Hexham
Wind Farm

Chapter 24

Electromanetic interference

WIND PROSPECT

24.1 Overview

This chapter identifies the existing radiocommunication licences in the vicinity of the project, as well as other services such as broadcast radio and television, meteorological radars, and wireless and satellite internet, that have the potential to experience electromagnetic interference from operating wind turbines. This chapter is based on the findings of the ***Electromagnetic Interference Impact Assessment*** prepared by DNV Australia Pty Ltd (provided in Appendix N).

Based on a review of the Australian Communication and Media Authority Register of Radiocommunication Licences database, there are limited radiocommunication services in the vicinity of the project site, with five point-to-point links (operated by AusNet Services, VerTel and NBN Co) passing over the project site and two point-to-multipoint stations located within 20 kilometres of the project site (operated by Aussie Broadband, and Wannon Region Water Corporation). Radiocommunications service providers, emergency services, mobile phone providers, NBN, Bureau of Meteorology, operators of fixed point-to-point communications links and radio services were consulted to determine the potential for electromagnetic interference. Respondents typically advised that no impacts, or acceptable (negligible) levels of impact were expected. Where they advised of potential impacts, respondents provided a range of feedback on conditions they require the project adopt (e.g., Bureau of Meteorology).

The project has sought to eliminate potential electromagnetic interference impacts from the project, including relocating turbines away from a fixed point-to-point link operated by AusNet Services, VerTel and NBN Co, and the adoption of a buffer to further avoid any potential interference. To ensure mobile phone, NBN, broadcast radio and broadcast television are not negatively impacted, a Signal Strength Survey at neighbouring dwellings would be conducted prior to construction, and then after construction if issues are identified. The proponent would undertake measures necessary to rectify any impacted services.

The assessment of electromagnetic interference concluded that, following the implementation of design and management controls, the project is unlikely or has a low potential to cause interference. Further consultation with the operators of communications and other service providers would occur during detailed design to confirm the avoidance of electromagnetic interference impacts, and to address any impacts identified.

24.2 EES objectives and key issues

The EES scoping requirements specify the evaluation objective and key issues, outlined in Table 24.1, relevant to electromagnetic interference that have guided this assessment.

Table 24.1 EES evaluation objective and key issues

Evaluation objective	
Land use and socioeconomic: *To avoid and minimise adverse effects on land use (including agricultural and residential), social fabric of the community (with regard to wellbeing and community cohesion), local infrastructure, electromagnetic interference, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.*	
Key Issues	Potential interference with communication systems that use electromagnetic waves as the transmissions medium (e.g., television, radio, mobile reception).

24.3 Legislation, policy and guidelines

Key legislation, policies and guidelines relevant to the ***Electromagnetic Interference Impact Assessment*** (Appendix N) are summarised in Table 24.2.

Table 24.2 Relevant legislation, policies and guidelines

Legislation/policy/ guideline	Description	Relevance to project
State		
Planning and Environment Act 1987	The purpose of the *Planning and Environment Act* is to establish a framework for planning the use, development and protection of land in Victoria. The Act sets out the process for obtaining permits under schemes, settling disputes, enforcing compliance with planning schemes and permits, and other administrative procedures.	The following Clause of the Particular Provisions of the Moyne Planning Scheme is relevant to the project: Decision Guidelines of Clause 52.32 Wind Energy Facility state that: "Before deciding on an application, in addition to the decision guidelines of Clause 65, the responsible authority must consider, as appropriate: • The effect of the proposal on the surrounding area in terms of … electromagnetic interference."
Guidelines/policies		
Planning guidelines for Development of Wind Energy Facilities in Victoria (Planning Guidelines) (DTP, 2023a)	These guidelines provide a set of consistent operational performance standards to inform the assessment and operation of a wind energy project; and guidance as to how planning permit application requirements might be met.	The Planning Guidelines recommend the potential for electromagnetic interference from the generation of electricity from a wind energy project is minimised, if not eliminated, through appropriate turbine design and siting. These guidelines also recommend that the siting of wind turbines in the 'line of sight' between transmitters and receivers is avoided.
National wind farm development guidelines – draft (Draft National Guidelines) (Environment Protection and Heritage Council, 2010)	The National wind farm development guidelines – draft (Draft National Guidelines) outline the best-practice methods for assessing the impacts associated with the development and operation of wind farms. This includes detailed methodologies for the assessment of electromagnetic interference.	The Draft National Guidelines informed the methodology adopted for the project electromagnetic interference assessment.

24.4 Investigation area

The electromagnetic interference assessment considered all identified dwellings within five kilometres of the project site. There are 301 dwellings located within this investigation area, of which 49 are stakeholder dwellings.

The Draft National Guidelines recommend that a radial distance of 50 kilometres to 60 kilometres from the centre of a wind farm would normally capture all the potentially affected services in the area. However, for the purpose of the electromagnetic interference assessment, the investigation area included a broader investigation area of approximately 75 kilometres from the project site (shown in Figure 24.1). This investigation area was used to identify mobile phone and NBN fixed wireless towers, and radiocommunication towers and licences.

24.5 Method

All radiocommunication towers (and radiocommunication licences attached to these towers) within the investigation area (defined in Section 24.4) were identified and the potential for electromagnetic interference to these towers and licences from the project was assessed. Information on radiocommunication licenses within approximately 75 kilometres of the project site was obtained from the Australian Communication and Media Authority Register of Radiocommunication Licences database, dated 24 February 2023. This database was used to determine the transmission paths of the licenced links.

Other services with the potential to experience interference from the project were also identified, including meteorological radars, trigonometrical stations, Citizen's Band (CB) radio and mobile phones, wireless internet, broadcast radio and television, and satellite television and internet, and broadcast television.

