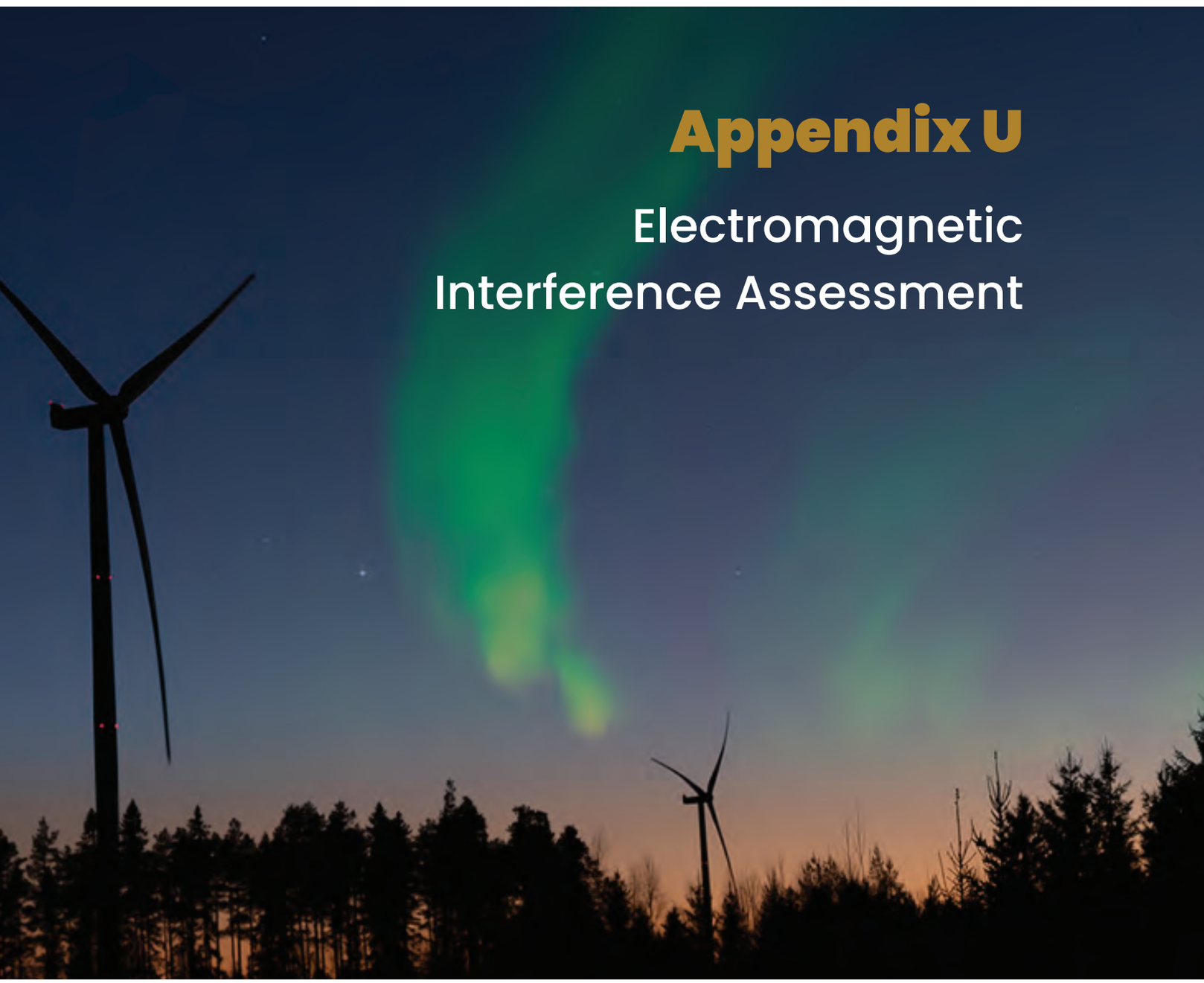

Appendix U

Electromagnetic Interference Assessment

KENTBRUCK GREEN POWER HUB

Electromagnetic Interference Assessment

Kentbruck Green Power Hub

Neoen Australia Pty Ltd

09 August 2024

→ **The Power of Commitment**

Project name	Kentbruck Green Power Hub						
Document title	Electromagnetic Interference Assessment | Kentbruck Green Power Hub						
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S4	0	J.Jones	J.Jones	**	L.Blight	**	23/06/2021
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S4	2	K.Khamthara	B.Leedham	**	C.Cass	**	22/08/2022
S4	3	K.Khamthara	B.Leedham	**	C.Cass	**	26/08/2022
S4	4	B.Siebert	B.Leedham	**	J.Jones	**	14/06/2023
S4	5	M.Eymael	B.Siebert	**	C.Cass	**	13/10/2023
S4	6	B.Siebert	B.Leedham	**	J. Jones	**	21/12/2023
S4	7	A.Macdonald	B.Siebert	*B.Siebert	T. Anderson	*T.Anderson	24/07/2024
S4	8	A.Macdonald	B.Siebert	*B.Siebert	T. Anderson	*T.Anderson	09/08/2024

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1. Introduction

1.1 Purpose of this report

The purpose of this report is to assess the potential impacts of the electromagnetic interference caused by wind turbines and electrical energy storage from the development of Kentbruck Green Power Hub. This report is intended to inform the project's assessment and approval processes to address mitigation measures where required.

The proposed wind farm development will be in far Southwest Victoria, approximately 330 km West of Melbourne (Glenelg Shire Council area). The proposed development incorporates approximately 8,318 hectares of private and public land and sits around 3 km from Nelson town and 17 km from Portland town. The proposed wind farm would have a total capacity of up to approximately 600 MW of wind energy, comprised of around 105 wind turbines.

GHD has performed the desktop analysis using ACMA Register of Radiocommunications Licences (RRL) database in conjunction with various information from the wind farm developer and third-party stakeholders including residents at the proposed wind farm development area. This report identifies and summaries the radio services within 50km radius of Kentbruck Green Power Hub boundary which includes the following radio types:

– Fixed point-to-point/multipoint microwave radio systems,
– Digital Television Broadcast,
– Aircraft Telecommunications Systems,
– Maritime Radio Systems,
– Defence Radio Systems,
– Meteorological Radar,
– AM/FM Radio Broadcast,
– Cellular Mobile Phone Systems.

To avoid any radio services from the radio sites that might be overlooked due to its location outside the identified area, the radio services within 50 km radius of Kentbruck Green Power Hub boundary has been reviewed for any possible electromagnetic interference impacts from the wind farm development.

This assessment also includes the impact of 50 Hz electromagnetic radiation.

1.2 Reference documents and assessment requirement

GHD has conducted the EMI assessment report in accordance with the current Victorian legislation and guidelines, notably:

– Section 5.1.2 (d) in the former Victoria Department of Environment, Land, Water and Planning Policy and Planning Guidelines - Development of Wind Energy Facilities in Victoria[1]

The above guidelines for wind farm development in Victoria state that the potential for electromagnetic interference from the generation of electricity from a wind energy facility should be minimised, if not eliminated through appropriate turbine design and siting.

The siting of wind turbines in the ‘line of sight’ between transmitters and receivers should be avoided.

In addition to the current Victorian legislation and guidelines, GHD has conducted the EMI assessment report with consideration for the objectives outlined in:

– Section 4.5 of the Scoping Requirements for Kentbruck Green Power Hub Environment Effects Statement (EES) (January 2020)

The scoping requirement's main objective is to identify the potential adverse effects on existing communication systems that use electromagnetic waves as the transmission medium and describe proposed mitigation or management measures to reduce potential effects on existing communication systems.

1.3 Abbreviations

The following abbreviations have been used in this report:

Table 1 Definitions

Abbreviation	Definition
ABC	Australian Broadcast Corporation
ACMA	Australian Communications and Media Authority
AM	Amplitude Modulation
AMTA	Australian Mobile Telecommunications Association
BoM	Bureau of Meteorology
FM	Frequency Modulation
GHz	Gigahertz (10^9)
GNSS	Global Navigation Satellite System
kHz	Bo
LMR	Land Mobile Radio
MHz	Mega-Hertz (10^6)
MHz	Mega-Hertz (10^6)
PTMP	Point to Multi-Point
PTP	Point to Point
RFNSA	Radio Frequency National Site Archive
UHF	Ultra-High Frequency
VAST	Viewer Access Satellite Television
VHF	Very High Frequency

1.4 References

Table 2 References

Ref No	Reference
1	Visiwave™, http://www.vias.org/wirelessnetw/wndw_04_08b.html
2	Rat River Technologies, http://www.ratrivertech.ca/archives/tools/fresnel_zone_clearance_calculator.htm
3	Fixed-Link Wind Turbine Exclusion Zone Method, D F Bacon, Radio Communications Agency
4	Victoria State Government, Department of Environment, Land, Water and Planning: Policy and Planning Guidelines of Wind Energy Facilities in Victoria, DELWP March 2019 https://www.planning.vic.gov.au/__data/assets/pdf_file/0024/95361/Development-of-Wind-Energy-Facilities-Mar2019.pdfhttps
5	The Complete Glenelg Planning Scheme, 18 February 2021 https://planning-schemes.api.delwp.vic.gov.au/__data/assets/pdf_file/0008/463949/Glenelg_PS_Ordinance.pdf
6	Draft National Wind Farm Development Guidelines, Environment Protection and Heritage Council of Australia and New Zealand, July 2010
7	International Telecommunications Union Recommendation ITU-R BT.1893, Assessment of impairment caused to digital television reception by a wind turbine

Ref No	Reference
8	ARPANSA Base Station Survey – Base Station Frequency Bands http://www.arpansa.gov.au/RadiationProtection/BaseStationSurvey/spectra.cfm, 9 Feb 2017
9	Radio Frequency National Site Archive (RFNSA), Australian Mobile Telecommunications Association, August 2019
10	AS/NZS 61000.6.4:2012, Electromagnetic compatibility (EMC) Generic standards - Emission standard for industrial environments, Standards Australia, 2012

1.5 Scope and limitations

This report has been prepared by GHD for Neoen Australia Pty Ltd and may only be used and relied on by Neoen Australia Pty Ltd for the purpose agreed between GHD and Neoen Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Neoen Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Neoen Australia Pty Ltd, publicly available details on the ACMA radio communications Licence database and information from consultation with other entities impacted by the proposed wind farm, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This assessment has been undertaken based on 105 specific turbine locations. Neoen Australia Pty Ltd is proposing a corridor in which the turbines may be sited, rather than individual locations. Development approvals typically allow some degree of flexibility in turbine siting. Prior to finalisation and micro siting of the turbine locations and construction, Neoen Australia Pty Ltd should geolocate all radio sites and undertake an updated electromagnetic interference assessment, in order to minimise potential impacts on radio link paths.

1.6 Consultation

Consultation with stakeholders was undertaken based on an initial turbine layout (provided February 2021) which comprised of 157 turbines with a maximum hub height of 185m and a maximum rotor diameter of 170m. The outcomes of the consultation are still relevant to the later turbine layouts (provided July 2022, updated May 2023 and further updated October 2023) which comprise of 105 turbines with a maximum hub height of 175 m and a maximum rotor diameter of 190m, as the quantity of turbines has reduced. A reduction in turbines and maximum hub height, will result in a reduction in impact to existing electromagnetic systems. The turbine rotor radius increase of 10m will have negligible to no impact to the Bureau of Meteorology's previous analysis to weather watch radar systems as the radar is located greater than 40km away from the wind farm area.

The following points of contact have been identified for consultation with the respective organisations:

Table 3 Points of Contact

Organisation	Contact Person	Contact Details
Bureau of Meteorology	Tom Kane	(03) 9669 4386, (04) 3916 8967 Tom.Kane@bom.gov.au
Bureau of Meteorology	Dr. Mohammad Zomorrodi	(03) 9669 4413

Organisation	Contact Person	Contact Details
		Mohammad.Zomorrodi@bom.gov.au
Department of Defence	Adam Murray	(02) 5109 5509 Adam.Murray3@defence.gov.au
Geoscience Australia	Ryan Ruddick	(02) 6249 9426, (04) 2977 1069 Ryan.Ruddick@ga.gov.au
Telstra	David A Stanley	David.A.Stanley@team.telstra.com
Optus	Ron Vesely	Ron.Vesely@optus.com.au

2. Electromagnetic interference theory

Electromagnetic fields are a combination of electric fields associated with a voltage source and magnetic fields associated with current flowing through a conductor. These fields increase in strength with voltage and current.

Radio system interference may occur when a wind turbine is located in such a way as to induce an unwanted disturbance to radio waves propagated between a signal source and signal receiver. This may occur by way of radiation of electromagnetic energy by the turbine within the operating band of the radio system, diffraction or partial reflection of the radio system signal by the turbine tower and rotor.

The following sections briefly describe the various types of interference that may impact on existing operational telecommunications services in the vicinity of Kentbruck Green Power Hub development boundary and to provide context to the specific findings identified in Section 6.1 of this report.

2.1 Radiation of electromagnetic energy

Electromagnetic interference potentially occurs when the wind turbine electrical infrastructure radiates energy with a frequency within the operating frequency of a radio communications system.

Turbines supplied within Australia are required to be compliant with electromagnetic as required by ACMA for a device to achieve C-Tick compliance or apply a Regulatory Compliance Mark (RCM).

As a result of complying to these standards, the electromagnetic emissions from the wind turbine should be negligible.

2.2 Diffraction

Diffraction occurs when the wind turbine infrastructure is positioned such that the signal of a radio communications system is partially or temporarily blocked causing a reduction in the signal power at the radio signal receiver.

For point-to-point radio systems it is understood that the radio signal travels on a path between the signal source and signal receiver defined by an ellipsoid area known as the Fresnel zone.

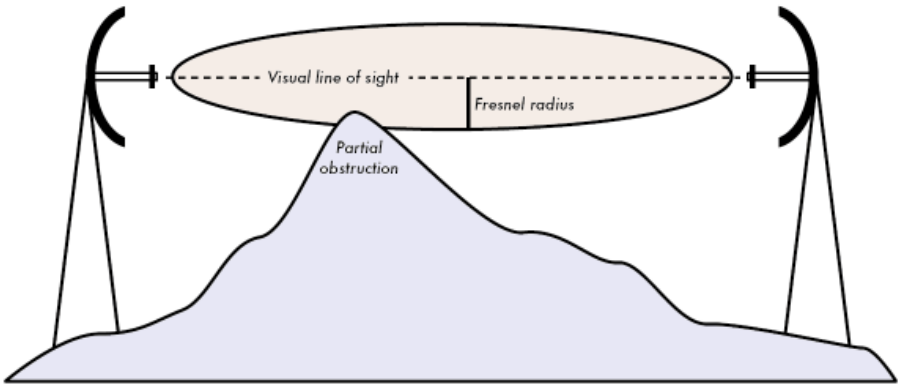


Figure 1 Fresnel Zone over the Radio Path[1]

The Fresnel zone is defined as the locus between two points, such as a radio transmitter and receiver, where the indirect ray path length from the point T to point R is multiple of the half-wavelength distance of the radio signal. Refer to Figure 2 and Figure 3 for further details.

[1] Source: Visiwave™, http://www.vias.org/wirelessnetw/wndw_04_08b.html

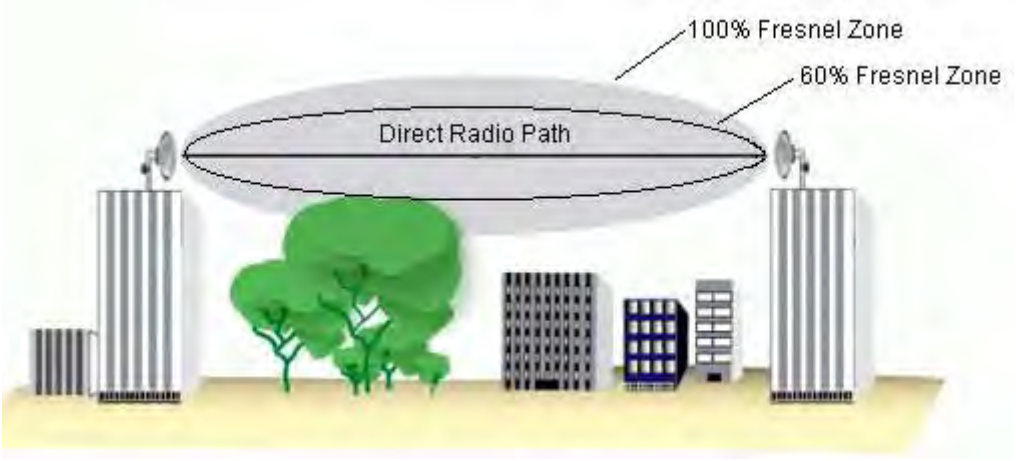


Figure 2 Fresnel Zone Clearance Criteria[2]

In the presence of an obstruction between the signal source and the signal receiver, it is generally accepted that an obstructed path provided with 60% clearance of the first Fresnel zone will operate without degradations to the communications system.

