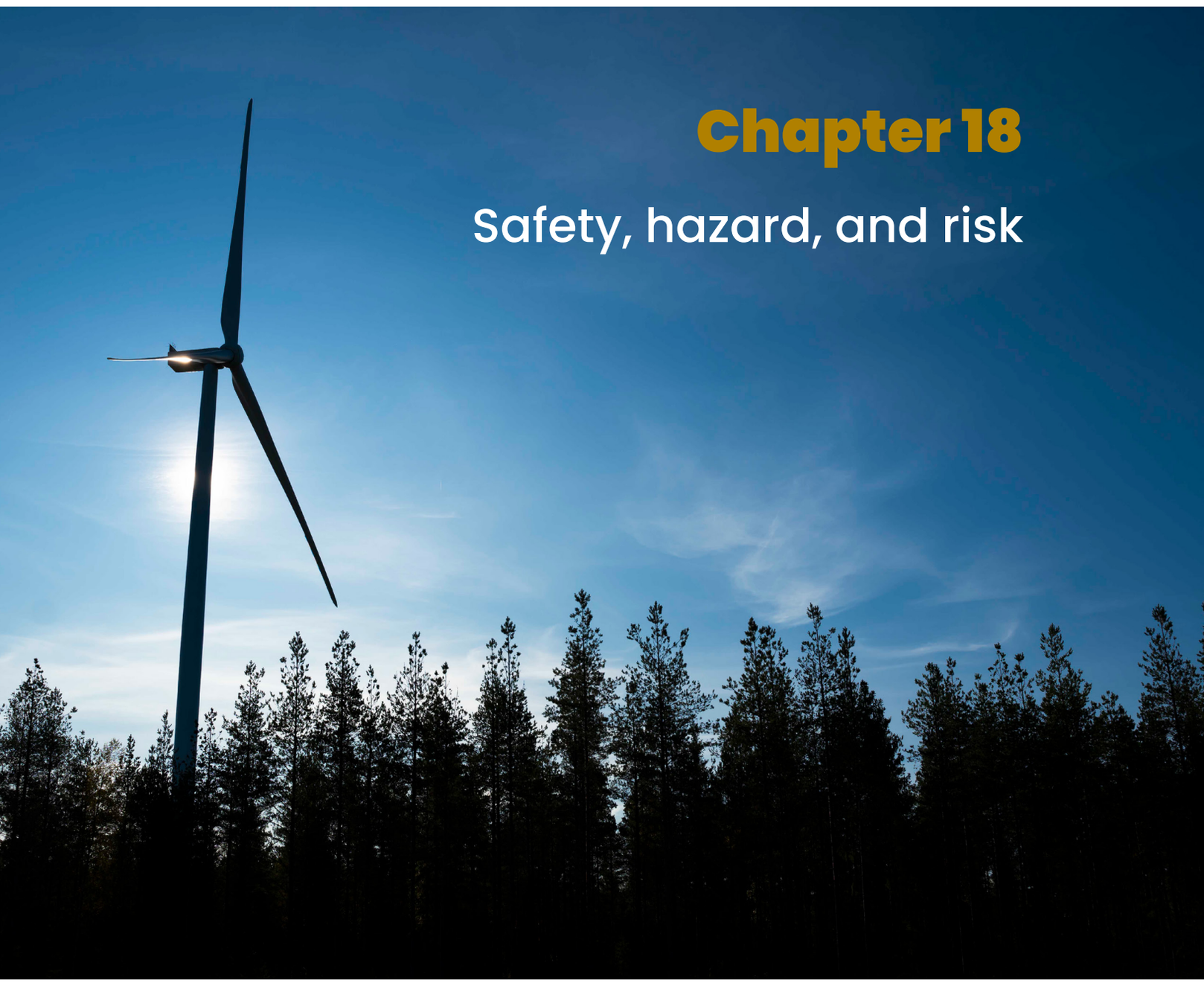


Chapter 18

Safety, hazard, and risk

Acknowledgement of Country

Neoen Australia acknowledges the traditional custodians of the land in which we live, and pays its respects to their elders, past and present. The Gunditjmara are the original custodians of the Country on which the Project is located and we acknowledge them as the original custodians. We are committed to Aboriginal engagement and reconciliation and aim to bring Aboriginal and Torres Strait Islander people, local communities and the councils along for the journey to strengthen relationships and enhance local community outcomes.

Disclaimer

18 Safety, hazard, and risk

This chapter describes the potential electromagnetic interference (EMI), aeronautical and bushfire impacts associated with the construction, operation, and decommissioning of the Project, as well as the mitigation measures proposed to avoid, minimise, and manage potential adverse impacts.

This chapter summarises the outcomes of the following technical reports:

- Electromagnetic Interference Assessment (Appendix U)
- Aeronautical Impact Assessment (Appendix T)
- Bushfire Risk Assessment and Mitigation Plan (Appendix V).

18.1 Overview

This section provides an overview of the findings of the assessments for EMI, aviation, and bushfire risk. More detailed summaries are provided in **Section 18.3** (EMI), **Section 18.4** (Aviation) and **Section 18.5** (Bushfire risk).

18.1.1 Electromagnetic interference

EMI occurs when there is unwanted noise or interference in an electrical path between a signal source and signal receiver. For wind farms, interference can take the form of diffraction, reflection, and scattering. Near field effects are also possible, when wind turbines are located too close to a radio communication system. There is also the possibility of radiation of electromagnetic energy, although in Australia wind turbines required to be compliant with certain standards, which means electromagnetic emissions from wind turbines should be within allowable levels.

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.

Potential impacts on a Telstra point-to-point radio system have been avoided via wind turbine layout changes in the vicinity of the signal source and receiver Fresnel zones.

Television broadcasting systems at dwellings south of the wind farm site may be affected, and there may be FM radio signal degradation for receivers in the immediate vicinity of the wind farm. Neoen Australia Pty Ltd (the Proponent) will engage an independent specialist to undertake a pre- and post-construction assessment of the television reception strength at these dwellings south of the wind farm site (and any other existing or approved dwellings at the time of planning approval) that are within the potential television signal scatter zone from the South East (Mt Burr) TV transmitter (where confirmed to not be using the Viewer Access Satellite Television System (VAST)). A pre and post-construction assessment of the FM radio reception strength at any existing or approved dwellings within 5 km of any turbine (as at the time of Project approval) will also be undertaken by an independent specialist. Measures to restore the affected reception to pre-construction quality will be undertaken if required.

Initial consultation with the Australian Bureau of Meteorology (BoM) identified that the wind farm may impact on Mount Gambier weather watch radar, with turbines situated within the lower two ‘scans’ of the radar, which provide the longest radar coverage and the most accurate data for rainfall analysis. The Proponent will continue to consult with the BoM prior to Project construction for the exact terms of the operational limits and/or other technical solutions for the Project to ensure that the radar can operate as required.

18.1.2 Aviation

Two regulated aerodromes and two unregulated aerodromes are located near the wind farm site. The closest regulated aerodrome, Portland Aerodrome, is located 10 nautical miles (nm) (18.5 km) south-east of the nearest turbine. The height of the wind turbines would intrude on one of the instrument approach procedures (IAPs) of the Portland Aerodrome. Several amendments to the non-precision IAPs are required for the Portland Aerodrome to remain clear of the wind farm. Consultation with the aerodrome operator and Airservices Australia is being undertaken to have these changes implemented. The aerodrome operator supports the required changes to the airspace at Portland and has advised Airservices Australia. The Project would not affect any air routes of the other aerodromes located near the Project Area.

A qualitative risk assessment was undertaken for the Project in accordance with *AS/NZS ISO 31000:2018 Risk Management and Guidelines* (AS/NZS ISO 31000). The wind farm would not penetrate any aerodrome airspace (after required amendments to the Portland Aerodrome non-precision IAPs have been made), and wind turbines will be appropriately painted to ensure they are conspicuous by their size and colour during daytime. As a result, the overall risk of the Project to aviation is low, and the wind farm is not considered to be a hazard to aircraft safety.

The Project has been reported to the Civil Aviation Safety Authority (CASA), and in accordance with CASA publication *AC 139-08(1) Reporting of Tall Structures*, Airservices Australia has also been notified of the Project to ensure the position of wind turbine and meteorological monitoring masts (met masts) are included within the vertical obstacle database and are marked on aeronautical charts.

18.1.3 Bushfire risk

The Bushfire Risk Assessment involved consideration of all possible fire mitigation and suppression efforts for the protection of life and property. Bushfire risk was assessed in relation to potential fires originating from both within and external to the wind farm site and in both the construction and operational phases of the Project.

The wind farm is primarily located within an active commercial plantation operation which is mainly managed by Green Triangle Forest Products (GTFP). GTFP is also the manager of a local Country Fire Authority (CFA) brigade. A bushfire protocol has been drafted as per the agreement between the Proponent and GTFP to ensure that existing best practices in bushfire management can be continued and adapted for the introduction of wind turbines and associated infrastructure. Existing bushfire records and conditions were also considered in consultation with local CFA members.

The Bushfire Risk Assessment concluded that:

- The bushfire risk associated with the construction and operation of the wind farm can be mitigated to an acceptable level with the implementation of sound bushfire mitigations strategies.
- The wind farm does not increase bushfire risk in the landscape.
- The wind farm provides additional opportunities for emergency service response.

Several mitigation measures have been developed to manage potential bushfire risk during construction and operation.

18.2 EES evaluation objective

The specific environmental matters to be investigated and documented in this EES are set out in the *Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement* (Scoping Requirements). The Scoping Requirements provide evaluation objectives that describe the desired outcomes to be achieved for each of the matters being addressed in this EES.

The following draft evaluation objectives are relevant for the safety, hazard and risk impact assessment:

- **Community amenity, safety, roads, and transport** – To avoid and minimise adverse effects for community amenity and safety, with regard to construction noise, vibration, dust, traffic and transport, operational turbine noise and fire risk management.
- **Land use and socioeconomic** – To avoid and minimise adverse effects on land use, social fabric of the community, local infrastructure, aviation safety and to neighbouring landowners during construction, operation and decommissioning of the project.

This chapter and the associated technical reports address the Project's safety, hazard and risk matters in response to the Scoping Requirements.

18.3 Electromagnetic interference

Electromagnetic fields are a combination of electric fields associated with a voltage source and magnetic fields associated with current flowing through a conductor. EMI occurs when there is disturbance to radio waves (electromagnetic radiation) being transmitted between a signal source and signal receiver.

Radio system interference can occur when wind turbines cause disturbance to radio waves transmitted between a signal source (transmitter) and signal receiver. For wind farms, interference can take the form of diffraction, reflection, and scattering (see **Figure 18.1**).

