Marri Wind Farm

Telecommunications Assessment

Alinta Energy

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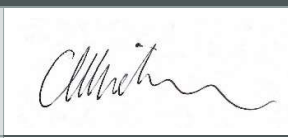
Author signature		Approver signature	
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Executive Summary

Aurecon Australasia (Aurecon) has carried out a telecommunications (electromagnetic interference) assessment for the proposed Marri Wind Farm (the Project) in Western Australia. The Project is located approximately ~20 kilometres (km) south of the township of Dandaragan in Western Australia's Wheat belt region. The Project encompasses approximately 12,500 hectares (ha) of land to the east of the Brand Highway.

Aurecon has obtained the licence details of all licensed telecommunication equipment in the vicinity of the Project to assess if any impact is expected.

Fixed licence telecommunications towers

Two fixed-licence telecommunication towers were identified within 2 (km) of the Project. One is within the site boundary ~0.9 km from the nearest turbine, and Aurecon has calculated that near field interference is expected, and scattering/reflection will most likely occur. The other tower is northwest of the site ~1.9 km from the nearest turbine, and although scattering/reflection for this tower is considered unlikely, Aurecon recommends consulting with the owner of all the licences associated with both towers to determine whether any impacts are expected.

Point-to-multipoint assessment

Four licensed towers are located within 20 km of the Project, and interference may occur if communications from these towers cross the Project. It is recommended to consult with the licence operators identified to confirm whether their communications may be impacted.

Point-to-point assessment

There are six point-to-point link signals crossing the Project boundary, of which five have potential to be impacted. One link is expected to be impacted by the proposed turbine layout. The owner of this licence (St John Ambulance WA) should be contacted to determine if it is still in use and if any interference is expected. If so, the affecting turbines may need to be re-positioned. Additionally, Aurecon notes that there are 14 turbines which may cause interference to one or more links if moved within their 300 m micro-siting zones. Therefore, mitigation may also be required if these turbines are moved.

Point-to-area assessment

Five broadcasting locations are within 2 km of a turbine, so interference may occur for the point-to-area licences from this site. Three of these are located within the Project boundary. Aurecon recommends consulting with the licence owners and mitigation such as relocating the transmission tower may be required.

Several dwellings are near or within no coverage areas for all mobile networks (Optus, Telstra, and Vodafone) that are available in the area around the Project, and may experience reduced signal resultant of the Project. It is recommended to contact Optus, Telstra, and Vodafone to seek feedback on any potential impact that the Project could have on their services, and if required confirm what mitigation options are available for users, such as a signal amplifier.

Wireless internet for several dwellings within the Project and northeast of the Project may be affected, and mitigation such as switching to satellite broadband may be recommended.

Digital television broadcasting transmitters are expected to be impacted by the Project, and therefore a reduced and/or interrupted signal may impact dwellings identified surrounding the Project. Mitigation options to improve signal could include installation of an upgraded antenna or signal booster, or satellite television.

Radar

There are seven Bureau of Meteorology radar sites within 250 nautical miles of the Project, of which one is approximately 75 km away and may experience interference. The Bureau of Meteorology has been contacted so that any potential effect of the Project on the weather radars can be assessed, but no assessment result has been received at the time of writing this document.

There are 32 aeronautical radar sites within 250 nautical miles of the Project. Two are 82 km from the Project and may experience interference. Aurecon understands that Airservices Australia has been

contacted as part of the Project's Aviation Impact Assessment to determine whether any impact on their radar use is expected. All other radars are over 100 km from the Project and are unlikely to be affected.

There are 17 Department of Defence radar sites within 250 nautical miles of the Project. Of these, 15 are within 100 km from the Project so there is potential for interference. Aurecon understands that Department of Defence has been contacted as part of the Project's Aviation Impact Assessment to understand any potential effect of the Project on the closest radars (refer to Appendix A).).

Contents

Figures

Tables

1 Introduction

Aurecon Australasia Pty Ltd (Aurecon) has been engaged by Marri WF Pty Ltd as trustee for the Marri WF Unit Trust (the Proponent) to carry out a telecommunications and electromagnetic interference assessment for the proposed Marri Wind Farm (the Project), located approximately ~20 km south of the township of Dandaragan and approximately 110 km north of Perth in Western Australia's wheat belt region.

The purpose of this report is to provide an assessment of the actual and potential electromagnetic interference effects anticipated once the wind farm is operational.

In further detail, this report contains:

- A description of the Project location and environment
- A description of electromagnetic interference causes and potential effects
- A description of the relevant legislation, policies and guidelines that were taken into consideration during the assessment
- An overview of the methodology undertaken to inform the assessment
- An assessment of actual and potential effects
- Conclusion and recommendations.

All maps are shown with north pointing to the top of the page, unless otherwise indicated.

2 Site Description

The Project is located approximately 1 km north of Regans Ford and 110 km north of Perth in Western Australia. The area is within a rural environment, consisting of areas of pasture, plantation blocks, working farms and lifestyle blocks with residential development. The site location and proposed maximum 82-turbine layout are shown in Figure 2-1. A micro-siting zone of 300 metres (m) radius is proposed around each turbine to allow for minor changes in turbine location during detailed design and construction activities. Micro-siting will only occur insofar as the 1.1 x tip height setback of 302 m from the site boundary can be met. Aurecon notes that one turbine is currently proposed within this setback distance but understands this turbine will be micro-sited further from the site boundary prior to construction.

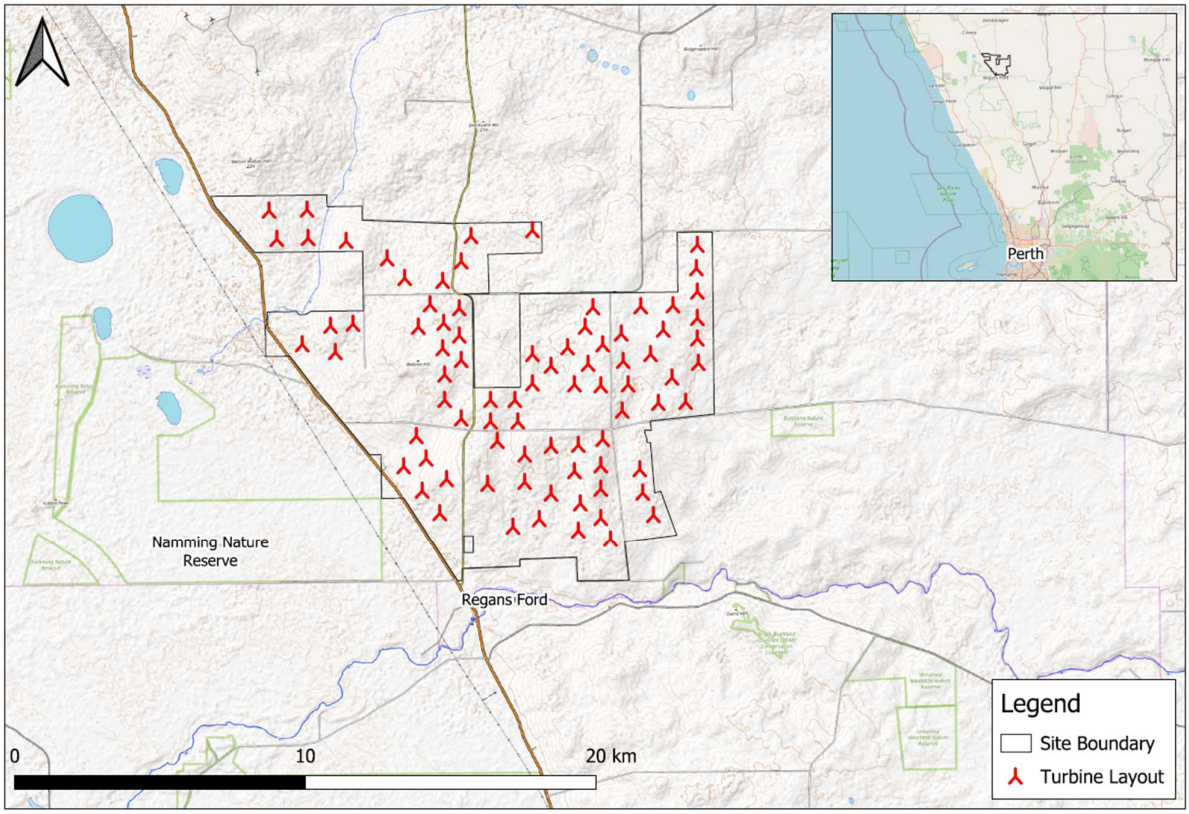

Figure 2-1 Site location and proposed turbine layout

3 Electromagnetic interference

3.1 Introduction

Electromagnetic interference (EMI) is a reduction in telecommunications signal quality, clarity or magnitude. The presence of turbines has the potential to cause EMI on telecommunication services including:

- Point-to-point and point-to-multipoint between fixed transmitter and receiver tower locations
- Point-to-area such as radio and digital television broadcasts, and mobile phone and internet services
- Radar such as meteorological (weather) and aeronautical.

EMI can occur through mechanisms such as the turbine structure or blades causing obstruction, reflection or refraction of the electromagnetic waves used in various telecommunications services[1]. In some cases, potential interference can be mitigated or avoided by appropriate siting of turbines. It is recommended that service operators be notified where potential impacts to their services may be anticipated to determine whether the impact of the wind farm will be acceptable.

3.2 Fresnel zone

Fixed point-to-point (as well as point-to-multipoint) radio communication signals follow the line of sight between transmitter and receiver locations. The established method to mitigate interference is to keep structures out of the Fresnel zone of the signal. This Fresnel zone is represented as an ellipsoid around the line of sight between the two ends of the link (telecommunication towers). The ellipsoid radius (r) is defined by the distance along the link (d1, d2), length of link (D), the telecommunications signal wavelength (λ), and the zone number (n), as shown in Figure 3-1 and the equation below:

$$r = \sqrt{\frac{nd_1d_2\lambda}{d_1 + d_2}}$$

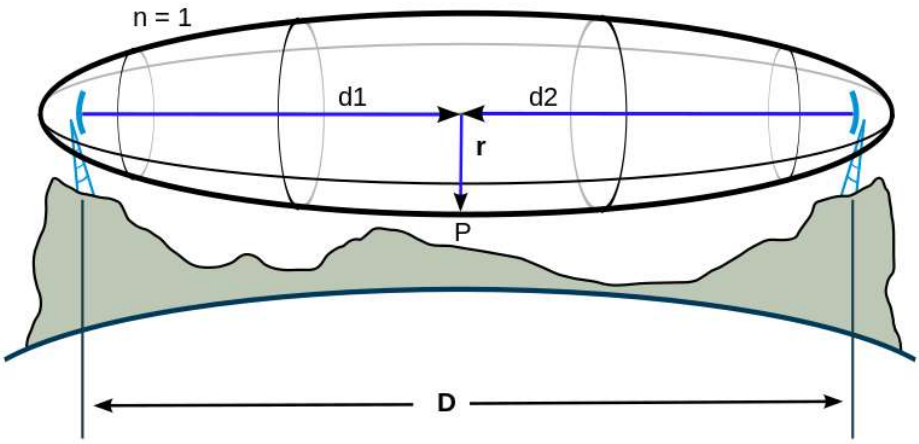

Figure 3-1 Telecommunication link Fresnel zone illustration[1]

The zone number can be any value greater than zero, and the radius of the Fresnel zone increases with the zone number. The zone number is an indication of how conservative the distance being allowed around the link is – a zone number of one is relatively close to the link, while a zone number of two has a larger radius around the link.