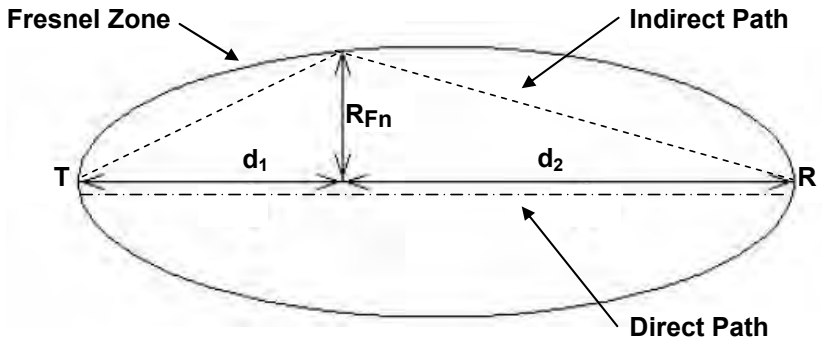


Figure 3 Fresnel Zone Calculation[3]

The Fresnel zone is defined by the formula:

$$R_{Fn} = \sqrt{\frac{n\lambda d_1 d_2}{d_1 + d_2}} \qquad (1)$$

R_{Fn} = the nth Fresnel Zone Radius in metres

n = the nth Fresnel zone

λ = the wavelength of the transmitted signal in metres

d_1 = the distance from T in metres

d_2 = the distance from R in metres

F1 may be used to describe the first Fresnel zone between two points. F1 may also be described as the 100% Fresnel zone. In this case, F2 is the second Fresnel zone or the 200% Fresnel zone.

According to D F Bacon *[Ref 4]* it is recommended to design the geographic wind turbine layout such that all infrastructure, including turbine blades, are located outside the second Fresnel zone of all point-to-point radio systems.

[2] Rat River Technologies, http://www.ratrivertech.ca/archives/tools/fresnel_zone_clearance_calculator.html
[3] Fixed-Link Wind Turbine Exclusion Zone Method, D F Bacon, Radio Communications Agency

The second Fresnel zone defines the region where an object such as a wind turbine may cause a reflected signal to be transmitted to the receiver at a half wavelength (180°) out of phase with the direct ray causing maximum interference potential.

The drawings included in Appendix B plot the ray-line (direct line of sight) and the second Fresnel zone for selected (high-risk) links.

2.3 Reflection

Reflection occurs when the wind turbine infrastructure is positioned such that the incident ray of a radio communication system is partially or temporarily reflected from its normal path of propagation. The complex geometrical design of the wind turbine causes the reflected signals to be dispersed or 'scattered' over a wide angle. These reflections have the potential to generate destructive interference to the radio signal resulting in signal power reduction or unwanted duplication of the radio signal as seen in Figure 4.

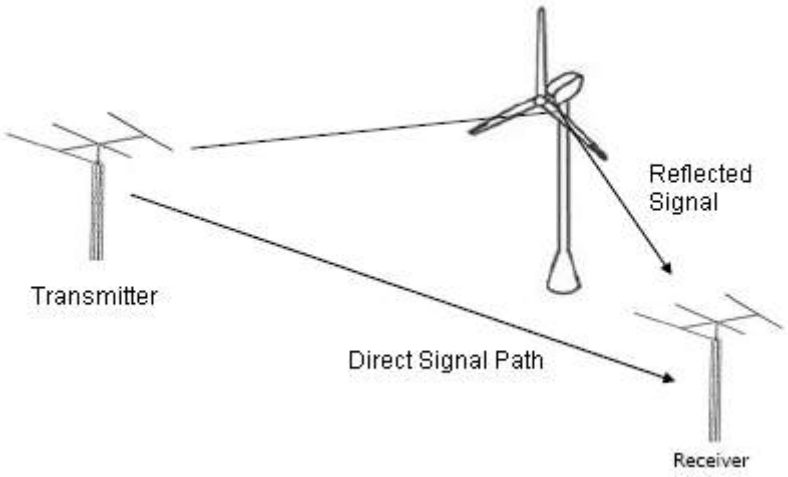


Figure 4 Reflection of Radio Signals by Wind Turbine Infrastructure[4]

At the boundary of the second Fresnel zone, any reflected wave will be 180° out of phase with the direct signal, which can lead to cancellation effects at the receiver. As such, any turbine located along (and near) the F2 boundary has the potential to significantly degrade a radio link.

2.4 Scattering

Wind turbines have been observed to cause interference by scattering the incident signal. Scattering is described as either 'forward' or 'back' and is depicted in Figure 5 below.

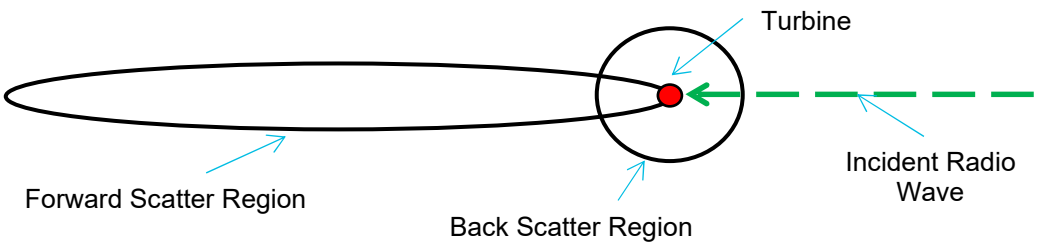


Figure 5 Scattering of Radio Signals by Wind Turbine Infrastructure

The forward scatter region is significant and can extend as far as 5 km forward of the wind turbine. Where the receiver is in direct line of sight of a turbine, but shielded from a direct signal from the transmission tower, the

[4] Kordia, Manhinerangi Wind Farm EMI Report

forward scatter region may extend beyond 5 km. The back scattering region created by the incident signal is generally less than 1 km from the turbine.

2.5 Near field effects

Wind turbine infrastructure located close to a radio communication system such that the separation distance is within the near field of the radiating antenna has the potential to detrimentally affect the normal radiation pattern of the antenna causing unwanted signal power reductions to the radio system service area. The result is an alteration of the antenna's impedance.

Typical near-field exclusion zone radii are:

– 2 metres for low band VHF paging systems (i.e., under 50 MHz)
– 20 metres for UHF, LMR and cellular sites (i.e., up to 2.5 GHz)
– 720 metres for point-to-point microwave radio links (in the direction of the link)

Transmitter installations should be built outside the exclusion zones noted above. In the case of future PTP microwave links, antennas can be installed within 720 meters of a turbine, but alignment of the link must be engineered to not point at a turbine.

3. Legislation

The former Victoria Department of Environment, Land, Water and Planning has created "*Policy and Planning Guidelines of Wind Energy Facilities*[5]*"* to protect individuals, communities, and the environment from adverse impacts as a result of the construction, operation and decommissioning of wind farm developments. The planning and policy guideline defines electromagnetic interference performance outcomes and the associated acceptable outcomes as: *"Development is designed, located and sited to avoid, or minimise and mitigate, electromagnetic interference to pre-existing television, Radar and radio transmission and reception.*"

Moreover, the "*Attachment B: Example permit conditions for wind energy facilities"* show example of the conditions to gain the development permit.

Additionally, a "*Draft National Wind Farm Development Guidelines*[6]*"* document has been created in July 2010 by a working group coordinated by The Environment Protection and Heritage Council of Australia and New Zealand. *"Section F – Electromagnetic Interference"*, of this guideline details the issues addressed in this Electromagnetic Interference (EMI) assessment and references the relevant Australian Standards and publications regarding the EMI caused by wind turbines from wind farm developments in Australia.

[5] The former Victoria State Government, Department of Environment, Land, Water and Planning: Policy and Planning Guidelines of Wind Energy Facilities in Victoria, DELWP March 2019

[6] Draft National Wind Farm Development Guidelines, Environment Protection and Heritage Council of Australia and New Zealand, EPHC July 2010

4. Analysis of development impact

4.1 Methodology

GHD has undertaken this electromagnetic interference assessment to determine which areas of the project site are unsuitable for the installation of turbines as well as to consider the impacts on wide-area services in the region.

Information of radio sites and services in the proximity of the Kentbruck Green Power Hub has been obtained from the ACMA Radiocommunications Licence (RRL) Database by considering an area of approximately 50 km radius from the centre of the provided wind farm boundary. This distance is sufficient to capture any potential point-to-point links traversing the development area.

Where point-to-point links have been identified, the Second (200%) Fresnel Zones have been modelled in purple to denote an area in which no part of the wind turbine should enter (including the blade extents).

Near-field exclusion zones (areas in proximity to a radio transmitter that would cause excessive reflections back to the transmitter), have been calculated for radio sites that sit within 3 km of the current site. Existing transmitters, and microwave point to point links in the vicinity of the proposed wind farm have been analysed to aid in turbine micro-siting activities to mitigate the near field effects such that turbines should not be placed in paths of known microwave links.

4.2 Radio system search

In June 2022, a search was conducted on the Australian Communications and Media Authority (ACMA) radio communications database to identify all licensed radio systems, operating on the frequency above 30 MHz, within 50 km radius of the proposed wind farm development. Additional radio frequency information was accessed from The Australian Mobile Telecommunications Association's (AMTA) and the Radio Frequency National Site Archive (RFNSA). This search was conducted in accordance with the methodology stated in Section F of the Draft National Wind Farm Development Guidelines.

The results of the ACMA radio communications data extraction were reviewed and presented in graphical format depicting the radio site locations and ray-lines of the radio systems within the vicinity of the wind farm. The map was refined to only show those radio sites and services with the potential impact for radio-interference caused by the proposed wind farm development.

This method will not determine the impact on users of class licence services in the area, as these services are not listed within the database.

The resulting map (for point-to-point radio links) is presented in Appendix B.

4.3 Radio technology review

The following radio system technologies were considered in this assessment:

- Fixed point-to-point microwave radio systems
- Fixed point-to-point UHF voice and telemetry systems
- Digital Television Broadcasts
- Aircraft Telecommunications Systems
- Maritime Radio Systems
- Defence Radio Systems
- Meteorological Radar
- AM/FM Radio Broadcast
- Cellular Mobile Phone Systems
- Trigonometric Reference Systems
- Citizen Band UHF Repeater Systems

Radio services below 30 MHz, including AM Radio Broadcast services, were excluded from this assessment as the propagation characteristics of the radio wave does not rely on direct-ray transmission characteristic between the transmitting and receiving antennas, e.g., AM radio broadcast services, operating within the Medium Frequency band of 300 Hz – 3 kHz, relies on ground wave (surface wave) propagation.

4.4 Assumptions

Based on information provided by Neoen Australia Pty Ltd, the proposed wind turbine sizes could be up to a maximum tip height of 270 m, with a maximum hub height of 175 m and comprising of rotors of maximum 190 m diameter. At the time of writing, the exact turbine model and manufacturer is yet to be determined as, in wind farm development, a procurement process is typically carried out after the planning approval is obtained.

5. Radio Technology Assessment

5.1 Fixed Point-to-point radio systems

The wind turbine can heavily impact point-to-point radio systems, but the mitigation method is uncomplicated. To avoid the wind turbine downgrading the service, it should not block the exclusion zones of the microwave links. While the wind turbine location is the primary factor for the radio interference impact for this system, it is also safe to consider the total height of the wind turbine if its location is close to the microwave links. When determining final wind turbine locations, the 200% Fresnel zone (Second Fresnel Zone) shown across the site boundary are considered exclusion zones.

The point-to-point radio systems within 50 km radius of the proposed wind farm are shown on Figure 1 of Appendix D. The exclusion zones of each point-to-point links are shown on Figure 2 of Appendix B.

All turbines are located outside the point-to-point link exclusion zones. Telstra initially recommended that turbine #185 to be relocated approximately 80 m to the west to allow for the required clearance on the Telstra point-to-point link. To remove any risk of interference, Neoen has removed turbine #185 from the project GHD does not foresee any electromagnetic interference impact that would degrade the radio signal.

The exclusion zone of the point-to-point link should not be entered when lifting turbines into place. If entering the exclusion zone is unavoidable, the link operator should be consulted before the construction, so the link operator can anticipate the potential temporary service degradation and take steps to minimise or negate the impact to their services.

5.2 Fixed Point-to-multipoint radio systems

The point-to-multipoint radio systems within 50 km radius of the proposed wind farm are shown on Figure 3 of Appendix D. The point-to-multipoint transmitters are located further than 20 km from the current turbine layout. GHD does not foresee any electromagnetic interference impact that would degrade the radio signal to this radio systems.

5.3 Land Mobile Radio Systems

A land mobile radio (LMR) system is a person-to-person voice communication system with the transmitter and receiver in one unit. It can be stationary (base station units), mobile (installed in vehicles), or portable (handheld walkie-talkies). In Australia, most land mobile radio systems operate in the VHF Mid Band (70-87.5 MHz), VHF High Band (148-174 MHz), and 400 MHz band[7], which are relatively low frequency and unlikely to be affected by the wind turbines.

Most land mobile radio systems are used exclusively for public safety organisations such as police, firefighters, and other emergency response organisations. The systems are quite resilient as they usually operated on the reserved frequencies.

The land mobile radio systems within 50 km radius of the proposed wind farm are shown on Figure 4 of Appendix D. There are no LMR transmitters located within 20 m of the current turbine layout (the approximated distance at which the above listed frequencies may experience issues from reflections off the turbines back into the transmitting antenna), therefore GHD does not foresee any electromagnetic interference impact that would degrade the radio signal from LMR transmitters.

5.4 Television broadcasting systems

Wind farms can cause signal degradation to the receptions due to scattering, diffraction and near field effects. In Australia, the analogue television broadcasting has been ceased since 10 December 2013[8], so only the digital television broadcasting systems are assessed.

[7] https://www.acma.gov.au/technical-details-land-mobile-licences
[8] https://www.acma.gov.au/sites/default/files/2019-08/Chapter-4.docx

The digital television is not susceptible to visible ghosting degradation as was experienced from analogue broadcasts; any impact of reflections from the turbines would be a minor reduction of coverage at the limit of the service area. However, the signal can be degraded when the receivers are already at the border of the television reception zone or when the receiver is located within approximately 1-5 km of the wind farm, in the range affected by scattering of signals off the turbines. The most significant effect occurs when the receivers are near the wind farm and in the line of sight of the turbines but not in the line of sight of the television transmitter.

The zone of potential interference for a wind farm on digital television broadcast is the resultant total of the individual turbines' effects. The International Telecommunications Union Recommendation ITU-R BT.1893[9] states that impacts beyond 10 km from a wind farm are unlikely.

MySwitch data shows coverage from three terrestrial digital television transmitters around the wind farm area, Mt. Clay, Mt Dundas, and Mt Burr. The signal propagating through the proposed wind farm development from Mt Clay and Mt Dundas is negligible and not likely usable for receptors at the southwest side of the proposed wind farm, it is expected that the dwellings southwest of the proposed wind farm point their receptors to Mt Burr transmitter.

The scattering effect from the wind turbines to radio signal from the Mt Burr digital television transmitter is shown on Figure 10 of Appendix C. The figure gives some indication on the possibility of the degraded signal to the dwellings at southwest side of the wind farm. The dwellings will need service investigation to determine whether they are receiving digital television signal from the Terrestrial Digital Television System or Viewer Access Satellite Television System (VAST). If the dwellings are using VAST, there should be no impact to these dwellings.

As shown in Figure 10, the dwellings which should be investigated pre and post construction are those green dots located within an orange scatter zone (where confirmed to not be using VAST).