Near field effects are also possible, when wind turbines are located too close to a radio communication system. There is also the possibility of radiation of electromagnetic energy, although in Australia wind turbines required to be compliant with certain standards, which means electromagnetic emissions from wind turbines should be within allowable levels.

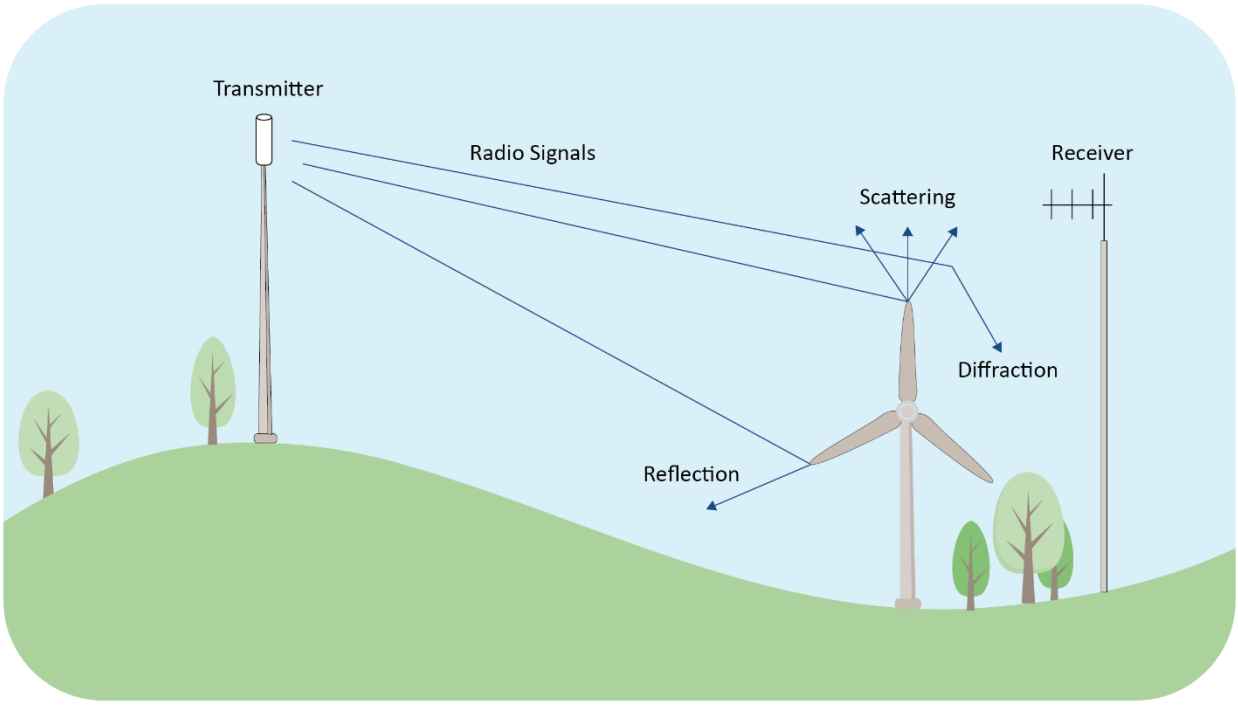


Figure 18.1: "Types of electromagnetic interference caused by wind turbines"

18.3.1 Assessment methodology

The following approach was undertaken for the **EMI assessment (Appendix U):**

- Established the study area to identify radio services within the area.
- Desktop review of publicly available information including the Australian Communications and Media Authority (ACMA) Register of Radiocommunications Licences database in conjunction with information from the Proponent and other relevant stakeholders/databases to identify all licenced radio systems operating on the frequency above 30 megahertz (MHz) within the study area (radio services below 30 MHz were excluded from the assessment as the characteristics of these radio waves rely on the ground rather than air for propagation, so would not be impacted on by the wind farm).
- Consultation with relevant organisations including the BoM, Department of Defence, Geoscience Australia, and the four network carriers (Telstra, Optus, Vodafone and the National Broadband Network (NBN))
- BoM was consulted to determine if any meteorological radars may be impacted on by the wind farm.
- The Defence Estate Planning, Land Planning and Regulation Infrastructure Division was consulted to determine if the wind farm would have an impact on Defence aviation and signals capability
- Geoscience Australia was consulted to determine if Geodetic infrastructure (trigonometrical stations, Global Navigation Satellite System (GNSS) reference stations or associated facilities) would be impacted on by the wind farm..
- The four network carriers were consulted to determine if the wind farm would have an impact on communications, as all carriers have transmitter sites covering the main population areas around the greater wind farm area.
- Identification and assessment of potential impacts on licensed radio systems from EMI caused by wind turbines during operation of the Project to inform areas that are unsuitable for the installation of wind turbines.
- Development of mitigation measures to avoid, minimise and manage potential impacts.
- Assessment of the residual EMI impacts with the implementation of mitigation measures.

18.3.2 Existing conditions

18.3.2.1 Study area

Searches for radio sites and services, point-to-point radio systems, point-to-multipoint radio systems, and land mobile radio systems were undertaken within 50 km of the wind farm site (see **Figure 18.2**).

Near-field exclusion zones were also identified for radio sites located within 3 km of the wind farm site. These exclusion zones are areas in proximity to a radio transmitter. No part of a wind turbine should enter these exclusion zones to ensure no excessive reflections back to the transmitter.

18.3.2.2 Radio systems

A search was conducted using the ACMA radio communications database to identify all licensed radio systems operating on a frequency above 30 MHz within the study area. Additional radio frequency information was accessed from the Australian Mobile Telecommunications Association and Radio Frequency National Site Archive. This search was conducted in accordance with the methodology stated in Section F of the Draft National Wind Farm Development Guidelines (EPHC, 2010).

Radio services below 30 MHz were excluded from this assessment as the characteristics of these radio waves do not rely on direct-ray transmission between the transmitting and receiving antennas and instead rely on ground waves (surface waves) so would not be impacted on by the wind farm.

Radio systems operating within the study area are outlined in **Table 18.1** and shown in **Figure 18.3** and **Figure 18.4**.

Table 18.1: Radio systems operating within the study area

Radio system	Description
Point-to-point radio	A Telstra point-to-point radio link passes through the north-eastern corner of the wind farm site. The line of this point-to-point system and the exclusion zone are shown in **Figure 18.3**.
Point-to-multipoint radio	Six point-to-multipoint radio systems occur within the study area. These are located more than 20 km from the wind farm site.
Land mobile radio systems	A land mobile radio system is a person-to-person voice communication system with the transmitter and receiver in one unit. It can be stationary, mobile, or portable. In Australia, most land mobile radio systems operate at a low frequency spectrum and are unlikely to be affected by wind turbines. There are no land mobile radio systems within 20 m of a wind turbine.
Television broadcast	MySwitch (a website set up to help viewers and installers retune digital televisions and see if television signal coverage is available) data shows coverage from three terrestrial digital television transmitters around the wind farm site, located at Mount Clay, Mount Dundas and Mount Burr. The signal propagating through the wind farm site from Mt Clay and Mt Dundas is negligible and unlikely to be usable for receptors located to the south of the wind farm. It is expected that these dwellings would point their receptors to the Mount Burr transmitter and may therefore be impacted on by EMI from wind turbines in this area. These dwellings are shown in **Figure 18.5**.
AM/FM radio	The majority of FM services transmitting in the vicinity of the wind farm are narrowcast services that are not focused on servicing the area around the wind farm site. Broadcast FM services are in a low frequency range and are therefore more resilient to disturbances. Five turbines in the eastern end of the wind farm site are located within the good reception coverage of the Portland AM/FM radio (see **Figure 18.4**). AM signals occur at a low frequency and have a sufficiently long wavelength relative to a turbine to not be affected by it.
Mobile telephone and broadband internet broadcast	Four carrier networks (Telstra, Optus, Vodafone and NBN) have transmitter sites covering the main population areas around the wind farm site. The availability of existing Telstra, Optus, and Vodafone 3G & 4G services coverage in the Project Area is variable throughout the wind farm site, with the eastern and western-most areas having the most coverage. There are no NBN fixed wireless services within the wind turbine site.
Aircraft communications systems	Wind farms have the potential to disturb navigational signals, which could distort the accuracy of aircraft positioning systems and introduce 'false targets'. Four aerodromes are located in proximity to the Project Area, including two regulated aerodromes (Mount Gambier and Portland), and two unregulated aerodromes (Nelson and Kentbruck).
Meteorological radar	The Mount Gambier weather watch radar is located approximately 40 km north-west of the wind farm site (see **Figure 18.4**). This site provides meteorological information to areas of Nelson, Portland, Heywood, and the Portland airport.
Defence radio systems	Defence radio systems are not required to be recorded in the ACMA radio communications database and therefore direct consultation with the Department of Defence is required to determine the impact of the wind farm on their operations in the area. Consultation with the Defence Estate Planning, Land Planning and Regulation Infrastructure Division and Defence Spectrum Office was undertaken for the Project. The outcomes of this consultation are discussed in **Section 18.3.4.5**.
Trigonometrical systems	Trigonometrical systems operating across Australia are administered by Geoscience Australia. The closest geometrical system to the wind farm site is the PTLD AGRN permanent geodetic quality GNSS receiver located approximately 30 km to the south-east.
Maritime radio systems	The wind farm site is situated inland to the maritime transmitter Marine Radio Victoria locations. The Project is therefore not expected to have any EMI impact on maritime services.
50 Hz radiation	The primary sources of electromagnetic fields associated with wind farms are the substations and transmission lines. The transmission line and substations in the Project would be equivalent to others in the existing electricity transmission network, with comparable electromagnetic field levels, and will be designed in accordance with the standards used by local transmission and distribution authorities to ensure safe levels of electromagnetic radiation are achieved. No further assessment of 50 Hz radiation has therefore been done.

