Revision no: 1

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To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith.

We note that all installations on the wind farm will comply with the Radiocommunications Act (1992) and associated notices.

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv, .shp and .kml format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If Optus have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards

Ebony Apps | middleton Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000



B.3 Telstra Correspondence

Hi Mike,

As discussed, if the telephony service is formally cancelled, Telstra would have no objection to the positions of wind turbines T67 and T120 and as such would not require them relocated.

Regards,

David Jonas

Senior Chapter Lead
Fixed Access Planning WA, SA & NT
Connectivity Engineering
Global Networks & Technology



Flow to Work – CAN Reliability Team

P 0862246268
M 0438934894
E David.Jonas@team.telstra.com
W www.telstra.com

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General

From: Michael Peters <Michael.Peters@baywa-re.com>
Sent: Friday, May 24, 2024 4:50 PM
To: Jonas, David <david.jonas@team.telstra.com>
Cc: Aidan O'Mahony <Aidan.OMahony@baywa-re.com>
Subject: RE: Bullawah Wind Farm

You don't often get email from michael.peters@baywa-re.com. [Learn why this is important](#)

[External Email] This email was sent from outside the organisation – be cautious, particularly with links and attachments.

Hi David,

Thank you for the response and update.

As discussed, the landowner of the property has agreed to cancel the telephony service.

Could you please confirm that following cancellation of the service by the landowner, at that time Telstra would have no objection to the proposed positioning of the turbines and would no longer request they are relocated as per Item 2 of the response (attached and below).

- 2) Based on the turbine locations provided one of our customer radio paths, which provides a telephony service to a single customer, is impacted:

- Singorimbah (-34.753261 145.374158) to Epsom Downs (-34.8755420 145.2874580), 1500 MHz

Turbines T67 and T120 encroach* on this radio path (please see Figure 1. below). It is requested that these turbines be relocated to at least 150 m from the turbine blade extent to the radio path.

*The criteria used for encroachment (and therefore clearance): The 1st and 2nd Fresnel zones of the radio path must be free from obstructions.

With thanks,

Mike

Michael Peters

Project Development Manager



BayWa r.e. Projects Australia Pty Ltd

Suite 1, Level 13, 356 Collins Street, Melbourne, 3000

Document name: Bullawah Wind Farm Project
Document no: 23048-E-RPT-0001
Revision no: 1

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Melbourne | Sydney | Brisbane | Hay

M +61 414 919 507

michael.peters@baywa-re.com

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Managing Directors: Daniel Gaefke, Durmus Yildiz

Commercial Register: Australian Securities and Investment Commission (ASIC) ACN 606 343 757

General

From: Jonas, David <david.jonas@team.telstra.com>
Sent: Thursday, May 23, 2024 7:20 PM
To: Michael Peters <Michael.Peters@baywa-re.com>
Cc: Aidan O'Mahony <Aidan.OMahony@baywa-re.com>
Subject: RE: Bullawah Wind Farm

Hi Mike,

No worries and thanks.

Please find attached the updated letter as requested.

If you have any further queries please do not hesitate to get back to me.

Regards,

David Jonas

Senior Chapter Lead
Fixed Access Planning WA, SA & NT
Connectivity Engineering

Document name: Bullawah Wind Farm Project
Document no: 23048-E-RPT-0001
Revision no: 1

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P 08 6224 6268
M 0438 934 894
E David.Jonas@team.telstra.com
W www.telstra.com

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General

From: Michael Peters <Michael.Peters@baywa-re.com>
Sent: Thursday, May 23, 2024 11:50 AM
To: Jonas, David <david.jonas@team.telstra.com>
Cc: Aidan O'Mahony <Aidan.OMahony@baywa-re.com>
Subject: RE: Bullewah Wind Farm

You don't often get email from michael.peters@baywa-re.com. [Learn why this is important](#)

[External Email] This email was sent from outside the organisation – be cautious, particularly with links and attachments.

Hi David,

Thanks for your time and assistance.