[9] International Telecommunications Union Recommendation ITU-R BT.1893, Assessment of impairment caused to digital television reception by a wind turbine

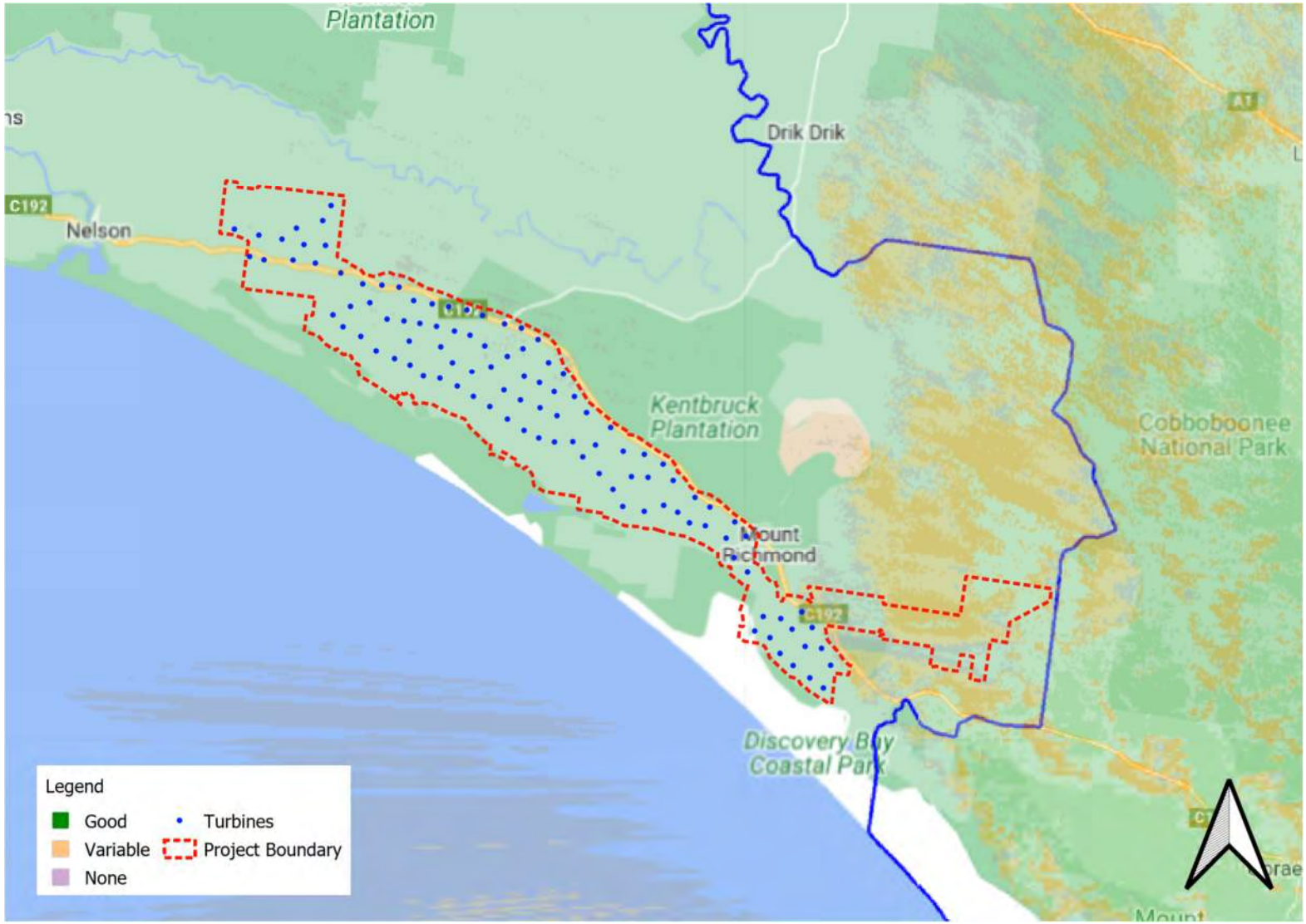


Figure 6 *Portland Digital Television (Mt. Clay) Broadcast Coverage Area*

Figure 6 shows expected television broadcast coverage by the Portland digital television transmitters at Portland (Mt. Clay) indicated from dark green as the strongest signal levels, to light orange as marginal signal level. There is marginal TV signal coverage provided by Portland TV transmitter in the wind farm vicinity. Proposed wind turbine locations are displayed as blue icons.

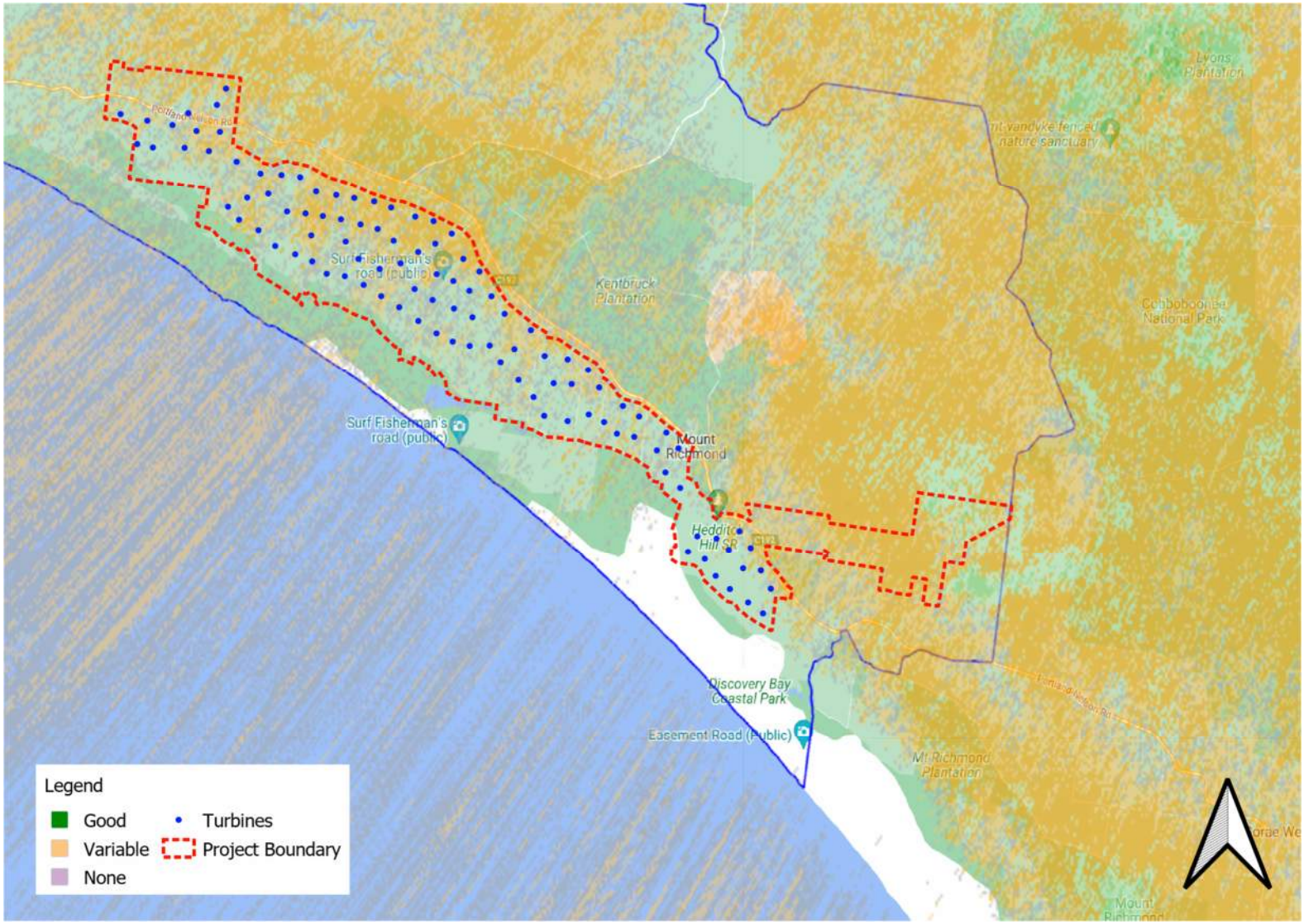


Figure 7 *Western Victoria Digital Television (Mt. Dundas) Broadcast Coverage Area*

Figure 7 shows expected television broadcast coverage by the Western Victoria television transmitter at Mt. Dundas indicated from dark green as the strongest signal levels, to light orange as marginal signal level. There is marginal TV signal coverage provided by Western Victoria (Mt. Dundas) transmitter in the wind farm vicinity. Proposed wind turbine locations are displayed as blue icons.

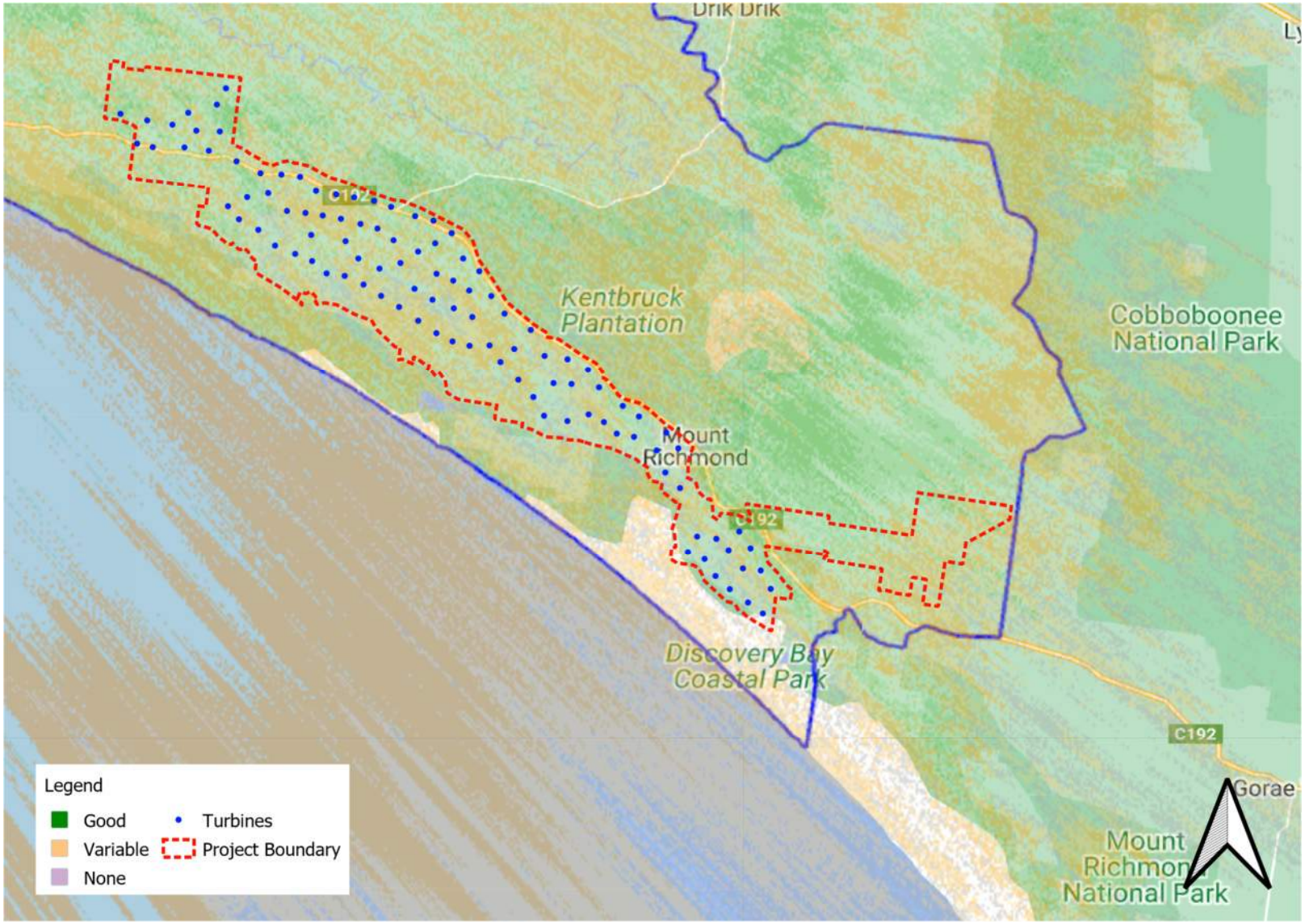


Figure 8 South East Digital Television (Mt. Burr) Broadcast Coverage Area

Figure 8 shows expected television broadcast coverage by the South-East television transmitter at Mt. Burr indicated from dark green as the strongest signal levels, to light orange as marginal signal level. There is good to variable coverage signal coverage provided by the South East television transmitter (Mt. Burr) transmitter in the wind farm vicinity. Proposed wind turbine locations are displayed as blue icons.

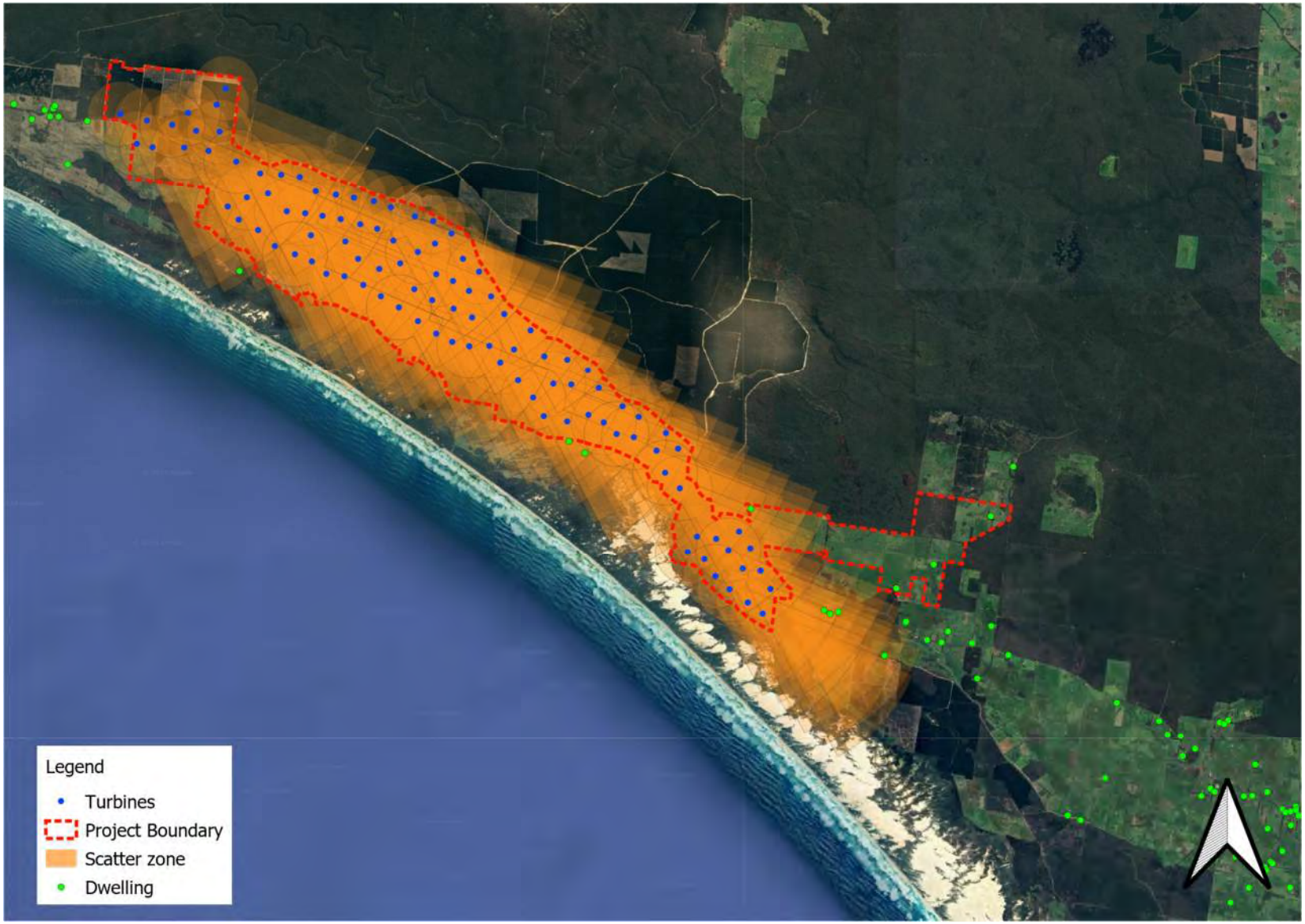


Figure 9 South East ((Mt Burr) Digital Television Transmitter signal scatter zones and dwellings in the proposed wind farm vicinity

Figure 9 shows the potential television signal scatter zone from the South East (Mt Burr) TV transmitter and shows the dwellings in the proposed wind farm vicinity. Where dwellings are inside the signal scatter zones there may be impact to TV signals.