Legend

- Wind Farm Site
- Electromagnetic Interference Study Area
- Local Government Boundary
- Parks and Reserves
- Roads
- Watercourses

FIGURE 18.2

Electromagnetic Interference Impact Assessment Study Area

Data source: VIC Data (2022)

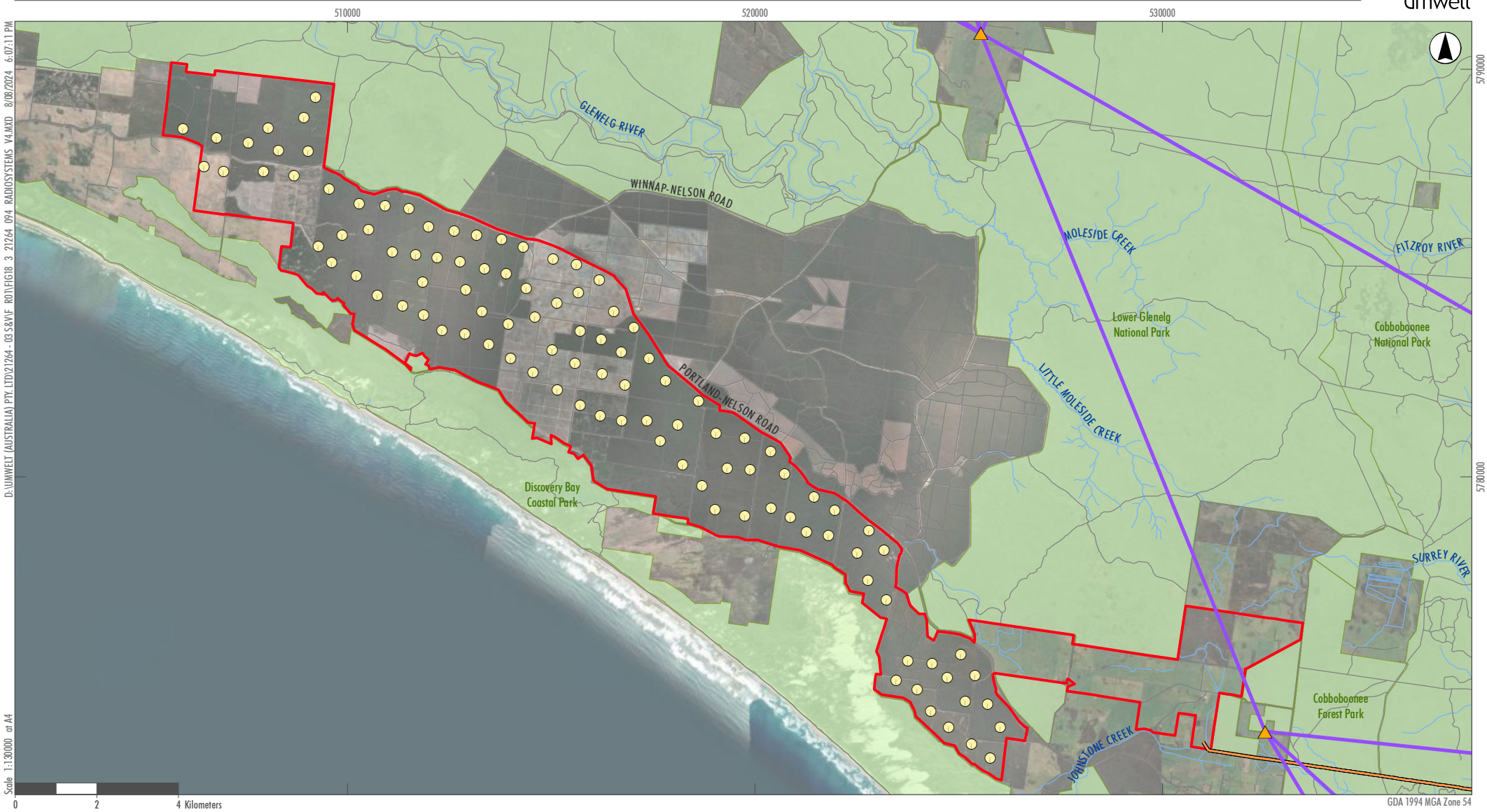
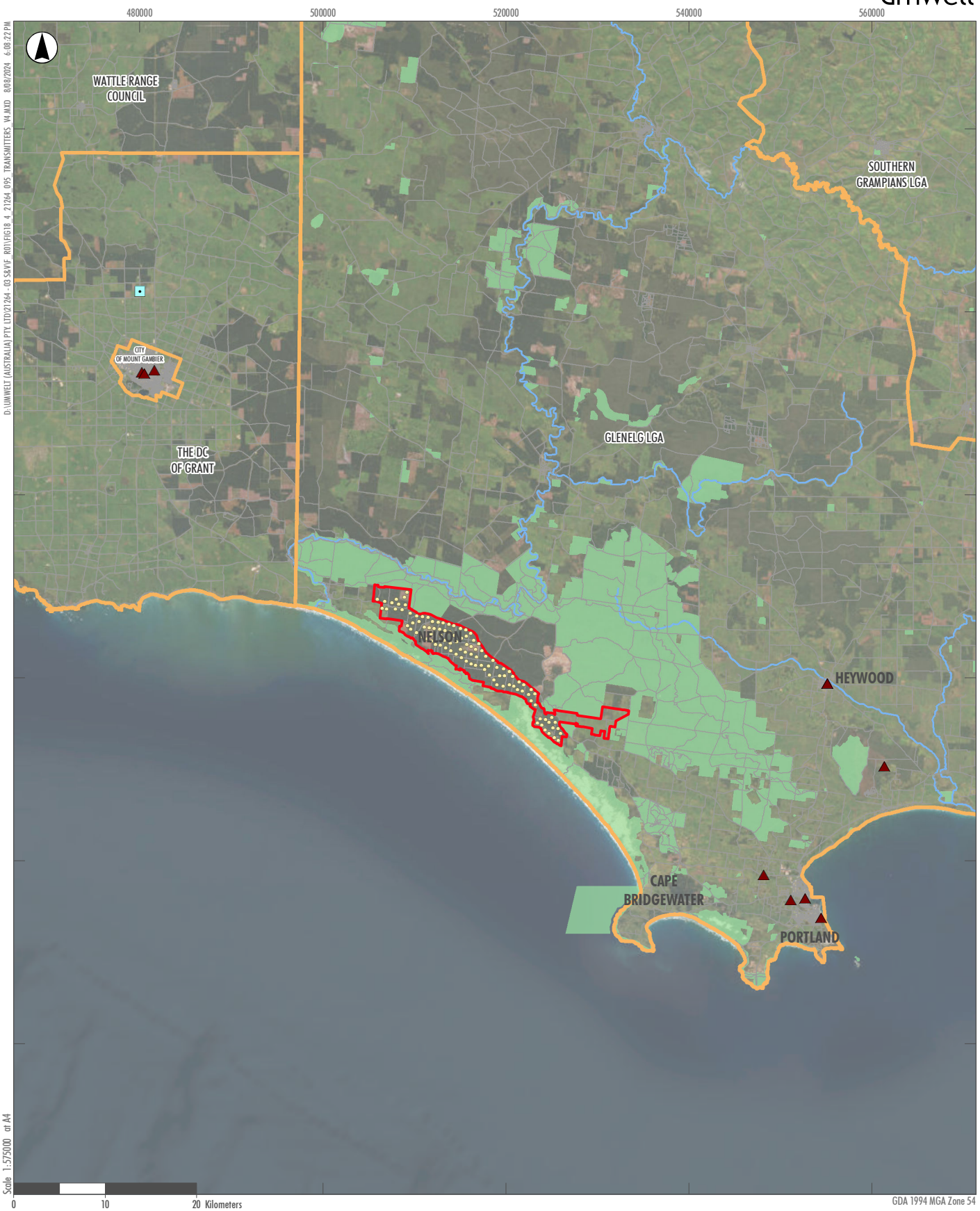


FIGURE 18.3

Radio Systems within the Study Area

Image Source: ESRI Basemap (2021) Data source: DELWP (2021)



Legend

- Wind Farm Site
- Local Government Boundary
- Parks and Reserves
- Roads
- Watercourses
- Turbines
- Mount Gambier Weather Station
- AM/FM Radio Narrowcast/Broadcast Transmitter

FIGURE 18.4

AM/FM Radio Transmitters and Weather Stations

Image Source: ESRI Basemap (2022) Data source: DELWP (2021)

18.3.3 Construction impacts

Construction is not expected to impact on radio systems. Wind turbines are outside the exclusion zone of the point-to-point link that crosses the north-east corner of the wind farm site and there is negligible potential for other radio systems to be affected by construction activities.

In the unlikely event that the exclusion zone for this point-to-point link cannot be avoided, the operator (Telstra) will be consulted prior to construction, allowing the link operator to anticipate the potential temporary service degradation and take steps to minimise or negate the impact on the communications link (see mitigation measure MM-EI01).

18.3.4 Operation impacts

The assessment of potential EMI impacts during wind farm operation found that for many radio system types, potential Project impacts are negligible:

- Fixed point-to-multipoint radio systems:
  - The point-to-multipoint transmitters are located further than 20 km from the current turbine layout. No foreseeable electromagnetic interference impacts that would degrade the radio signal to this radio systems are expected to occur
- Land mobile radio (LMR) systems:
  - There are no LMR transmitters located within 20 m of the current turbine layout, therefore no EMI that would degrade the radio signal from LMR transmitters is expected to occur.
- Aircraft communications systems:
  - Glenelg Shire Council (GSC) (the Portland aerodrome operator) supports changes being made to the instrument approach procedure, as discussed in the Aeronautical Impact Assessment (see also **Section 18.4.4**).
- Trigonometrical systems:
  - Geoscience Australia has confirmed that there are no foreseeable impacts on their trigonometrical stations, GNSS reference stations or associated facilities or services arising from the Project.
- Maritime radio systems:
  - The wind farm site is located inland to maritime transmitter Marine Radio Victoria (MRV) locations; hence it is anticipated that the Project would not have any impacts on the MHz, Very High Frequency (VHF) and High Frequency (HF)maritime services.
- 50 Hz radiation
  - Designing to the standards utilised by the local transmission and distribution authorities will ensure safe levels of electromagnetic radiation are achieved along the overhead powerline. No foreseeable impacts are expected.

The assessment found there is some potential for the Project to impact on point-to-point radio, television broadcast, AM/FM radio, meteorological radar and defence radio systems. These potential impacts are discussed in more detail in the following sections.

18.3.4.1 Point-to-point radio systems

All turbines are located outside point-to-point radio system links. An earlier iteration of the wind farm layout included turbines in the vicinity of the point-to-point link that passes through the north-east section of the wind farm site. Subsequent design amendments have included the removal of these turbines, and there is now negligible potential for interference to this point-to-point link during wind farm operation.

18.3.4.2 Television broadcast

The wind farm has potential to result in scattering effects to radio signal of dwellings on the southern side of the wind farm across from the Mt Burr digital television transmitter. Potentially affected dwellings are shown on **Figure 18.5**. The Proponent will organise for these dwellings to be investigated to determine whether they are receiving digital television signal from the Terrestrial Digital Television System or VAST. If the dwellings are using VAST, there should be no impact on these dwellings.