[1] Podhorský, Dušan & Fabo, Peter. (2016). *Localization of rainfall and determination its intensity in the lower layers of the troposphere from the measurements of local RF transmitter characteristics*. Journal: Contributions to Geophysics and Geodesy Vol 46(4). DOI:10.1515/congeo-2016-0018

There are various recommendations to avoid adverse effects of structures on the point-to-point telecommunication signal, such as no more than 20% or 40% blockage of the first Fresnel zone (n = 1), and the 0.6 Fresnel zone (n = 0.6) is often applied when designing point-to-point telecommunications links over terrain and vegetation. The second Fresnel zone (n = 2) is often used as a conservative safeguarding of the telecommunications links from potential interference from turbine[2].

[2] D. Bacon, “Fixed-link wind turbine exclusion zone method - Version 1.1,” 28 October 2009.

4 Guidelines

The most relevant Australian guidelines appropriate for electromagnetic interference assessment and setting limits are the Australian Draft National Guidelines[3]. These Guidelines are 15 years old and were never progressed past “draft” stage as individual states were beginning to develop their own planning guidelines[4], but they remain the most detailed and thorough set of recommendations in Australia and are still generally held in industry as the basis for assessment. Aurecon is not aware of any specific Western Australia guidelines.

The Draft National Guidelines recommends the following setbacks to avoid interference:

- Point-to-point and point-to-multipoint links: ensuring no encroachment of any part of the turbine (including the rotor extent) on the second Fresnel zone around the link
- Telecommunication towers/sites: 2 km setback from turbines
- Radar: 250 nautical miles, i.e. 463 km from turbines

If any turbines are within these limits, consultation with the owner(s) of the affected telecommunications licence(s) is recommended to assess any potential impact of the wind farm on the signal.

[3] Commonwealth of Australia Environment Protection and Heritage Council (EPHC), “National Wind Farm Development Guidelines”, DRAFT July 2010

[4] https://www.nepc.gov.au/publications/archive/ephc-archive/ephc-archive-future-national-wind-farm-development-guidelines

5 Assessment of potential effects

Aurecon has accessed the Australian Communications and Media Authority (ACMA) telecommunication licences database[5] through the MAPRAD.IO website[6] to obtain the broadcasting locations and other details for point-to-point, point-to-area and radar telecommunications in the vicinity of the Project. Sites within approximately 50 km of the Project have been included for all licence types except for meteorological radar, which a distance of 463 km (250 nautical miles) has been applied in accordance with the Draft National Guidelines.

Impacts on mobile phone, wireless internet and digital television point-to-area telecommunications to nearby buildings were investigated using coverage maps from the various service providers.

Aurecon notes that the below assessment was undertaken for the current maximum layout of 82 turbines. This layout could be subject to micro-siting during detailed design and construction, however any changes to turbine locations will only impact fixed point links and interference zones and these potential impacts have been assessed.

5.1 Point-to-point and point-to-multipoint

5.1.1 Telecommunications towers

The locations of the closest identified fixed (point-to-point and point-to-multipoint) telecommunications towers within 50 km of the Project are shown in Figure 5-1. The closest site is within the Project boundary, with the site name “Dampier to Bunbury Gas Pipeline WALYOO”. The second closest site (“Telstra/Police Site Walyer Walyer Hill CATABY”) is within 2 km of the Project boundary. Details for both are shown in Table 5-1. There is potential for interference to occur for both of these towers.

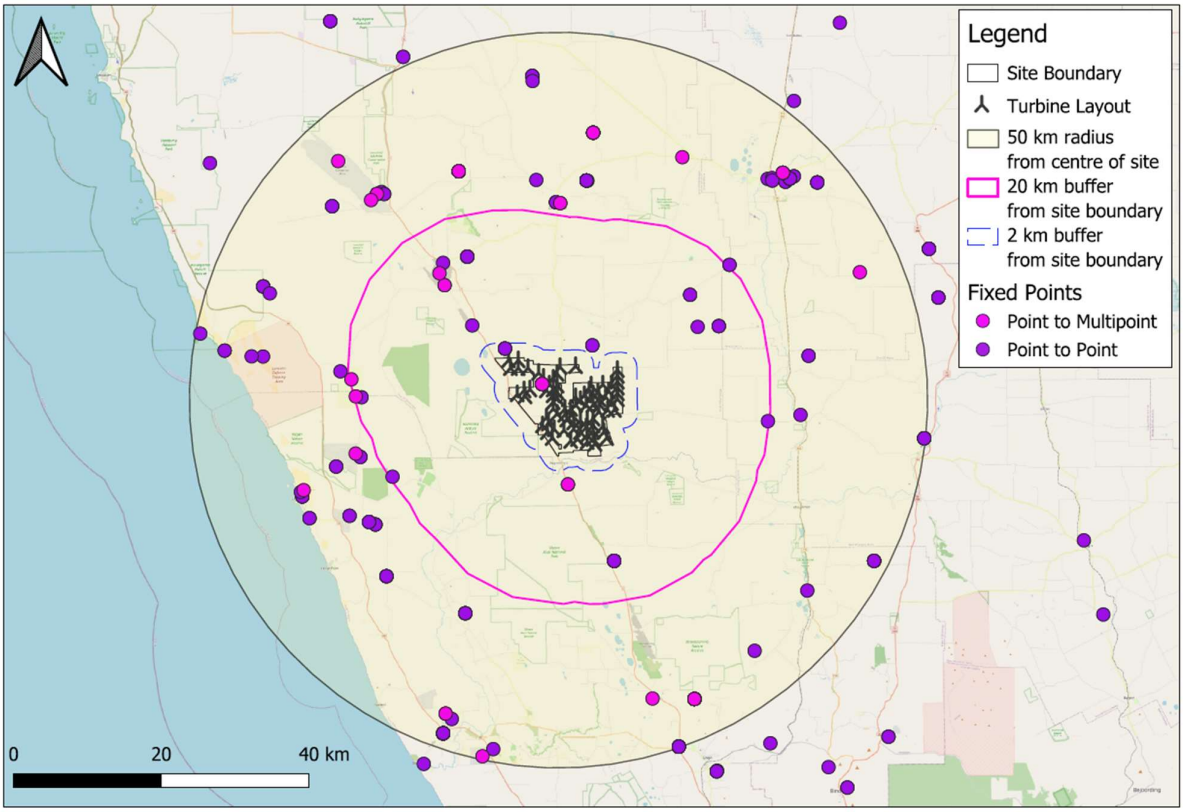

Figure 5-1 Closest fixed telecommunications sites to the Project

[5] Australian Communications and Media Authority, Register of Radiocommunications Licences, https://web.acma.gov.au/pls/radcom/site_proximity.main_page/

[6] MAPRAD.IO website, https://maprad.io/au, data downloaded 31/07/2025

Table 5-1 Closest fixed telecommunication sites to the Project

Site name	Site ID	Lat/Long	Licence number	Licence frequencies	Licensee	Distance to nearest turbine [km]
Dampier to Bunbury Gas Pipeline WALYOO	36736	-30.887463°, 115.678812°	1191263/1	7.5435 GHz, 7.7045 GHz	Electricity Networks Corporation (Western Power)	0.9 (WP76)
			12309844/1	6.0193 GHz, 6.2714 GHz		
			1191262/1	7.5295 GHz, 7.6905 GHz		
			12309845/1	6.0193 GHz, 6.2714 GHz		
			1192998/2	6.54 GHz, 6.88 GHz	DBNGP (WA) Nominees Pty Ltd	
			1193000/2	6.58 GHz, 6.92 GHz		
			1193001/2	6.74 GHz, 7.08 GHz		
			1192999/2	6.7 GHz, 7.04 GHz		
Telstra/Police Site Walyer Walyer Hill CATABY	30554	Provided: -30.843544°, 115.626922° Aerial Imagery: -30.843617°, 115.627244°	10209405/1	10.735 GHz, 11.225 GHz	TELSTRA LIMITED	1.9 (WP2)
			10678058/1	7.73288 GHz, 8.0442 GHz	WESTERN AUSTRALIA POLICE	
			1976436/1	7.5435 GHz, 7.7045 GHz		
			1976446/1	7.8218 GHz, 8.1331 GHz		

Near-field effects

Both of the above towers are within 2 km of a turbine so some interference may occur. To assess the likelihood of this, Aurecon has calculated the near-field interference zone from the available information about each licence on ACMA.

Aurecon has assessed the near-field interference zone for the registered antenna and licence frequencies for this site using the method outlined by D Bacon[2]. The maximum near-field zone for the Telstra/Police site is approximately 120m. Therefore, this tower is sufficiently far from the turbines that no interference is expected for the near-field interference zones of any licence at this tower. However, three licences at the Dampier to Bunbury Gas Pipeline WAYLOO site were calculated to be potentially affected by near-field interference from turbine WP76. The affected licence numbers are 1192998/2, 1192999/2, and 1191263/1. The former two are licenced to DBNGP (WA) Nominees Pty Ltd (DBNGP), and the latter to Electricity Networks Corporation (Western Power). These three licences have near field zones of over 900m, which means they are encroached upon by WP76 and may experience interference.

For the licences at the Dampier to Bunbury Gas Pipeline WALYOO site within the Project boundary, Aurecon understands that the Proponent has engaged with DBNGP who have provided feedback that they are "broadly fine with the turbine layout and proximity to the pipeline"[7]. This is assumed to mean that no significant effects are expected and no mitigation is required for these licences. However, Aurecon recommends consultation with Western Power who own the other licences at this tower to determine whether any effects are anticipated for their licences.

Although considered unlikely there may still be interference for the licences at the Telstra/Police Site Walyer Walyer Hill CATABY site just north of the Project boundary. This could be caused by reflection/scattering even though no near-field effects are predicted, as the site is within the 2 km consultation zone recommended by the Draft National Guidelines. Aurecon recommends consulting with the owners of the licences at this site (Telstra Limited and Western Australia Police) to understand if any impacts to their services are also expected.

Aurecon notes that there is a micro-siting zone of 300m radius for each turbine location, and the near-field interference zone effects may be increased if WP70, WP76, WP68, WP9, and/or WP2 are moved closer to the Telstra/Police Site Walyer Walyer Hill CATABY site within their 300 m zones.

[7] Comment from the Client via the RFI document, *P525973_Marri_RFI_RevA_20250424*, 28/07/2025

Point-to-multipoint licences

Fixed point-to-multipoint licences operate on a similar basis to point-to-point licences, with the main difference being the use of a central tower communicating with a number of corresponding remote stations. Only the central tower location is registered in the ACMA database, so the signal link paths cannot be determined without consultation with the operator. However, as these licences are designed to service nearby locations, impacts are generally considered unlikely if turbines are over ~20 km from the nearest central tower.

Details of the nearest licenced towers are shown in Table 5-2. There are four towers with multipoint licences within 20 km of the Project, one of which is the same site within the Project boundary previously assessed for near-field effects. These licences may experience interference if the associated communications link paths cross the Project. This is likely for the multipoint licence originating at the tower within the Project boundary, and may also be likely for the tower ~6 km from the nearest turbine. As discussed above, Aurecon understands that DBNGP are aware of and comfortable with the proposed turbine layout, but Aurecon recommends consultation with the identified licence operator to confirm whether their services will be impacted.

Table 5-2 Point-to-multipoint telecommunication sites within 20 km of a turbine in the Project

Site name	Site ID	Lat/long	Licence number(s)	Licensee	Distance to nearest turbine [km]
Dampier to Bunbury Gas Pipeline WALYOO	36736	-30.887463°, 115.678812°	12857892/1	Electricity Networks Corporation	0.9
Regans Ford SubStation 3k Sth Brand Hwy REGANS FORD	601960	-31.010456°, 115.713825°	1951167/1	Karakin Wind Pty Ltd and North East Equity Pty Ltd	5.8
Haul Road Tower Iluka Mine Site Mimegarra Road CATABY	10010562	-30.76525°, 115.54255°	10546352/1	Iluka Resources Limited	13.6
Cataby concentrator 1.7 km SSW of Cataby	10012495	-30.750614°, 115.535588°	10546353/1	Iluka Resources Limited	15.3

5.1.2 Point-to-point links

The locations of fixed point-to-point links identified within 60 km of the Project centre are shown in Figure 5-2 below.