The impacts of wind farm developments to terrestrial television signals may occur in close proximity of the turbines (approximately 1-5km) and is modelled in orange in Figure 9.

If there is an impact to TV signals, the power level of the signal may be reduced slightly, however due to the resiliency of Digital TV encoding, the picture and sound quality will remain clear.

TV receptors who may have an impact from the WTGs (such as receptor inside, or less than 1km from, the wind farm development), there is a possibility of a reduction in the power level of the TV signal over the threshold of Digital TV encoding, and the video and sound will be blank (no video/audio). In these instances, an upgrade of the TV antenna aerial will rectify most cases. If an upgraded TV antenna does not rectify the TV signal, the viewer can upgrade to free-to-air satellite service, VAST.

5.5 AM/FM narrowcast and broadcast

Overseas and local experience indicates that radio reception is unlikely to be affected by operating wind farms. AM signals are not affected due to their low frequency resulting in a wavelength large enough relative to the turbine to not be affected by it. The majority of FM services transmitting in the vicinity of the wind farm are narrowcast services not focussed on servicing the wind turbine area.

Broadcast FM services are in a low frequency range and hence they are more resilient to disturbances. There is a minor chance of signal degradation for services broadcast for receivers in the immediate vicinity of the wind farm. If receptors experience interference to their FM radio signals, the rectification can be easily done by moving the antenna to the higher altitude, relocate the antenna location or installing a high-quality antenna.

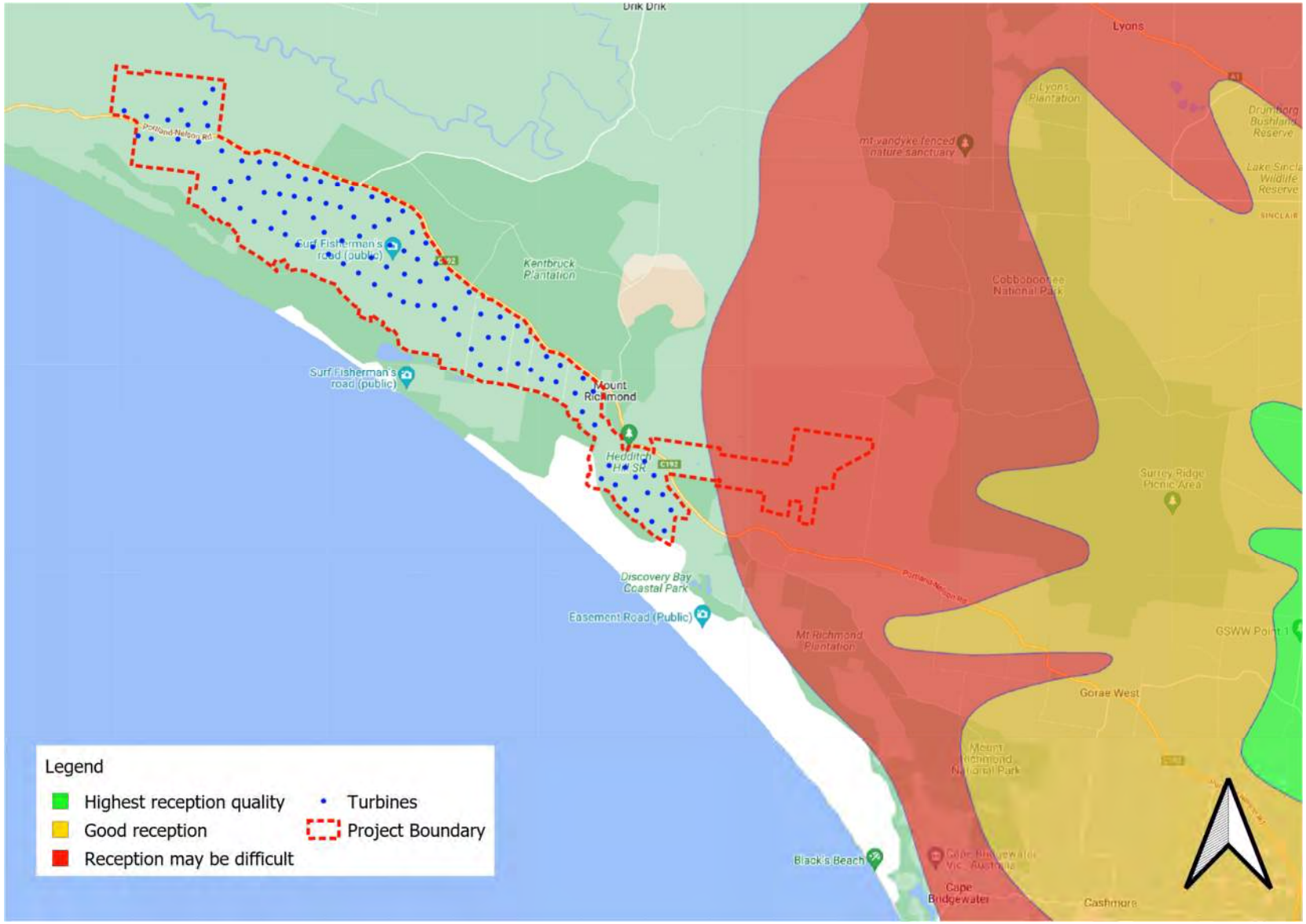


Figure 10 Portland FM Radio Transmitter Coverage to the wind farm

Figure 10 shows that there are no turbines located in the Portland FM radio signal coverage area. No impact on FM radio services is expected from the wind farm development and therefore, GHD does not foresee any electromagnetic interference impact that would degrade the radio signal to this radio systems.

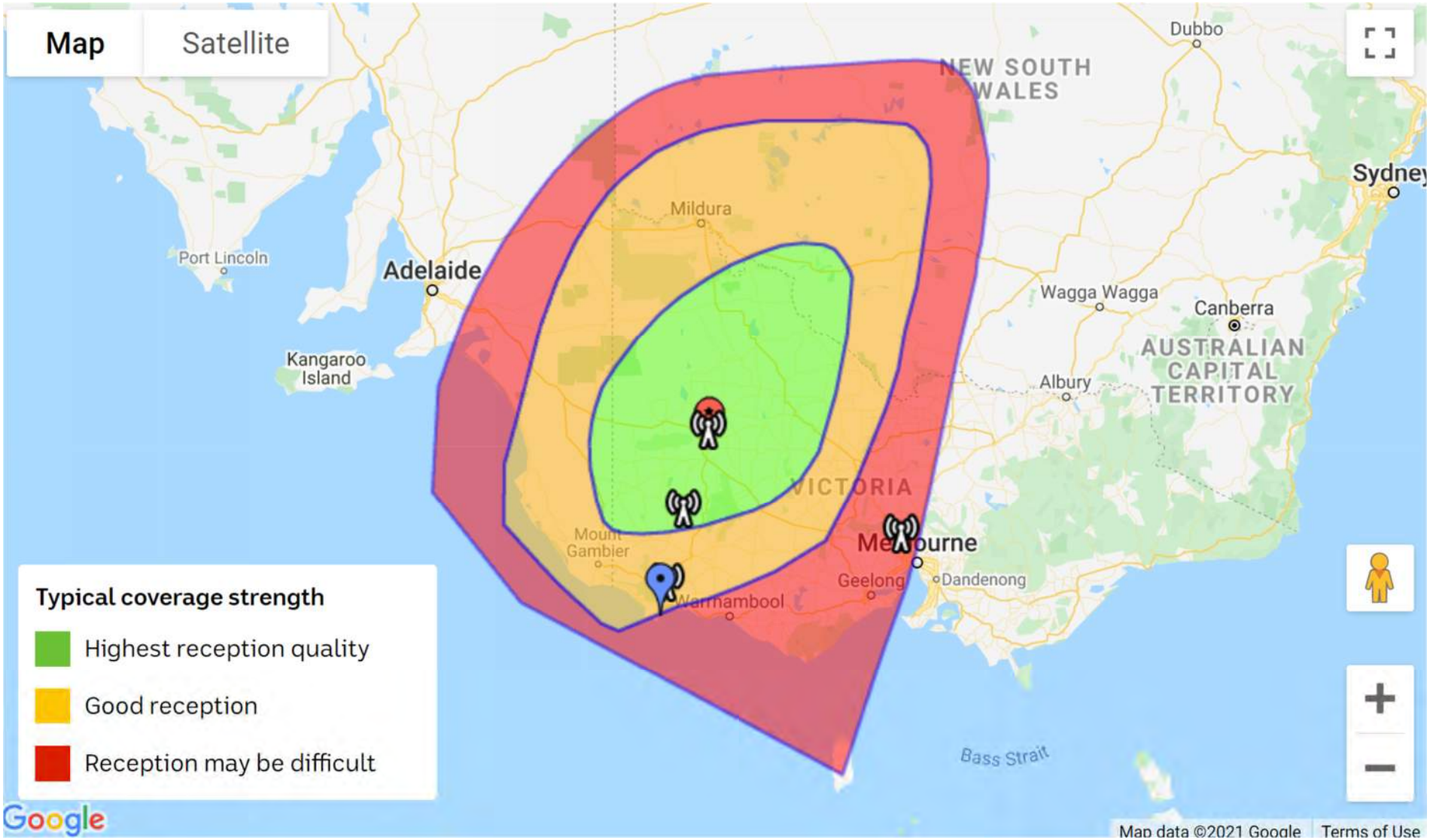


Figure 11 Horsham AM Radio Transmitter Coverage

Figure 11 shows the wind farm area is serviced by ABC's Horsham AM transmitter as shown in Figure 11. AM radio services are resistant to wind turbines due to large wavelength. GHD does not foresee any electromagnetic interference impact that would degrade the radio signal.

5.6 Mobile telephone and broadband internet broadcast sites

Cellular mobile phone technologies provide robust communications in areas of significant obstruction via multipath communications between customer equipment and the network base station sites. The four carrier networks (Telstra, Optus, Vodafone and NBN) have transmitter sites covering the main population areas around the greater wind farm area.

Typically, interference to cellular phone coverage from wind turbine installations is minimal. The possibility for interference exists if a wind turbine intercepts the signal between a mobile phone and the tower. For those operating close to the proposed wind farm, such as maintenance staff, the signal might be degraded significantly, however, the risk of interference to mobile phone services outside the immediate vicinity of the wind farm is considered very low.

Figure 12 Existing Telstra Coverage in Wind Farm Area (3G)

Figure 13 Existing Telstra Coverage in Wind Farm Area (4G)

Figure 12 and Figure 13 show existing Telstra 3G & 4G coverage in the wind farm area, with green and aqua overlay defining estimated available signal with the wind farm boundary area shown in red. The marginal regions of the wind farm with Telstra mobile phones may be slightly affected directly beneath and around the turbines. Note that Telstra 3G services are expected to be closing mid-2024 before the wind farm would commence their operation. Currently there is no Telstra 5G coverage in the wind farm vicinity.

Refer to Appendix E for the Telstra response to the proposed wind farm development.