Apologies, realised I hadn't passed on my contact details - michael.peters@baywa-re.com

As discussed, if you could please update item 2) of the attached letter to confirm that the impacted radio path is a 'telephone line' for one property that would be much appreciated.

With thanks,

Document name: Bullawah Wind Farm Project
Document no: 23048-E-RPT-0001
Revision no: 1

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Mike Peters

Michael Peters

Project Development Manager



BayWa r.e. Projects Australia Pty Ltd

Suite 1, Level 13, 356 Collins Street, Melbourne, 3000

Melbourne | Sydney | Brisbane | Hay

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michael.peters@baywa-re.com

www.baywa-re.com.au

Join us on     



BayWa r.e. Australia acknowledges the First Peoples as Traditional Custodians of the land, water, sea and sky.

We pay our respect to all Aboriginal and Torres Strait Islander people and to Elders past, present and emerging.

From: Windfarm Assessment Requests <WindfarmAssessmentRequests@team.telstra.com>
Sent: Friday, May 24, 2024 5:18 PM
To: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Cc: Ebony Apps <Ebony.apps@middletongroup.com.au>; Eric Bendtsen <eric.bendtsen@middletongroup.com.au>; Nathan Baker <nbaker@umwelt.com.au>; Lauren Evans <LEvans@umwelt.com.au>
Subject: RE: Bullawah Wind Farm - Telstra Consultation

Hi Ramez,

No worries.

In answer to your questions:

- Can you please indicate the basis of the 150 m buffer on the analysis from Telstra. The usual approach we follow is clearance of the 2nd maximum Fresnel zone, in this case 39.62 m.
[As we are only undertaking a desktop assessment, we use a 150 m buffer to account for any geospatial errors in the coordinates used.](#)
- We'd like to seek clarification whether the tower itself needs to be considered as an obstacle
[The tower should be treated as an obstacle if it lies within the 1st or 2nd Fresnel zone of the radio path. In the case of turbine WTG 120, the tower is an obstacle as it not only lies within the 1st Fresnel zone of the radio path it also lies directly on the radio path i.e. it would completely block the radio signal.](#)

Further comments on your findings.

We do take a conservative approach to these assessments as they are only desktop studies. Having wind turbines operating above the radio path is not ideal. We would prefer a 150 m separation between the radio path and the blade and tower extents both horizontally and vertically.

I have already spoken to the proponent and I am happy to discuss our response with the proponent and yourselves via MS Teams or a tele-conference. Please give me a call and we can arrange a suitable time.

Regards,
David Jonas
Senior Chapter Lead
Fixed Access Planning WA, SA & NT
Connectivity Engineering
Global Networks & Technology



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P 08 6224 6268
M 0438 934 894
E David.Jonas@team.telstra.com
W www.telstra.com

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From: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Sent: Wednesday, May 22, 2024 2:08 PM
To: ! Windfarm Assessment Requests <WindfarmAssessmentRequests@team.telstra.com>
Cc: Ebony Apps <Ebony.apps@middletongroup.com.au>; Eric Bendtsen <eric.bendtsen@middletongroup.com.au>; Nathan Baker <nbaker@umwelt.com.au>; Lauren Evans <LEvans@umwelt.com.au>
Subject: RE: Bullawah Wind Farm - Telstra Consultation
Importance: High

Hi David,

Thank you for the response letter.

After a conversation with our partners at Umwelt (CC'd), we'd like to clarify some points. If we can avoid relocating WTG positions at this stage of the design it would be preferred.

Just a quite note can you confirm:

- Can you please indicate the basis of the 150 m buffer on the analysis from Telstra. The usual approach we follow is clearance of the 2nd maximum Fresnel zone, in this case 39.62 m.
- We'd like to seek clarification whether the tower itself needs to be considered as an obstacle.

We've ran some 3D analysis on the link looking at the elevation profile of the project boundary. I've attached some figures for your reference.

