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Pre-construction noise assessment



Before you read this document

This document contains reports about predicted noise from a planned wind energy facility.

Wind turbine noise must not exceed levels set in regulations. These technical reports are prepared to accompany the wind energy facility planning application. They provide evidence that noise levels have been predicted and assessed as part of planning for new facilities.

The information below will help you understand:

- why these reports are produced
- who's involved and what their roles are
- where they fit in broader system that aims to protect the community and environment.

These are the first of many noise assessments:

Planning

Construction

Operation

Decomissioning



Pre-construction (predictive) noise assessment reports

This aims to predict noise emissions from wind turbines in accordance with the relevant noise standard. This report contains the assessment, predictive results and may include recommendations.



Verification report

This confirms if the assessment methods used in the above report comply with those in the relevant noise standard.

These reports do not approve the construction or operation of a wind energy facility.



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Who's involved at this stage:

Wind energy facility



- Must meet regulatory requirements
- Engages both:
 - a suitably qualified acoustician
 - an EPA-appointed environmental auditor.

Acoustician



- Predicts and assesses wind turbine noise against the relevant noise standard
- Completes the pre-construction (predictive) noise assessment report.

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Environmental auditor



- Independently verifies the pre-construction (predictive) noise assessment report
- Determines if the assessment methods comply with the relevant noise standard
- Completes the verification report
- While environmental auditors are appointed by EPA, they are independent and are not employed by EPA.

Department of Transport and Planning



- Administers the planning application process for a wind energy facility
- These reports will be considered when determining a planning application
- Minister for Planning is the responsible authority for a wind energy facility planning application
- For more information, go to dtp.vic.gov.au.



For further information about how we regulate wind turbine noise visit our [website](http://www.epa.vic.gov.au).



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Project: 116-25-001

28 May 2026

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Dear Elena,

Re: Addendum to Auditor Verification of Pre-Construction Predictive Noise Assessment - Meering West Wind Farm (Original letter dated 19 September 2025)

1. Introduction

This letter presents an addendum to the Auditor's review and verification of the Pre-Construction Noise Assessment Report prepared by Resonate Acoustics for the Meering West Wind Farm. The addendum has been prepared in response to minor updates to the predictive noise assessment including revisions to the wind turbine model, turbine coordinates, and receiver locations and updated Wind Turbine Generator (WTG) layout and parameters as presented in Revision E (**Attachment 2**).

The purpose of this addendum is to review the updated information and to confirm whether the changes affect the conclusions of the original verification. The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne, 110 km north of Bendigo and 25 km south-west of Kernag and is proposed to consist of up to 164 wind turbines supported by ancillary infrastructure including collector stations, transmission infrastructure and a Battery Energy Storage System (BESS) of approximately 1000MWh.

This addendum has been prepared to meet the requirements of clause 52.32-4 of the Victorian Planning Provisions (VPP) and all planning schemes and is consistent with the guidance provided under EPA publication *1692.1: Verification and Review of Wind Energy Facilities*, the Environment Protection Regulations 2021 and *NZS 6808:2010 Acoustics - Wind Farm Noise*.

The review and verification presented in this addendum have been prepared by Wajahat Bajwa of Bajwa EnviroConsult Pty Ltd (BEC), an EPA Appointed Environmental Auditor appointed under the *Environment Protection Act 2017* (the Act), with the support of the Auditor's Support Team member on noise, Vahid Alamshah, Principal Consultant – Acoustic Lead, of Cundall.

The acoustic terminology used in this letter is consistent with the terminology used in the acoustic report and relevant standards.

2. Documents Reviewed for the Addendum

The following documents have been considered during the peer review of the *Pre-Construction Noise Assessment Report*:

- *Resonate Report titled, Meering West Wind Farm - Pre-Construction Predictive Noise Assessment Report, M240298RP1 Revision C (Tuesday, 3 June 2025).*
- *Resonate Report titled, Meering West Wind Farm - Pre-Construction Predictive Noise Assessment Report, M240298RP1 Revision D (Monday, 1 September 2025).*
- *Resonate Report titled, Meering West Wind Farm - Pre-Construction Predictive Noise Assessment Report, M240298RP1 Revision E (Thursday, 23 April 2026), herein after referred to as the "final noise assessment report".*
- *Environment Protection Act 2017.*
- *Environment Protection Regulations 2021.*
- *EPA publication 1692.1: Environmental Auditor Guidelines Verification and Review for Wind Energy Facilities, December 2024.*
- *EPA Victoria (2025). Wind Energy Facility Turbine Noise Regulation Guidelines. Web-based guideline dated 2 May 2025. Available at: <https://www.epa.vic.gov.au/wind-energy-facility-turbine-noise-regulation-guidelines>*
- *EPA publication 3011: Wind Energy Facility Turbine Noise Technical Guideline, December 2024.*
- *EPA publication 1826.5: Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, September 2025*
- *Planning Guidelines for Development of Wind Energy Facilities, Victoria Department of Transport and Planning, September 2023.*
- *New Zealand Standard 6808:2010 Acoustics – Wind Farm Noise (NZS 6808:2010).*

3. Addendum Verification Scope

The scope of this addendum is limited to the review of the updated inputs and modelling outputs provided in the final Pre-construction Noise Assessment report. This includes consideration to the wind turbine model, turbine coordinates, and receiver locations as well as confirmation of any changes to predicted noise contours and affected receptors. The purpose of this review is to determine whether these updates affect the conclusions of the original verification letter.