As per the recommendations of the Draft National Guidelines, consultation was undertaken with relevant radiocommunication operators within two kilometres of a wind turbine or within 250 nautical miles of an aeronautical or meteorological radar site. Based on these consultation zones, the following service operators were contacted as part of the project electromagnetic interference assessment:

- AusNet Transmission Group Pty Ltd (AusNet Services)
- NBN Co Ltd
- Vertical Telecoms Pty Limited (VerTel)
- Aussie Broadband Pty Ltd. (Aussie Broadband)
- Iona Operations Pty Ltd (Lochard Energy)
- Powercor Australia Pty Ltd. (Powercor)
- Wannon Region Water Corporation (Wannon Water)
- Ambulance Victoria
- Country Fire Authority (CFA)
- Regional Mobile Radio
- Visionstream Australia (VisionStream)
- Department of Energy, Environment and Climate Action (DEECA)
- St John Ambulance Australia Incorporated
- Victoria State Emergency Service (VICSES)
- Australian Bureau of Meteorology
- BAI Communications
- Geoscience Australia
- Department of Transport and Planning
- Telecommunication providers Telstra, Optus and Vodafone.

24.6 Existing conditions

24.6.1 Radio communication towers

A review of the Australian Communication and Media Authority Register of Radiocommunications Licences database identified 457 radiocommunication towers within the investigation area, with one tower located within two kilometres of the turbine locations (approximately 1,993 metres) (Figure 24.1). The licences associated with this tower are point-to-are (land mobile) style communications, operated by the CFA.

24.6.2 Fixed point-to-point licences

There are five point-to-point links listed in the Australian Communication and Media Authority Register of Radiocommunication Licences database, operated by AusNet Services, VerTel, and NBN Co, which pass over the project site (Figure 24.1).

24.6.3 Fixed point-to-multipoint licences

There are 44 point-to-multipoint links listed in the Australian Communication and Media Authority Register of Radiocommunication Licences database within the investigation area, with two stations located within 20 kilometres of the project site. These stations are owned by Aussie Broadband and Wannon Region Water Corporation.

Radiocommunication

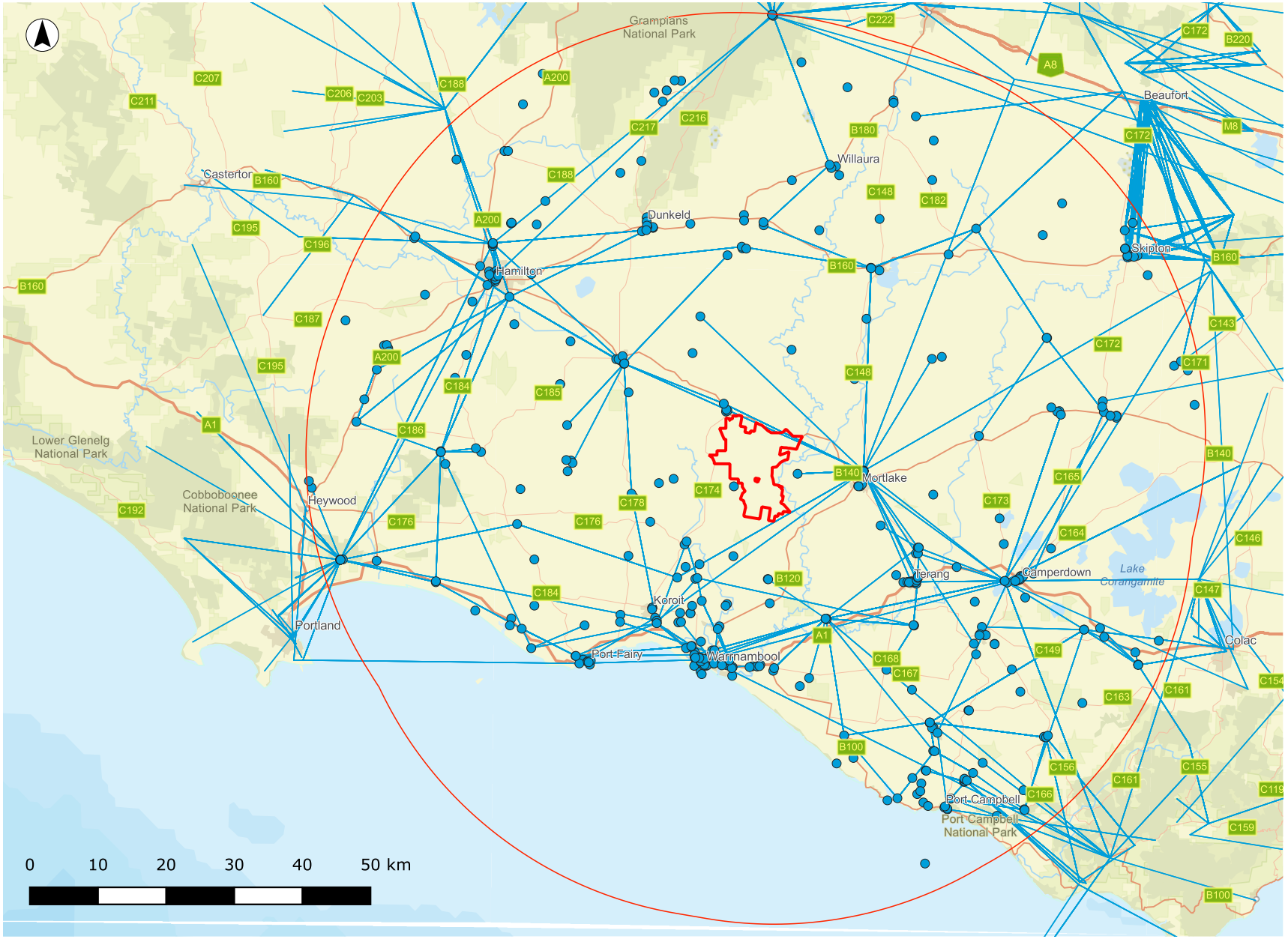
The transmission, emission and/or reception of radio waves for specific telecommunication purposes.

Point-to-point links

Point-to-point links are often used for line-of-sight connections for data, voice and video (such as on mobile and television broadcast towers).

Point-to-multipoint links

Point-to-multipoint links provide connections from one location to multiple locations, via multiple paths. Examples of point-to-multipoint links include those used for wireless internet connections.



Data: State of Victoria (DECCA/Land Use Victoria), Commonwealth of Australia, Wind Prospect, and specialist studies/reports. Data is indicative only; accuracy and completeness are not guaranteed.