Link details as follows:

- Length: 15.712 km – based on point-to-point line between coordinates provided by Telstra.
- Frequency: 1500 MHz
- Intersecting turbines: 2 (WTG 67 and WTG 120)
- Maximum 1st Fresnel Zone: 28 m
- Maximum 2nd Fresnel Zone: 39.62 m

Our findings:

- WTG67: The Telstra CAN link passes within the vicinity of WTG 67 in the horizontal plane. However, the analysis above (cross-section figures) show that the link is below the WTG rotors vertically. The furthest extent of the rotor and the edge of the 2nd Max Fresnel zone is shown as 50 m in the cross-sectional view above. There is no indication that this link will be affected by WTG 67.
- WTG 120: The link will not be affected by WTG 120's rotors (similar reason as above). The furthest extent of the rotor and the edge of the 2nd Max Fresnel zone is shown as 40 m in the cross-sectional view above. There is a possibility that the tower itself may interfere with this signal.

Lastly, please note that infrastructure associated with the southern part of the link is actually situated on a host landholder's property i.e. a person who is proposed to have wind turbines on their lands. As such the proponent (BayWa r.e.) would like to discuss this matter with Telstra directly to understand the link and options available to mitigate the issue. We have passed on you contact details but a tele-conference between us and BayWa r.e. may also be beneficial to address this efficiently. Please advise some suitable time slots and we'll co-ordinate that.

Many thanks

Ramez Barakat

Electrical Engineer

M: +61 481 088 605 | **E:** ramez.barakat@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000 **W:** www.middletongroup.com.au



10 May 2024

Ebony Apps
middleton Group
Sydney NSW 2000

Re: Proposed Bullawah Wind Farm

Dear Ebony,

To provide a better understanding of potential impacts to Telstra infrastructure a desktop assessment was undertaken. Based on this assessment, to minimise potential interference to Telstra's telecommunications network, Telstra requires the developer to confirm its agreement to the conditions and matters set out below:

- 1) There are no expected impacts to Telstra's Mobile network due to this wind farm based on the turbine locations provided.
- 2) Based on the turbine locations provided one of our customer radio paths is impacted:
 - Singorimbah (-34.753261 145.374158) to Epsom Downs (-34.8755420 145.2874580), 1500 MHz

Turbines T67 and T120 encroach* on this radio path (please see Figure 1. below). It is requested that these turbines be relocated to at least 150 m from the turbine blade extent to the radio path.

*The criteria used for encroachment (and therefore clearance): The 1st and 2nd Fresnel zones of the radio path must be free from obstructions.

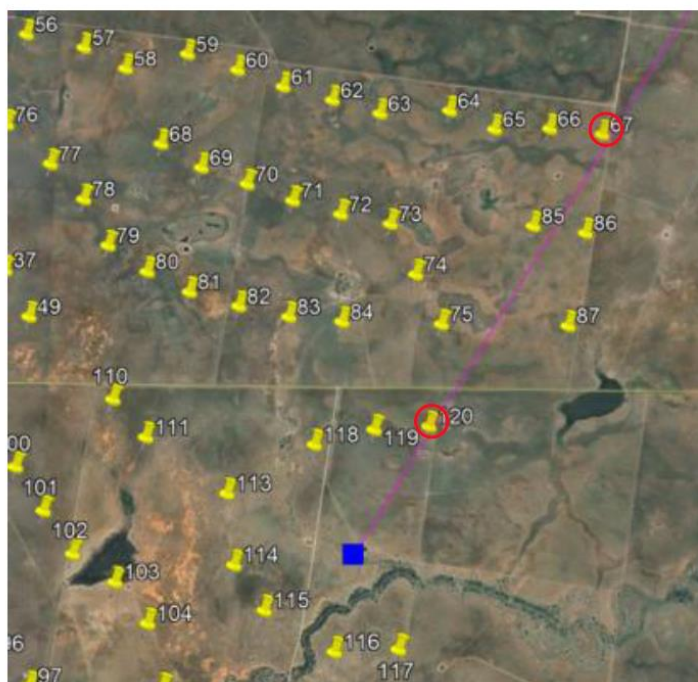


Figure 1. Turbine Impacts

- 3) A detailed analysis of the full power coordination impact (Low Frequency Induction (LFI) and/or Earth Potential Rise (EPR)) of the wind farm development is required. This includes location of the wind farm switch yard, the route and potential of any associated HV transmissions lines and the LFI and EPR impact on any Telstra plant they may affect.
- 4) It is recommended that you contact Before You Dig Australia, so you are aware of the underground assets in the area. They will provide you with the location of Telstra's as well as any other utilities' underground assets.