The addendum review has been undertaken with reference to the same regulatory and technical framework applied in the original verification, including:

- New Zealand Standard (NZS) 6808:2010 standard and assessment methodology
- EPA Publication 1826.5 for ancillary infrastructure noise (i.e., substations)
- EPA Publication 1692.1: Environmental Auditor Guidelines – Verification and Review for wind energy facilities

This addendum did not involve new measurements or modelling by the Auditor but relied on an evidence-based review of provided documentation, complemented by requests for clarification from the proponent and consultant where required.

4. Summary of updates reviewed

The updated Pre-construction Noise Assessment includes a few minor revisions to modelling inputs and project parameters. These updates have been reviewed to determine whether they affect the conclusion of the original verification. The key changes are summarised below:

4.1. Wind Turbine Model Updates

The candidate turbine model has remained the same. The updated assessment continues to adopt the Vestas V172-7.2 MW turbine with minor adjustments to turbine hub height and rotor diameter as per the updated specification and associated WTG layout parameters. These changes result in only minor adjustments to the acoustic inputs used in predictive modelling. The candidate turbine adopted for noise modelling is still considered representative.

4.2. Noise-sensitive locations

Updated noise predictions have been provided for noise sensitive locations within the 35dB LA90 noise contour. The updated modelling confirms that no additional noise-sensitive locations are introduced within the 35 dB LA90 noise contour, with the number of affected dwellings (nine within the 35 dB contour) remaining unchanged. The spatial extent of both the 35 dB and 40 dB noise contours also remain materially consistent with that presented in previous assessment revisions which is expected given the minor changes.

4.3. Involved stakeholders

Revised noise predictions have also been provided for involved stakeholders and are consistent with expectations given in the updates. The predicted noise levels at these locations remain below the 45 dB LA90 target recommended in the DTP guidelines. Minor changes to turbine stakeholder distances from updated coordinates will not affect the compliance outcome.

4.4. Natural areas

The updated assessment has been reviewed with respect to identified natural areas, including Leaghur State Park and associated recreational uses. The revisions to turbine layout and modelling inputs do not result in any material change to predicted noise levels within these areas. The previous conclusions relating to human tranquility and enjoyment outdoors remain valid, with predicted noise levels continuing to be below relevant guideline values for high amenity environments.

4.5. Ancillary infrastructure

The addendum review confirms that the updates to turbine layout and modelling inputs do not affect the assessment of noise from ancillary infrastructure, including the BESS and substations. The conclusions of compliance with the applicable limits, as defined in EPA Publication 1826.5, remain unchanged for both involved stakeholders and non-involved receivers.

4.6. Noise character

The updates reviewed do not alter the assessment of noise character. The risk of special audible characteristics such as tonality and low-frequency noise remains low, and predicted levels continue to be below the applicable thresholds outlined in EPA Victoria guidance. Accordingly, the conclusions of the original assessment regarding noise character remain valid.

5. Conclusions

Based on the review of the updated turbine specifications, revised turbine and receptor coordinates and updated noise predictions provided in the final noise assessment report, the changes are considered minor and do not materially alter the basis of the assessment.

Predicted noise levels at both noise-sensitive locations and involved stakeholder locations remain consistent with those presented in the previous revision and all locations continue to comply with the applicable noise limits in accordance with NZS 6808:2010, the DTP guidelines and EPA publication 1826.5.

The reductions in turbine height and rotor diameter do not result in any increase in predicted noise levels or any change to the compliance outcome.

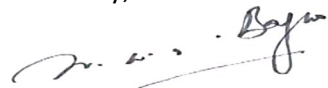
The updates presented in this final noise assessment report do not affect the conclusions of the original verification letter dated 19 September 2025.

The updated assessment does not introduce any additional sensitive receivers within relevant noise contours, nor does it alter predicted impacts at natural areas or ancillary infrastructure locations. The assessment of noise character, including tonality and low-frequency noise, remains unchanged from previous revisions.

6. Closing

If you have any further questions or require clarification on specific matters raised in this review, please do not hesitate to contact us. This addendum should be read in conjunction with the original verification letter.