Figure 24.1 Location of identified radiocommunication towers and fixed point-to-point links within 75 kilometres of the project site

24.6.4 Other licence types and services

Other licence types include point-to-area type communications, including those used by spectrum emergency services, mobile phones, and radio and television broadcasting. The sections below provide a summary of these licence types within the project investigation area, as well as other services with the potential for electromagnetic interference-related impacts.

Emergency services licences

There are no emergency services point-to-point links crossing the project site. The closest licence is approximately one kilometre from the project site and is owned by the CFA.

Meteorological radar

The World Meteorological Organisation guidelines state that wind turbines should not be located within five kilometres of a meteorological station due to the potential for the weather radar signal to be blocked by the turbines. Significant impacts are generally not expected for wind farms located more than 45 kilometres from a meteorological radar, however this can depend on the elevations of the radar and wind farm and the terrain.

The Bureau of Meteorology operates 17 weather radars within 250 nautical miles of the project, with the closest radar (Mount Gambier) located approximately 154 kilometres west of the project site.

Trigonometrical stations

The Geoscience Australia National Geospatial Reference System database indicates there is one trigonometrical station within 20 kilometres of the project site, located approximately 13 kilometres east of the project at Shadwell.

CB radio and mobile phones

As users of CB radio do not require a licence, there is no record of users of the service and their location.

A review of the mobile phone towers in the project region shows that the closest tower is location approximately 2.7 kilometres north of the project site.

Weather radar

Standard weather watch radars emit pulsed microwave radiation, which reflects from water particles in the atmosphere to detect rain activity. Doppler radars are able to measure the speed of moving water particles by bouncing a microwave signal off a desired target. This provides information on wind speed and direction.

Trigonometrical stations

Trigonometrical stations (or trig points) are observation marks used for surveying or measuring distance. Trig points may host surveying equipment such as GPS and electronic distance measuring devices, which measure the distance from the trig point to the target object by a reflected beam.

Global navigation satellite system technology is also commonly used for surveying and distance measurements by using positioning and timing information received from satellite signals.

CB radio

CB radio can be used by the general public and is commonly used in rural areas for emergency communications, road safety information and general conversation. The most common type of CB radio is mobile or handset CB radios (vehicle mounted) and hand-held (walkie-talkie style) CB radios.

Radio transmission

AM: diffracted by the ground,
AM transmissions are able to travel significant distances under the right conditions and can readily propagate around physical obstructions such as wind turbines. However, due to the distances AM transmissions can travel, the signal may be weak and can be susceptible to interference from sources such as changes in atmospheric conditions, electrical power lines and electrical equipment.

FM: better suited to short range broadcasting,
FM transmissions may be blocked by significant terrain features.

Wireless internet (broadband and NBN), and satellite television and internet

Aussie Broadband holds a license in the vicinity of the project site, with the nearest base station located 17 kilometres south-west of the project site. While the location of Aussie Broadband customers is not known, it is possible that these stations may be servicing customers in the vicinity of the project. Other residences in the vicinity may use wireless broadband services provided by Optus, Telstra and Vodafone.

NBN is currently available in the region as a fixed wireless services and satellite internet service. The NBN tower servicing the project region is located at Caramut, approximately 2.7 kilometres from the project site. It is likely that some residents are currently accessing the internet via the NBN.

Due to marginal coverage of some communication services, some residents in the vicinity of the project may use satellite television and internet.