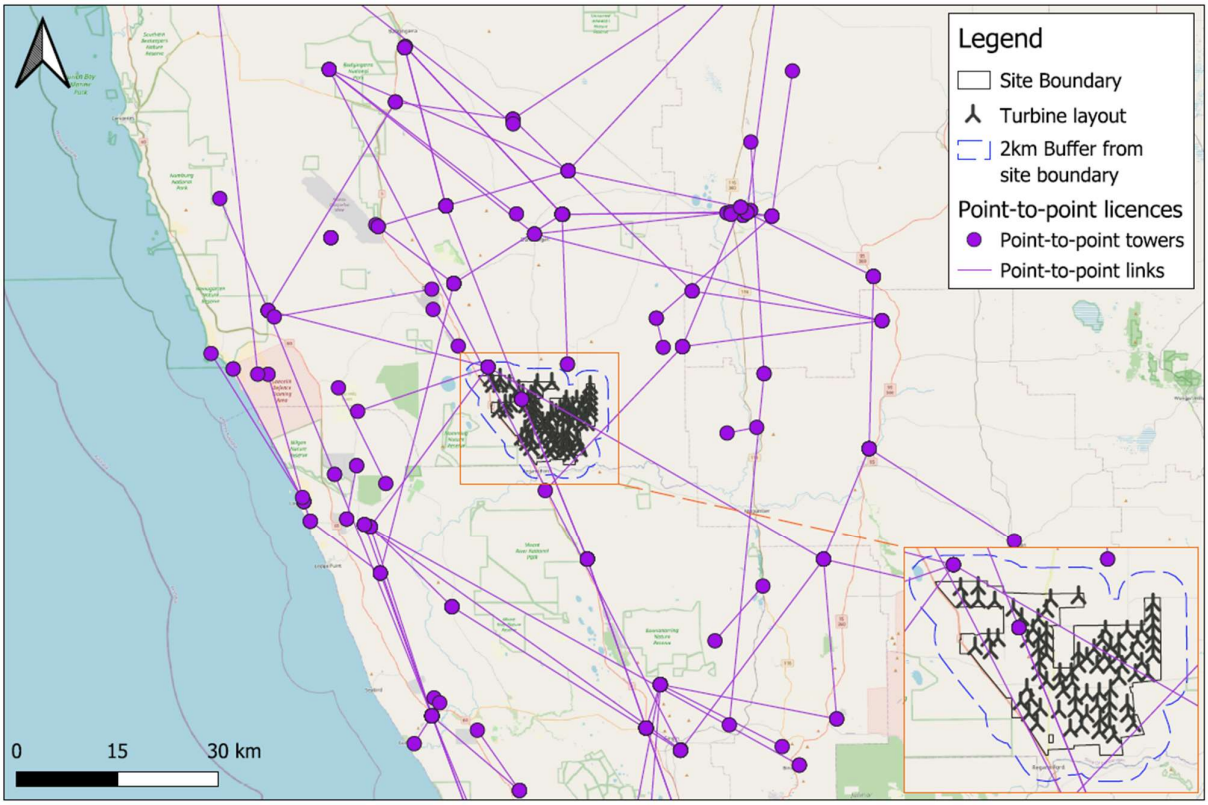

Figure 5-2 Fixed point-to-point licence links in the vicinity of the Project

Six point-to-point links have been identified that cross the Project boundary. Four links are associated with the same telecommunication towers within and near the Project boundary identified in Table 5-1 above. One link passes through the far north-western edge of the Project and is over 1.5 km away from the nearest turbine, so is therefore not at risk of interference. The other five link details are outlined in Table 5-3 below.

Table 5-3 Point-to-point links at risk of interference

Link number (Aurecon)	Site ID 1	Site ID 2	Licence number(s)	Licensee	Minimum frequency	2nd Fresnel Zone radius
1	30554	9020999	1976436/1	WESTERN AUSTRALIA POLICE	7.5435 GHz	33.9 m
2	30551	36736	1192998/2, 1191263/1, 12309844/1, 1192999/2	Western Power, DBNGP	6.0193 GHz	27.8 m
3	36723	36736	1191262/1, 12309845/1, 1193000/2, 1193001/2	Western Power, DBNGP	6.0193 GHz	26.2 m
4	601960	9020902	1974491/1	Western Power	7.7329 GHz	24.0 m
5	30504	30750	284717/1	ST JOHN AMBULANCE AUSTRALIA (WESTERN AUSTRALIA) INC.	404.0625 MHz	205.6 m

Aurecon notes that sometimes the ACMA coordinates for the start and end locations of links are incorrect and do not line up accurately with the actual tower that can be seen in satellite imagery. Aurecon has therefore verified the position of the towers associated with the five links that cross the Project boundary using satellite imagery, and made adjustments where necessary. Aurecon notes that the southern end point

of link #5 in Table 5-3 above could not be verified from satellite imagery, and should be confirmed through consultation with the link owner. All other links are far enough from the Project that any minor adjustment to the coordinates will not impact the results.

The second Fresnel zone was calculated for each of the five links that were at risk of being impacted by the turbines. These are shown in Table 5-3 above and Figure 5-3, as well as an additional 91 m width on either side which is the maximum turbine blade width. For four of the links the licences are all Super High Frequency (SHF) / microwave frequency above 3 GHz which means the Fresnel zones are narrow, but for one link the licences are in the lower Ultra High Frequency (UHF) band of 300 MHz to 3 GHz. With the provided layout, three turbines (WP2, WP3 and WP7) will intersect the second Fresnel zone of the UHF link (link #5), and therefore interference may occur. The owner of this link should be contacted to determine whether any impacts to services are expected, and mitigation may have to be implemented such as relocating or removing these turbines.

As previously noted, there are micro-siting zones of 300m radius for each turbine in the layout. There are 14 turbines that could interfere with the point-to-point links due to their micro-siting proximity (not including WP2, WP3, and WP7 as noted above). These turbines are WP5, WP70, WP75, WP9, WP16, WP69, WP12, WP72, WP35, WP41, WP50, WP51, WP77, and WP54. If any of these turbines are moved within their micro-siting zones then a reassessment should be undertaken to ensure there is no interference of the second Fresnel zone of any link. Alternatively, the allowed micro-siting zones could be reduced so that the turbines can move freely within the zones without any chance of impacting a link second Fresnel zone. The three turbines (WP2, WP3 and WP7) that are intersecting link #5 in their current proposed locations would not have any impact on the link if they are moved east / northeast to the edge of the micro-siting zones and out of the link exclusion buffer (second Fresnel zone plus blade length).

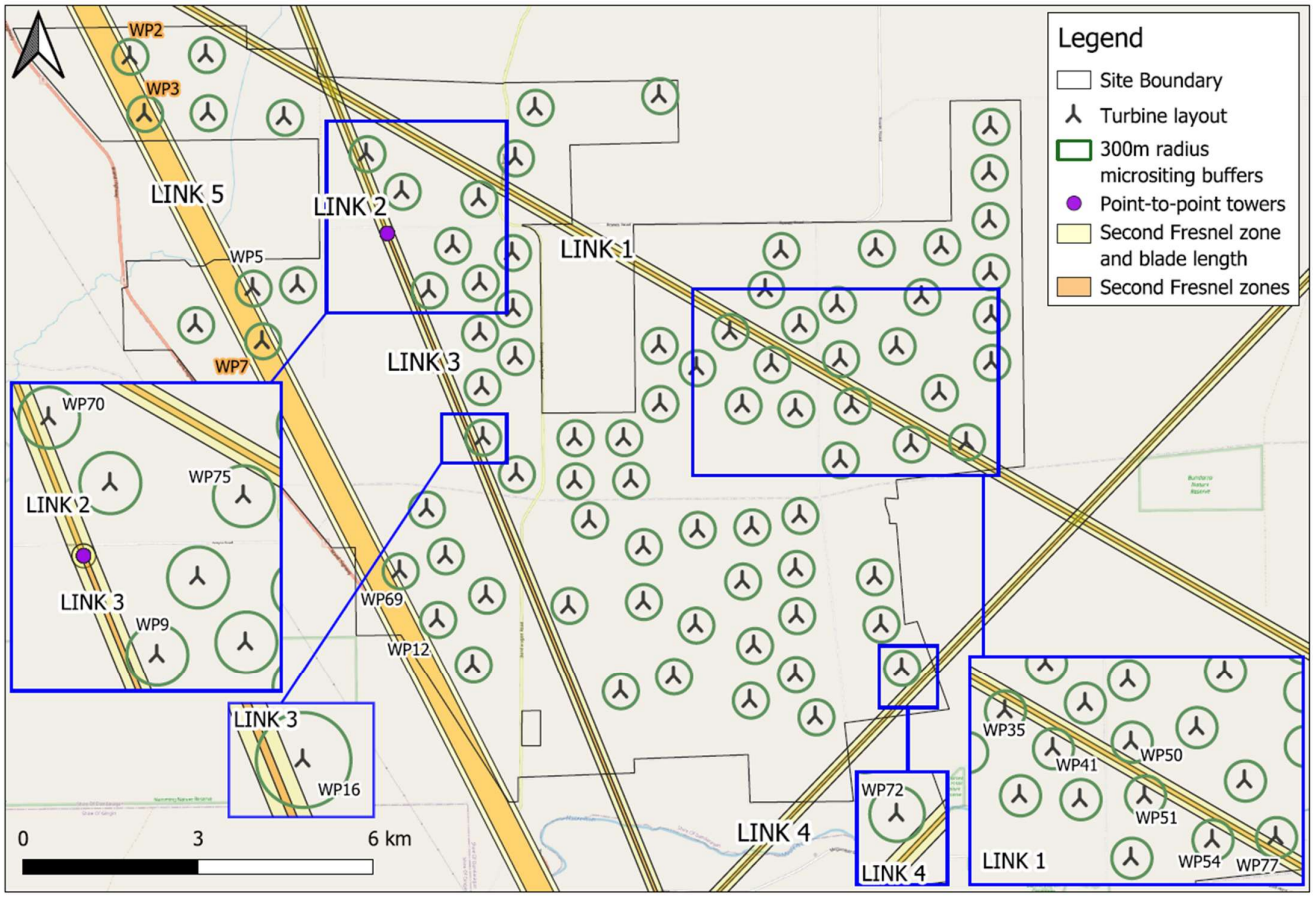

Figure 5-3 Point-to-point links with second Fresnel zones

5.2 Point-to-area

5.2.1 Transmission locations

Point-to-area telecommunication locations are shown in Figure 5-4 below for locations that are within 50 km of the centre of the Project boundary. Aurecon notes that some sites may have more than one licence type associated, but only one licence type is shown in the figure below.