The wind farm's impact on digital TV services will be quantified by recording and comparing preconstruction baseline signal measurements and post-construction signal level measurements in and around the wind farm. The Proponent will engage an independent specialist to undertake a pr- and post-construction assessment of the television reception strength at the location of any existing or approved dwellings as at the date of planning approval that are within the potential television signal scatter zone from the South East (Mt Burr) TV transmitter (where confirmed to not be using VAST) for the wind farm layout (see mitigation measure MM-EI02). If the post-construction assessment determines that the wind farm is causing an unacceptable level of interference to reception, measures to restore the affected reception to pre-construction quality will be undertaken (see mitigation measure MM-EI02). These measures would be determined by the qualified specialist who undertakes the baseline and post-construction assessments.

18.3.4.3 AM/FM radio narrowcast and broadcast

There is a small chance of signal degradation for services broadcast to receivers in the immediate vicinity of the wind farm site. If receptors experience interference to their FM radio signals, this will be rectified by moving the antenna to a higher altitude, relocating the antenna location, or installing a high-quality antenna (see mitigation measure MM-EI03). The pre- and post-construction assessment of radio reception would also ensure any unacceptable interference by the wind farm is identified and restored to pre-construction quality (see mitigation measure MM-EI02). These measures would be determined by the qualified specialist who undertakes the baseline and post-construction assessments.

18.3.4.4 Meteorological radar

Wind turbines would partially obstruct the lower two ‘scans’ of the BoM’s Mt Gambier weather watch radar (see **Plate 18.1**). These scans provide the longest radar coverage, which is then used to provide more accurate data for forecasting. The area potentially affected includes the inhabited areas of Nelson, Portland, Heywood, and the Portland airport, and there is no alternative weather radar coverage.

The Proponent has undertaken initial consultation with the BoM in relation to the potential impacts of this obstruction (refer to the **Electromagnetic Interference Assessment (Appendix V).**

The Proponent will consult with BoM on the exact terms of the operational limits and/or other technical solutions for the Project to ensure that the radar can maintain operational efficiency (see mitigation measure MM-EI04). Mitigation measures to be agreed upon with BoM and implemented by the Proponent could for instance consist in notifying BoM of any proposed changes to the Project as soon as possible, providing BoM notice before any planned shutdown of the wind farm so the BoM has time to calibrate its radar system, and actively cooperating with the BoM in the event of severe weather.

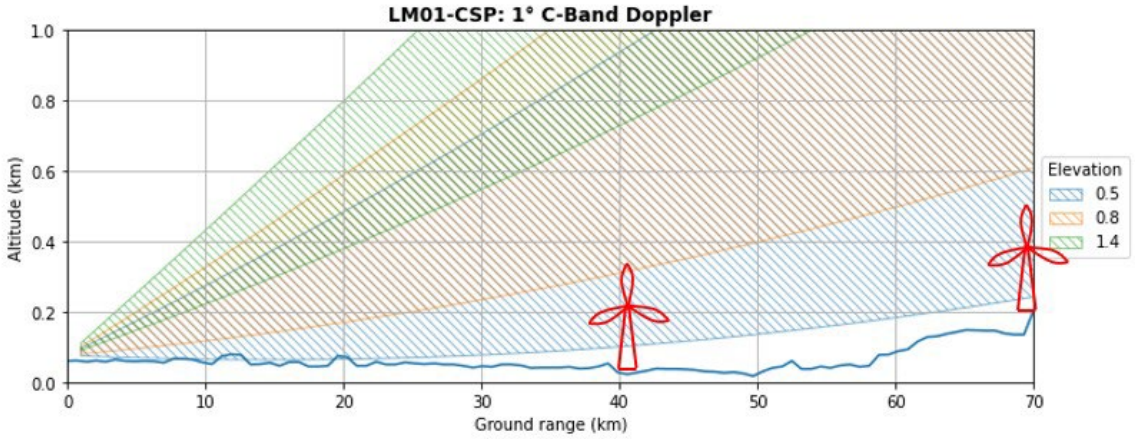


Plate 18.1: The ‘scan bands’ of the BoM radar at Mount Gambier (from the EMI Impact Assessment)

18.3.4.5 Defence radio systems

Consultation with the Defence Estate Planning, Land Planning and Regulation Infrastructure Division has determined that the wind farm site will not impact on Defence aviation and signals capability. However, the Defence Spectrum Office have raised concerns about the effects of wind farms on Defence high frequency transmissions.

Many wind farms (not all) can generate a large increase in high frequency radio noise in the surrounding environment, which can impact on high frequency systems. The wind farm site will conform with *AS/NZS 61000.6.4:2012 Electromagnetic compatibility (EMC) Generic standards - Emission standard for industrial environments* which means that the wind farm will reduce, as much as is practicable, the emission of high frequency noise from the turbines, substations and electronic control equipment (see mitigation measure MM-EI05).

Legend

- Wind Farm Site
- Underground Transmission Line
- Turbines
- Dwellings
- Parks and Reserves
- Roads
- Watercourses

FIGURE 18.5

Potential Television Broadcast Impacts

Image Source: ESRI Basemap (2021) Data source: DELWP (2021)

18.4 Aviation

18.4.1 Assessment methodology

The following approach was undertaken for the **Aeronautical Impact Assessment (Appendix T)**:

- Established the study area to identify all registered/certified aerodromes within the area
- Undertook a desktop review of the Australian Aeronautical Information Publications, Air Services Australia sources, and CASA publications to:
  - Identify all registered and certified aerodromes within the study area.
  - Identify any Instrument Departure and Approach Procedures associated with these aerodromes.
  - Identify the extent of the Obstacle Limitation Surface (OLS) and Procedures for Air Navigation – Operations (PANS-OPS) surfaces for the identified Instrument Departure and Approach Procedures.
  - Specify any published air routes over or near the wind farm.
  - Specify the airspace classification surrounding the wind farm.
  - Identify the locations of aviation communications, navigation, and surveillance facilities.
- Conducted a qualitative risk assessment involving the following tasks:
  - Identification and assessment of potential aviation risks based on the above desktop review.
  - Consultation with key stakeholders to identify and assess any other relevant issues, including State Government Police Air Wing, Air Ambulance and Fire Services, and local operators and recreational aviation groups.
  - Assessment of perceived impacts of the turbines on the operation of aerodromes and airstrips in the immediate vicinity of the wind farm.
  - Assessment of perceived impacts of the turbines on aviation activity, such as recreational/commercial flying and emergency services.
  - Assessment of any implications for the above from topographical, weather and visibility issues.
  - Determine the degree of aviation risk posed by the Project and recommend appropriate mitigation measures.
- Assessed the need for aviation obstacle lighting as a risk mitigation based on the results of the qualitative risk assessment.

18.4.2 Existing conditions

18.4.2.1 Study area

The study area for the Aeronautical Impact Assessment was defined using a 30 nm (56 km) buffer around the wind farm site to detect existing aerodromes and airstrips in proximity to the Project Area (see **Figure 18.6**).

The National Airports Safeguarding Framework – Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* (NASF Guidelines) (DOIT, 2012) considers 30 km (16.2 nm) from a certified aerodrome to be “in the vicinity”. *Planning Guidelines* for *Development of Wind Energy Facilities* (DTP, 2023) also require consideration of aerodromes within 30 km (16.2 nm) of a wind farm.

Lowest Safe Altitudes (LSALT) are published to allow for pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in situations where the pilot can’t see the terrain or obstacles due to cloud or poor visibility. The LSALT is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a route that a pilot might fly.

For the Project, the LSALT has been calculated as 2,400 feet AHD. This has been calculated using the tallest turbine, which is 412 metres AHD.

18.4.2.2 Aerodromes in the study area

There are two regulated aerodromes within the study area (see **Figure 18.7**):

- Portland Aerodrome, situated 10 nm (18.5 km) south-east of turbine 57
- Mount Gambier Aerodrome, situated 22.3 nm (41.4 km) north-west of turbine 94.

Portland Aerodrome has three runways and two published non-precision IAPs. Mount Gambier Aerodrome has three runways and five published non-precision IAPs.

An IAP is a series of pre-determined manoeuvres that allows an aircraft to safely land at an aerodrome. Non-precision IAPs require the pilot to navigate laterally using their aircraft instruments and guidance information, and to manage vertical movements without any vertical path guidance information. These procedures can vary for different flight paths and have the potential to be impacted on by development in the surrounding area.

There are two unregulated aerodromes within the study area:

- Nelson airstrip, situated 1.9 nm (3.5 km) west of turbine 94
- Kentbruck airstrip, situated 1.5 nm (2.8 km) north-east of turbine 18.

The Nelson runway is a 600 m-long grass strip operated by the Nelson Aeroplane Company, which specialises in restoring and maintaining vintage aircraft. The Kentbruck runway is a 950 m-long runway on unrated dirt and is used for aerial agricultural work and fire suppression associated with the adjoining forestry plantation. Neither airstrip is listed in the Enroute Supplement Australia or Designated Airspace Handbook, and they do not appear on the 1:50,000 topographic chart for the area.

Regulated aerodromes usually have an Obstacle Limitation Surface (OLS) and Procedures for Air Navigation – Operational (PANS-OPS) surfaces prescribed to protect the airspace associated with published instrument approach and land procedures. An OLS defines airspace around an aerodrome that is required to be maintained free of obstacles to allow for safe aviation operations. This will often result in height restrictions for structures within the area. Unregulated aerodromes cannot have a published instrument approach and landing procedure so do not have associated prescribed airspace protected by OLS or PANS-OPS

18.4.2.3 Air routes and lowest safe altitudes

Significant published air routes in the vicinity of the wind farm site are listed in **Table 18.2** along with their LSALTs. These LSALTs were compared to the LSALT over the wind farm site (2,400 ft) to determine potential impacts on the air routes and appropriate mitigation measures (see **Section 18.4.4.2**).