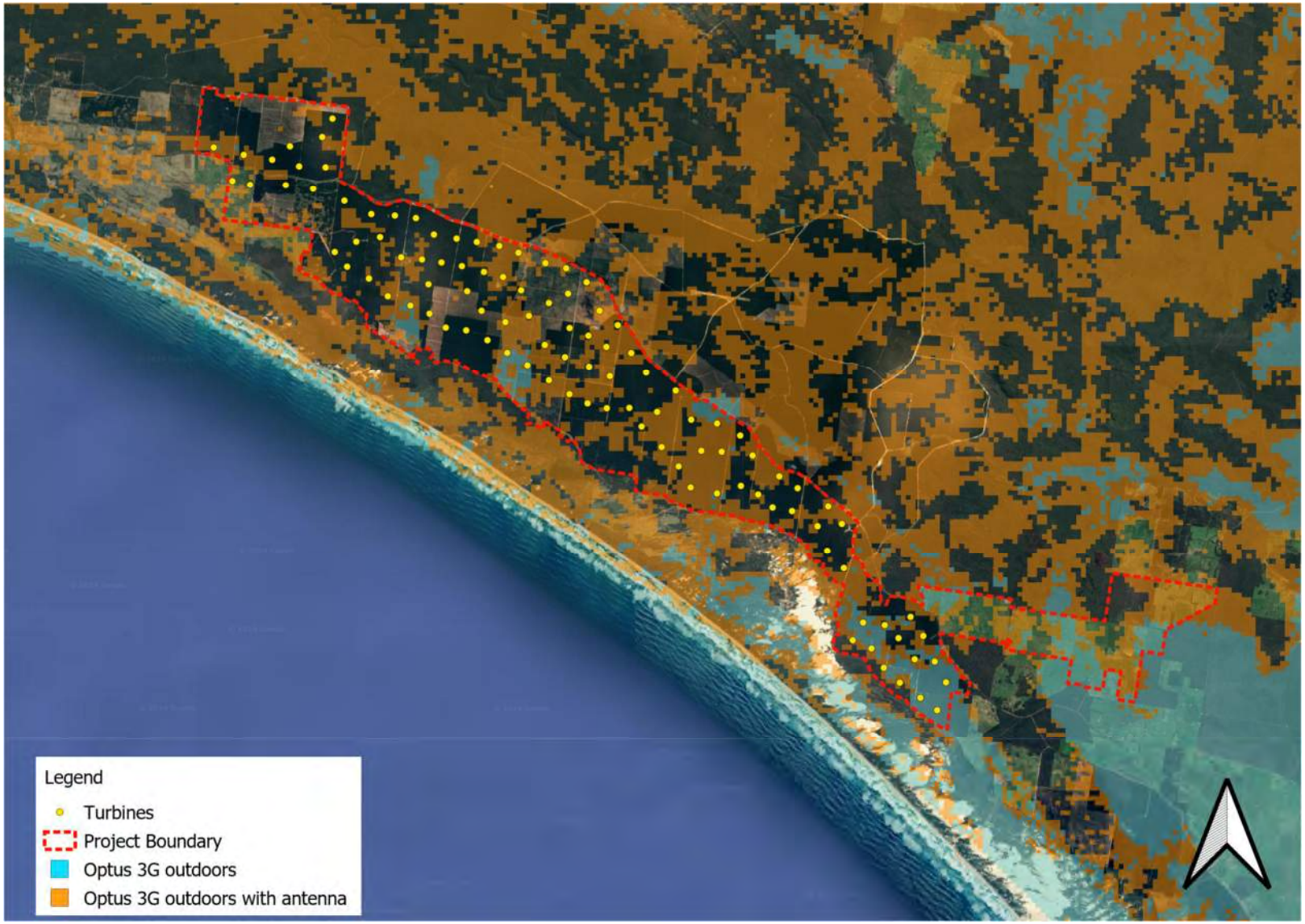


Figure 14 Optus 3G Coverage in Wind Farm Area

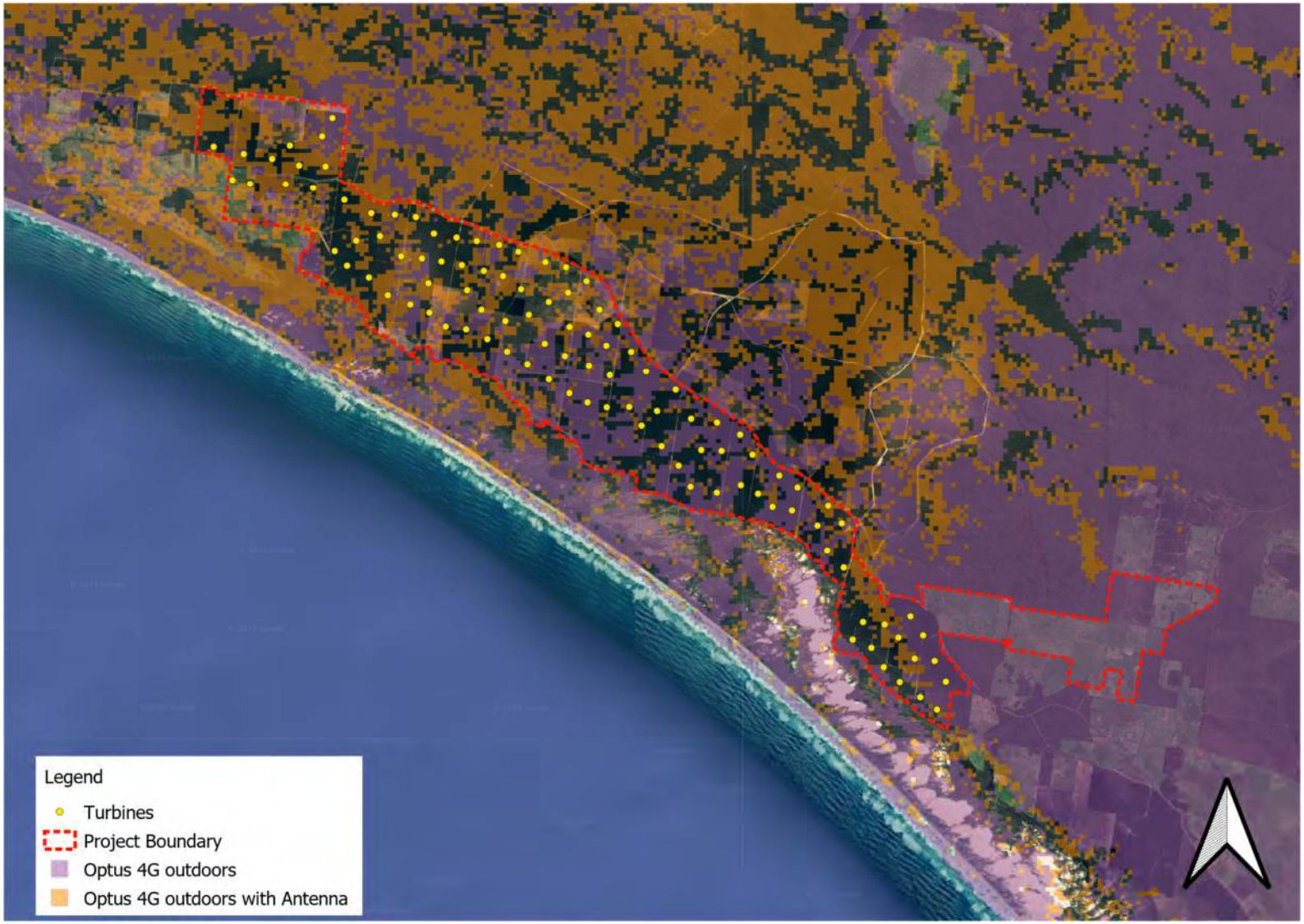


Figure 15 Optus 4G Coverage in Wind Farm Area

Figure 14 and Figure 15 shows existing Optus 3G & 4G coverage in the wind farm area as per coloured legend with the wind farm boundary area shown in red. The marginal regions of the wind farm with Optus mobile phones may be slightly affected directly beneath and around the turbines. Note that Optus 3G services are expected to be closing September 2024 before the wind farm would commence their operation. Currently there is no Optus 5G coverage in the wind farm vicinity.

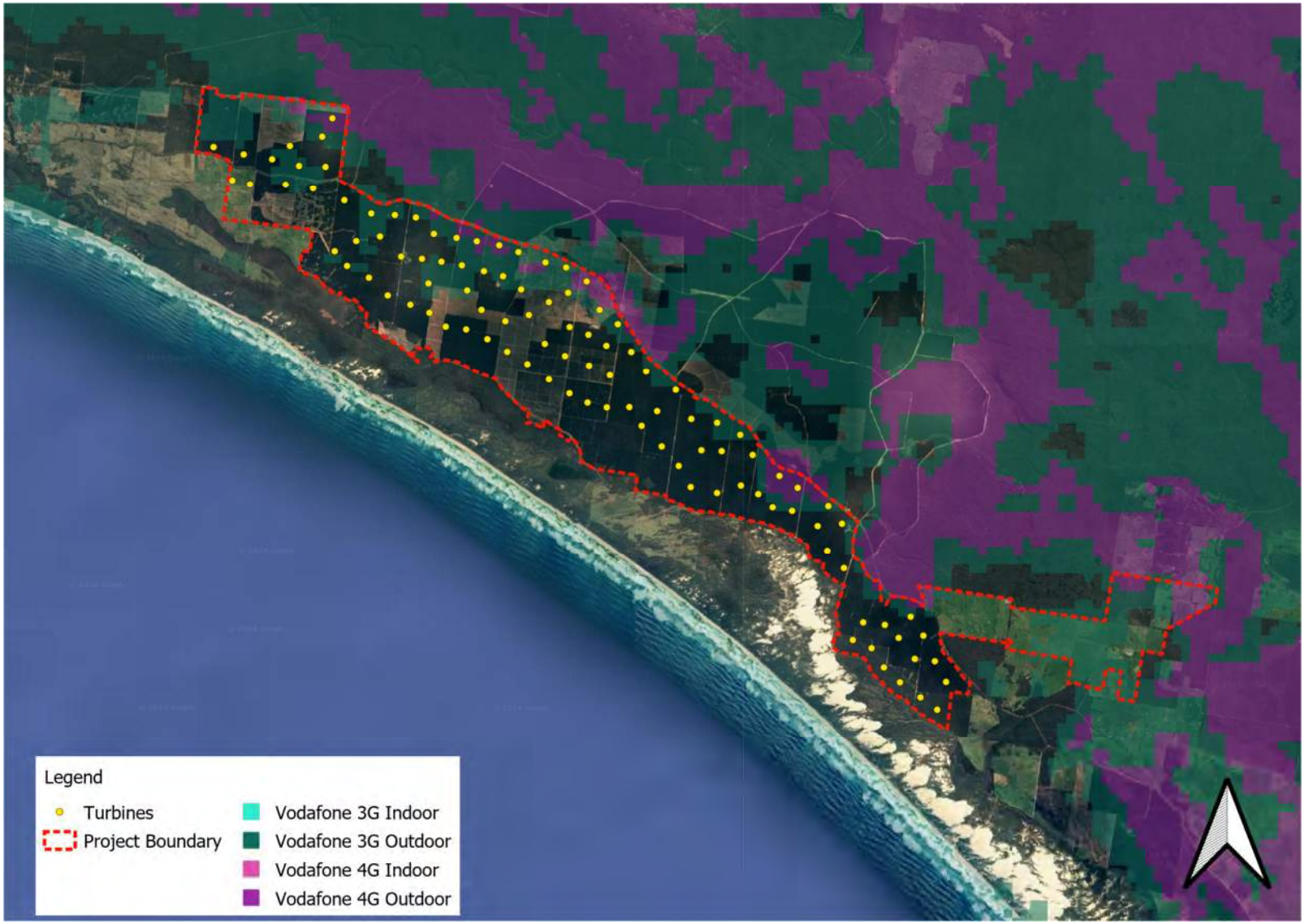


Figure 16 Vodafone Coverage in Wind Farm Area (3G & 4G)

Figure 16 shows existing Vodafone 3G & 4G coverage in the wind farm area as per coloured legend with the wind farm boundary area shown in red. There is no Vodaphone 5G coverage in the proposed wind farm development vicinity. The wind farm's marginal regions with Vodafone mobile phones may be slightly affected directly beneath and around the turbines.

Figure 17 NBN Coverage in Wind Farm Area (Fixed Wireless)

Figure 17 shows NBN fixed wireless coverage in purple with the wind farm boundary area shown in red. There is no NBN fixed wireless services within the wind turbine area. GHD does not foresee any electromagnetic interference impact that would degrade the radio signal on NBN fixed wireless services.

5.7 Aircraft communications systems

Wind farms have the potential to disturb navigational signals, which can distort the accuracy of the aircraft positioning systems and introduce 'false targets'. Four aerodromes are located in proximity to the Kentbruck Green Power Hub, including two Regulated Aerodromes (Mount Gambier and Portland), and two Unregulated Aerodromes (Nelson and Kentbruck).

An Aeronautical Impact Assessment was prepared for the EES to assess the risk of the Kentbruck Green Power Hub to aviation and aircraft safety. It found that the project would not impact on the operation of the Mount Gambier, Nelson or Kentbruck aerodromes. Glenelg Shire Council (the Portland aerodrome operator) supports changes to the instrument approach procedures at the Portland aerodrome and has advised Airservices Australia (the instrument approach designed) of this.

GHD understands that Neoen is continuing to consult with Glenelg Shire Council and Airservices Australia on this matter.

5.8 Meteorological radar

The Mt Gambier weather watch radar is the only C-band radar operated around the proposed wind farm, approximately 40 km away. The radar is located at approximately 70m altitude and the proposed wind farm obstructs the area beyond the southeast of the project as depicted in Figure 18. There is no alternative radar to cover these areas.

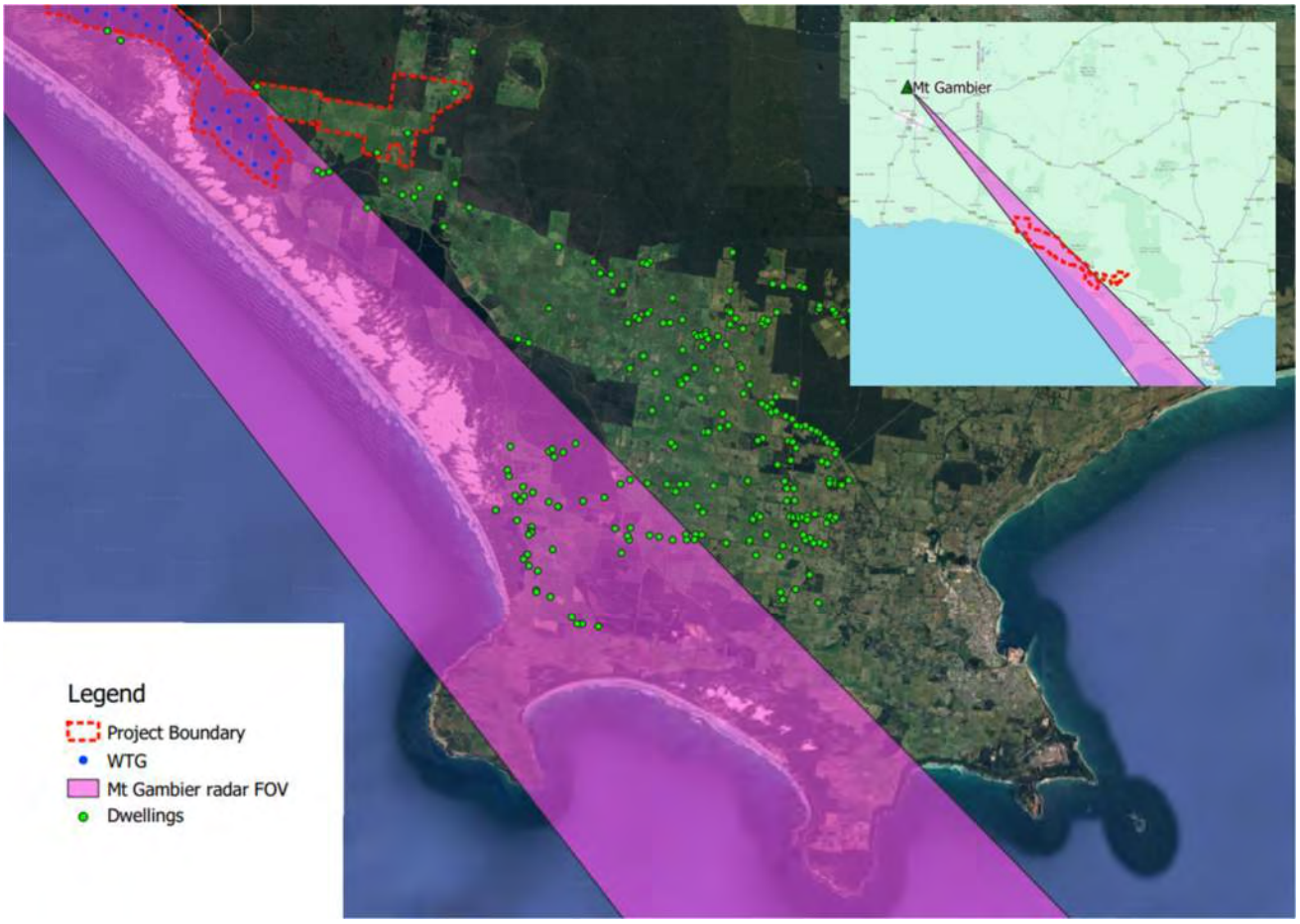


Figure 18 Mt Gambier radar FOV

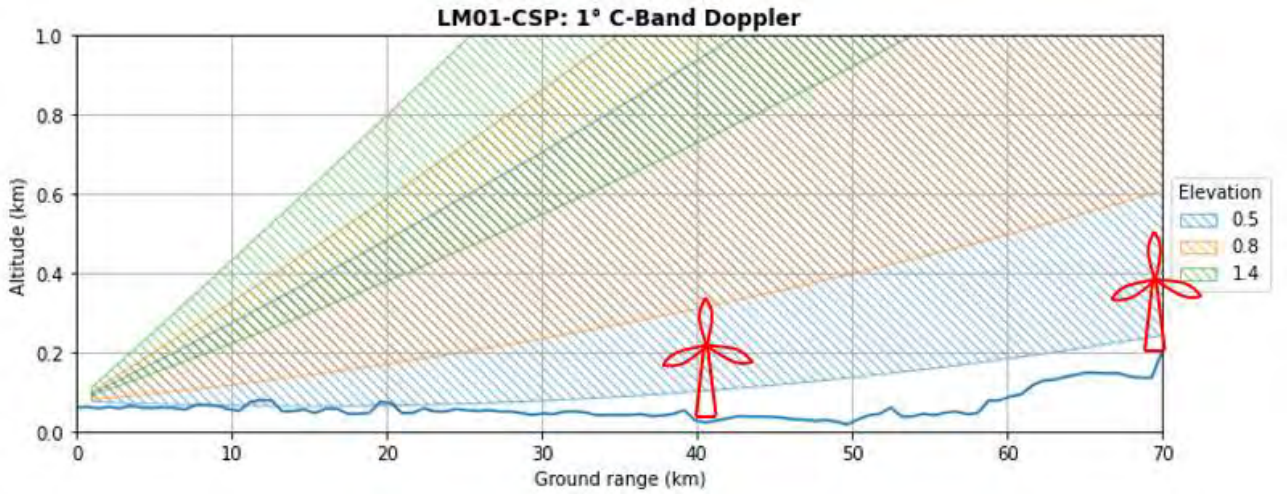


Figure 19 The radar scans from the C-band radar to the wind turbines

Figure 19 shows the estimated location of some proposed turbines with the distance (km) to the weather watch radar on the X axis and altitude (km) on the Y axis. Any turbines that have the total height (turbine tip height plus the elevation height) beyond the blue hatch will contaminate the radar scans. The first two scans of the radar are important as they provide the longer coverage which then used to provide a more accurate data on forecasting.

Consultation with the Bureau of Meteorology (BoM) in 2021, has identified that the location of the proposed wind farm and WTGs have potential to contaminate the first two scans of the radar. During the updated analysis in 2023, the turbine max blade tip height has been reduced, which will reduce the impact to the first two weather radar scans. The blade tips lengths have marginally increased (10m), however the increased impact of the additional cross-sectional area of the turbine to the weather radar scan impact would be negligible at the distance of the radar to the turbines (40km).

The radar scan azimuth that is contaminated by the WTG layout is minor. The nearest town of Portland lies outside the impacted area. The rainfall scans will be impacted by sustained contamination beyond the southeast of the wind farm, however, this can be remediated during normal weather conditions by technical solutions such as radar masking.

During severe weather events, mitigation options include turning off WTGs for uncontaminated rainfall scan monitoring. Note that during high wind speed events WTGs are disabled to prevent WTG damage as a standard operating procedure.

Neoen will continue consultation with the Bureau on the specific terms of the operational constraints and/or other technical solutions which can be implemented by the Project to ensure that the Mount Gambier radar maintains operational efficiency.

Refer to Appendix E for the Bureau of Meteorology response to the proposed wind farm development.

5.9 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.

Consultations with the Defence Estate Planning Land Planning and Regulation Infrastructure Division has determined that the wind farm development will have no impact on Defence aviation and signals capability.

Typically, the Defence Spectrum Office (DSO), raises the following concerns to Defence HF transmissions and wind farm development projects:

– Defence use HF in both a fixed and itinerant nature on their ranges and bases. They can use this equipment anywhere in country, but typical high tempo use of the itinerant variation could be at the range boundaries.
– Impact to HF systems is often manifested in an increase in the HF noise within the near locational environment. It is a known issue that many wind farms (not all) with their switching systems can generate a large increase in the radio noise in the environment. If it is not known what the system impact is on the HF noise, the only other "layout" consideration is physical separation which could be in the distance between 10 km to 100 km.
– As the wind farm conforms to AS/NZS 61000.6.4:2012, the wind farm will reduce, as much as is practicable, the emission of HF noise from the turbines, substation(s) and electronic control equipment.
– Refer to Appendix E for the Defence response to the proposed wind farm development.