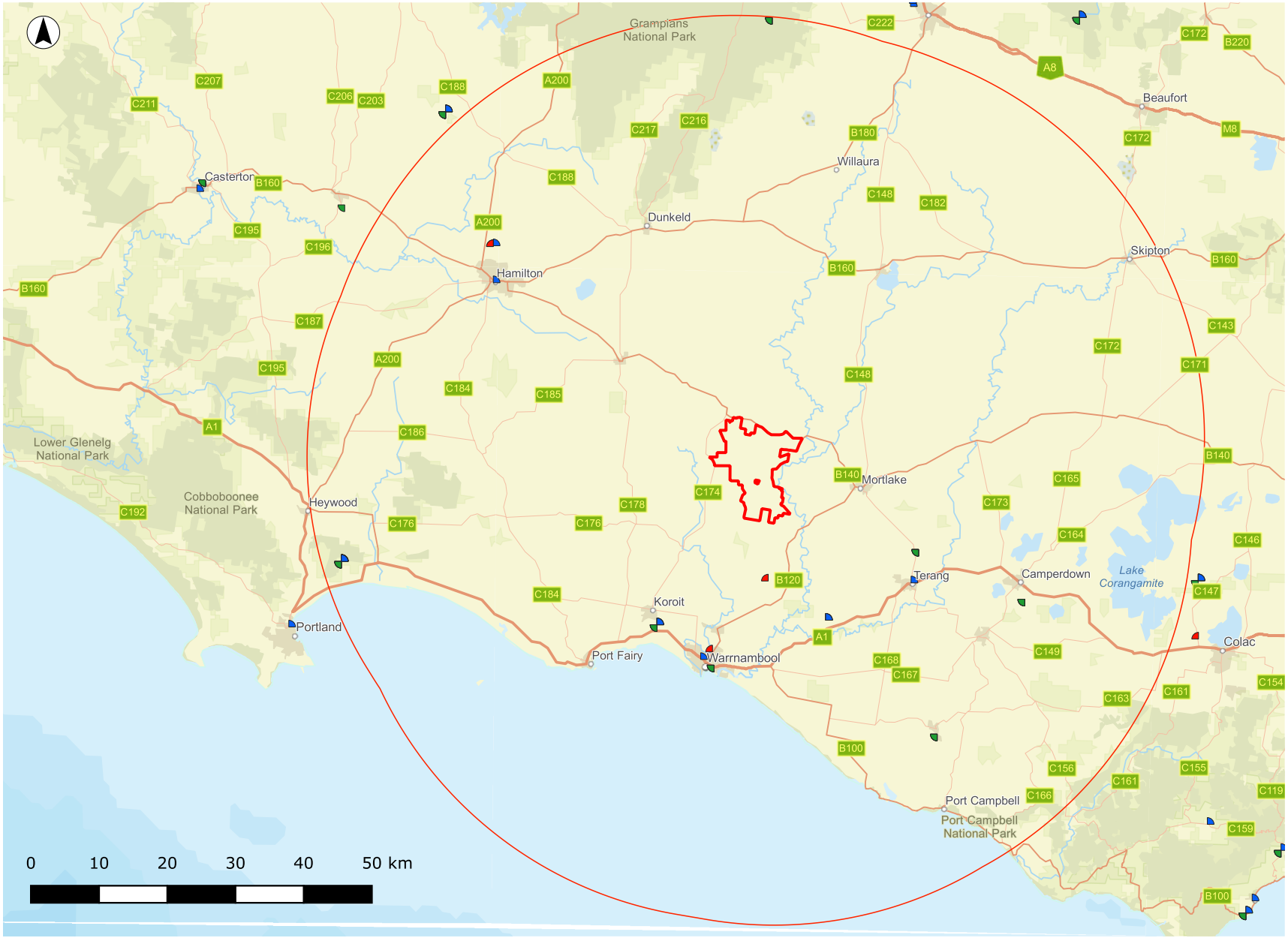
Broadcast radio

The location of AM and FM radio broadcast transmitters are shown in Figure 24.2 below. The closest FM broadcast transmission tower is located approximately 21 kilometres south of the project site.

There is no digital radio coverage currently available in the region.

Broadcast television

The main digital television broadcast transmitter used by residents in the region is the Ballarat transmitter at Lookout Hill (Figure 24.2). However, it is also possible that nearby residents can receive digital television signals from the West Victoria (Mount Dundas) and Warrnambool City transmitters.



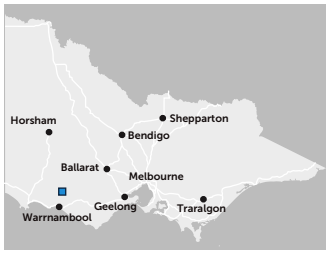
Legend

Hexham Wind Farm

- Proposed site boundary
- 75 km from proposed site boundary

Broadcasting towers

- AM
- FM
- DTV broadcasting



Data: State of Victoria (DECCA/Land Use Victoria), Commonwealth of Australia, Wind Prospect, and specialist studies/reports. Data is indicative only; accuracy and completeness are not guaranteed.

Figure 24.2 Location of radio and television broadcast transmitters within 75 kilometres of the project site

24.7 Impact assessment

24.7.1 Impact pathways

The operating wind turbines have the potential to interfere with radiocommunication services (i.e., cause electromagnetic interference) to communication signals such as television broadcast signals and fixed point-to-point signals. This can be due to the wind turbines causing:

- complete obstruction of electromagnetic signals.
- diffraction (bending), reflection or scattering of electromagnetic signals.
- near field effects, where interactions of the turbines with a transmitter or receiver antenna can cause changes to the signal characteristics.

A schematic of the key mechanisms of electromagnetic interference is shown in Figure 24.3.

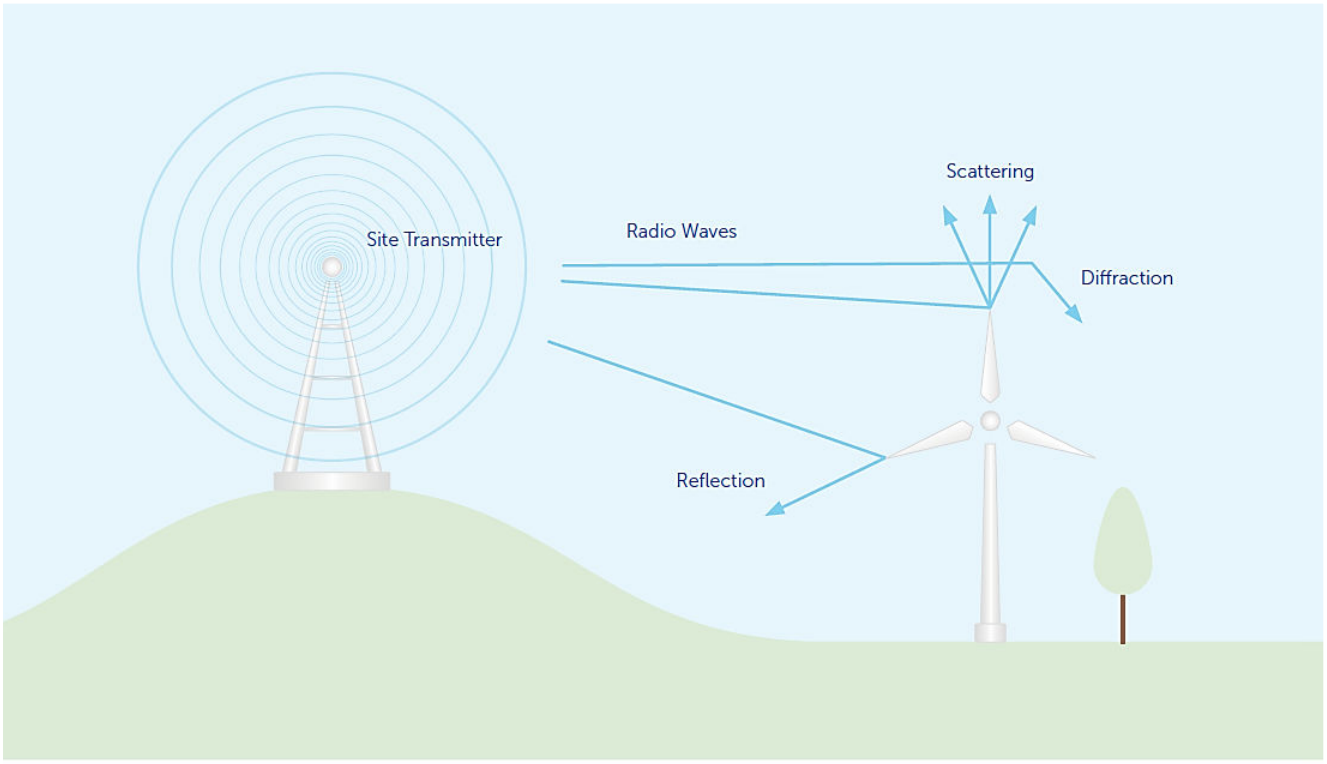


Figure 24.3 Schematic of key mechanisms of electromagnetic interference

24.7.2 Design mitigation

Avoidance by design has been the primary measure to limit electromagnetic interference impacts. This has been an iterative process whereby:

- the specialist engineer assessed potential electromagnetic interference impacts based on the concept design and turbine dimensions.
- the specialist engineer provided setback distances and recommendations in relation to the position of turbines to minimise or avoid potential electromagnetic interference.
- the specialist engineer conducted consultation with the relevant operators to receive feedback on the potential for interference to their services.
- these setback distances and recommendations were incorporated into the design and assessed by other specialists for their potential to impact other values.