Table 18.2 :Published air routes and lowest safe altitudes

Route	Associated aerodrome flight path	Lowest safe altitude (ft)	Amended lowest safe altitude (ft)
GRID	N/A	2,200	2,400
W519	Portland Aerodrome, south-east/north-west flight path	2,200	2,400
W584	Portland Aerodrome, north-east/south-west flight path	2,900	No change
W584	Portland Aerodrome, south-west/north-east flight path	2,500	No change

Legend

- Wind Farm Site
- Aeronautical Impact Assessment Study Area
- Local Government Boundary
- Parks and Reserves
- Roads
- Watercourses
- Turbines

FIGURE 18.6

Aeronautical Impact Assessment Study Area

Image Source: ESRI Basemap (2022) Data source: DELWP (2021)

Legend

- Wind Farm Site
- Aeronautical Impact Assessment Study Area
- Local Government Boundary
- Parks and Reserves
- Roads
- Watercourses
- Turbines
- Mount Gambier Aerodrome
- Portland Aerodrome
- Unregistered Nelson runway
- Unregistered Kentbruck runway

FIGURE 18.7

Aerodromes within the Study Area

Image Source: ESRI Basemap (2022) Data source: DELWP (2021)

18.4.2.4 Air space

The Project is within Class G airspace, below Class E airspace with a lower limit of 12,500 ft. Class G airspace is non-controlled airspace where aircraft may operate without Air Traffic Control (ATC) clearance. Aircrafts may operate in accordance with either Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) within Class G airspace. There are no Prohibited, Restricted or Danger (PRD) areas, nor published flying training areas, in proximity to the Project Area.

18.4.2.5 Communications, navigations and surveillance

An Airservices Australia ATC communications facility is located at Mount William, 82 nm (151 km) to the north-east of the Project Area. The Project would not impact on the operations of this facility. The nearest ground navigation aids are a non-directional beacon and a very high frequency omni range, both located at the Mount Gambier Aerodrome. The non-directional beacon has a range of 75 nm (139 km) and is a low frequency (266 kHz) radio transmitter. The omni range is a facility that operates based on line of sight. The Project would not affect the operation of either of these navigational aids.

The nearest civil aviation surveillance facility is a Secondary Surveillance Radar at Mount Macedon, 160 nm (296 km) north-east of the Project Area. The Primary Surveillance Radar at Gellibrand Hill (Tullamarine airport, Melbourne) is 168 nm (311 km) north-east of the Project Area. The Project is beyond the line of sight of both the Mount Macedon and Gellibrand Hill radars and would not affect their operation.

18.4.2.6 Existing aerial operations and activities

The Mount Gambier and Portland Aerodromes are equipped with Pilot Activated Lighting and non-precision GNSS IAPs and are therefore available for night operations by aircraft in accordance with both IFR and VFR during night flights.

There are no published flying training areas, or highly trafficked areas in the vicinity of the Project Area. Currently, all emergency services flying is subject to ongoing dynamic risk assessment throughout the flight.

There is no formal flying training school at Portland, however, there is an active aeroclub at Portland with approximately 15 light aircraft based at the airport. Recreational and sport aircraft are generally classified as ultra-light aircraft. The Nelson airstrip is operated by the Nelson Aeroplane Company which specialises in vintage light aircraft restoration and maintenance. Through discussions with the company, it is understood that these aircraft are slow by modern standards and if they take off to the east towards the Project Area, would be required to manoeuvre right (toward the coast) or left to avoid rising ground, which keeps them clear of the wind turbines. Any aircraft operation into Nelson requires prior approval from the company, which has committed to briefing the pilots about the wind farm's location.

Part of the wind farm is located within the GTFP plantation area. Aerial applications within the plantation areas for seeding, fertilizing, and pest control can continue to occur with an agreement in place between GTFP and the Proponent to shut down the turbines during aerial applications.

The Police Air Wing helicopters and Helicopter Emergency Medical Services are capable of IFR flight and are flown by IFR rated pilots who are also qualified for low level flight, for example, search and rescue operations. For low level night operations, the aircraft are equipped with Night Vision Imaging Systems enabling the pilot to "see" in reduced light conditions. For final descent and landing the searchlight is used to illuminate the landing area. These helicopters utilise dynamic risk assessment for all operations and the pilot in command has the final say as to whether the operation is aborted because of the risk to the aircraft and crew.

From previous work undertaken by Chiron Aviation Consultants, firefighting within wind farms is considered by the rural firefighting agencies in Victoria as 'just another hazard' that has to be considered in the risk management process associated with aerial firefighting. Aerial firefighting flying is conducted at low levels using specialist aircrafts that are flown by appropriately rated pilots in accordance with the VFR. The pilot is required to maintain forward visibility with the ground, and will therefore remain clear of smoke so that they can accurately and safely drop fire retardant.

18.4.3 Construction impacts

The erection of wind turbines during construction may cause interference to air traffic control communications, navigation and surveillance facilities if they cross acceptable clearance limits. Impacts would be similar to those discussed in **Section 18.4.4** below for operational impacts.

18.4.4 Operation impacts

18.4.4.1 Aerodromes

The Portland Aerodrome has an OLS of 15 km. As the wind farm site is located 18.5 km from the Portland Aerodrome, the Project would not impinge on the OLS. Portland Aerodrome has two published non-precision IAPs. The height of the wind turbines would impact on the IAP at Portland Aerodrome, as the Project's LSALT is 2,400 ft, which is within both the 25 nm and 10 nm MSAs of 2,000 ft. This will require the 25 nm and 10 nm MSAs to be raised to 2,400 ft, and the IAPs to be redesigned.

The following amendments to the non-precision IAPs at Portland Aerodrome are required for it to remain clear of the Project (see mitigation measure MM-AI01):

- Raise the 10 nm and 25 nm MSAs to 2,400 ft.
- Raise the holding procedure altitude to 2,400 ft.
- Amend the missed approach procedures to climb to 2,400 ft.
- Amend both the RWY08 and RWY26 runway approach paths (east-north-east and north-northwest runways) to commence at 2,400 ft.

Consultation with GSC and Airservices Australia is being undertaken to have these changes implemented. GSC supports the required changes to the airspace at Portland and has advised Airservices Australia accordingly.

The Project is below the Mount Gambier MSA of 2,500 ft and beyond the 15 km OLS. The Project therefore would not impact on the operation of Mount Gambier Aerodrome.

The wind farm would not affect aircraft operations at the unregistered Nelson and Kentbruck Aerodromes, given the type of aircrafts operating from these unregistered aerodromes.

In accordance with paragraph D of the NASF Guidelines, wind turbines that are taller than 150 m above ground level and located within 30 km of a certified aerodrome require notification to relevant authorities. The Project has been reported to CASA, and in accordance with *AC 139-08(1) Reporting of Tall Structures*, Airservices Australia was also notified to ensure that the turbine locations are included within the vertical obstacle database and marked on aeronautical charts.

18.4.4.2 Air routes

The Project would not impact on the W584 air route as the LSALT of 2,900 ft is above the Project's LSALT of 2,400 ft.

The LSALT for the Grid and W519 air routes is 2,200 ft, which would be affected by the Project. The GSC, as the operator of Portland Aerodrome, wrote to Airservices Australia on 21 May 2021 in support of the required changes to the GRID and W519 LSALT changes. An application will be made to Airservices Australia to raise the LSALT for these two air routes to 2,400 ft. This change will be required before construction of the Project commences (see mitigation measure MM-AI02). Airservices Australia identified that further consultation will be required regarding the raising of the LSALTs, which will be undertaken prior to the commencement of construction.

18.4.4.3 Meteorological monitoring masts

Met masts are often difficult to see due to their slender construction and thin guy wires. They are often a grey (galvanised steel) colour that readily blends with the background. Operators of aerial applications and emergency services pilots all note the danger of met masts to low flying aircraft. Each of these stakeholders requested that the NASF Guidelines, except for the strobe light, be used to make the masts more visible and that the markings be maintained in a serviceable condition. Measures outlined in the NASF Guidelines to improve visibility include (see mitigation measure MM-AI03):

- The top one third of the met mast is be painted in alternating contrasting bands of colour.
- Marker balls, high visibility flags or high visibility sleeves are to be placed on the outer guy wires.
- The guy wire ground attachment points are to have contrasting colours to the surrounding ground and vegetation.

Met masts for the Project will be reported as per *AC 139.E01 v1.0 Reporting of Tall Structures* and to the Aerial Application Association of Australia (see mitigation measure MM-AI05). A notice to airmen will also be issued that provides the height and location of the met masts (see mitigation measure MM-AI03).

18.4.5 Qualitative risk assessment

A qualitative risk assessment was undertaken to determine the level of risk that operation of the Project would have on aviation operations and aircraft safety in the study area. The qualitative risk assessment was conducted using AS/NZS ISO 31000, and considered air routes of aerodromes near the Project Area, known flying activities around these aerodromes, and potential impacts from the wind farm and transmission line. The outcomes of this risk assessment informed the need for the Project to install aviation obstacle lighting on the wind turbines.

The wind farm site is not sited within the OLS of any certified aerodrome and will not penetrate any PANS-OPS airspace (after required amendments to the Portland Aerodrome non-precision IAP and relevant air routes identified are made). Wind turbines will be appropriately painted to ensure they are conspicuous by their size and colour during daytime (see mitigation measure MM-AI04). After these mitigation measures are implemented, the Project would not impact on any LSALTs within the study area. Night operations for aircraft do not occur below the LSALTs for IFR and VFR at night. IFR aircraft are protected by the LSALT and PANS-OPS prescribed airspace at each aerodrome. Where an approach to land is undertaken operating to VFR at night, descent below the lowest safe altitude does not occur until within 3 nm of the airport and within sight. The nearest aerodrome equipped for night operations is Portland 10 nm (18.5 km) to the south-east of the wind farm site.

The risk assessment for the Project indicates that the overall risk to aviation is low. A risk assessment of low indicates that the wind farm is ‘not a hazard to aircraft safety’. The Project does not therefore require obstacle lighting and no additional mitigation measures are required.

18.5 Bushfire risk

18.5.1 Assessment methodology

The following approach was undertaken for the **Bushfire Risk Assessment (Appendix V)**:

- Established the study area and characterised the existing conditions, including overall fuel hazard analysis, plantation age, and existing firefighting resources.
- Desktop review of relevant data on fire weather conditions, fire history, bushfire prone areas, vegetation, topography, and assets at risk from existing sources.
- Identification of bushfire hazards arising from construction and operation of the Project for communities and the environment in surrounding areas.
- Detailed site assessment to understand site conditions influencing bushfire risk and its management, including bushfire fuel hazard, topography, access, surrounding land uses, and vegetation types.
- Identification of bushfire response capability in the vicinity of the Project Area and potential for adequate response to a bushfire event, including identification of egress routes.
- A bushfire risk assessment to identify the likelihood and consequence of potential bushfire risks during construction and operation of the Project and assist in developing mitigation actions.
- Phoenix Rapid Fire predictive fire modelling which assists with analysing risk and understanding the effect a wind farm may have on bushfire risk, providing a better understanding of bushfire movement through landscapes and subsequent consequences.
- Development of preventative bushfire risk controls (which seek to avoid bushfire ignitions) and mitigation bushfire risk controls (which seek to reduce the effects of fire once it has been ignited) for the Project.
- Identification of measures to avoid, minimise, or manage potential impacts.