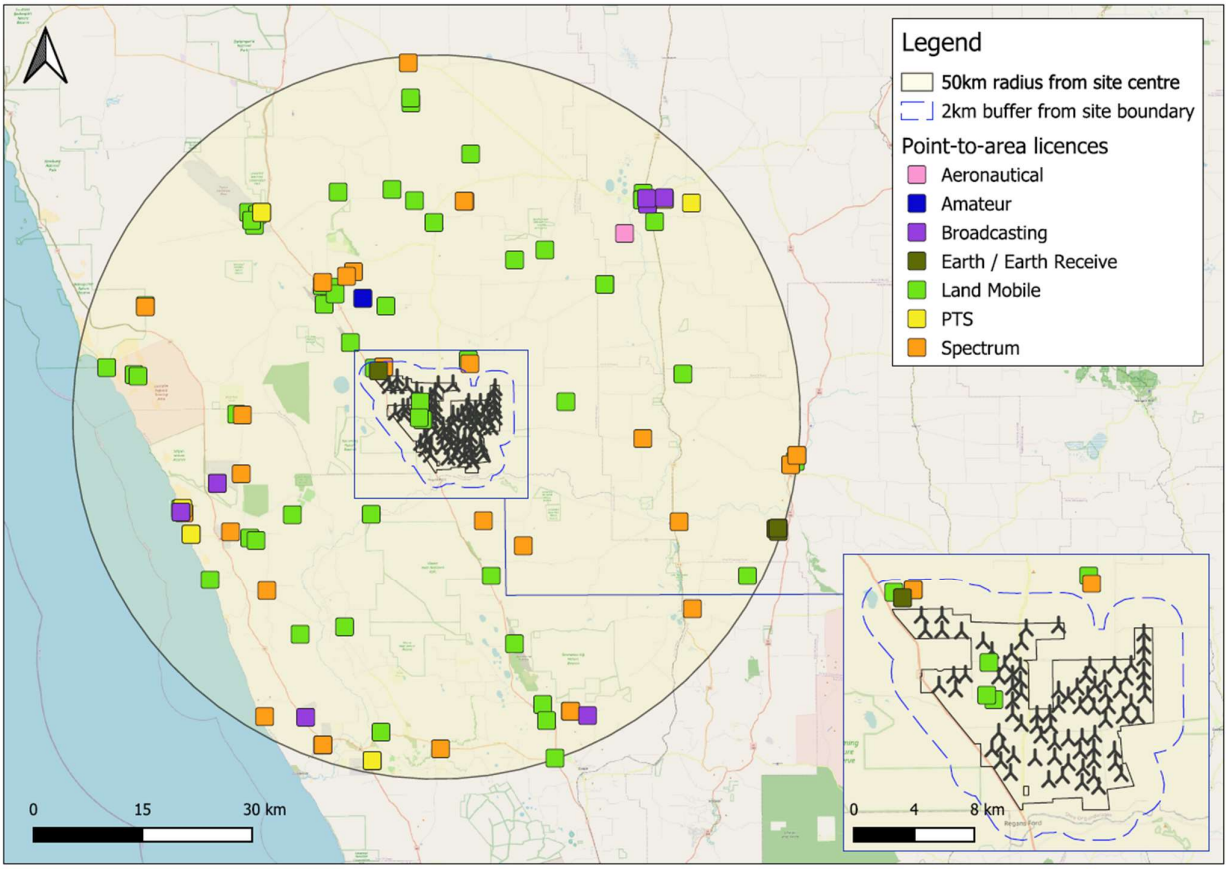

Figure 5-4 Point-to-area communication transmitters

There are three point-to-area telecommunication sites within the Project site boundary (all land mobile licenses), and three outside the site boundary but within the 2 km potential interference buffer (mix of land mobile, spectrum, and earth receive licences). The details of these point-to-area telecommunication sites are listed in Table 5-4. The results below only include five out of the six identified point-to-area sites due to being 2.5 km from the nearest turbine, even though it is visually within the 2 km buffer zone in Figure 5-4.

Table 5-4 Closest point-to-area telecommunication site to the Project

Site name	Site ID	Lat/Long	License Type	Licensee	License number(s)	Distance to nearest turbine (km)
Dampier to Bunbury Gas Pipeline WALYOO	36736	-30.887463°, 115.678812°	Land Mobile	Electricity Networks Corporation (Western Power)	1149397/1, 12858026/1, 12858027/1, 12858025/1	0.9 (WP76)
				DBNGP (WA) Nominees Pty Ltd	516093/1	
Walyoo Farm 8402 Brand Highway YATHROO	10007295	-30.909677°, 115.681941°	Land Mobile	LAWSON GRAINS PTY LIMITED	10305133/1	1.2 (WP27)

Site name	Site ID	Lat/Long	License Type	Licensee	License number(s)	Distance to nearest turbine (km)
DGPS Site 581 Walyoo Road YATHROO	9021037	-30.906933°, 115.676976°	Land Mobile	AFGRI EQUIPMENT AUSTRALIA PTY LTD	1975298/1	1.5 (WP9)
Starlink Earth Station Brand Highway, 14 Km SE of CATABY	10025044	-30.848289°, 115.61951°	Spectrum	STARLINK AUSTRALIA PTY LTD	11190520	1.8 (WP2)
			Earth Receive		11240790/1, 11240789/1	
Telstra/Police Site Walyer Walyer Hill CATABY	30554	-30.843544°, 115.626922°	Land Mobile	WESTERN AUSTRALIA POLICE	1975329/1	1.9 (WP2)
			Spectrum	TELSTRA LIMITED	9469862, 9263433	

Most types of point-to-area licences are generally not expected to be impacted by the presence of turbines. However, the proximity of the sites to the Project boundary could potentially cause interference. As four out of five of these sites are within the 2 km consultation zone from a turbine recommended by the Draft National Guidelines, Aurecon recommends discussions with the licence owners identified in Table 5-4 within less than 2 km distance from a turbine to understand if any impacts to their services may occur.

5.2.2 Signal coverage maps

Aurecon has reviewed publicly available mobile phone (Optus[8], Telstra[9], and Vodafone[10]), wireless internet (National Broadband Network)[11] and digital television coverage[12] maps with regards to identified dwellings within close vicinity of the proposed wind farm. Residences are categorised as “involved” (landowners hosting the wind farm) or “non-involved” and have been identified based on satellite imagery by the Proponent. Locations that are in presently low or no coverage areas and in proximity to turbines may experience interference to available service due to signal scattering off the turbine.

Mobile phone

The available signal coverage maps are shown below in Figure 5-5, Figure 5-6 and Figure 5-7.

[8] https://www.optus.com.au/living-network/coverage
[9] https://www.telstra.com.au/coverage-networks/our-coverage
[10] https://www.vodafone.com.au/network/coverage-checker
[11] https://www.nbnco.com.au/learn/rollout-map
[12] https://myswitch.digitalready.gov.au/