The developer also confirms its role as the proponent and ultimate owner of the proposed wind farm and that it has the authority to ensure that the conditions set out above are implemented and complied with. If the agreement of any other person or entity is required to ensure the conditions set out in this letter are complied with, the developer undertakes to obtain that agreement in writing and to provide it to Telstra prior to lodging a development application for the wind farm.

If the proposed plans and specifications of the development are altered or amended, Telstra reserves the right to request further conditions and amendments to the development.

Should you wish to discuss any aspect of this letter please do not hesitate to contact the undersigned. Otherwise, I would appreciate you responding to me confirming the developer's agreement to the conditions and matters set out above.



Yours faithfully,

David Jonas
Senior Access Planner
Fixed Access Planning
david.jonas@team.telstra.com

From: Windfarm Assessment Requests <WindfarmAssessmentRequests@team.telstra.com>
Sent: Friday, May 10, 2024 7:13 PM
To: Ebony Apps <Ebony.apps@middletongroup.com.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: RE: Bullawah Wind Farm - Telstra Consultation

Hi Ebony,

Please find attached our response to the proposed Bullawah wind farm.

Please get back to me if you have any queries on our response.

Regards,
David Jonas
Senior Chapter Lead
Fixed Access Planning WA, SA & NT
Connectivity Engineering
Global Networks & Technology



Flow to Work – CAN Reliability Team

P 08 6224 6268
M 0438 934 894
E David.Jonas@team.telstra.com
W www.telstra.com

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General

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 8:57 AM
To: Windfarm Assessment Requests <windfarmassessmentrequests@team.telstra.com>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: Bullawah Wind Farm - Telstra Consultation

To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith.

We note that all installations on the wind farm will comply with the Radiocommunications Act (1992) and associated notices.

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv, .shp and .kml format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If Telstra have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards,

Ebony Apps | **middleton** Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000



B.4 Bureau of Meteorology Correspondence

From: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>

Sent: Wednesday, March 6, 2024 11:44 AM

To: Ebony Apps <Ebony.apps@middletongroup.com.au>; windfarmenquiries <windfarmenquiries@bom.gov.au>

Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>

Subject: RE: Bullawah Wind Farm - Bureau of Meteorology Consultation [SEC=OFFICIAL]

Hi Ebony,

The Bureau of Meteorology's assessment of the proposed Bullawah wind farm in NSW is now complete, which indicates manageable impact to our neighboring assets, under normal propagation conditions.

The Bureau requests that the owner/operator of the *Bullawah* wind farm to:

- informs the Bureau of any changes in the wind farm, including varying the layout of the farm, changing the location of a turbine more than 100 meters, or altering turbine height
- informs the Bureau at least 2 weeks before any planned shut-down of the wind farm (for maintenance or any other reason) so that the Bureau may calibrate its weather radar system
- collaborates with the Bureau in the event of severe weather conditions to assist in matters of community safety.

Please kindly acknowledge the receipt of this E-mail and direct any further correspondence to energy@bom.gov.au & windfarmenquiries@bom.gov.au, including Bullawah WF in the subject line, and let us know if you have any queries.