18.5.1.1 Risk assessment methodology

The bushfire risk assessment was undertaken in accordance with AS/NZS ISO 31000 as incorporated into the National Emergency Risk Assessment Guidelines (NERAG).

A bushfire risk is a function of the likelihood of an adverse event occurring and the consequence of that event. The likelihood scale refers to the potential of unplanned fire ignition in the Project Area and spreading to adjoining properties. The consequence scale refers to the potential seriousness of damage which could occur in the event of a bushfire. The risk rating table shown in **Table 18.3** is then used to combine likelihood and consequence to determine an overall risk rating.

Table 18.3: Bushfire risk assessment table

		Consequence		
		Minor Minor or negligible consequences or effects. No damage to property or persons. Small impact on the environment with no lasting effects.	**Moderate** Moderate loss of property, some medical treatment but no fatalities. Localised damage that can easily be rectified. Some impact on the environment with short to long-term effects	**Major** Significant consequences – major damage or effect. Loss of life and/or property. Significant injuries, hospitalisations, large number of displaced persons
Likelihood	**Very Likely** Will definitely occur, and /or high level of recorded incidents, or there is a strong likelihood that the event will occur	Medium	Very High	Extreme
	Likely High probability it may occur; and/or some recorded incidents	Medium	High	Very High
	Unlikely It is not expected to occur, but it is not impossible	Low	Medium	High

18.5.1.2 Phoenix Rapid Fire predictive scenarios

Phoenix Rapidfire models were developed as part of the Bushfire Risk Assessment to determine the potential influence that the Project would have on the existing bushfire risk in the landscape. The model can be used to assist with analysing risk and understanding the effect that a wind farm may have on bushfire risk, and allow for a better understanding of bushfire movement through landscapes and subsequent consequences.

A summary of the results of this modelling is provided in **Section 18.5.3.3**.

18.5.2 Existing conditions

18.5.2.1 Study area

The study area in the Bushfire Risk Assessment was defined as the Project Area and surrounding region. A buffer of a specific size around the Project Area has not been used as the assessment of bushfire risk requires landscape-scale consideration.

18.5.2.2 Environmental and land use conditions

The Project Area is located on the Glenelg Plains, which is a series of long low narrow ridges running parallel to the coastline. Topography in the Project Area is moderately undulating with limited variation, and comprises numerous remnant sand dunes. Part of the Project Area comprises farmland on the edge of the Warrnambool Plains. The topography of the Project Area is not expected to influence bushfire behaviour on the wind farm site and in the surrounding area.

Four main vegetation types define the Project Area and its surroundings, including:

- Pine plantations of various stages of growth – fire fuel characteristics vary depending on crop rotation, establishment phase and management practices.
- Native coastal heath along the southern perimeter of the Project Area – characterised by Ecological Vegetation Class (EVC) 3, it includes low, grassy or bracken-dominated eucalypt forest or open woodland to 15 m tall with a large shrub layer and ground layer rich in herbs, grasses and orchids. The area allows for interruption of bushfires due to the fragmentation of vegetation and bare earth areas.
- Forest vegetation in the north of the plantation – primarily contained within public land, these areas include long unburnt vegetation that have elevated fuel loads. Bushfires through these areas would have high intensities under elevated fire danger and be difficult to supress.
- Farmland – largely grassland used as cropping and pastoral fields. Grassland fires have a lower intensity and flame height than forest fires. However, grassland fires can spread rapidly under windy conditions.

The Project Area is largely a modified landscape with softwood plantation forestry, areas of agricultural pasture and cropping. While parts of the landscape beyond the Project Area share similar land use types, there are also areas of high value coastal parks and native forested areas north and south of the Project Area.

There is an existing network of roads and tracks throughout the Project Area including in private land, plantations and public land. In particular, the track network within the plantations is well defined, provides all weather access, and has managed road verges. The current transport network condition provides effective access to the plantation for firefighting resources. Further improvements to the road network are proposed for the transportation of wind turbine infrastructure.

18.5.2.3 Firefighting resources

Forest Industry Brigades (FIBs) are established when a plantation reaches a critical size and is required to provide firefighting resources in accordance with section 23AA of the *Country Fire Authority Act 1958 (VIC)* and the *Country Fire Authority Regulations 2014*. There are two CFA FIBs within the CFA District 4 which service the Project Area:

- GTFP FIB
- Hancock Victorian Plantation (HVP) FIB.

CFA fire brigades within the surrounding area are located at Mount Richmond, Gorae West, Heywood, Dartmoor, Drik Drik, Mumbannar and Nelson. Forest Fire Management Victoria also operates within the local area and can respond to bushfires within the surrounding area.

In the land tenure agreement with the plantation manager GTFP, the Proponent has accepted the inclusion of a bushfire protocol which will ensure the continuation of existing emergency services practices. These practices will be adapted with consideration of the final wind farm design, in consultation with GTFP.

The Green Triangle Fire Alliance is an alliance of ten forest grower companies within the Green Triangle (the area of south-west Victoria and south-eastern South Australia) that have agreed to work together to improve the efficiency and effectiveness of fire suppression, detection, and prevention activities by forest owners/managers. This includes a set of agreed standards and specifications for equipment, standardised operating procedures, mutual aid arrangements and arrangements for sharing the costs of chartering and operating aircraft for detection and suppression.

18.5.2.4 Fire conditions

Bushfire ignition can occur from a range of different causes, including naturally occurring events such as lightning strike, or human activities such as arson or by accident (e.g. from a campfire). Following ignition, the direction and speed of a fire's travel, and the height and intensity of the flames, are determined by climatic and weather conditions, topography and fuel in the area.

Land surrounding the Project Area consists of large patches of forested areas over a long north-south expanse with non-forested areas in between. This would typically limit a fire size to less than 20,000 ha as fires move out into grass areas where more rapid containment is possible. While the classic northwest-to-southwest fire weather pattern does sometimes occur in the far south-west, it is common for bushfires in this area to be primarily driven by west or west-south-west winds. Heathy fuels, sometimes combined with very low fuel moisture conditions in the far south-west of the region make suppression difficult, even under mild conditions. The presence of peat was also identified in low-lying areas of the Project Area (see **Chapter 10 *Soil contamination and acid sulfate soils***). When peat is ignited, it can spread underground and cause new fires in other areas.

Data from the Victorian Fire Risk Register indicates the occurrence of fire ignitions in the wind farm site is considered low. Less than ten ignitions have been recorded over a 10-year period.

18.5.3 Bushfire risk assessment

Using the risk assessment methodology outlined in **Section 18.5.1.1**, the potential risk of a bushfire igniting during construction and operation of the Project has been assessed and is outlined below. The assessment considered potential fires originating from within and external to the Project Area.

18.5.3.1 Bushfire risk during wind farm construction

The risk of a fire igniting during construction of a development is always present. This is due to the presence of ignition sources including hot works, increased vehicle traffic and vehicles travelling across vegetated areas. Construction of turbines and substations would likely involve construction techniques that require operating equipment within vegetated areas, including plantations and grassland. It can be assumed that if a bushfire starts during construction, there would be people present and they would have equipment available to make attempts to suppress the fire before it escalates. Should an ignited fire start burning through peat, it can generate increased amounts of smoke that can cause respiratory issues for firefighters and others including the surrounding community.

The risk of a bushfire igniting during construction is rated very high (likelihood rating of likely and consequence rating of major). Mitigation measures to lower the risk of a bushfire igniting during construction include development of an Emergency Management Plan (EMP) prior to construction commencing, that requires the exclusion of staff and contractors from the plantation when the weather is forecast to be above a fire danger rating of extreme (see mitigation measure MM-BF01), implementation of a communication system to ensure workers can always be contacted and notified of warnings and alerts, and implementation of a staff and contractor induction system that includes an overview of the bushfire risk and the procedures to follow if a bushfire starts (see mitigation measure MM-BF02). A peat management procedure will be implemented to ensure that any peat identified during construction is managed to prevent fire ignitions (see mitigation measure MM-BF06).

When moving to a new construction site, vegetation clearance and construction of the hardstand areas will occur prior to works commencing (see mitigation measure MM-BF03). A person will also be appointed as fire watch on days where the fire danger rating is forecast to be very high or greater. The fire watch position is to monitor the surrounding areas and ensure all hot works and other activities that may cause a bushfire are monitored and reviewed regularly (see mitigation measure MM-BF02).

It is anticipated that the suite of mitigation measures developed to manage bushfire risks during construction would also serve to manage bushfire risks associated with the onsite quarry, which would not present unique bushfire risks requiring specific mitigation. In addition, MM-QU08 requires a detailed risk assessment and associated risk treatment plan be prepared, addressing all the hazards on the site. The risk assessment must be developed to the satisfaction of ERR before the quarry can be approved.

The Bushfire Risk Assessment determined that the risk rating of a bushfire igniting during construction, with the implementation of the above mitigation measures, would decrease from very high to medium.

18.5.3.2 Bushfire risk during wind farm operation

Turbines

Oils and flammable liquids located within proximity to moving parts, including turbine blades and electrically charged equipment, present a fire risk. Turbines have potential to ignite a fire through the use of combustible and flammable materials and liquids, a lack of maintenance causing failures within the turbines, or a lack of fire detection systems. During periods of warmer weather, ignited materials may drop from the turbine and start a bushfire in the surrounding areas.

Another possible ignition source is the turbines being struck by lightning. Turbine blades also have potential to be impacted on by direct flame contact or elevated levels of radiant heat during a bushfire. Bushfire behaviour in a plantation under elevated weather conditions can cause flame heights at least double the height of the trees. These flame heights could penetrate the turbine rotor swept area where the blades pass through. Flame contact on the blades may cause warping or ignition of the blades. Under these conditions a blade or part of the blade may become dislodged.

The risk of bushfire ignition during operation of the wind turbines is rated very high (likelihood rating of likely and consequence rating of major). Modern turbines incorporate design features to reduce the risk of ignition and fire spread into surrounding vegetation. Detection and suppression systems are also installed within the nacelle to provide early detection of a fire and upon activation, deliver suppressants (in most cases gas) to extinguish the fire. Where possible, non-combustible or low combustibility and low flammability liquids including oils and lubricants, will be used within the nacelle (see mitigation measure MM-BF07).

To prevent lightning from starting fires, all turbines will have lightning protection systems installed, such as lightning receptors, overvoltage, and overcurrent protection systems, and down conducting systems that conduct the lighting current down through the wind turbine (see mitigation measure MM-BF07). This system will provide some protection for the pine plantation from lightning strikes in the vicinity of wind turbines.