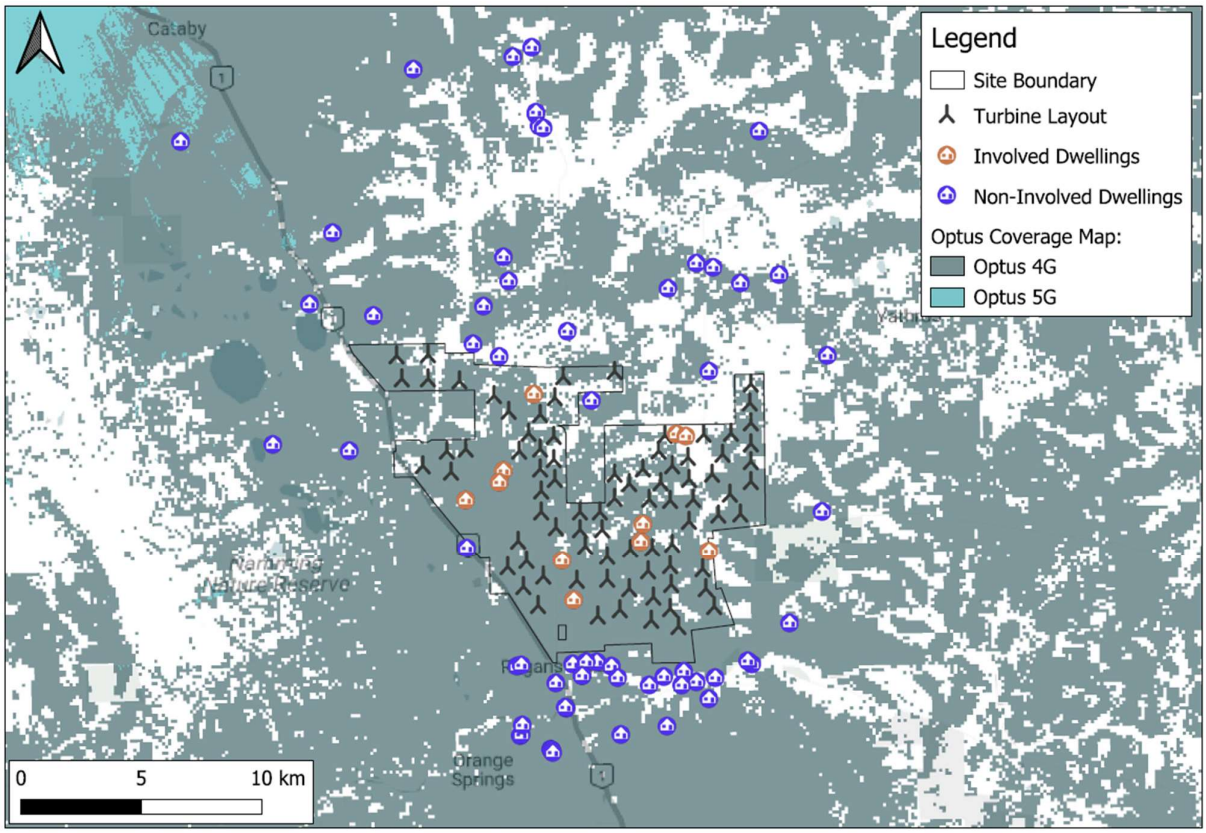

Figure 5-5 Optus mobile network coverage

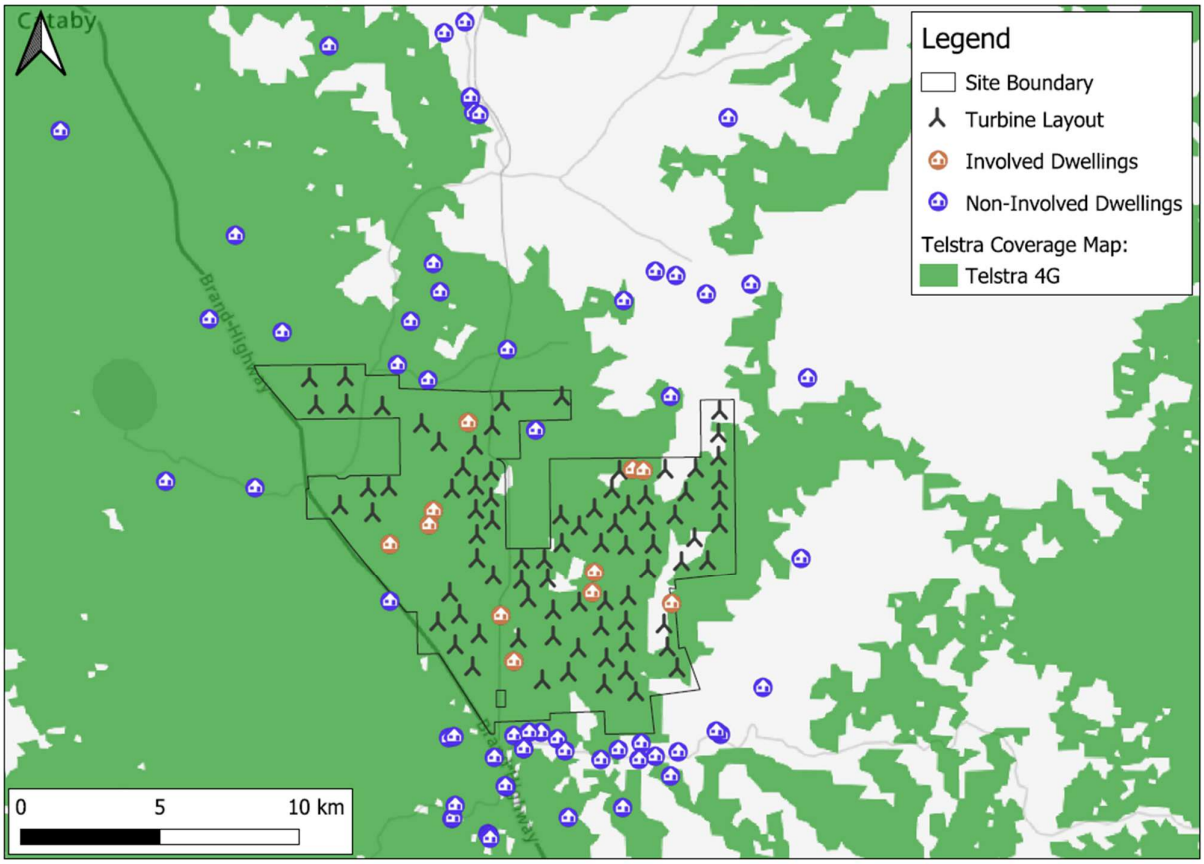

Figure 5-6 Telstra mobile network coverage

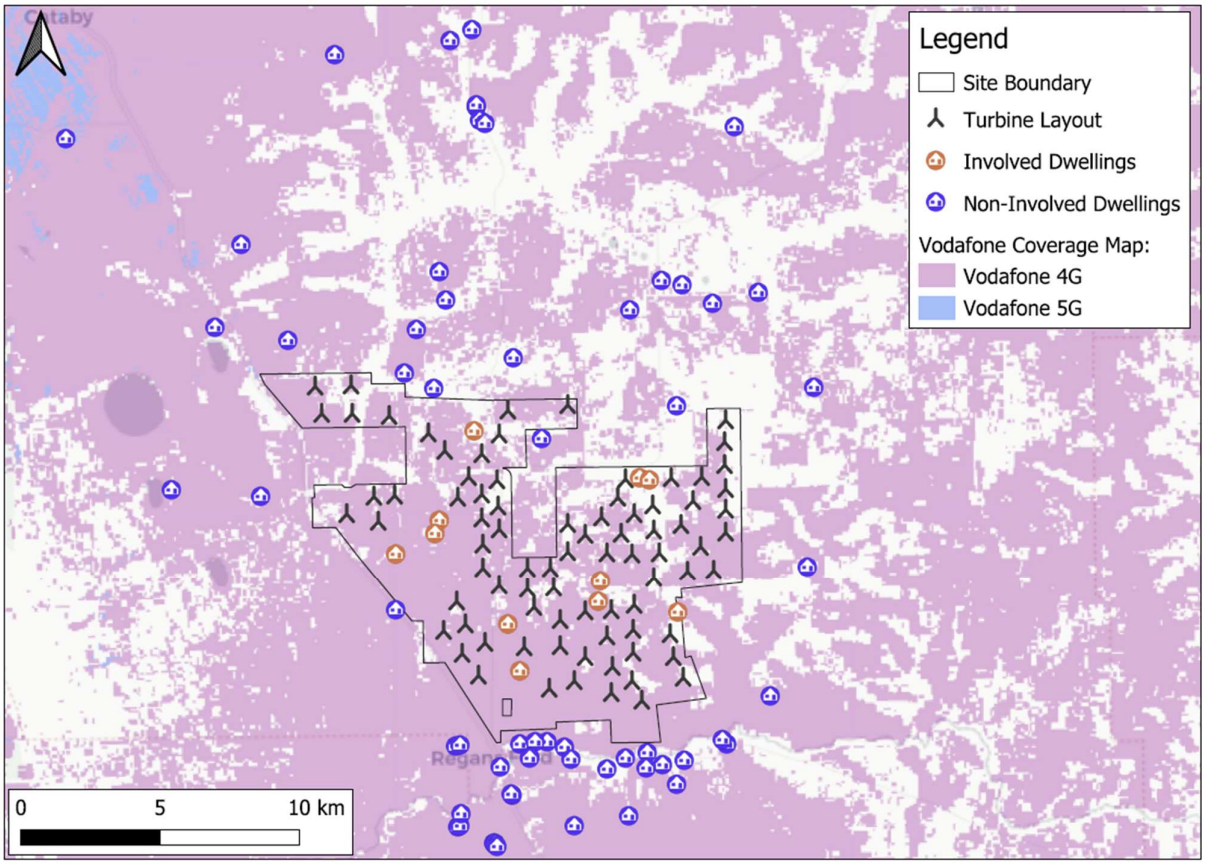

Figure 5-7 Vodafone mobile network coverage

Several dwellings are near or within no coverage areas for all three mobile networks that are available and may experience reduced signal as a result of the Project. In the case of interference to signals, mitigation options for users may include the use of an external antenna. It is recommended to contact Optus, Telstra, and Vodafone to seek feedback on any potential impact that the Project could have on their services.

Internet

National Broadband Network (NBN) indicates that wireless and satellite broadband is available within various parts of the Project boundary, and the surrounding area. The wireless signal available at some dwellings locations and is transmitted from a station in Nilgen to the west of the Project (see Figure 5-8). Based this, most dwellings behind the wind farm (in the northeast) are generally not expected to have any interference due to already not having coverage, although any existing coverage not predicted by the NBN map will likely be negatively impacted by the Project. The involved residences in the west half of the site are likely to be affected, as they are within the existing coverage area but the turbines will likely interfere with their received signal. Any residences with wireless signal to the north, south or west of the Project are not obstructed by the proposed turbines and are therefore not expected to be affected. For the few users that may experience reduced signal mitigation options include installing a signal booster or external antenna or switching to satellite broadband. Satellite broadband is the option available for areas without wireless coverage and is typically unaffected by wind turbines as the signal is received from above rather than from across the land. Therefore, no mitigation for satellite internet service is required.

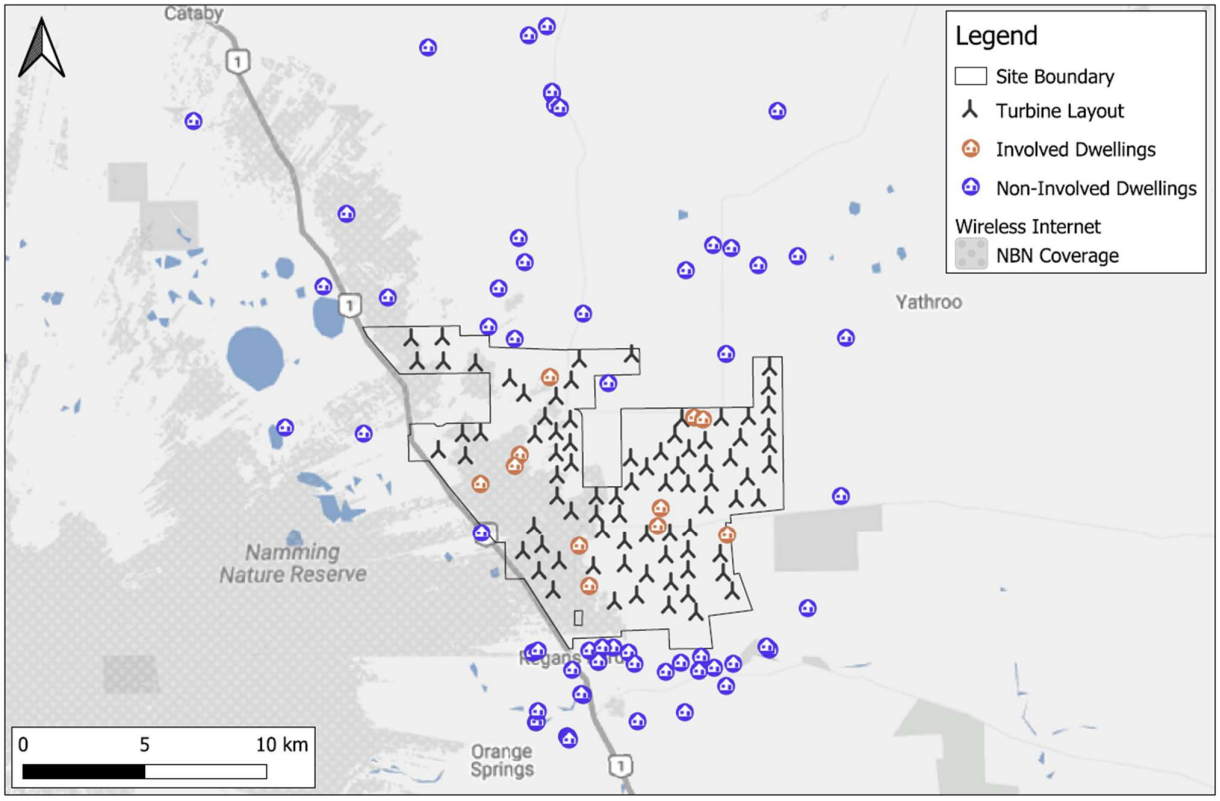

Figure 5-8 NBN Fixed Wireless Coverage

Digital TV

The Australian Government 'MySwitch' map indicates that there are three stations that have signal coverage within the Project boundary, and the surrounding area on the west, northeast and south sides of the Project boundary. The closest digital television station is Lancelin located ~26 km west of the Project, which provides "variable" coverage across the west of the Project. The second station is Moora located ~44km northeast of the Project, which provides "good" to "variable" coverage across the northwest of the Project. The third station is Perth located ~120 km south of the Project, which provides "variable" coverage mainly in the south of the Project. The coverage maps are shown in Figure 5-9, Figure 5-10 and Figure 5-11 and details for each site are listed in Table 5-5-- below. Note that Perth includes four transmitting towers for multiple networks, all within a 2.1 km^2 area.

Table 5-5 Digital television sites with coverage over the Project and surrounding residences

Name	Lat/Long	Site ID	Site Name	Licence Number/s	Networks
Lancelin	-30.98507°, 115.38565°	150533	Broadcast Site Ocean Farms CALM Nilgen Nature Reserve 6 km NE of LANCELIN	1958836, 1958835, 1958839, 1958837, 1958838	ABC, SBS, Network Ten (NEW), Seven Network (TVW), Nine Network (STW)
Moora	-30.63520°, 116.15970°	30599	Broadcast/Telstra Site Quarrel Range MOOR	1901615, 1967343, 1948019, 1948052, 1948053	ABC, SBS, WIN Television (WOW), GWN (WAW), West Digital Television (WDW)
Perth	-32.0°, 116.1°	26620	Tower Broadcast Australia Site Television Road BICKLEY	1156326, 1961929	ABC, SBS
		26624	TXA Carmel Site 255 Welshpool Road East CARMEL	1156294, 1171340	Network Ten (NEW), Community TV (CTW)

Name	Lat/Long	Site ID	Site Name	Licence Number/s	Networks
		26642	Tower Swan TV and Radio Site Lawnbrook Road 500m S of WALLISTON	1156295	Nine Network (STW)
		26647	TXA Bickley Site Tower 10 Television Road BICKLEY	1156293	Seven Network (TVW)

There is potential for television signal interference for residences identified around the Project, due to all broadcasting signals already being relatively weak ("variable" to "none"). However, the impact may be reduced due to having multiple stations available to provide signal. The region affected by scattering that may receive reduced signal generally extends up to 5 km behind the turbine and 500 m in all other directions around the turbine[13,14]. For this site with poor signal for most residences, in general only residences with no turbines between their location and the strongest broadcasting signal origin are not expected to be impacted. The involved residences within the Project boundary will likely be the most affected due to being surrounded by turbines, deflecting signal from all three towers. Mitigation options at impacted residences could include installation of an upgraded antenna or signal booster to improve the signal, or installation of satellite television.