Key measures that were implemented during the design process to minimise electromagnetic interference across the project site and region included:

- identifying five point-to-point communication links crossing the site and incorporating an appropriate setback (calculated using the second Fresnel zone of lowest frequency plus a blade length of 95 metres and an additional uncertainty buffer) into the project design. Consultation was conducted with the link operators who subsequently did not raise any concerns over the calculated link setback distances.
- consulting with operators of services that could not be directly assessed to confirm that the impacts are considered unlikely and/or manageable.
- applying an uncertainty buffer to the communications link setbacks, as recommended by the specialist engineer, to account for potential inaccuracies of the link locations.
- relocating several turbines to be clear of the radiocommunication link setbacks identified by the specialist engineer.

24.7.3 Environmental management measures

Where feasible, engineering design measures have been included to avoid potential electromagnetic inference impacts. Electromagnetic related impacts to radiocommunication services and operations in the investigation area are unlikely, or there is low potential for interference to occur as a result of project operation. Where there is low potential for electromagnetic interference, the following management measures outlined in Table 24.3 have been proposed to manage these impacts during project pre-construction, construction and operation.

Table 24.3 Electromagnetic interference management measures

Electromagnetic interference impact	Project phase	Management measures	Number
Potential for the project to cause electromagnetic interference to point-to-point and point-to-multipoint links	Pre-construction	**Stakeholder Engagement and Communications Plan - Point-to-point and point-to-multipoint services** 1. The proponent will consult with relevant point-to-point and point-to-multipoint service operators to confirm potential effects (or lack thereof) from final project design, prior to construction. This will be documented in the Stakeholder Engagement and Communications Plan (EMM02). 2. Where interference is not eliminated through turbine design and siting, a mitigation strategy will be developed and implemented in consultation with organisations operating point-to-point and point-to-multipoint services to minimise or avoid interference to communications. These measures could include re-routing of affected services, installing additional towers, or replacing affected links with alternative technologies.	EMI01
Potential for the project to cause electromagnetic interference to other licence types and services: • emergency services (mobile radio systems) • mobile phones • FM radio	Pre-construction	**Stakeholder Engagement and Communications Plan - Radio communications** 1. The proponent will consult with relevant radio service operators to confirm potential effects (or lack thereof) from final project design prior to construction. This will be documented in the Stakeholder Engagement and Communications Plan (EMM02). 2. Where interference is not eliminated through turbine design and siting, a mitigation strategy will be developed and implemented in consultation with organisations operating radio communications sites within 2 kilometres of wind turbines to minimise or avoid interference to radio communications. These measures could include increasing the signal strength from the affected tower or alternative towers, installing a signal repeater or an additional tower.	EMI02
Potential for the project to cause electromagnetic interference to wireless internet signals (NBN)	Pre-construction	**Stakeholder Engagement and Communications Plan - Telecommunications and NBN services** 1. The proponent will consult with relevant telecommunications carriers and other parties potentially affected by electromagnetic interference to confirm potential effects (or lack thereof) from final project design, prior to construction. This will be documented in the Stakeholder Engagement and Communications Plan (EMM02). 2. Where interference is not eliminated through turbine design and siting, a mitigation strategy will be developed and implemented in consultation with organisations operating telecommunications and NBN services to minimise or avoid interference to communications. These measures could include re-directing antenna at affected dwelling to alternative tower, changing location of antenna, or installing a new tower.	EMI03

Electromagnetic interference impact	Project phase	Management measures	Number
Potential for the project to cause electromagnetic interference to meteorological radar	Pre-construction Operation	**Bureau of Meteorology conditions** 1. The project will adhere to the following conditions provided by the Bureau of Meteorology: a. inform the Bureau of Meteorology of any changes to the wind farm design, including varying the wind farm layout, changing turbine locations by more than 100 metres or altering the turbine height b. notify the Bureau of Meteorology at least two weeks prior to any planned shutdown for more than 12 hours of the wind farm (for maintenance or any other reason) c. collaborate with the Bureau of Meteorology on the event of severe weather condition to assist in endeavours of community safety.	EMI04
Potential for the project to cause electromagnetic interference to services: • television • FM radio • Point to point services • wireless internet signals (NBN) or satellite internet	Pre-construction	**Signal Strength Survey** 1. Prior to the commencement, conduct a Signal Strength Survey, which would be submitted to, approved, and endorsed by the responsible authority. The survey will: a. be carried out by a suitably qualified and experienced independent specialist b. include testing at selected locations within five kilometres of the project site to enable the average signal strength to be determined for television, radio and other point to point services (including GPS autosteer functions used in agricultural operations) that could be impacted by electromagnetic interference from the project c. identify and consult with organisations operating point to point communication links d. include a mitigation strategy for impact to television radio, NBN reception and point to point transmission.	EMI05
	Construction Operation	**Complaint response** 1. If a complaint is received regarding the effect of the project on television or radio reception at an existing dwelling within five kilometres of the project site, then: a. the complaint would be investigated in accordance with an approved Complaint Investigation and Response Plan b. if the investigation indicates that the project has had a detrimental impact on the quality of reception or signal strength, the proponent will restore reception/ signal strength to at least the quality determined in the preconstruction Signal Strength Survey. c. Complaints will be managed in accordance with the Complaints and Grievance Mechanism (EMM03).	EMI06

Electromagnetic interference impact	Project phase	Management measures	Number
	Construction Operation	**Television and satellite internet** 1. Where interference to television and satellite internet services is not eliminated through turbine design and siting, develop and implement a mitigation strategy in consultation with homeowners and service providers to restore the affected service to at least the quality determined in the preconstruction Signal Strength Survey. These measures could include re-directing communication links, re-locating antenna/satellite dishes, and/or upgrading antenna/satellite dishes, installing cable or satellite television, or installing a relay transmitter.	EMI07

24.7.4 Residual impacts

Following the implementation of design measures, an assessment of residual effects and impacts was completed describing the changes to the environment brought about by the construction, operation and eventual decommissioning of the project, and rating the significance of these effects.