A fuel managed area will be provided around the base of the wind turbine to prevent fires ignition from falling burning material. A maintenance regime will be implemented that ensures turbines are inspected and serviced in accordance with the manufacturer's specifications (see mitigation measure MM-BF08). A hot works management system will also be implemented and include consideration of the bushfire risk on any given day (see mitigation measure MM-BF06). An EMP will be developed to keep staff and contractors out of the plantation during extreme Fire Danger Periods, and to document the procedures to shut down areas of the wind farm that are impacted on or threatened by bushfire (see mitigation measure MM-BF05).

The Bushfire Risk Assessment determined that the risk rating of a bushfire ignition within the plantation, during operation of the wind turbines and with the implementation of the above mitigation measures, would decrease from very high to medium.

Powerlines

During the desktop review as part of the Bushfire Risk Assessment, very little information was found about historical bushfires that have been caused by overhead powerline failure. It is widely believed that the vegetation management that occurs under overhead powerlines and the creation of easements (in this case, 40 m-wide) minimises bushfire fuel load. However, there is potential for a bushfire to ignite due to poor work practices, delayed suppression activities due to the presence of the powerline, or failure in the powerline which ignites a fire.

The risk of the Project's high voltage overhead powerline (located along Portland-Nelson Road) causing a bushfire is considered medium (likelihood rating of unlikely and consequence rating of moderate). An EMP will be developed that requires the exclusion of staff and contractors from the plantation when the weather is forecast to be above a fire danger rating of extreme (see mitigation measure MM-BF06). An easement will also be provided under the overhead powerline and be regularly maintained as per regulatory requirements (see mitigation measures MM-BF07 and MM-BF08). These mitigation measures would reduce the overall risk to low.

18.5.3.3 Phoenix Rapidfire predictive scenarios

Phoenix Rapidfire models were developed to determine the potential influence that the Project would have on the existing bushfire risk in the landscape. The modelling determined that the most significant reduction in bushfire risk as a result of the Project would be in flame height at turbine locations where the cleared areas minimise bushfire activity. The model assumed that the bushfire would burn around the cleared areas but not through them due to the lack of available fuel. There would be no real change in ember density, with ember density in plantations assumed to be low due to pine trees not being known to produce large quantities of embers when compared to native forests.

The Phoenix Rapidfire assessment shows that there would be a minor reduction in potential bushfire impacts resulting from the development of a wind farm, mainly through reduced flame heights in the cleared areas.

18.5.4 Impacts on fire bombing and firefighting operations

Firebombing is a method of aerial bushfire suppression, where aircrafts are used to release water, foam, or fire-retardant slurries over, or in front of bushfires, to reduce or cease the spread of the fire. Wind farms may impact on aerial firefighting due to wind turbines and met masts creating aerial obstacles. The location of met masts and wind turbines will be reported to Airservices Australia to ensure records of these are maintained in the tall structures database (see mitigation measure MM-AI05). Met masts will also be installed with markers to improve visibility during aerial firefighting operations including painting the top one third of the met mast with alternating contrasting colours and placing marker balls on outer guy wires (see mitigation measure MM-AI03).

Wind farms introduce a range of infrastructure into the landscape including wind turbines, powerlines, substation, access tracks, asset protection zones and easements. The available guidance material acknowledges that this infrastructure may create new risks, however in relation to bushfire suppression activities the ability to intervene may be improved. Cleared areas around turbines and additional tracks to access turbine locations, as well as overhead powerline easements, require area with no vegetation which will assist firefighters with undertaking fire suppression activities.

The Proponent will work to support the integration of the Project with existing bushfire operations including liaison with the local CFA brigades and groups to help familiarise them with the Project operations and infrastructure, develop a response plan and suppression strategies to assist firefighters in understanding the risks associated with turbines fires and shutting down turbines in the vicinity of reported fires to support firefighting operations (see mitigation measure MM-BF09).

18.6 Mitigation measures

Table 18.4 outlines the mitigation measures developed to avoid, minimise, and manage safety, hazard, and risk impacts from construction and operation of the Project.

Table 18.4: Safety, hazard and risk mitigation measures

ID	Mitigation measure	Relevant work area	Project phase
Electromagnetic interference			
MM-EI01	**Exclusion zones** Any turbines to be micro-sited will avoid the second Fresnel zone of the Telstra point-to-point link. If entering the exclusion zone is unavoidable during construction when lifting turbines into place, the link operator (Telstra) will be consulted before construction so they can anticipate the potential temporary service degradation and take steps to minimise or negate the impact to their services.	Wind farm	Planning Construction
MM-EI02	**Pre and Post Television and Radio Signal Assessments** The Proponent will undertake a pre- and post-construction assessment of the television reception strength at the location of any existing or approved dwellings as at the date of development approval that are within the orange scatter zone (where confirmed to not be using VAST) for the wind farm layout. The assessments will be undertaken by an independent television and radio monitoring specialist and include testing at locations to be determined by the television and radio monitoring specialist to enable the average television and radio reception strength to be determined. If the post-construction assessment establishes an unacceptable increase in interference to reception as a result of the wind farm, as determined by the independent television and radio monitoring specialist, measures to restore the affected reception to pre-construction quality will be undertaken.	Wind farm	Planning Construction Operation
MM-EI03	**AM / FM radio narrowcast and broadcast** The Proponent will undertake a pre- and post-construction assessment of the radio reception strength at the location of any existing or approved dwellings as at the date of development approval that are within 5 kilometres of any turbine. The assessments will be undertaken by an independent television and radio monitoring specialist and include testing at locations to be determined by the television and radio monitoring specialist to enable the average television and radio reception strength to be determined. If the post-construction assessment establishes an unacceptable increase in interference to reception as a result of the wind farm, as determined by the independent television and radio monitoring specialist, measures to restore the affected reception to pre-construction quality will be undertaken.	Wind farm	Operation
MM-EI04	**Meteorological radar** The Proponent will continue consultation with the BoM on the exact terms of the operational limits and/or other technical solutions for the Project to ensure that the Mount Gambier radar can maintain operational efficiency.	Wind farm	Planning
MM-EI05	**Defence radio system** The wind farm will conform with *AS/NZS 61000.6.4:2012 Electromagnetic compatibility (EMC) Generic standards - Emission standard for industrial environments* which means the wind farm will reduce, as much as is practicable, the emission of high frequency noise from the turbines, substation(s) and electronic control equipment.	Wind farm	Design
Aeronautical			
MM-AI01	**Portland Aerodrome** The following amendments to the non-precision IAPs at Portland Aerodrome will need to be made for them to remain clear of the Project: • The 10 nm and 25 nm Minimum Safe Altitudes need to be raised to 2,400 ft. • The holding procedure altitude needs to be raised to 2,400 ft. • The missed approach procedures need to be raised to 2,400 ft.	Wind farm	Planning

ID	Mitigation measure	Relevant work area	Project phase
	• Both the RWY08 and RWY26 runway approach paths need to be raised to commence at 2,400 ft. Consultation with the Portland Aerodrome operator (Glenelg Shire Council) and the Instrument Approach designer (Airservices Australia) has been undertaken to facilitate these amendments. The required amendments will need to occur prior to construction of the Project commencing.		
MM-AI02	**Air route lowest safe altitude** The Lowest Safe Altitudes for the GRID and W519 air routes will need to be raised from 2,200 ft to 2,400 ft. An application will be made to Airservices Australia to raise the LSALT for these two air routes before construction of the Project commences.	Wind farm	Planning
MM-AI03	**Meteorological monitoring masts** All met masts will be marked in accordance with the National Airports Safeguarding Framework – *Guideline D Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring* Tower to improve visibility as follows: • The top one third of the met mast will be painted in alternating contrasting bands of colour. • Marker balls, high visibility flags or high visibility sleeves will be placed on the outer guy wires. • The guy wire ground attachment points will have contrasting colours to the surrounding ground and vegetation. All met masts will be notified to Airservices Australia in accordance with AC 139.E-01 v1.0. The location of the met masts will also be provided to the aerodrome operators at Portland and Nelson, Aerial Application Association of Australia, local aerial applications operators, Police Air Wing, Helicopter Emergency Medical Services (Ambulance Victoria), Forest Fire Management and the Country Fire Authority A notice to airmen will also be issued that provides the height and location of the met masts.	Wind farm	Operation
MM-AI04	**Wind turbine design** Wind turbine designs that have a conspicuous size and colour will be used to ensure visibility in the daytime.	Wind farm	Planning
MM-AI05	**Reporting tall structures** The location of met masts, wind turbines and associated transmission line infrastructure will be reported to Airservices Australia in accordance with AC 139 E-01 v1.0. A Notice to Air Mission will also be issued that provides the height and location of the met masts, wind turbines and associated transmission line infrastructure	All areas	Planning
Bushfire risk			
MM-BF01	**Construction Emergency Management Plan** A Construction Emergency Management Plan will be prepared and implemented that includes procedures for managing the risk from bushfire during the construction phase. The Emergency Management Plan will be prepared in consultation with the CFA and the Victorian Department of Energy, Environment and Climate Action. At a minimum, the plan will: • Outline the procedures to be undertaken in accordance with different fire danger ratings. As a minimum, work will not be undertaken on days of extreme fire danger or higher, unless for emergency response, or critical repair or maintenance purposes. • Outline the induction and other training requirements for staff and contractors working at the site during the Fire Danger Period	All areas	Construction