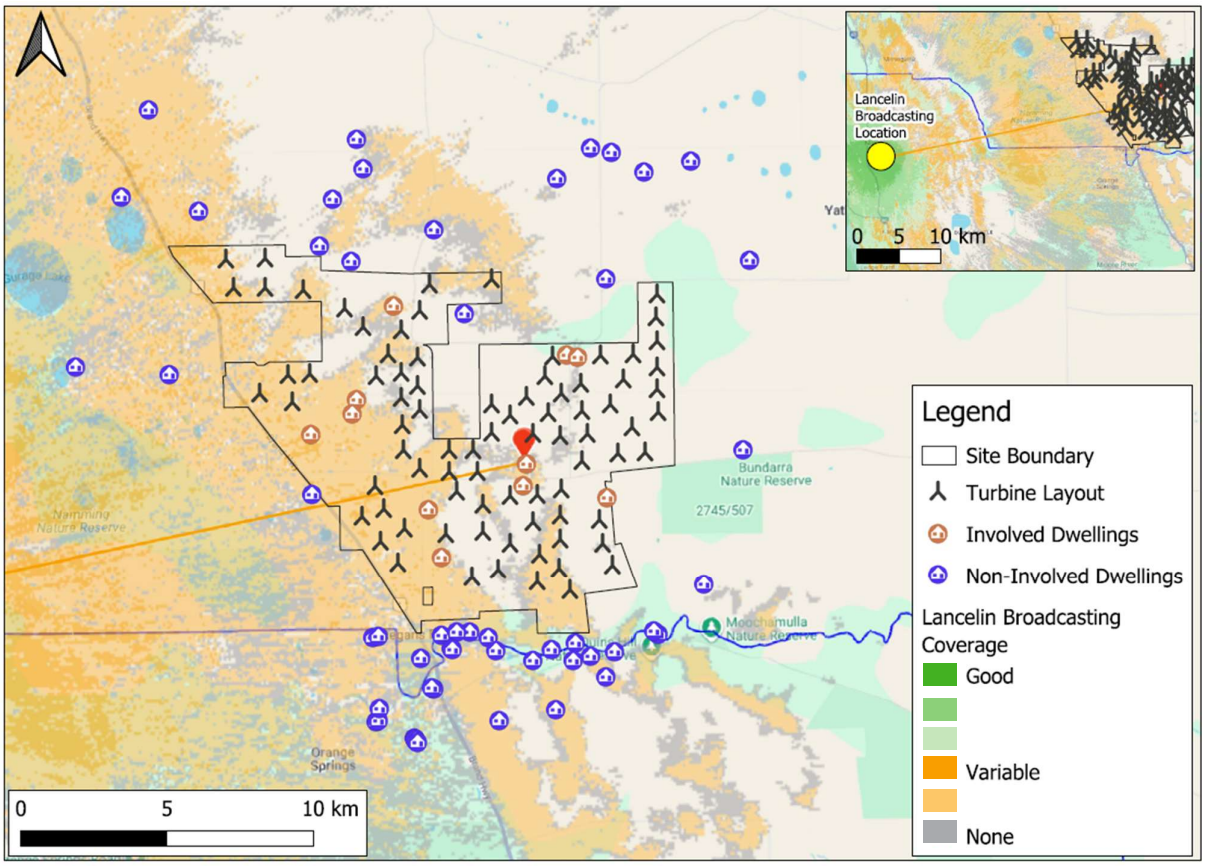

Figure 5-9 Broadcast digital TV signal for Lancelin

[13] S. H. Hall, "The assessment and avoidance of electromagnetic interference due to wind farms," Wind Engineering, vol. 16, no. 6 (1992), pp. 326-338

[14] Ofcom, "Tall structures and their impact on broadcast and other wireless services," dated 26 Aug 2009

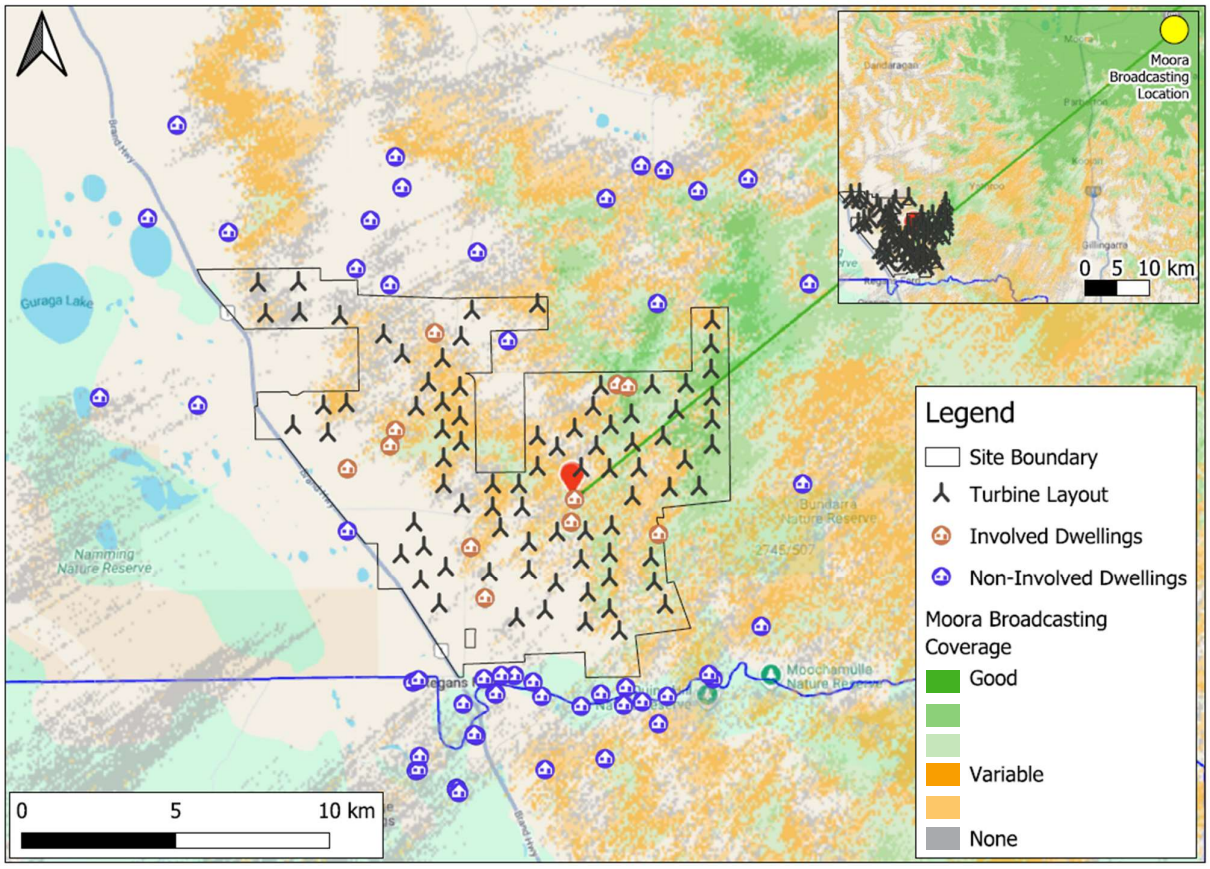

Figure 5-10 Broadcast digital TV signal for Moora

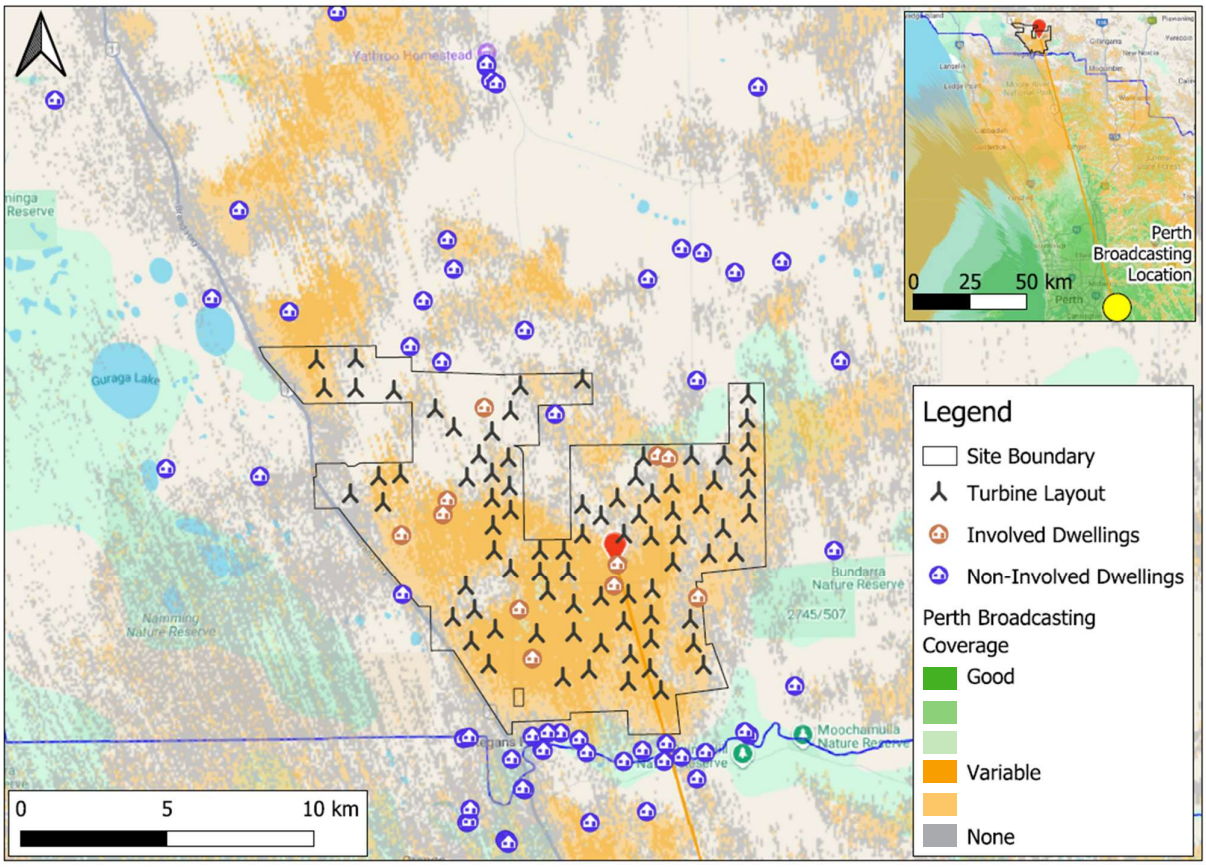

Figure 5-11 Broadcast digital TV signal for Perth

5.3 Radar

According to the Draft National Guidelines, radar services may be impacted by the presence of turbines hundreds of kilometres away if they are located within the radar operating range and line of sight. However, due to the curvature of the earth the interference from near-ground level objects reduces over large distances. Aurecon has assessed the location of meteorological and aeronautical radar stations in line with the Draft National Guidelines, as well as Defence radars.

5.3.1 Meteorological

Meteorological radar stations licensed to the Bureau of Meteorology (BOM) are shown in Figure 5-12. There were seven BOM radar sites identified within 463 km radius of the site. Details of the closest BOM radar sites to the Project (within 200 km) are shown in Table 5-6.