Radiocommunication towers

Through consultation with the CFA, no potential interference from the project to their radiocommunication tower services was identified. The residual impact is therefore considered negligible.

Fixed point-to-point licences

Responses from AusNet Services, NBN Co and VerTel, operators of point-to-point links that pass over the project site, indicate they do not expect inference due to diffraction or reflection of the point-to-point link signals. The impact assessment identified potential for the project to interfere with NBN fixed wireless internet signals received from the Caramut, Woolsthorpe and Mortlake towers, however consultation with NBN Co has indicated that interference caused by the project is not expected. With the application of a buffer on either side of the link path and the micro-siting several turbines further away from the edge of this clearance zone, there is unlikely to be a material impact. The residual impact is considered negligible.

Fixed point-to-multipoint licences

The project is unlikely to interfere with fixed point-to-multipoint licences. Consultation with Aussie Broadband Lochard, and Powercor, operators of point-to-multipoint base stations within 60 kilometres of the project site, indicate that the project will not interfere with their services. No formal response has been received from Wannon Region Water Corporation to date. The residual impact is considered negligible.

Other licence types and services

Emergency services licences

There is no potential for interference with point-to-point licences operated by emergency services as no links cross the project site. Other licenses operated by emergency services in the region are mobile telephone licences used for mobile radio and paging systems. These systems are generally not affected by the presence of wind turbines any more than other forms of signal obstruction.

From consultation with emergency service licence operators within 60 kilometres of the project site, DEECA and Regional Mobile Radio have not responded to DNV's consultation letters. The response from Ambulance Victoria indicated that interference to their services due to the Project is unlikely. Based on the location of the project site and turbines, the CFA, Visionstream Australia, and St John Ambulance Incorporated do not expect interference to their services. Victoria State Emergency Service has also confirmed that interference to their radiocommunications assets as a result of the project is not expected. To date no response has been provided from the DEECA, Victoria State Emergency Service or Regional Mobile Radio. The residual impact is considered negligible.

Meteorological radar

Consultation with the Bureau of Meteorology identified that the project's impact on their meteorological radars is considered to be low and that the Bureau have no objections to the project. The project will adhere to the conditions provided by the Bureau of Meteorology including notification of any design changes, planned shutdowns, and collaboration with the Bureau in the event of severe weather [EMM EMI04]. The residual impact is considered negligible.

Trigonometrical stations

There is one trigonometrical point within 20 kilometres of the project site, located 16 kilometres east of the nearest proposed turbine location. It is considered unlikely that it hosts electronic distance measuring devices or other equipment that may be subject to electromagnetic interference. As such, it is unlikely that the project would cause interference to trigonometrical stations or the global navigation satellite system network. Consultation with the Department of Transport and Planning and Geoscience Australia has identified impacts as unlikely and not foreseen. The residual impact is considered negligible.

CB radio and mobile phones

It is unlikely that the wind turbines would impact CB radio signals passing through the project site, with these signals likely to be intercepted by existing obstructions (e.g., terrain, vegetation).

Within the project site, interference to mobile signals is unlikely where there is existing good mobile phone network coverage. However, in areas in the project site where the reception is marginal, there is the potential for interference where a wind turbine intercepts the signal between the mobile phone and tower.

Optus, Telstra, and Vodafone were contacted to inform them of the proposed project and to seek feedback on any potential impacts. Optus expressed no concern regarding interference to their services from the project. Vodafone reviewed the locations provided and determined that they do not expect any interference due to the Project. To date, no response has been received from Telstra. Where interference may be detected, a mitigation strategy will be developed and implemented in consultation with service operators [EMM EMI02]. The residual impact is considered negligible.

Wireless internet (broadband and NBN)

There is low potential for turbines at the project site to interfere with NBN fixed wireless internet signals received from the Caramut tower at six identified dwellings. Consultation with NBN Co, Aussie Broadband, Optus and Vodafone has indicated that potential interference resulting from the project is considered unlikely. To date, no response has been received from Telstra. If interference occurs, a mitigation plan would be developed and implemented in consultation with organisations operating telecommunications and NBN services to minimise or avoid interference to communications. Management controls include re-directing antenna at affected dwellings to alternative towers, changing location of antenna, or installing a new tower [EMM EMI03]. The residual impact is considered negligible.

Satellite television and internet

For satellites that provide television or internet services to eastern Australia, the project may interfere with signals from 16 satellites to 12 nearby dwellings (who are all stakeholder dwellings). There is potential for these 12 dwellings to experience interference to signals that provide television signals intended for international audiences. However, it is considered unlikely that residents would be receiving signals from these satellites due to their low angles of elevation.

To manage any potential impacts, prior to construction, a Signal Strength Survey would be undertaken to test the average signal strength for television, radio and other point to point services that could potentially be impacted by electromagnetic interference from the project [EMM EMI05]. During pre-construction, construction, and operation of the project, any impact to television or radio reception at an existing dwelling within five kilometres of the project site would be managed and addressed in consultation with the affected party (EMI09, EMI11). The potential impact on satellite television and internet services is unlikely. With the implementation of management controls the residual impact is considered negligible.

Broadcast radio

Impact to AM radio signals is considered low, as AM radio signals can propagate around obstructions and would not cause significant interference for a receiver. Impacts to the FM radio signals is considered low due to the distance between the FM broadcast transmission tower and the project site. As there is no digital radio coverage in the region, there is no impact to digital radio signals from the project. Impacts to broadcast radio are therefore unlikely and the residual impact is considered negligible.