5.10 Trigonometrical systems

Trigonometrical systems operating across Australia are administered by Geoscience Australia. The closest trigonometrical system to the proposed wind turbine development area is the PTLD AGRN permanent geodetic quality Global Navigation Satellite System (GNSS) receiver approximately 30 km southeast of the proposed wind farm area.

Geoscience Australia has confirmed that there are no foreseeable impacts to their trigonometrical stations, GNSS reference stations or associated facilities or services associated with the proposed Project

Refer to Appendix E for the Geoscience Australia response to the proposed wind farm development.

5.11 Maritime radio systems

The wind farm location is sited inland to the maritime transmitter MRV (Marine Radio Victoria) locations; hence it is anticipated that there will be no impact on the MHz, VHF and HF maritime services by the wind farm development. GHD does not foresee any electromagnetic interference impact that would degrade the radio signal to this radio systems.

5.12 50 Hz Radiation (Transmission lines)

The primary sources of electromagnetic fields associated with wind farms are the substations and transmission lines. While not explicitly included in this study, the transmission line and substation will be equivalent to others in the electricity transmission network, with comparable electromagnetic field levels.

Designing to the standards utilised by the local transmission and distribution authorities will ensure safe levels of electromagnetic radiation are achieved.

GHD does not foresee any electromagnetic interference impact that would degrade the radio signal to this radio systems.

6. Conclusion

As demonstrated earlier in this report, Neoen Australia Pty Ltd have made several endeavours to reduce the impact on existing radio services in the region through the choice of turbine materials and the layout of the turbines. This report demonstrates compliance with Policy and Planning Guidelines of Wind Energy Facilities in Victoria and that with the implementation of the proposed mitigation measures, that the wind farm development is designed, located and sited to avoid, minimise and mitigate electromagnetic interference to pre-existing television, radar (TBC) and radio transmission and reception services.

The conclusions do not change with the new turbine details (provided July 2022, May 2023 and October 2023) which comprises of 105 turbines with a maximum hub height of 175 m and maximum rotor diameter of 190 m.

6.1 Summary of mitigation strategies and recommendations

All types of radio communications can benefit from general mitigation through the design of the turbine and the choice of materials used in its construction.

The turbines have been spaced to mitigate the effect of creating a "virtual wall" of turbines. A virtual wall is an electromagnetic barrier between a TV transmitter and households serviced by that transmitter.

In addition, wind farm developers should utilise (wherever practical) equipment complying with the Electromagnetic Emission Standard, AS/NZS 61000.6.4:2012 to avoid the creation of excessive noise at frequencies that interfere with radio communication signals. Electrical insulation and shielding should be considered in the turbine design to reduce the RF noise emitted from the electronic control systems located in the nacelle.

Table 4 Mitigation Strategies and Recommendations for each radio system

Impact	Service Mitigation Strategy	Recommendation
Fixed Point-to-Point Microwave		
Nil to negligible	Avoid micro-siting turbines within 2nd Fresnel zone exclusion zones.	When lifting turbines into place. If entering the exclusion zone is unavoidable, the link operator should be consulted before the construction, so the link operator can anticipate the potential temporary service degradation and take steps to minimise or negate the impact to their services.
Fixed Point-to-Multipoint Microwave		
Nil	Nil	Nil
Land Mobile Radio Systems		
Nil	Nil	Nil
Digital Television Broadcast		
Minor to no impact anticipated to services.	The wind farm's impact on digital TV services can be quantified by recording and comparing pre-construction baseline signal measurements and post-construction signal level measurements in and around the wind farm areas by an independent radio monitoring specialist; however, the mitigation measures remain the same. The first mitigation strategy can be performed from the user side by realigning the receptor antenna more directly towards the existing transmitter, repositioning or replacing	Neoen Australia Pty Ltd should 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 should 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.

Impact	Service Mitigation Strategy	Recommendation
	existing antennas to higher gain alternatives can also remedy the majority of forward scatter signal degradation effects.	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 should be undertaken.
AM / FM Narrowcast and Broadcast		
Minor to no impact anticipated to services.	Mitigation options may include installing high-quality antennas or amplifiers at affected dwellings, increasing broadcast signal strength from the transmission tower, moving the tower to a new location further away from the turbines, or installing a signal repeater or additional tower on the opposite side of the wind farm	Neoen Australia Pty Ltd should 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 should 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 should be undertaken.
Aircraft Communications Systems		
Minor to no impact anticipated to services.	Nil.	Nil
Meteorological Radar		
Feedback from the BoM has confirmed that there is a likelihood that the Project will affect the radar at Mount Gambier.	Consider the radar impact and consider operational limits and/or other technical solutions for the Project.	Neoen Australia Pty Ltd should continue consulting with BoM on the specific terms of the operational limits and/or other technical solutions for the Project to ensure that the radar can maintain operational efficiency.
Defence Radio Systems		
Possible impact on systems due to HF noise introduced by wind farm equipment.	Construction materials and conformance to AS/NZS IEC 61000.6.4:2012.	

6.2 Construction Approach

The WTG layout may be adjusted to incorporate the mitigation strategies from this study, other impact studies and/or to optimise energy yields. If the WTG layout is changed, it is recommended to undertake a review of the changes and update this report with the updated findings.

Appendices

Appendix A

Radio sites in vicinity of wind farm ACMA details

Point to Point Radio Links

Licence No.	Licensee	Radio Site A	Radio Site B	Operating Frequency
9848597/1	Telstra Corporation Limited	Telstra off Blacks Road MT KINCAID 304271	Telstra Site JONES RIDGE 51171	15.1485 GHz 14.5045 GHz

Land Mobile Radio Sites

ACMA Site No.	Location (GDA94)	Site Name	Licensee(s)	Operating Frequency
304271	-38.182687, 141.371367	Telstra off Blacks Road MT KINCAID	DEPARTMENT OF JUSTICE AND REGULATION (20011154)	166.3375 MHz 165.5875 MHz 165.8875 MHz 164.9875 MHz 170.4875 MHz 170.1875 MHz 171.2375 MHz 166.6375 MHz 160.3875 MHz 170.9375 MHz
55322	-38.16032, 141.289931	Nioka Farm Nelson Rd KENBRUCK	ONEFORTYONE PLANTATIONS PTY LTD (20027194)	159.475 MHz 164.075 MHz
142219	-38.033, 141.019049	Forrest Rd NELSON	Country Fire Authority (210019)	164.25 MHz 159.65 MHz
461580	-38.047625, 141.010584	32 Sturt St	DEPARTMENT OF JUSTICE AND REGULATION (20011154)	168.075 MHz 171.625 MHz 172.075 MHz 171.775 MHz 167.775 MHz 167.025 MHz 172.675 MHz 167.475 MHz 172.375 MHz 167.175 MHz
			Country Fire Authority (210019)	161.0875 MHz 161.1125 MHz 161.1125 MHz 161.0875 MHz 160.9875 MHz 160.9875 MHz
45569	-38.044007, 141.007518	LSE CFA Site 28 North Nelson Rd NELSON	DEPARTMENT OF JUSTICE AND REGULATION (20008374)	148.9125 MHz 148.6875 MHz

Spectrum Sites

ACMA Site No.	Location (GDA94)	Site Name	Licensee(s)	Operating Frequency
305568	-38.182154,	Optus site Blacks	Optus Mobile Pty	763 MHz
	141.371452	Rd MT KINCAID	Limited (1149289)	708 MHz
131825	-38.162675, 141.369504	Telstra CDMA Mt Kincaid off Blacks Rd	Telstra Corporation Limited (1103275)	837.5 MHz 882.5 MHz 723 MHz 778 MHz
461580	-38.047625,	32 Sturt St	Telstra	837.5 MHz
	141.010584		Corporation Limited (1103275)	882.5 MHz 723 MHz 778 MHz

Television Broadcast Sites

Callsign	Licence No.	Operating Frequency
Broadcast Site Mt Clay Angelino Rd servicing Portland area ACMA Site Number: 153479		
SBS40 (Special Broadcasting Service Corporation)	1160095	613.5 MHz
ABC41 (Australian Broadcasting Corporation)	1160124	620.5 MHz
AMV42 (Prime Television (Victoria) Pty Ltd)	1159975	627.5 MHz
VTV43 (WIN Television Vic Pty Ltd)	1160189	634.5 MHz
BCV44 (Southern Cross Communications Ltd)	1159983	641.5 MHz
Broadcast Site Mt Dundas servicing Western Victoria area ACMA Site Number: 38531		
ABC6 (Australian Broadcasting Corporation)	1935173	571.5 MHz
SBS7 (Special Broadcasting Service Corporation)	1935122	578.5 MHz
VTV10 (WIN Television Vic Pty Ltd)	1384717	585.5 MHz
BCV11 (Southern Cross Communications Ltd)	1159979	592.5 MHz
AMV12 (Prime Television (Victoria) Pty Ltd)	1384013	599.5 MHz
Broadcast Site 11 km E of Millicent Mt Burr servicing Southeast area ACMA Site Number: 23800		
SBS28 (Special Broadcasting Service Corporation)	1931730	529.5 MHz
SDS29 (WIN Television SA Pty Ltd)	1942620	536.5 MHz
MGS30 (WIN Television SA Pty Ltd)	1942621	543.5 MHz
ABC31 (Australian Broadcasting Corporation)	1957971	550.5 MHz
SES32 (WIN Television SA Pty Ltd)	1384488	557.5 MHz

AM/FM Radio Broadcast Sites

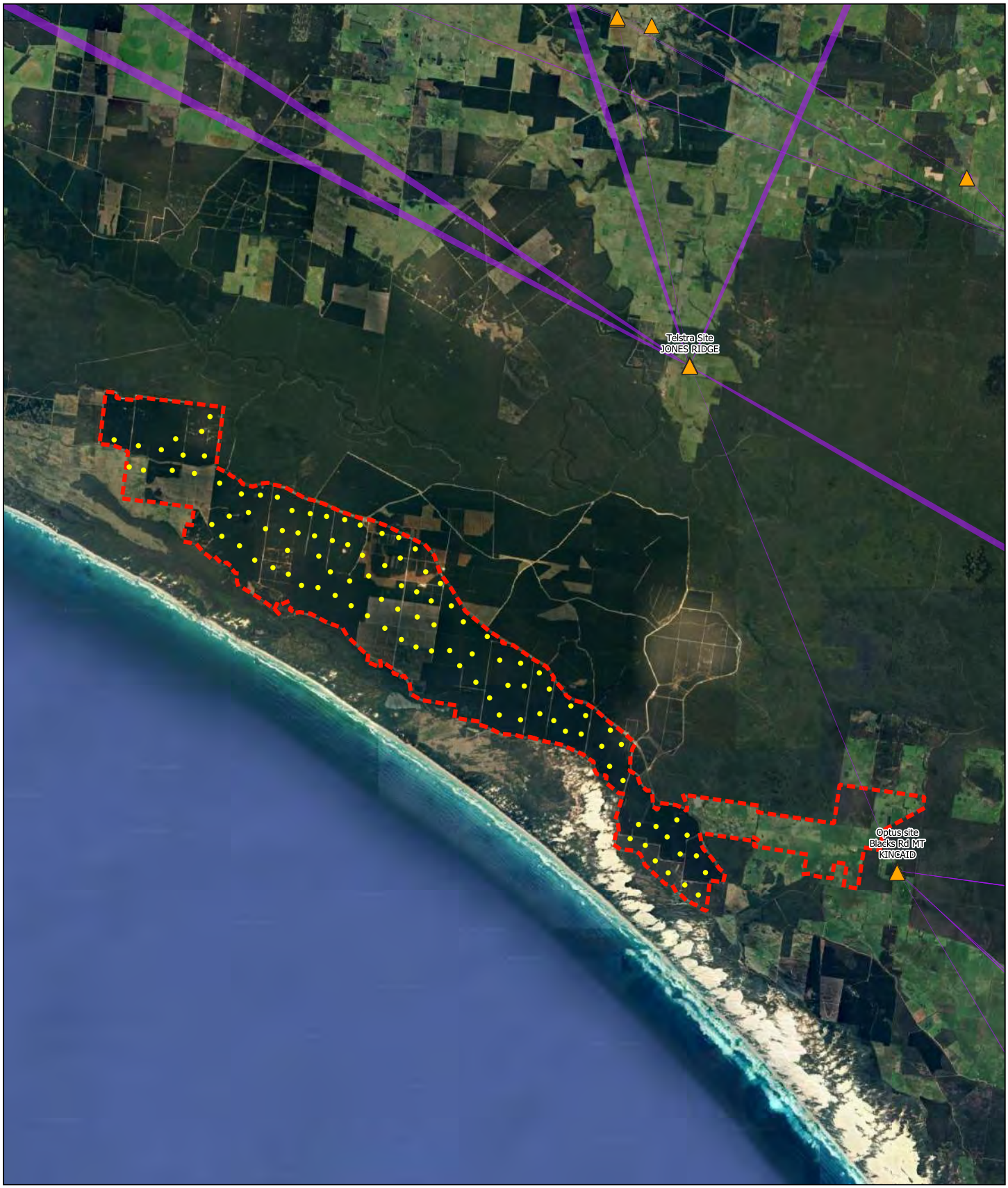
Callsign	Licence No.	Operating Frequency
Council Site Mount Clay Angelino Rd NARRAWONG ACMA Site Number: 153479		
3HA (Commercial Broadcasting)	10131445	92.9 MHz
3HFM (Commercial Broadcasting)	10132216	93.7 MHz

Appendix B

Point-to-point radio link exclusion zones

Content

– Electromagnetic Interference Assessment – Figure 2 – Point-to-Point Radio Link Exclusion Zones (Project Area)



LEGEND

- Project area
- Turbines
- Point to point transmitter
- Exclusion zone

Paper Size A4

0 2.5 5 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub

EMI Assessment

Point to Point Radio Link Exclusion Zones (Project Area)

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 2

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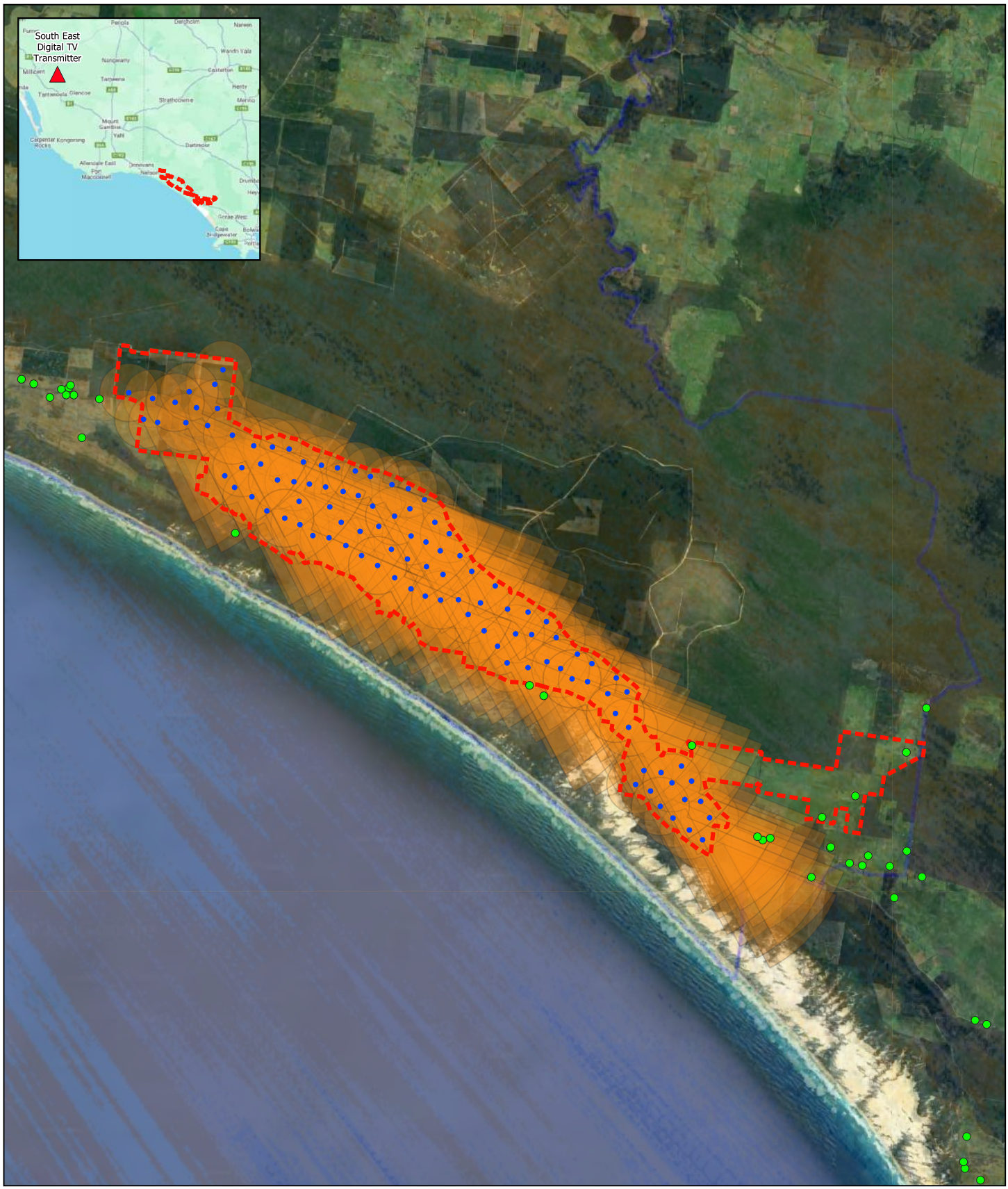
Google Earth Imagery 2023. Created by: ME