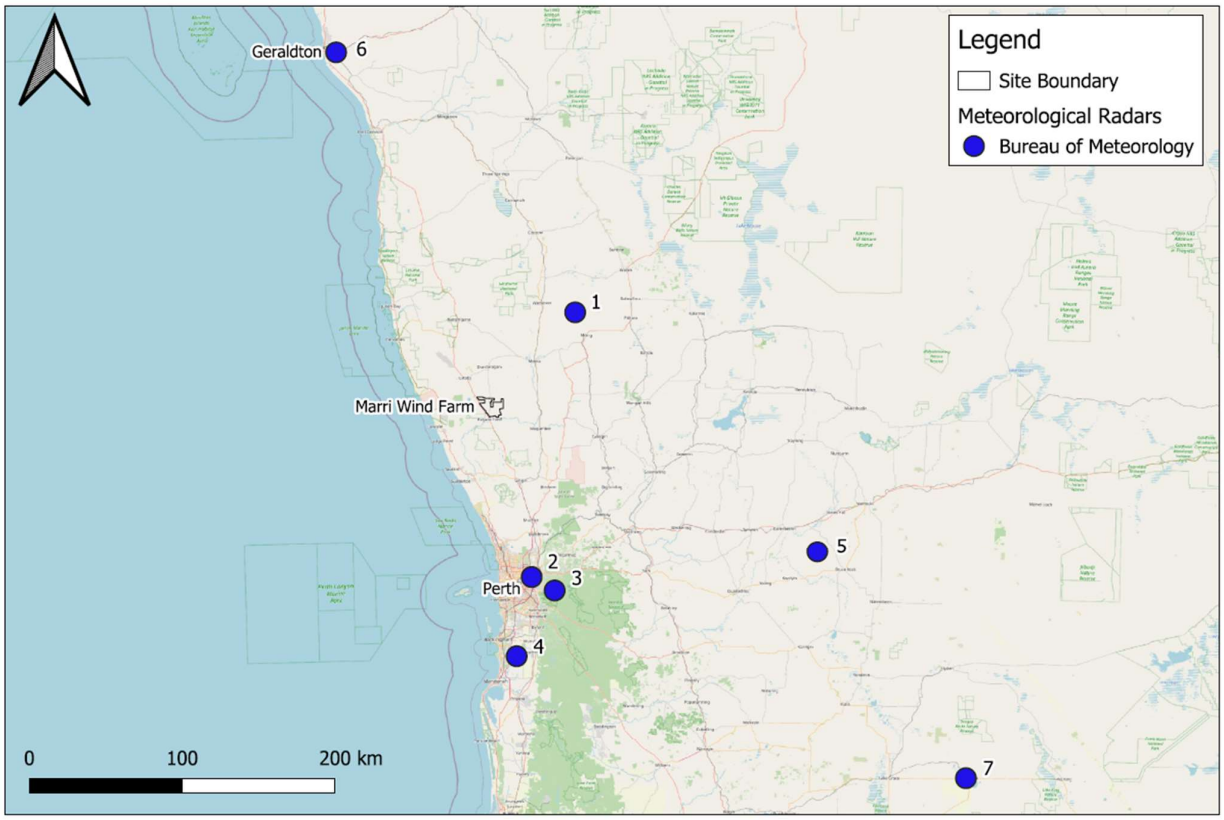

Figure 5-12 BOM radar locations

Table 5-6 Closest BOM radar sites to the Project

Label on Map	Site name	Site ID	Lat/Long	Licence number	Frequency [GHz]	Distance from Project [km]
1	Off Edawa Road	10000636	-30.3600°, 116.2896°	10073103/1	5.625	75
2	Bureau of Meteorology Office Northern Perimeter Road PERTH AIRPORT	601351	-31.927387°, 115.976477°	1909700/1	5.625	110
3	Walnut Rd BICKLEY	44829	-32.007684°, 116.134871°	1215014/3	0.0113	120
4	Bureau of Meteorlogy across the road from runway Lot 164 (286) Yangedi Rd HOPELAND	138152	-32.391691°, 115.866971°	11309328/1	2.817	160

All of the above radars are within 200 km of the Project and interference may occur, so Aurecon recommends consultation with BOM. In particular, the Watheroo radar (Off Edawa Road site) is at a relatively close distance of 75 km so interference is relatively likely. Additionally, Aurecon notes that radars listed above as number 1 and 4 (site ID's 10000636 and 139890 respectively) are high resolution Doppler radars[15] which are of high importance, and BOM may require an assessment of potential effects for these. Aurecon has informed BOM of the wind farm development so that any potential effects on the radars listed above can be assessed[16]. At the time of wiring, the preliminary assessment result has not been received from the BOM. The other three identified radars over 200 km from the Project are not expected to be affected by the Project, pending confirmation from the BOM.

5.3.2 Aeronautical

Aeronautical radar stations licensed to Airservices Australia are shown in Figure 5-13. There were 32 aeronautical radars identified within a 463 km radius from the site. Details of the closest aeronautical radar sites to the Project (within 100 km) are shown in Table 5-7. The two radars are within 80m distance, but appear to be separate towers in the same area and therefore have different site IDs.

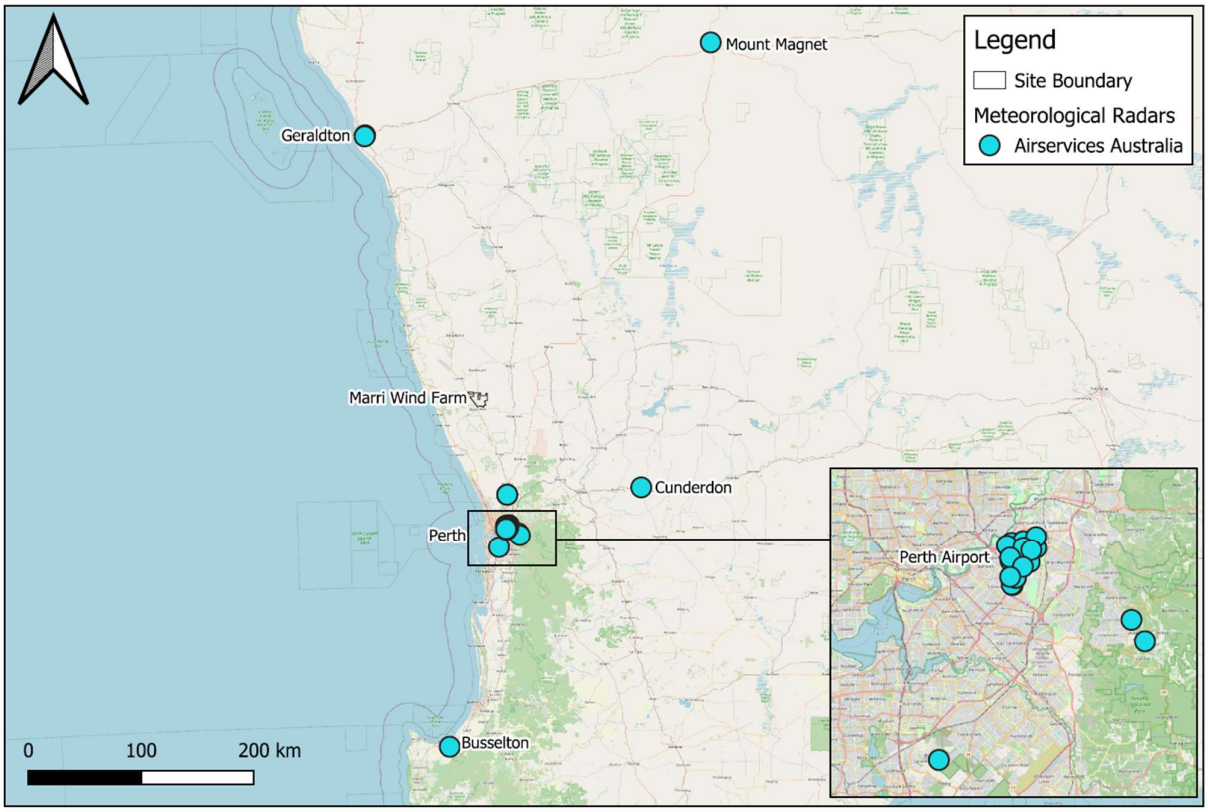

Figure 5-13 Aeronautical radar locations

Table 5-7 Closest aeronautical radar sites to the Project

Site name	Site ID	Lat/Long	Licence number	Frequency [GHz]	Distance from Project [km]
Airservices Radar Site Monitor Eclipse Hill BULLSBROOK WA	9003784	-31.679815°, 115.96898°	1193328/1, 1193370/1	1.03, 1.09	82
Airservices HF Rx Site Communications Tower BULLSBROOK	9021382	-31.680017°, 115.968965°	1978060/1	1.03, 1.09	82

[15] http://www.bom.gov.au/australia/radar/about/radar_coverage_national.shtml

[16] *RE: Marri Wind Farm / CAS-112718-L0Q5R5*, email to windfarmenquires@bom.gov.au, sent on 29/07/2025.

The Project may cause interference for both of these radar licences. There are a large number of radar licences registered around Perth airport, although these are less likely to be affected at over 100 km away. The other radar licences are expected to be too far away for experience any impacts. Aurecon understands from the Proponent that Airservices Australia has been informed of the Project as part of the Aviation Impact Assessment to assess any potential effects for the identified radar stations. Mitigation options may include the use of enhanced radar filters by the operator that can remove reflections caused by turbines.

5.3.3 Defence

Radar stations licensed to the Department of Defence (DOD) are shown in Figure 5-14. There were 17 Department of Defence radars identified within 463 km radius of the site, with a large number scattered along the highway between the Project and Perth. Of the 17 identified, 15 are less than 100 km from the Project and their details are shown in Table 5-8.

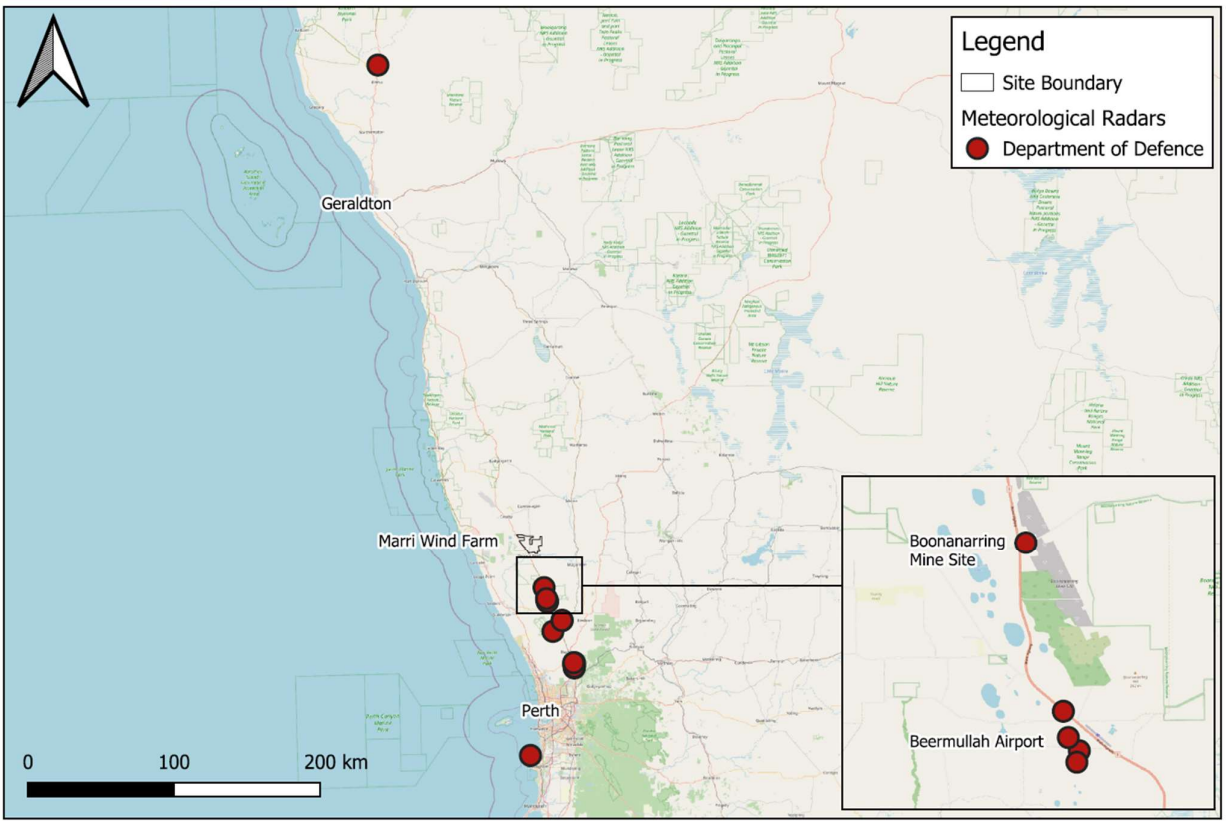

Figure 5-14 Defence radar locations

Table 5-8 Closest defence radar sites to the Project

Site name	Site ID	Lat/Long	Licence number(s)	Frequencies	Distance from Project [km]
Outer Marker RAAF Training Area BEERMULLAH	600784	-31.189388°, 115.805129°	1137357/1	0.075	26
Middle Marker RAAF Training Area BEERMULLAH	600787	-31.257561°, 115.821864°	1137358/1	0.075	33
Glide Path RAAF Training Area BEERMULLAH	600785	-31.268161°, 115.824066°	12213023/1 1137360/1	0.332, 1.054, 0.991	35
RAAF Training Area BEERMULLAH	130776	-31.273538°, 115.829126°	10528266/1	1.042, 0.979	35