Broadcast television

Digital television signals are unlikely to be impacted by the project in areas of adequate coverage. In areas where coverage is marginal, interference may occur to signals from the Ballarat transmitter to dwellings located at the south and west of turbines. Interference to signals from the Western Victoria (Mount Dundas), and Warrnambool City transmitters is unlikely. Consultation with BAI Communications, who are responsible for broadcasting national public television services in Australia, has indicated that impact to digital television signals is unlikely and would be confined to the project site. During pre-construction, construction, and operation of the project, any impact to broadcast television at an existing dwelling within five kilometres of the project site would be managed and addressed in consultation with the affected party [EMMs EMI06 and EMI07). The potential impact on broadcast television is unlikely, and with the implementation of management controls the residual impact is considered negligible.

Aviation communications, navigation and surveillance facilities

Given the distance to closest communications facility, ground-based navigation aid and surveillance radars, the project would not impact these operations. For further detail on aeronautical and radiodetermination, refer to Appendix O – ***Aviation Impact Assessment***.

24.7.5 Cumulative impact

The nearest wind farm developments are the Mt Fyans Wind Farm, Salt Creek Wind Farm, Mortlake South Wind Farm, Hawkesdale Wind Farm, Woolsthorpe Wind Farm and Mortons Lane Wind Farm, all of which are located within 20 kilometres of the project site. DNV has assessed potential cumulative impacts to nearby radiocommunication services from the project in conjunction with other nearby wind farms. For services where impact from the project itself is considered either unlikely or non-existent, it is generally expected that there will be no cumulative impact.

The assessment also identified potential for increased interference to mobile phone signals where coverage is marginal and there are multiple turbines between the mobile phone tower and the user, however consultation with Optus and Vodafone has confirmed impacts are not likely. No response has been received from Telstra. Potential impacts to meteorological radars may occur but are manageable with the implementation of management controls outlined in Table 24.3.

The assessment found that dwellings to the southwest of the project may receive signals from the Ballarat transmitter that have passed through the Salt Creek Wind Farm or Mt Fyans Wind Farm prior to passing through the project. This may increase the potential for interference to be experienced at dwellings in this area. However, as all proposed turbine locations are more than 10 kilometres from turbines at the Salt Creek Wind Farm and Mt Fyans Wind Farm, this is considered to reduce the overall potential for cumulative impact to television broadcasting. For all other transmitters, there are no areas in the vicinity of the Project which are likely to be receiving signals that have passed through multiple wind farms.

For DTV broadcasting services, there may be potential for cumulative impacts for areas within 10 kilometres of multiple wind farms where the existing DTV signal coverage is already weak, however affected areas may receive a stronger signal from an alternative transmitter that may be less susceptible to interference, which would decrease the overall potential for cumulative impact. It is noted that this assessment is based on an assumed potential interference distance of 10 kilometres, and does not include detailed analysis of the existing DTV signal coverage in the area around the project. Consultation undertaken with BAI Communications confirms that interference with DTV signals is considered unlikely.

The results of the cumulative impact assessment are detailed in Table 24.4.

Table 24.4 Potential for cumulative impact

Licence or service type	Potential for cumulative impact
Radiocommunication towers	Very low potential for cumulative impact.
Fixed point-to-point links	No cumulative impact, as the link paths do not cross multiple wind farms near turbines.
Fixed point-to-multipoint links	No cumulative impact, as the link paths do not cross multiple wind farms near turbines.
Emergency services	No cumulative impact to point-to-point links, very low potential for cumulative impact to point-to-area style communications.
Meteorological radar	Potential for low risk cumulative impact if turbines at multiple wind farms can be detected by radars.
Trigonometrical stations	Very low potential for cumulative impact.
Citizens band radio	Very low potential for cumulative impact.
Mobile phones	Low potential for cumulative impact where there are multiple turbines between the tower and the user.
Wireless internet	Low potential for cumulative impact to wireless broadband services provided by mobile phone networks where there are multiple turbines between the tower and the user. No cumulative impact to NBN fixed wireless signals, as the signal lines of sight do not cross multiple wind farms.
Satellite television and internet	No cumulative impact.
Radio broadcasting	Low potential for cumulative impact where there are multiple turbines between the tower and the user.
Television broadcasting	Some potential for cumulative impact to signals from the Ballarat transmitter at dwellings located to the southwest of the project, where there are multiple turbines between the transmitter and the user, and in areas with poor or marginal coverage located within 10 kilometres of multiple wind farms.

24.7.6 Impact assessment summary

A summary of the ***Electromagnetic Interference Impact Assessment*** is provided in Table 24.5, with the full assessment presented in Appendix N. Refer to Appendix O – ***Aviation Impact Assessment*** for impacts relating to aviation communications, navigation and surveillance facilities.

Table 24.5 Electromagnetic interference impact assessment summary

Impact pathway	Asset, value, or receptor	Project phase	Mitigation and management	Likely impact (considering magnitude, extent and duration)	Residual effect
Potential for wind turbines to cause electromagnetic interference	Radiocommunication towers	Operation	• Consult with relevant radio service operators to confirm potential effects (or lack thereof) from final project design [EMM EMI02]. • Where interference occurs, develop, and implement a mitigation strategy in consultation with service operators [EMM EMI02].	Low potential for interference, as the closest radiocommunication tower is located within 2 kilometres of the turbine locations. Consultation with CFA indicates no potential interference from the project.	Residual effect is negligible.
	Point-to-point links	Operation	• Create wind turbine buffer around communications link based on consultation with link operator. • Relocate several turbines immediately adjacent to further minimise interference risk to the communications buffer. • Consult with relevant point-to-point service operators to confirm potential effects (or lack thereof) from final project design [EMM EMI01]. • Where interference is not eliminated through turbine design and siting, a mitigation strategy would be developed [EMM EMI01].	Low potential for interference. With the application of a buffer either side of the link path and micro-siting several turbines further away from the edge of this clearance zone, there is unlikely to be a material impact (e.g., through diffraction or reflection of the signals). Consultation with NBN Co, Ver Tel and AusNet Services VerTel indicate no interference is anticipated.	Residual effect is negligible.
	Point-to-multipoint links	Operation	• Consult with relevant point-to-multipoint service operators to confirm potential effects (or lack thereof) from final project design [EMM EMI01]. • Where interference is likely to be detected a mitigation strategy would be developed [EMM EMI01].	Low potential for interference. Consultation with Aussie Broadband, Powercor and Lochard Energy indicates no interference is anticipated. No response has been received from Wannon Region Water Corporation to date.	Residual effect is negligible.
	Emergency services	Operation	• Consult with relevant radio service operators to confirm potential effects (or lack thereof) from final project design [EMM EMI02]. • Where interference is likely to be detected, develop and implement a mitigation strategy in consultation with service operators [EMM EMI02].	No links cross the project site. Consultation with Ambulance Victoria, CFA, Visionstream Australia, St John Ambulance, Victoria State Emergency indicates no interference is anticipated. No response has been received from DEECA and Regional Mobile Radio to date.	Residual effect is negligible.