Appendix C

Television signal scatter zones from broadcast transmitters

Content

– Electromagnetic Interference Assessment – Figure 10 – Southeast (Mt Burr) Digital Television Transmitter Scatter Zones



LEGEND

- Project area
- Turbines
- Dwelling
- Scatter Zone

South East Transmitter Coverage

- Good
- Variable
- None

Paper Size A4

0 2.5 5 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

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NEOEN

Neoen Kentbruck Green Power Hub

EMI Assessment

South East (Mt Burr) Digital Television Transmitter Scatter Zones

Project No. **12583141**
Revision No. **7**
Date. **23/07/2024**

FIGURE 10

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Google Earth Imagery 2024. Created by: AM

Appendix D

Radio transmitters in vicinity of Kentbruck Green Power Hub

Content

LEGEND

- Project area
- Turbines
- Point to point transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

Point to Point Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 1

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Google Earth Imagery 2023. Created by: ME

LEGEND

- Project area
- Turbines
- Point to multipoint transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

Point to Multipoint Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 3

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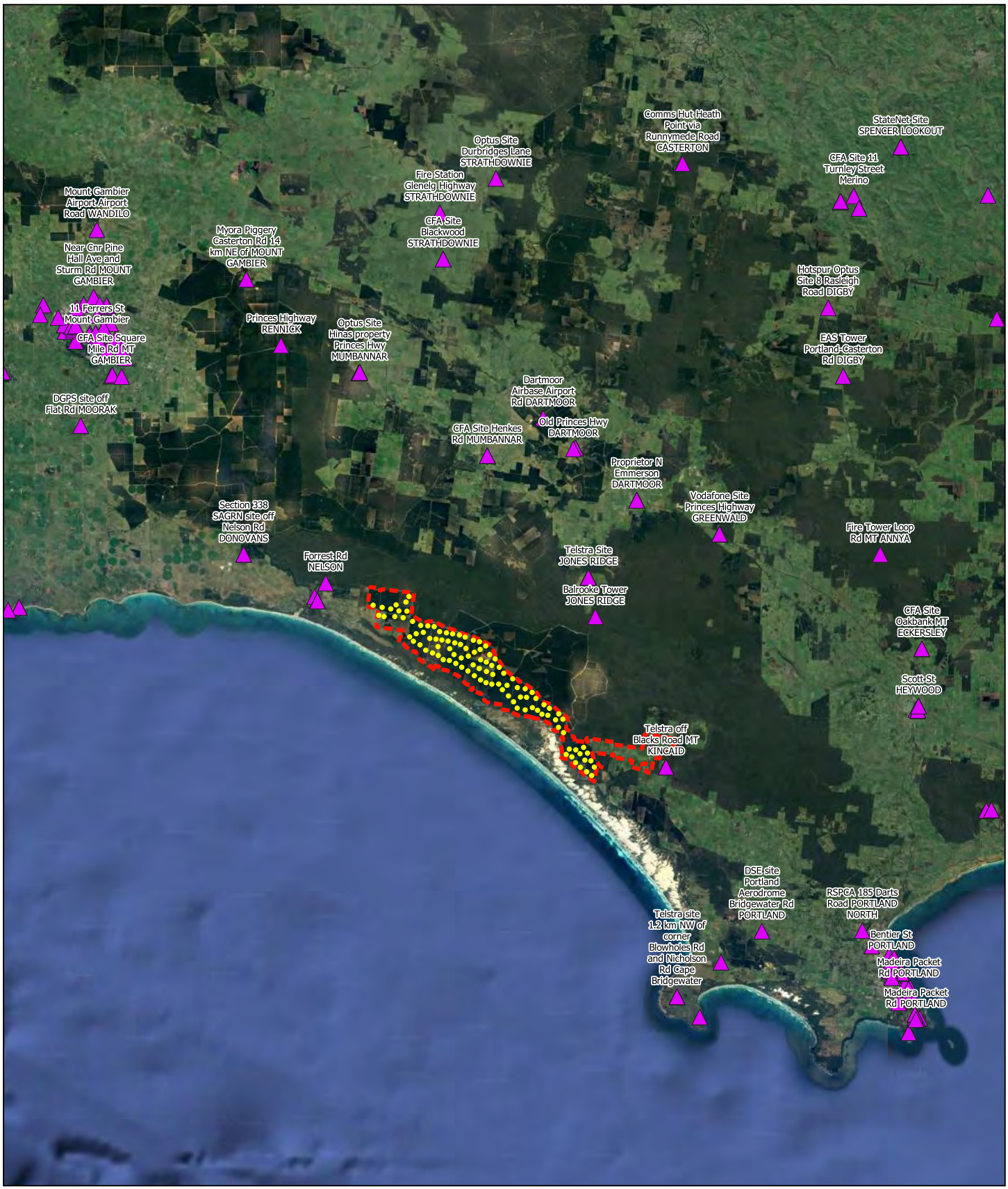
Google Earth Imagery 2023. Created by: ME



LEGEND

- Project area
- Turbines
- Land mobile transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

Land Mobile Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 4

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Google Earth Imagery 2023. Created by: ME

LEGEND

- Project area
- Turbines
- Narrowcast/Broadcast transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub

EMI Assessment

Digital Television Broadcast, AM/FM Narrowcast and Broadcast Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 5

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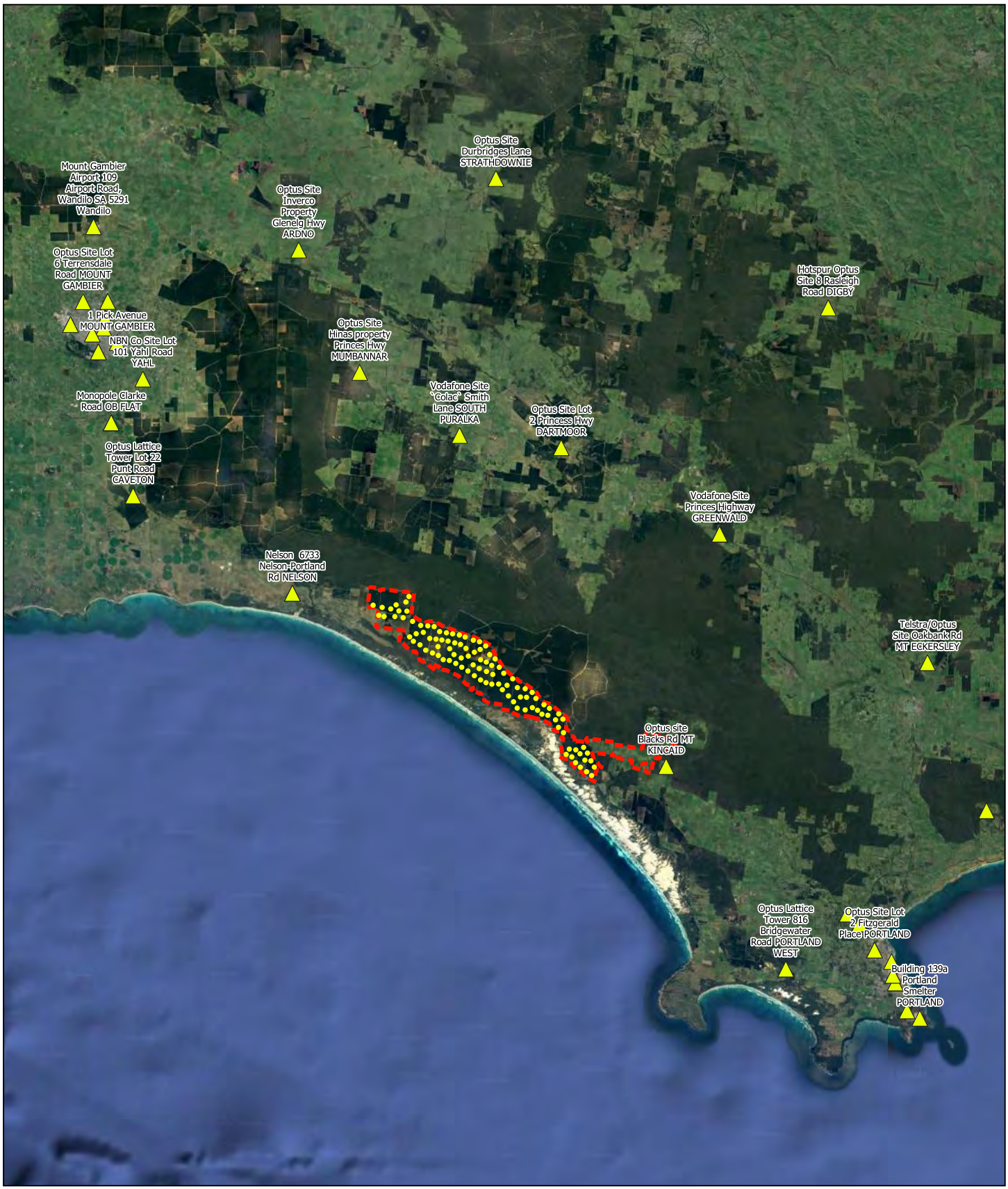
Google Earth Imagery 2023. Created by: ME



LEGEND

- Project area
- Turbines
- Public communication service transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

Public Communication Service Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 6

\\ghdnet\ghd\AU\Adelaide\Projects\31\12547179\GIS\Maps\PDF\EMI

Google Earth Imagery 2023. Created by: ME

LEGEND

- Project area
- Turbines
- Maritime/Aeronautical/Other transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub

EMI Assessment

Maritime, Aircraft, Meteorological and Other Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 7

\\ghdnet\ghd\AU\Adelaide\Projects\31\12547179\GIS\Maps\PDF\EMI

Google Earth Imagery 2023. Created by: ME

LEGEND

- Project area
- Turbines
- Unclassified transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

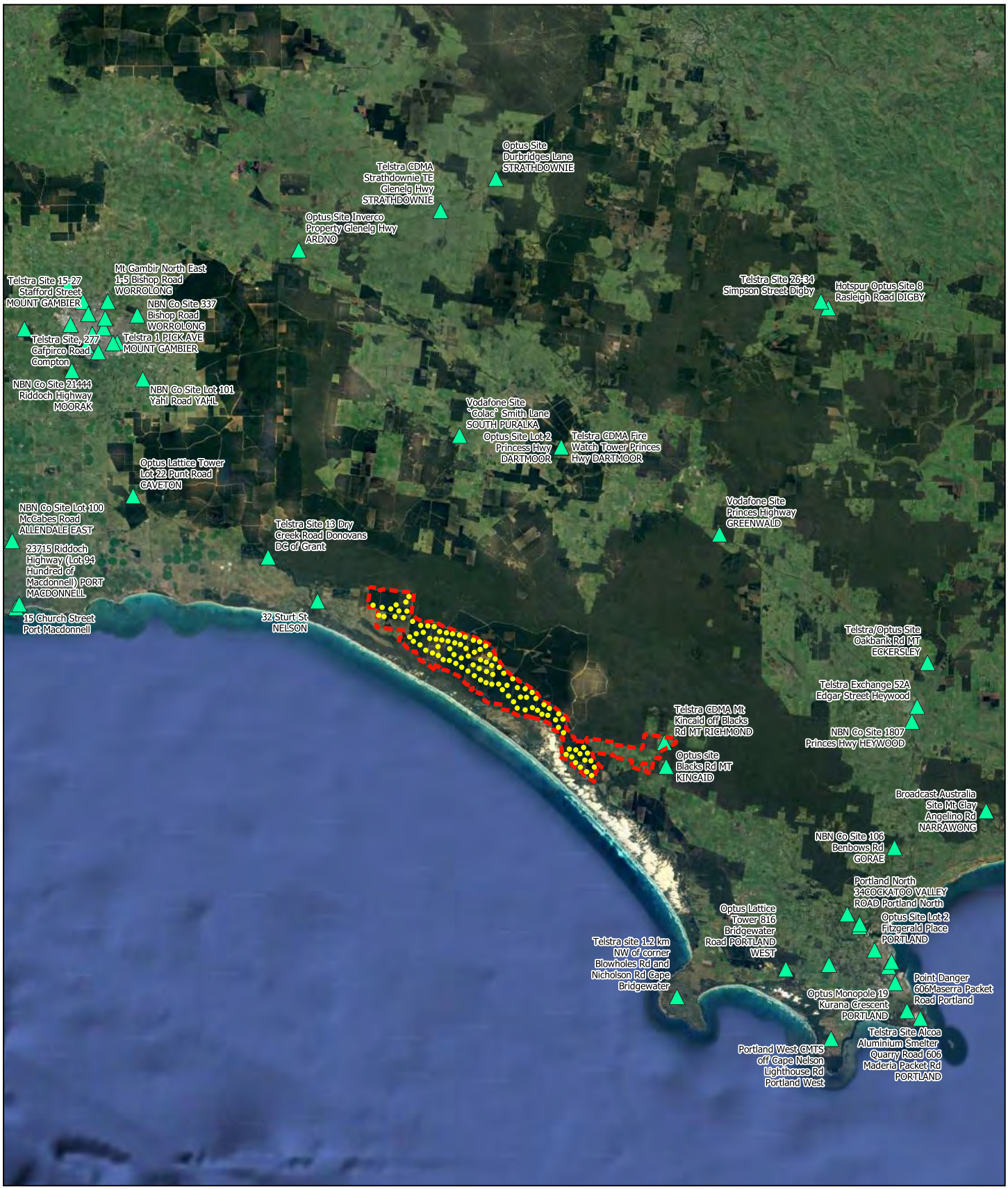
Unclassified Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 8

\\ghdnet\ghd\AU\Adelaide\Projects\31\12547179\GIS\Maps\PDF\EMI

Google Earth Imagery 2023. Created by: ME



LEGEND

- Project area
- Turbines
- Spectrum transmitter

Paper Size A4

0 7.5 15 km

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 54

N

GHD

NEOEN

Neoen Kentbruck Green Power Hub
EMI Assessment

Spectrum Transmitters

Project No. **12583141**
Revision No. **5**
Date. **13/10/2023**

FIGURE 9

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Google Earth Imagery 2023. Created by: ME

Appendix E

Consultation reference letters

Content

- Defence - Kentbruck Wind Farm Response Letter
- Geoscience Australia – Kentbruck Wind Farm Response Letter
- Telstra - Kentbruck Wind Farm Response Letter
- BoM - Kentbruck Wind Farm Response Letter

Brendan Siebert

From: Murray, Adam MR 3 <adam.murray3@defence.gov.au> on behalf of E&IG-Estate Planning Branch-External Land Planning & Regulation <land.planning@defence.gov.au>
Sent: Wednesday, 24 February 2021 8:18 AM
To: Whan Khamthara
Cc: Brendan Siebert
Subject: RE: Kentbruck Wind Farm - Electromagnetic Interference Assessment Impact on Defence [SEC=OFFICIAL]
Attachments: Defence response.pdf

OFFICIAL

Good morning Whan,

If this proposal is the wind farm 27km northwest of Portland Township in south western Victoria with 157 turbines and maximum height of 270 metres AGL (to blade tip), Defence have previously conducted an assessment of the Kentbruck WF proposal for any impact to Defence aviation and signals capability. There is no impact from this proposal. Our response to Chiron Aviation Consultants in September 2020 is attached.