Kind regards,

Mohammad

Dr. Mohammad Zomorodi

Radio Frequency Spectrum Manager

Data & Digital, Operational Technology & Engineering

M: 0415 524 457 | T: 03 9669 4413

Level 7, 700 Collins St, Docklands, VIC 3008

Mohammad.Zomorodi@bom.gov.au | www.bom.gov.au



From: Mohammad Zomorodi <Mohammad.Zomorodi@bom.gov.au>
Sent: Tuesday, February 13, 2024 2:50 PM
To: Ebony Apps <Ebony.apps@middletongroup.com.au>; windfarmenquiries
<windfarmenquiries@bom.gov.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: RE: Bullawah Wind Farm - Bureau of Meteorology Consultation [SEC=OFFICIAL]

Hi Ebony,

Thanks for contacting the Bureau regrading Bullawah WF in NSW.

We initiate the process for analysis of the proposed wind farm on the Bureau's radiocommunication assets and will update you on the result.

It should be note that WMO guidance document has been published in 2010 based on available wind farm technology, tip height of 150-170 m, at that time and it is not applicable to the current wind farm with 300 m tip height.

Moreover, the process for investigation of the Bullawah wind farm's impact depends on other work priorities within the Bureau and as such we might not be able to update you by 27 Feb 2024.

Regards

Mohammad

Dr. Mohammad Zomorodi

Radio Frequency Spectrum Manager

Data & Digital, Operational Technology & Engineering

M: 0415 524 457 | T: 03 9669 4413

Level 7, 700 Collins St, Docklands, VIC 3008

Mohammad.Zomorodi@bom.gov.au | www.bom.gov.au



From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 12:20 PM
To: windfarmenquiries <windfarmenquiries@bom.gov.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: Bullawah Wind Farm - Bureau of Meteorology Consultation

To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith.

As a result of our assessment, three (3) sites have been identified as per below:

Weather Radar Name	Coordinate	Radar type			Distance to Boomer Range Wind Farm Project Area
Yarrawonga	36.03° S, 146.03° E	WSR 81C C-Band			139.686 km
Hillston	33.55° S, 145.52°	Meteor Band	735CDP	C-	141.580 km
Wagga Wagga	35.17° S, 147.47° E	WF 100 C-Band			199.458 km

Based on our analysis of the coverage area of BoM radars and the WMO guidance document (WMO- No.1064, Annex VI Table), we do not anticipate that the wind farm will significantly impact the radar operation.

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv and .kml format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If the Bureau of Meteorology have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards,

Ebony Apps | middleton Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000



B.5 NSW Rural Fire Service Correspondence

From: Haydn Follett <Haydn.Follett@rfs.nsw.gov.au>
Sent: Friday, April 5, 2024 1:57 PM
To: Ramez Barakat <ramez.barakat@middletongroup.com.au>; Joanne Laundess <Joanne.Laundess@rfs.nsw.gov.au>
Cc: Ebony Apps <Ebony.apps@middletongroup.com.au>
Subject: RE: Forward: Bullawah Wind Farm - ACMA Link Consultation

Hi Ramez

The identified link path in question is not longer used by the RFS.

Therefore there is no impact to the NSW RFS radio network by the Bullawah Wind Farm.

Regards



Haydn Follett | ICT Field Operations Officer | ICT Field Engineering & Communications

NSW RURAL FIRE SERVICE

Unit 2, 63 Cranbrook Road, Batemans Bay 2536 | PO Box 35, Batemans Bay 2536

P 02 4472 0600 **F** 02 4472 0690 **M** 0428 280 066 **E** haydn.follett@rfs.nsw.gov.au

ICT Help Desk **P** 02 8741 5123 **E** Communication.systems@rfs.nsw.gov.au

www.rfs.nsw.gov.au | www.facebook.com/nswrfs | www.twitter.com/nswrfs

PREPARE. ACT. SURVIVE.

From: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Sent: Monday, March 25, 2024 3:57 PM
To: Joanne Laundess <Joanne.Laundess@rfs.nsw.gov.au>; Haydn Follett <Haydn.Follett@rfs.nsw.gov.au>
Cc: Ebony Apps <Ebony.apps@middletongroup.com.au>
Subject: RE: Forward: Bullawah Wind Farm - ACMA Link Consultation

Hi team,

Can I get an update on the below request.