Impact pathway	Asset, value, or receptor	Project phase	Mitigation and management	Likely impact (considering magnitude, extent and duration)	Residual effect
	Meteorological radar	Operation	• Adhere to the conditions provided by the Bureau of Meteorology notification of any design changes, and planned shutdowns, and collaborate with the Bureau in the event of severe weather [EMM EMI04].	Potential impact to the Mount Gambier weather radar is low. Potential impact is mitigated with the management controls.	Residual effect is negligible.
	Trigonometrical stations	Operation	N/A	Unlikely to cause interference to trigonometrical stations or the global navigation satellite system network. Consultation with Geoscience Australia and the Department of Transport and Planning indicate no interference is anticipated.	Residual effect is negligible.
	CB radio and mobile phones	Operation	• Consult with relevant radio service operators to confirm potential effects (or lack thereof) from final project design [EMM EMI02]. • Where interference is likely to be detected, develop, and implement a mitigation strategy in consultation with service operators [EMM EMI02].	Unlikely that the wind turbines would impact CB radio signals passing through the project site. Low potential for interference to mobile signals where there is existing good mobile phone network coverage. However, in marginal coverage areas there is the potential for interference. Consultation Optus and Vodafone indicates no interference is anticipated. No response has been received from the Telstra to date	Residual effect is negligible with implementation of management controls.

Impact pathway	Asset, value, or receptor	Project phase	Mitigation and management	Likely impact (considering magnitude, extent and duration)	Residual effect
	Wireless internet (broadband and NBN)	Operation	• Consult with all telecommunications carriers and other potentially affected parties to confirm potential effects (or lack thereof) from final project design [EMM EMI03]. • Develop and implement a mitigation strategy in consultation with internet providers where interference is not eliminated through turbine design and siting [EMM EMI03].	Low potential for interference to wireless broadband services in the project region with marginal reception if a wind turbine intercepts the signal between a receiver and the tower. Low potential to cause interference to NBN services, with mitigation options available to reduce impact. The six dwellings that may experience interference are all stakeholder dwellings located within the project. Consultation with Aussie Broadband, Optus, Vodafone indicates no interference is anticipated. Consultation with NBN Co indicates interference potential is low. No response has been received from the Telstra to date.	Residual effect is negligible with implementation of management controls.
	Satellite television and internet	Operation	• Conduct a Signal Strength Survey prior to construction [EMM EMI05]. • Develop and implement a complaints process for managing complaints relating to electromagnetic interference [EMM EMI06]. • Where interference to satellite television and internet is recorded, a mitigation strategy is to be developed and implemented in consultation with homeowners (EMI11).	Low potential for interference for services intended for Australian audiences. Potential interference from 16 satellites to 12 dwellings for services intended for international audiences. It is considered unlikely that dwellings would be receiving signals from these satellites due to their low angles of elevation.	Residual effect is negligible with implementation of management controls.
	Broadcast radio	Operation	• Conduct a Signal Strength Survey prior to construction [EMM EMI05]. • Develop and implement a complaints process for managing complaints relating to electromagnetic interference [EMM EMI06]. • Where interference to broadcast radio is recorded, a mitigation strategy is to be developed and implemented in consultation with homeowners (EMI11).	Potential inference is low for AM radio signals as they can propagate around obstacles. Potential inference is low for FM radio signals due to the distance between the FM broadcast transmission tower and the project site.	Residual effect is negligible.

Impact pathway	Asset, value, or receptor	Project phase	Mitigation and management	Likely impact (considering magnitude, extent and duration)	Residual effect
	Broadcast television	Operation	• Conduct a Signal Strength Survey prior to construction [EMM EMI05]. • Develop and implement a complaints process for managing complaints relating to electromagnetic interference [EMM EMI06]. • Where interference to television is recorded, a mitigation strategy is to be developed and implemented in consultation with homeowners (EMI11).	Low potential interference to signals from the Ballarat transmitter at dwellings located at the south and west of turbines. Low potential interference to signals from the Western Victoria (Mount Dundas), and Warrnambool City transmitters. Consultation with BAI Communications indicates that impact to digital television signals is unlikely and would be confined to the project site.	Residual effect is negligible with the implementation of management controls.
	Aviation communication, navigation and surveillance facilities	Operation	N/A	No impact to aviation communications, navigation and surveillance facilities is anticipated.	Residual effect is negligible.

24.8 Conclusions

Wind turbines can cause interference to electromagnetic signals because of the physical disruption of radiocommunication signals by complete obstruction, diffraction, reflection or scattering of signals, or near field effects.

Limited radiocommunication services are in the vicinity of the project, with five point-to-point links (operated by AusNet Services, VerTel and NBN Co) passing over the project site and two point-to-multipoint stations located within 20 kilometres of the site (operated by Aussie Broadband and Wannon Region Water Corporation).

Where feasible, engineering design measures have been implemented to avoid potential electromagnetic inference impacts to the services identified in the electromagnetic inference assessment as key issues. Management measures have been proposed for the pre-construction, construction and operational phases of the project to further manage potential impacts caused by electromagnetic inference. With the implementation of these design measures and management controls, the potential for electromagnetic interference to impact existing radiocommunication services is either unlikely or low, and the residual effects are negligible.