Kind regards,
Adam

Adam Murray

Estate Strategic Planner - Land Planning and Regulation Directorate
Estate Planning Branch | Infrastructure Division | Estate & Infrastructure Group

Department of Defence | BP26-1-A004 | Brindabella Business Park | Canberra Airport | ACT 2609
P: (02) 5109 5509 | E: adam.murray3@defence.gov.au

Australian Government
Department of Defence

Charles Mangion
Director Land Planning and Regulation
Brindabella Business Park (BP26-1-A053)
PO Box 7925
Department of Defence
CANBERRA BC ACT 2610
☎: (02) 6266 8191
🖳: charles.mangion@defence.gov.au

ID-EP-DLP&R/OUT/2020/BS13691760

Ian Jennings
Chiron Aviation Consultants
27 Hilda Street
Essendon VIC 3040

Dear Ian

RE: KENTBRUCK WIND FARM AVIATION IMPACT STATEMENT

Thank you for referring the abovementioned wind farm proposal to the Department of Defence (Defence) for comment. Defence understands that this is a proposal for the construction, operation and decommissioning of a wind farm 27km northwest of Portland Township in south western Victoria with 157 turbines and maximum height of 270 metres AGL (to blade tip)

As tall structures, wind farms can have the potential to pose a number of concerns for Defence, particularly with regard to aircraft safety, military low flying and radar interference. Defence has conducted an assessment of the amended proposal for potential impacts on the safety of Defence flying operations.

There is an ongoing need to obtain and maintain accurate information about tall structures so that this information can be marked on aeronautical charts. Marking tall structures on aeronautical charts assists pilot navigation and enhances flight safety. Airservices Australia (ASA) is responsible for recording the location and height of tall structures. The information is held in a central database managed by ASA and relates to the erection, extension, or dismantling of tall structures, the top of which is above:

a. 30 metres AGL, that are within 30 kilometres of an aerodrome; and

b. 45 metres AGL elsewhere.

The proposed 250 metres AGL turbines meet the requirements for reporting of tall structures. Defence therefore requests that the applicant provide ASA with “as constructed” details. The details can be emailed to ASA at vod@airservicesaustralia.com.

Defence notes that the National Airports Safeguarding Framework Guideline D – Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers recommends that where a wind turbine 150 metres or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment and submit that assessment to the Civil Aviation Safety Authority (CASA) to determine whether the proposal is a hazard to aircraft safety and requires approved lighting or marking. If CASA

determines that obstacle lighting is to be provided, it should be compatible with persons using night vision devices. If LED lighting is proposed, the frequency range of the LED light emitted should be within the range of wavelengths 665 to 930 nanometres. Defence also requests that the colour used for the wind turbines ensure that they are conspicuous to aircraft during daylight hours.

Defence has no objection to the proposed wind farm provided that the project complies with the above conditions.

Should you wish to discuss the content of this advice further, my point of contact is Adam Murray at land.planning@defence.gov.au or telephone on (02) 6266 8474.

Yours sincerely,

Charles.Mangion

Digitally signed by Charles.Mangion
Date: 2020.09.03 17:31:56 +10'00'

Charles Mangion
Director Land Planning & Regulation

September 2020

Australian Government
Geoscience Australia

Cnr Jerrabomberra Avenue
and Hindmarsh Drive,
Symonston ACT 2609

GPO Box 378,
Canberra ACT 2601
Australia

+61 2 6249 9111
www.ga.gov.au

ABN 80 091 799 039

HPRM Ref. D2021-10824

23 February 2021

Kaveewat Khamthara (Whan)
Engineer - Telecommunications
GHD
Level 4, 211 Victoria Square
ADELAIDE SA 5000

February 23, 2021

Dear Whan,

POTENTIAL IMPACTS OF THE PROPOSED KENTBRUCK WIND FARM ON GEOSCIENCE AUSTRALIA GEODETIC INFRASTRUCTURE

Geoscience Australia do not foresee any impacts to our trigonometrical stations, Global Navigation Satellite System (GNSS) reference stations or associated facilities with the proposed Kentbruck Wind Farm in Victoria.

Sincerely

Ryan Ruddick

Director – GNSS Infrastructure and Informatics

National Positioning Infrastructure

Geoscience Australia

From: Stanley, David A <David.A.Stanley@team.telstra.com>
Sent: Monday, 15 March 2021 7:52 AM
To: Whan Khamthara <Whan.Khamthara@ghd.com>
Subject: RE: Kentbruck Wind Farm - Electromagnetic Interference Assessment Impact on Telstra Radio Network

Khamthara,

The attachment shows Turbine 185 as an issue.
It is recommended that the proposed turbine 185 be moved approx. 80m west to allow required clearance from the radio path of the SMR microwave link between Mount Kincaid and Jones Ridge.
All other Turbines appear clear of Telstra wireless infrastructure

When excavating or boring underground in Australia you should confirm all Telstra underground infrastructure by calling 1100 and obtaining Communication plans for the area.
If you have any concerns with Telstra network please call Telstra Network Integrity on 1800 810 443
It is preferred to give a minimum of 16 weeks' notice before the start of work on site.

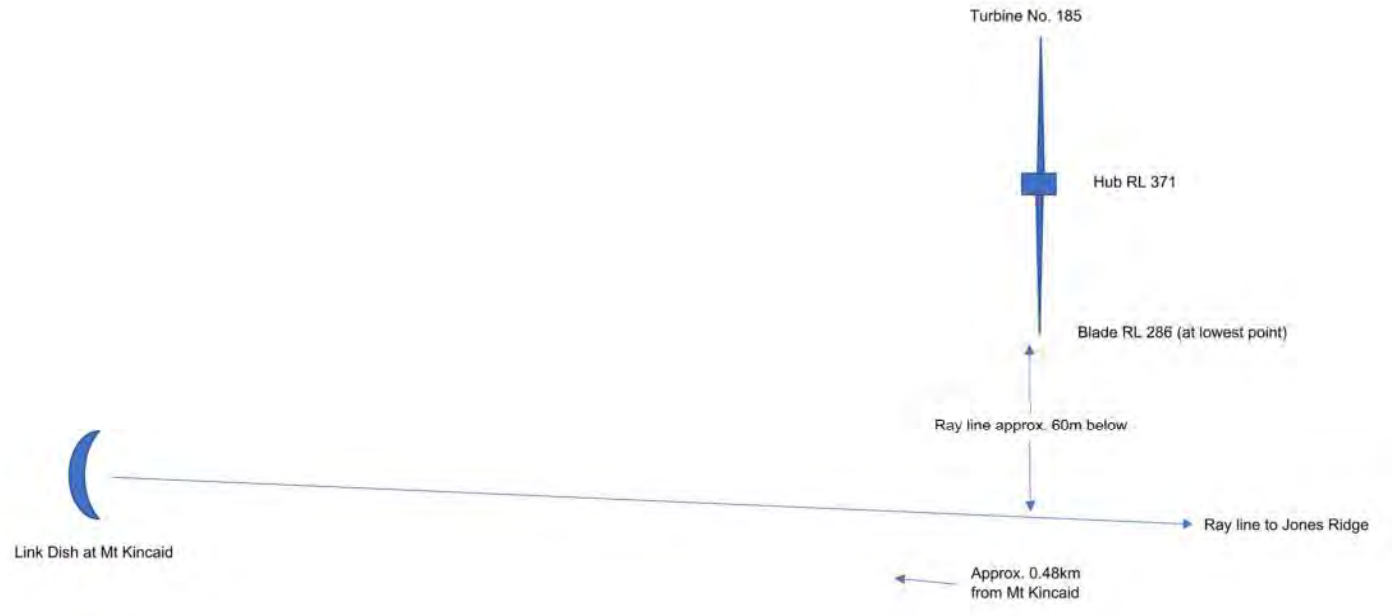
For future contact please reach out to one of the following;

Vojo.Zdravkovski@team.telstra.com	Technical
Nik.T.Patel@team.telstra.com	Technical
1800 810 443 – Network Integrity	Telstra Network protection/relocation

David A Stanley
Fundamental Planning Specialist
Access Network Planning

Contact No. 0419291802
E-Mail David.A.Stanley@team.telstra.com

Attachment: Turbine 185 Clearance



From: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Sent: Thursday, 4 March 2021 4:39 PM
To: Brendan Siebert
Cc: Tom Kane; Marc Keppler; Whan Khamthara
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

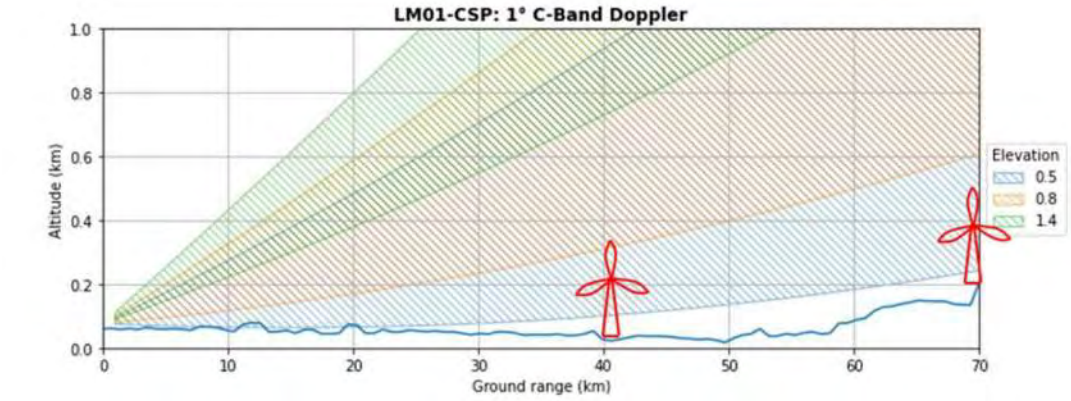
Follow Up Flag: Follow up
Flag Status: Completed

Hi Brendan,
We have three 185s in our analysis.

1. 185 m as the turbine tower height (or you call it Hub height)
2. Turbine number 185 that has the highest elevation
3. The maximum elevation of farm that is again 185 m.

So the maximum tip of turbine 270 m (185+85) should be added to the maximum elevation of farm (185) that results in 455 m.

Picture below shows that turbines, that are distributed over 30 km farm, contaminate the first two scans of the radar. The first few scans are the most important ones as they provide the longest coverage as well as the more accurate data for precipitation analysis.



Regards
Mohammad

From: Brendan Siebert <Brendan.Siebert@ghd.com>
Sent: Thursday, 4 March 2021 3:23 PM
To: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Cc: Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>; Whan Khamthara <Whan.Khamthara@ghd.com>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Mohammad,

Can you please confirm that your analysis is based on maximum tip height of 270 meters (hub at 185m + 85m blade tip = 270m total).

1- The tip height of turbines go to over 450 meter (185+270) while the radar is at 70 meter

The turbine details are as below;
Tip Height – 270m
Hub Height – 185m
Blade – 85 metre

We hope this alleviates some of BoM's concerns regarding this proposed windfarm and appreciate the feedback and response.

Best regards,
Brendan Siebert
BE(IT&Telecommunications)(Hons.) MIEAust MTCNA
Senior Engineer - Telecommunications
GHD
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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6743 **O** +61 8 8111 6600 **E** brendan.siebert@ghd.com
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Connect

Please consider the environment before printing this email

From: Brendan Siebert
Sent: Wednesday, 3 March 2021 1:06 PM
To: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Cc: Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>; Whan Khamthara <Whan.Khamthara@ghd.com>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Mohammad,

Thank you for again for providing this information to us.

Is it possible that you could provide some further diagrammatical analysis which we can include in our report?

In the interim, we will pass your initial response on to the developer so they are aware of the BoM's stance on this proposed development.

Best regards,
Brendan Siebert
BE(IT&Telecommunications)(Hons.) MIEAust MTCNA
Senior Engineer - Telecommunications
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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6743 **O** +61 8 8111 6600 **E** brendan.siebert@ghd.com
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Please consider the environment before printing this email

From: Whan Khamthara <Whan.Khamthara@ghd.com>
Sent: Wednesday, 3 March 2021 12:51 PM
To: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Mo

Thank you so much for your valuable feedback.

I will have a discussion with the developer for the strategies to minimise/mitigate from the provided information.

Regards

Kaveewat Khamthara (Whan)
BE (ELECTRICAL)
Telecommunications Engineer

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Please consider the environment before printing this email

From: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Sent: Wednesday, 3 March 2021 11:05 AM
To: Whan Khamthara <Whan.Khamthara@ghd.com>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Whan,
This is to kindly provide you the result of our assessment for the Kentbruck wind farm in VIC.

The closest radar station, Mt Gambier, is only 40 km from the proposed farm. There are other factors that worsen the compatibility of such wind farm with our radar network including:

1. The tip height of turbines go to over 450 meter (185+270) while the radar is at 70 meter altitude only.
2. Relative position of farm obstructs large inhibited area from the radar coverage.
3. There is no alternative radar to cover those areas.

Therefore, the Bureau is not in position to agree with such wind farm proposal at Kentbruck.

Should you require further information or have any question, please don't hesitate to contact me.

Regards

Dr. Mohammad Zomorrodi

Australian Government
Bureau of Meteorology

Spectrum Management
Observing Systems and Operations Program
Bureau of Meteorology
GPO Box 1289 Melbourne VIC 3001
Level 5, 700 Collins Street, Docklands VIC 3008
Tel: (03) 9669 4413 | mohammad.zomorrodi@bom.gov.au
www.bom.gov.au

From: Mohammad Zomorrodi
Sent: Monday, 22 February 2021 10:52 AM
To: Whan Khamthara <Whan.Khamthara@ghd.com>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Whan,
Thanks for info. I will run the analysis based on provided turbines info and then we can modify it when the turbines layout is get finalised.

Regards
Mohammad

From: Whan Khamthara <Whan.Khamthara@ghd.com>
Sent: Monday, 22 February 2021 10:45 AM
To: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Mo

The Upper Burdekin Wind Farm Project is currently under review and expected to get some feedback from the developer in the next few weeks. 😊

Please find the attached .CSV file for turbine coordinates.

Regards

Kaveewat Khamthara (Whan)
BE (ELECTRICAL)
Telecommunications Engineer

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D +61 8 8111 6755 **O** +61 8 8111 6600 **E** whan.khamthara@ghd.com

---

From: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Sent: Friday, 19 February 2021 4:30 PM
To: Whan Khamthara <Whan.Khamthara@ghd.com>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: RE: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services [SEC=OFFICIAL]

Hi Whan,
Thanks for asking. We are all doing well but busy😊

I have got your request for the Kentbruck wind farm. May I just ask you to provide me the list, preferably in CSV, of all turbines in the area?
Upon the receipt of your data, I am hoping to provide you the result of our initial assessment within a week.

Also I'd like to use this and ask about your previous project in Upper Burdekin in QLD. Is there any update on that project regarding to the farm impact on our radar network?

Regards
Mohammad

From: Whan Khamthara <Whan.Khamthara@ghd.com>
Sent: Wednesday, 17 February 2021 11:08 AM
To: Mohammad Zomorrodi <Mohammad.Zomorrodi@bom.gov.au>
Cc: Brendan Siebert <Brendan.Siebert@ghd.com>; Tom Kane <tom.kane@bom.gov.au>; Marc Keppler <Marc.Keppler@bom.gov.au>
Subject: Wind Farm - Kentbruck - Request advice on the potential impact of wind farm development on BoM services

Hi Mo

Hope you had a good break during the Christmas and New Year Holiday, even though it is now February!

Please find the Google file attached for the current turbine locations.

The turbine details are as below;
Tip Height – 270m
Hub Height – 185m
Blade – 85 metre

From my initial investigation, there is the Mt Gambier Radar approximately 42km N/E from the nearest turbine.

Does BoM have any plan to increase the weather watch radar in this area?

Please recommend the way to mitigate/minimise the impact on this weather watch radar.

PS. I can organise the meeting if BoM would like to discuss further.

Regards

Kaveewat Khamthara (Whan)
BE (ELECTRICAL)
Telecommunications Engineer

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