Site name	Site ID	Lat/Long	Licence number(s)	Frequencies	Distance from Project [km]
Localiser RAAF Training Area BEERMULLAH	600786	-31.278094°, 115.827947°	1137359/1 12213023/1	0.1093	36
SSR Site RAAF Base PEARCE	205162	-31.392722°, 115.933056°	1228621/1	1.03	51
Eclipse Hill SSR Site Creighton Rd GINGIN	9021519	-31.393792°, 115.931731°	10293698/1 10294402/1	2.785, 2.887, 2.779, 2.893, 1.03, 1.09	51
Airservices NDB Site GINGIN	30501	-31.459717°, 115.865558°	495287/1	0.372	56
Runway 36 Localiser PEARCE	600782	-31.655°, 116.012778°	11971093/1	0.1119	81
NDB Site RAAF Base Pearce PEARCE 6084	10007015	-31.654403°, 116.018911°	495286/2	0.340	81
Runway 18 Glide Path PEARCE	39354	-31.664957°, 116.012771°	12336160/1	0.332, 1.005, 1.068	82
ATC Tower RAAF Base Pearce PEARCE	39352	-31.668723°, 116.020031°	10294402/1	1.03, 1.09	82
Defence Site PEARCE	26684	-31.673944°, 116.017389°	495248/2	1.099, 1.162	83
Runway 36 Glide Path PEARCE	600781	-31.681017°, 116.017456°	11971093/1	0.3311, 1.017, 1.08	84
Runway 18 Localiser PEARCE	39353	-31.686778°, 116.01694°	12336160/1	0.1107	84

The Project may cause interference for the radars listed above, but the other two radars identified are expected to be too far from the Project for any impacts to occur. Aurecon understands from the Proponent that the Department of Defence has been informed of the Project as part of the Project's Aviation Impact Assessment to understand any potential effects on these radar stations.

5.4 Cumulative impacts

Cumulative impacts on point-to-area and radar services can occur due to a collection of several neighbouring wind farms where none or minimal impacts were predicted for each individual wind farm. This can contribute to impacts such as TV and mobile service: e.g. where service may still be viable with a single wind farm, but too much interference is caused by two wind farms. Aurecon has identified three existing wind farms and one proposed in the vicinity of the Project, as summarised in Table 5-9.

Table 5-9 Wind farms in the vicinity of the Project

Wind farm	Status	Number of turbines	Distance between nearest turbines
Yandin Wind Farm	Operational	51	~5 km north
West Hills Wind Farm	Operational	10	~23 km west
Karakin Wind Farm	Operational	6	~20 km southwest
Yathroo Wind Farm	Proposed	65	~2 km north (estimated)

A detailed cumulative impact analysis has not been considered as part of this assessment. West Hills and Karakin Wind Farms are at sufficient distance from the Project that no cumulative effects are expected. However, Yandin Wind Farm involves a large number of turbines and is located close to the Project, and cumulative effects may occur. Yathroo Wind Farm is directly north of the Project and would effectively increase the Project size by double in terms of EMI impacts, likely causing cumulative effects. Aurecon recommends that a cumulative assessment should be undertaken if Yathroo Wind Farm progresses to construction.

6 Conclusions and recommendations

Turbines have the potential to cause some EMI with telecommunications including point-to-point, point-to-multipoint, point-to area, and radar services. Aurecon has obtained the licence details of all licensed telecommunication equipment in the vicinity of the Project to assess if any impact is expected.

Fixed telecommunications towers

Two fixed telecommunication towers were identified within 2 km of the Project, one being within the site boundary ~0.9 km from the nearest turbine, and one being northwest of the site ~1.9 km from the nearest turbine. Aurecon has calculated that near field interference is expected for the tower within the wind farm and scattering/reflection will most likely occur. Although considered unlikely for the other tower, Aurecon recommends consulting with the owner of all the licences on these towers to determine whether any impacts are expected.

Point-to-multipoint assessment

Four point-to-multipoint licensed towers are located within 20 km of the Project boundary, and so interference may occur if communications from these towers cross the Project. It is recommended to consult with the licence operators identified to confirm whether their communications may be impacted.

Point-to-point links

There are six point-to-point link signals crossing the Project boundary, but one of these is at the edge of the site and too far from the turbines to be affected. One link is expected to be impacted by the Project turbines in their proposed positions. The owner of this licence (St John Ambulance WA) should be contacted to determine if it is still in use and if any interference is expected. If so, the affecting turbines may need to be re-positioned. Additionally, there are 14 turbines which may cause interference to one or more links if moved within their 300 m micro-siting zones. Mitigation may also be required if these turbines are moved within their micro-siting zones.

Point-to-area assessment

Five broadcasting locations are within 2 km of the Project turbines, so interference may occur for the point-to-area licences from these sites. Three of these sites are located within the site boundary. Aurecon recommends consulting with the licence owners and mitigation such as relocating the transmission tower may be required.

Several dwellings are near or within no coverage areas for all mobile networks (Optus, Telstra, and Vodafone) that are available in the surrounding area around the Project, and may experience reduced signal as a result. It is recommended to contact Optus, Telstra, and Vodafone to seek feedback on any potential impact that the Project could have on their services, and if required confirm what mitigation options are available for users, such as a signal amplifier.

Wireless internet for several dwellings within and northeast of the Project may be affected, and mitigation such as switching to satellite broadband may be recommended.

Signals from digital television broadcasting transmitters are expected to be impacted by the Project, and therefore a reduced and/or interrupted signal may impact dwellings identified surrounding the Project. Mitigation options could include installation of an upgraded antenna or signal booster, or satellite television.

Radar

There are 7 BOM radar sites within 250 nautical miles of the Project. Aurecon has contacted BOM on behalf of the Client to so that any potential effect of the Project on these weather radars can be assessed.

There are 32 aeronautical radar sites within 250 nautical miles of the Project. Two are 82 km from the Project and may experience interference. It is recommended to consult with Airservices Australia to determine whether any impact on this radar use is expected. All other radars are over 100 km from the Project and are less likely to be affected.

There are 17 DOD radar sites within 250 nautical miles of the Project. Of these, 15 are within 100 km of the Project so there is potential for interference. It is recommended to contact the DOD so that any potential effect of the Project on the closest radars can be assessed.

Appendix 1 – Turbines and Residences

Turbine ID	UTM (south) – GDA2020, zone 50		Elevation [m ASL][1]	Turbine ID	UTM (south) – GDA2020, zone 50		Elevation [m ASL][1]
	Easting	Southing			Easting	Southing	
WP1	375880	6580830	194	WP42	380725	6579115	230
WP2	369318	6585145	160	WP43	380793	6577286	199
WP3	369571	6584167	147	WP44	380729	6576378	210
WP4	382071	6576236	190	WP45	380739	6575571	186
WP5	371429	6581177	158	WP46	380017	6575059	180
WP6	372190	6581235	160	WP47	380720	6574560	180
WP7	371590	6580277	129	WP48	376944	6577877	215
WP8	381069	6573822	180	WP49	381438	6580899	231
WP9	374443	6581143	183	WP50	381491	6579970	229
WP10	383184	6579392	215	WP51	381690	6579167	214
WP11	374398	6577395	139	WP52	381486	6578240	203
WP12	374591	6575505	152	WP53	382104	6581861	220
WP13	375872	6581788	201	WP54	382699	6578510	210
WP14	375318	6581269	200	WP55	380790	6580552	234
WP15	375308	6580411	220	WP56	378630	6574526	140
WP16	375360	6578625	190	WP57	382459	6580188	229
WP17	375426	6575920	180	WP58	379946	6574111	162
WP18	375197	6574728	136	WP59	384063	6581455	230
WP19	375938	6577998	193	WP60	383225	6581889	232
WP20	370445	6580551	101	WP61	384071	6580723	208
WP21	382184	6575424	187	WP62	379031	6579815	192
WP22	376942	6578616	223	WP63	375919	6580007	220
WP23	370657	6584180	120	WP64	382886	6581033	240
WP24	377779	6578618	220	WP65	384067	6583946	204
WP25	377896	6577888	200	WP66	384036	6583156	227
WP26	376839	6575745	181	WP67	384050	6582336	238
WP27	375350	6579488	220	WP68	374844	6581909	184
WP28	378385	6580198	200	WP69	373947	6576339	124
WP29	378113	6576753	218	WP70	373379	6583479	138
WP30	378114	6575812	173	WP71	370629	6585176	127
WP31	377718	6574271	135	WP72	382537	6574670	161
WP32	378396	6579204	217	WP73	371968	6584100	149
WP33	379813	6576163	190	WP74	384080	6579907	206
WP34	379013	6575410	168	WP75	375293	6582707	181
WP35	379597	6580436	213	WP76	373981	6582835	150
WP36	379821	6579173	210	WP77	383648	6578547	207
WP37	379971	6577090	212	WP78	379037	6577047	200
WP38	374720	6576594	149	WP79	377192	6577209	190
WP39	380471	6581820	216	WP80	376260	6584272	160
WP40	380209	6581156	210	WP81	375923	6583406	150
WP41	380314	6579872	222	AE82	378394	6584473	210

1. Above sea level

Dwelling ID	UTM (south) - GDA2020, zone 50		Elevation [m ASL]	Dwelling ID	UTM (south) – GDA2020, zone 50		Elevation [m ASL]
	Easting	Southing			Easting	Southing	
Involved							
2	382327	6577021	200	17	376669	6574936	163
5	379576	6578153	230	21	379471	6577410	224
10	381332	6581817	240	41	372198	6579160	140
12	376223	6576594	210	43	373604	6579875	202
13	373779	6580367	220	99	380956	6581887	233
16	375040	6583550	163	-	-	-	-
Non-Involved							
1	385214	6588528	180	40	372506	6585618	129
3	377644	6572395	90	42	372218	6577118	100
4	378252	6572190	93	44	380614	6587923	210
6	385643	6574016	160	45	387224	6585140	190
7	383596	6588159	200	46	374339	6572206	86
8	382289	6584483	230	47	374525	6572253	88
9	380445	6571791	105	48	375956	6571494	90
11	387001	6578660	140	49	376390	6570457	85
14	376420	6586166	161	50	376342	6570493	85
15	384387	6594496	200	51	375741	6568755	89
18	382305	6570840	130	52	375757	6568729	89
19	381768	6588973	180	53	375773	6568707	88
20	373581	6585096	130	54	375832	6568618	87
22	377438	6583297	180	55	378631	6569357	140
23	376661	6572288	90	56	374445	6569326	90
24	368347	6586800	190	57	374501	6569364	90
25	365711	6587277	93	58	380571	6569722	160
26	364157	6581457	80	59	381773	6571563	108
27	367354	6581201	94	60	384088	6572308	110
28	360359	6594055	110	61	383941	6572439	112
29	366662	6590268	189	62	381258	6572005	100
30	373996	6588260	154	63	379803	6571411	100
31	372940	6587199	150	64	382488	6588824	170
32	373771	6589264	190	65	377206	6572393	90
33	375112	6595187	180	66	374559	6569790	80
34	375103	6595256	180	67	378522	6571740	100
35	375236	6594718	173	68	381184	6571433	102
36	375433	6594612	170	69	382588	6571721	103
37	370004	6597071	260	70	377014	6571831	92
38	374930	6597953	200	71	377023	6571805	92
39	374154	6597572	217	40	372506	6585618	129

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