ID	Mitigation measure	Relevant work area	Project phase
	• Include all the information contained within the CFA's *Design Guidelines and Model Requirements for Renewable Energy Facilities* (2022) pertaining to emergency management planning. • Be developed in accordance with *AS 3745:2010 Planning for emergencies in facilities*. • Establish emergency assembly areas, emergency access points, and emergency evacuation procedures.		
MM-BF02	**Fire risk communications** The following communication activities will be undertaken during construction to manage bushfire risk: • A communication system will be developed that operates during the Fire Danger Period which provides the ability to contact all onsite staff and contractors to inform them of bushfire alerts and warnings. • A fire watch position will be appointed at each construction location during the Fire Danger Period to monitor the surrounding area and regularly ensure hot work activity is being managed safely. • Local Country Fire Authority fire brigades will be engaged and offered regular Project familiarisation tours to support their understanding of the activities occurring. • A high standard of communication will be maintained with landowners, relevant stakeholders and the community regarding daily activities via a 'steering committee' or the like, in accordance with an appropriate communication plan (see mitigation measure MM-SE01) • A primary contact person will be established for the community to contact with concerns, questions or issues about the Project during the construction period.	All areas	Construction
MM-BF03	**Design and infrastructure** The following design and infrastructure requirements will be implemented during construction to manage bushfire risk: • Vegetation clearance and hardstand areas will be implemented prior to any works being undertaken at the location of each turbine and other infrastructure. • All facilities and infrastructure will be designed so as to not be exposed to more than 12.5 kW/m² of radiant heat. • Vegetation clearance will be provided around the base of the wind turbines within a 50 metre radius. • A static water supply will be established for each stage of construction in accordance with the Country Fire Authorities' *Design Guidelines and Model Requirements for Renewable Energy Facilities* (2022). The water supply will be kept full during the Fire Danger Period. • All access roads and tracks will be identified and will meet the CFA *Design Guidelines and Model Requirements for Renewable Energy Facilities* (2022) and Forest Fire Management Victoria Guidelines for emergency vehicle access. • Appropriate signs will be used to assist emergency response crews with determining track names, turbine locations etc. • A fire response capability will be developed in conjunction with the plantation companies and other relevant land managers that as a minimum includes tanks and firefighting pumps fitted to vehicles during the Fire Danger Period.	All areas	Design
MM-BF04	**Fire Danger Period** All activities undertaken during the Fire Danger Period will be appropriate under the *Country Fire Authority Act 1958*, (Vic) including: • Compliance with Total Fire Ban Day restrictions. • Obtaining permits for any hot work activities.	All areas	Construction

ID	Mitigation measure	Relevant work area	Project phase

MM-BF05	**Operational Emergency Management Plan**
	An Operational Emergency Management Plan will be developed in consultation with the Victorian Department of Energy, Environment and Climate Action , and will include:
	• For unmanned sites, appropriate monitoring and intervention measures will be provided to ensure that any shorts, faults, off-gassing, temperature increases above normal parameters and equipment failures with the potential to ignite or propagate fire are rapidly identified and controlled, and any off-gassing, smoke or fire is notified to 000 immediately.
	• Emergency procedures based on identified risks and hazards at the facility will be incorporated into the Emergency Management Plan, as per the Country Fire Authority (CFA) *Design Guidelines and Model Requirements for Renewable Energy Facilities* (2022). Emergency procedures will include, but not be limited to:
	  ○ Bushfire/grassfire.
	  ○ Wind turbine faults and fire.
	  ○ Electrical infrastructure faults and fire.
	  ○ Other dangerous goods spills/leaks.
	• Procedures will incorporate activities prior to and during days of Catastrophic and Extreme fire danger rating and align with local planning including the Municipal Emergency Management Plan.
	• Procedures will be developed and implemented to identify and respond to the fire danger ratings/Total Fire Ban status during the declared Fire Danger Period.
	• Procedures will be developed and implemented for detecting and responding to bushfire activity within 50 km of the Project (e.g., through the VicEmergency website or ABC local radio) including the ability to monitor for bushfire for at least three days in advance.
	• Non-essential personnel will have limited site access on days with a fire danger rating of extreme or catastrophic, and non-essential activities will be limited on these days.
	• Bushfire ignition hazards will be included in any Job Hazard Analysis or similar activity-based risk management process for site activities.
	• As a minimum, no work will be undertaken on catastrophic days except in emergencies.
	• Induction and other training requirements will be outlined in the Emergency Management Plan for staff and contractors working at the site during the Fire Danger Period.
	• Firefighting maintenance activities will not be undertaken in the cleared area surrounding the turbine towers under elevated fire danger conditions.
	• All the information contained within the CFA *Design Guidelines and Model Requirements for Renewable Energy Facilities* (2022) pertaining to emergency management planning will be incorporated into the Emergency Management Plan.
	• The Emergency Management Plan will be developed in accordance with AS 3745.
	• Emergency assembly areas will be established, and evacuation procedures and emergency access points will be detailed in the Emergency Management Plan to be covered in site inductions.
		All areas	Operation

MM-BF06	**Fire Management Plan** A Fire Management Plan (FMP) will be developed for the Project prior to construction and amended as required prior to operation. The FMP may form part of the broader Emergency Management Plan. The FMP will consider fire risks to and from the site and detail the control measures (systems, activities and accountabilities) for the prevention and management of fire. The FMP will include but not be limited to:	All areas	Construction Operation

ID	Mitigation measure	Relevant work area	Project phase
	• Monitoring for fire in the area. • Vegetation and fire break management. • Wind turbine monitoring and servicing. • Peat presence and management (see also mitigation measure MM-CA05). • Fire protection systems and equipment inspections and servicing. • Hot work permits/processes and other ignition control mechanisms. • Internal access roads, gates and fencing maintenance.		
MM-BF07	**Operational design and infrastructure** The following design measures will be implemented during operation of the Project and are best placed in the Operational Environmental Management Plan: • Fire detection systems, in built fire protection and suppression systems, and remote alarming and notification systems will be installed in turbines to report potential bushfire risks. These systems will be connected to the supervisory control and data acquisition (SCADA) system that provides remove control over the wind farm. • Where possible, cameras will be installed on selected turbines to increase landscape situational awareness and provide early warning of bushfires. • Remote shut down procedures will be implemented for turbine operations during bushfires or reported faults, or at the request of emergency services. • Lightning conductors will be installed to dissipate electricity to ground and reduce turbine damage and bushfire risk. • Suitable firefighting equipment will be available onsite or readily accessible (as per response plan). • Operator management vehicles will carry firefighting water and basic fire equipment during the declared Fire Danger Period. • Static water supplies will be installed at strategic locations across the Project Area with 45,000 L installed in each set. • Where possible, non-combustible or low combustibility and low flammability liquids including oils and lubricants, will be used within the turbine nacelles.	All areas	Design
MM-BF08	**Operational maintenance** The following maintenance and audit activities will be undertaken during operation of the Project: • Regular inspections will be undertaken of all turbines, substations, and powerlines (including easements). Inspection details and findings will be recorded. • Bushfire preparedness audits will be developed and implemented to record all “annual” fire danger season preparedness activities and prevention works. • Asset protection zones around turbines and buildings will be maintained. • All access roads and tracks used for the Project will be maintained to meet industry standards for emergency vehicle access.	All areas	Operation
MM-BF09	**Bushfire suppression operations** The following measures will be implemented to support integration with existing bushfire operations: • A response plan and suppression strategies will be developed to assist firefighters with understanding the risks associated with fires in turbines. • The Proponent will liaise with the local Country Fire Authority brigades and groups to assist with familiarising them with the Project’s operations and infrastructure. • A liaison person will be provided to support incident management during bushfires. • Turbines will be shut down in the vicinity of reported fires to support firefighting operations.	All areas	Operation

18.7 Conclusion

An Electromagnetic Interference Impact Assessment, Aeronautical Impact Assessment, and a Bushfire Risk Assessment have been undertaken to determine the potential impacts of the Project associated with EMI and aviation safety and operations, and the potential risk of a bushfire igniting during construction and operation of the Project.

Potential impacts on a Telstra point-to-point radio systems have been avoided by removing a wind turbine from the layout in the vicinity of the signal source and receiver Fresnel zones. Television broadcasting systems at dwellings south of the wind farm site may be affected, and there may be FM radio signal degradation for receivers in the immediate vicinity of the wind farm. The Proponent will engage an independent specialist to undertake a pre- and post-construction assessment of the television reception strength at these dwellings south of the wind farm site (and any other existing or approved dwellings at the time of Project approval) that are within the potential television signal scatter zone from the South East (Mt Burr) TV transmitter (where confirmed to not be using VAST). A pre- and post-construction assessment of the FM radio reception strength will also be undertaken at any existing or approved dwelling within 5 km of any turbine (as at the time of Project approval). Measures to restore the affected reception to pre-construction quality will be undertaken if required.

Initial consultation with the BoM identified that the wind farm may impact on Mount Gambier weather watch radar, with turbines situated within the lower two ‘scans’ of the radar, which provide the longest radar coverage and the most accurate data for rainfall analysis. The Proponent will continue to consult with the BoM prior to Project construction for the exact terms of the operational limits and/or other technical solutions for the Project to ensure that the radar can operate as required.

Two regulated aerodromes and two unregulated aerodromes are located near the wind farm site. The closest regulated aerodrome, Portland Aerodrome, is located 10 nautical miles (nm) (18.5 km) south-east of the nearest turbine. The height of the wind turbines would intrude on one of the IAPs of the Portland Aerodrome. Several amendments to the non-precision IAPs are required for the Portland Aerodrome to remain clear of the wind farm. Consultation with the aerodrome operator and Airservices Australia is being undertaken to have these changes implemented. The aerodrome operator supports the required changes to the airspace at Portland and has advised Airservices Australia. The Project would not affect any air routes of the other aerodromes located near the Project Area.

The qualitative risk assessment undertaken for the Project determined the wind farm will not penetrate any aerodrome airspace (after required amendments to the Portland Aerodrome non-precision IAPs have been made), and wind turbines will be appropriately painted to ensure they are conspicuous by their size and colour during daytime. As a result, the overall risk of the Project to aviation is low, and the wind farm is not considered to be a hazard to aircraft safety.

The Project has been reported to CASA, and Airservices Australia has been notified in accordance with AC 139-08(1) *Reporting of Tall Structures* to ensure the position of wind turbine and met masts are included within the vertical obstacle database and marked on aeronautical charts.

Bushfire risk was assessed in relation to potential fires originating from both within and external to the wind farm site and in both the construction and operational phases of the Project. The Bushfire Risk Assessment concluded that the bushfire risk associated with construction and operation of the wind farm can be mitigated to an acceptable level with the implementation of mitigation measures. The wind farm would not increase bushfire risk in the landscape.

The risk of fire ignition during construction of a wind farm is present due to the presence of ignition sources including hot works, increased vehicle traffic and vehicles travelling across vegetated areas. With the implementation of the Project’s proposed mitigation measures, the risk of a bushfire being ignited during wind farm construction is reduced and is not considered to be significant.

Turbines have potential to ignite a fire through the use of combustible and flammable materials and liquids, a lack of maintenance causing failures within the turbines, or a lack of fire detection systems. A range of design and maintenance mitigation measures will be implemented including the installation of detection and suppression systems within the nacelle of the turbines and providing a fuel managed area around the base of the wind turbine to prevent ignition from falling burning materials. The risk of a bushfire igniting during operation of the wind turbines with the implementation of mitigation measures is reduced and is not considered to be significant.

It is therefore considered that the Project satisfies the relevant safety, hazard, and risk evaluation objective specified in the EES Scoping Requirements, to avoid and minimise adverse effects for community safety and aviation safety.

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