Thank you

Ramez Barakat

Electrical Engineer

M: +61 488 088 605 | **E:** ramez.barakat@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000 **W:** www.middletongroup.com.au

From: Joanne Laundess <Joanne.Laundess@rfs.nsw.gov.au>
Sent: Monday, March 4, 2024 12:10 PM
To: Haydn Follett <Haydn.Follett@rfs.nsw.gov.au>
Cc: Ebony Apps <Ebony.apps@middletongroup.com.au>
Subject: Forward: Bullawah Wind Farm - ACMA Link Consultation

Hi Haydn,

For your response.

Regards,

Jo

Jo Laundess

Administration Officer, Planning & Environment Services (South)



P 02 4472 0600 E joanne.laundess@rfs.nsw.gov.au

Unit 2, 63 Cranbrook Road | PO Box 35, Batemans Bay, NSW 2536

www.rfs.nsw.gov.au



The RFS acknowledges the Traditional Owners of Country throughout Australia. We pay our respects to Elders past and present.

From: Webmaster <webmaster@rfs.nsw.gov.au>
Sent: Wednesday, February 28, 2024 1:54 PM
To: Planning & Environment Services <CustomerService.Centre@rfs.nsw.gov.au>
Subject: FW: Bullawah Wind Farm - ACMA Link Consultation

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 12:50 PM
To: Webmaster <webmaster@rfs.nsw.gov.au>
Cc: Joanne Laundess <Joanne.Laundess@rfs.nsw.gov.au>; Ramez Barakat

Document name: Bullawah Wind Farm Project
Document no: 23048-E-RPT-0001
Revision no: 1

Uncontrolled when printed

<ramez.barakat@middletongroup.com.au>

Subject: Bullawah Wind Farm - ACMA Link Consultation

To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith.

We note a Rural Fire Service link is in proximity of the initial wind turbine layout. Details are provided below:

BSL Licence No	/ Site 1	Site 2	Length (km)	Frequency (MHz)	Owner
1207619/1	Murrumbidgee Shire Council 76.6m Guyed Mast Argoon, off Kidman Way COLEAMBALLY ID: 402871	Essential Energy Lattice Tower Warwillah WANGANELLA ID: 35605	35m 101 75 Rd	404.28	NSW Rural Fire Service

The link is approximately 1.2 kms away from the nearest WTG (WTG 135).

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv, .kml and .shp format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If the Rural Fire Service have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards,

Ebony Apps | **middleton** Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000



B.6 New South Wales Government Telecommunications Authority

From: Jay Sharma <Jayanta.Sharma@customerservice.nsw.gov.au>

Sent: Wednesday, February 21, 2024 9:28 AM

To: Ebony Apps <Ebony.apps@middletongroup.com.au>

Cc: Ivonne Lienau <Ivonne.Lienau@customerservice.nsw.gov.au>; Dylan Mead

<Dylan.Mead@customerservice.nsw.gov.au>; CCEP Info <CCEPinfo@customerservice.nsw.gov.au>; Luke

Fletcher <luke.fletcher@customerservice.nsw.gov.au>; Telco Spectrum

<telco.spectrum@customerservice.nsw.gov.au>; Ramez Barakat <ramez.barakat@middletongroup.com.au>

Subject: RE: Bullawah Wind Farm - ACMA Link Consultation

Hi Ebony,

Thank you for your email.

I have checked the coordinates you provided and can confirm that the windfarms are clear of PSN microwave links. There are no impact to our links.

Could you please confirm if other government agencies have been contacted regarding the proposal?

For future consultations regarding wind farms or transmission lines, you can email telco.spectrum@customerservice.nsw.gov.au.

Additionally, the ESRI shapefile provided cannot open by itself. It requires the projection, shape and database file to interpret and display the geospatial data. So we weren't able to read the data. The coordinates provided were in Cartesian coordinate system format. Without Zone information it can lead to errors when projecting on a spatial tool.

Kind Regards

Jay Sharma

Principal Spectrum Engineer, NSW Telco Authority

ICT and Digital Government Division | Department of Customer Service

p 02 9219 3158

e jayanta.sharma@customerservice.nsw.gov.au | www.customerservice.nsw.gov.au

Level 10, McKell Building, 2-24 Rawson Place NSW 2000



Please consider the environment before printing this email

From: CCEP Info <CCEPinfo@customerservice.nsw.gov.au>

Sent: Friday, February 16, 2024 9:53 AM

Document name: Bullawah Wind Farm Project

Document no: 23048-E-RPT-0001

Revision no: 1

Uncontrolled when printed

To: Jay Sharma <Jayanta.Sharma@customerservice.nsw.gov.au>; Luke Fletcher <luke.fletcher@customerservice.nsw.gov.au>

Cc: Ivonne Lienau <Ivonne.Lienau@customerservice.nsw.gov.au>; Dylan Mead <Dylan.Mead@customerservice.nsw.gov.au>

Subject: FW: Bullawah Wind Farm - ACMA Link Consultation

Hi Jay, hi Luke,

Hope you're both well!

We have received the attached inquiry from Bullawah Wind Farm.

Can you please advise if NSWTA have any comments to make in response to the Bullawah Wind Farm proposal? Or are we comfortable with the proximity of the proposal to our link path (Hay South – Wanganella)?

Dylan is also happy to support if you have any questions.

Please CC me and the CCEP Info email if responding to Middleton Group directly; they're expecting a reply before 27 February.

Thank you kindly,

Ivonne

Ivonne Lienau

Stakeholder Engagement | Customer and Stakeholder Services | CCEP

NSW Telco Authority

T (02) 8276 8076 | M 0405 639 931 | E ivonne.lienau@customerservice.nsw.gov.au

W nsw.gov.au/telco-authority

McKell Building

2-24 Rawson Place

Sydney NSW 2000



**Department of
Customer Service**

I acknowledge the traditional custodians of the land and pay respects to Elders past and present. I also acknowledge all the Aboriginal and Torres Strait Islander staff working with NSW Government at this time.

Please consider the environment before printing this email.

From: Ebony Apps <Ebony.apps@middletongroup.com.au>
Sent: Tuesday, February 13, 2024 12:41 PM
To: CCEP Info <CCEPinfo@customerservice.nsw.gov.au>
Cc: Ramez Barakat <ramez.barakat@middletongroup.com.au>
Subject: Bullawah Wind Farm - ACMA Link Consultation

[CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.]

To whom it may concern,

We are conducting early-stage consultation for the Bullawah Wind Farm Project in New South Wales, focusing on Electromagnetic Interference. The Project is being developed by BayWa r.e. Projects Australia Pty Ltd. The Environmental Impact Statement (EIS) is being prepared by Umwelt (Australia) Pty Ltd. The wind farm project is located approximately 36 km southeast of Hay and 100 km southwest of Griffith.

We note a NSW Telecommunications Authority link is in proximity of the initial wind turbine layout. Details are provided below.

Link details:

BSL / Licence No	Site 1	Site 2	Length (km)	Frequency (MHz)	Owner
11300366/1	Transgrid 80m Guyed Mast off 1494 Jerilderie Rd HAY SOUTH ID: 35103	NSWTA 100m Guyed Mast 75 Warwillah Road WANGANELLA ID:10026558	46.3	7435	New South Wales Telecommunications Authority

The link is approximately 16 km away from the nearest WTG.

We append the wind turbine co-ordinates for turbines in proximity to the link in .csv and .shp format. Note that the rotor diameter of the turbines will be up to 200 m, with a tip height of 300 m.

If the NSW Telecommunications Authority have any concerns relating to the development and any potential impacts on their communication link or mobile services, please get in contact by return email or by calling us on the phone number listed below prior to 27th February 2024.

Warm Regards,

Ebony Apps | middleton Group

M: +61 424 777 971 | **E:** ebony.apps@middletongroup.com.au

Level 4, 59 Goulburn St, Haymarket NSW 2000