Sincerely,



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Wajahat Bajwa
Environmental Auditor (Appointed Pursuant to the Environment Protection Act 2017)
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Attachment 1: Auditor Verification of Meering West Wind Farm (Original letter dated 19 September 2025)

Attachment 2: Pre-Construction Predictive Noise Assessment (April 2026)

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ATTACHMENT 1

Auditor Verification of Meering West Wind Farm (Original letter dated 19 September 2025)

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Project: 116-25-001

19 September 2025

Jo Barnett
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Aurecon
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Dear Jo,

Re: Meering West Wind Farm – Auditor Verification of Pre-Construction Predictive Noise Assessment

1. Introduction

This letter presents the outcome of an Auditor's verification of the Pre-Construction Noise Assessment Report prepared by Resonate Acoustics for the Meering West Wind Farm. The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne, 110 km north of Bendigo and 25 km south-west of Kernag. The project is proposed to consist of up to 164 wind turbines. The wind energy component will be supported by ancillary infrastructure consisting of collector stations, transmission infrastructure and Battery Energy Storage System (BESS) of approximately 1000 MWh.

The verification was undertaken to meet the requirements of Clause 52.32-4 of the *Victorian Planning Provisions* (VPP) and follows guidance provided under EPA Publication 1692.1: *Verification and Review for Wind Energy Facilities*, the *Environment Protection Regulations* 2021, ancillary infrastructure guidance in the noise protocol 1826.5 and *NZS 6808:2010 Acoustics – Wind Farm Noise*.

Clause 52.32-4 of the VPP and all planning schemes, requires an environmental auditor appointed pursuant to part 8.3 of the *Environment Protection Act 2017* (the Act) to prepare a report verifying whether the acoustic assessment undertaken for the purpose of the pre-construction (predictive) noise assessment report has been conducted in accordance with *NZS 6808:2010 Acoustics - Wind Farm Noise*.

This verification report, has been prepared by Wajahat Bajwa of Bajwa EnviroConsult Pty Ltd (BEC), an EPA Appointed Environmental Auditor appointed under the Act, with the support of the Auditor's Support Team member on noise, Vahid Alamshah, Principal Consultant – Acoustic Lead, of Cundall.

The acoustic terminology used in this letter is consistent with the terminology used in the acoustic report and relevant standards.

2. Documents Considered

The following documents have been considered during the peer review of the *Pre-Construction Noise Assessment Report*:

- *Resonate Report titled, Meering West Wind Farm - Pre-Construction Predictive Noise Assessment Report, M240298RP1 Revision C (Tuesday, 3 June 2025).*
- *Resonate Report titled, Meering West Wind Farm - Pre-Construction Predictive Noise Assessment Report, M240298RP1 Revision D (Monday, 1 September 2025), herein after referred to as the “final noise assessment report’.*
- *Environment Protection Act 2017.*
- *Environment Protection Regulations 2021.*
- *EPA publication 1692.1: Environmental Auditor Guidelines Verification and Review for Wind Energy Facilities, December 2024.*
- EPA Victoria (2025). *Wind Energy Facility Turbine Noise Regulation Guidelines*. Web-based guideline, dated 2 May 2025. Available at: <https://www.epa.vic.gov.au/wind-energy-facility-turbine-noise-regulation-guidelines>
- *EPA publication 3011: Wind Energy Facility Turbine Noise Technical Guideline, December 2024.*
- *EPA publication 1826.5: Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, September 2025*
- *Planning Guidelines for Development of Wind Energy Facilities, Victoria Department of Transport and Planning, September 2023.*
- *New Zealand Standard 6808:2010 Acoustics – Wind farm noise (NZS 6808:2010).*

3. Verification Scope

The scope of this verification is limited to the review of wind turbine noise predictions as presented in the Pre-Construction Noise Report. The verification covers compliance with:

- New Zealand Standard (NZS) 6808:2010 standard and assessment methodology
- EPA Publication 1826.5 for ancillary infrastructure noise (i.e., substations)
- EPA Publication 1692.1: Environmental Auditor Guidelines – Verification and review for wind energy facilities

This verification did not involve new measurements or modelling by the Auditor but relied on an evidence-based review of provided documentation, complemented by requests for clarification from the proponent and consultant where required.

4. Methodology

In undertaking this verification, consideration has been given to:

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- The methodology proposed in the New Zealand Standard 6808:2010 and EPA Publication 1826.5. It is noted that reference to version 1826.5 is included in this verification report for completeness, as this report was finalised in August 2025 with consideration of version 1826.4, and subsequently formatted and issued in September.
- The findings of the verification are provided in a tabulated format to allow a response to each finding in Attachment 1 to 3. A summary of the key findings is provided in Section 5 below.

5. Key Findings

The key findings of this verification are as follows:

- Subject to implementing the recommendations included in Section 5.3 below-
 - Overall, the methodology outlined in the final noise assessment report is considered consistent with the requirements of the specified windfarm standard NZS 6808:2010. The assessment indicates that noise from the wind farm is expected to comply with the applicable limits set out in the NZS6808:2010.
 - The risk of impact to amenity was assessed qualitatively in the final noise assessment report by direct reference to compliance with above referred limits. Accordingly, noise levels that comply with the limits set out in the NZS6808:2010 are deemed to protect both human health and the amenity of a noise sensitive location.

6. Recommendations

- Written confirmation should be obtained from the Wind Energy Facility (WEF) operator confirming that signed wind turbine noise agreements are in place for properties identified as *Involved Stakeholders*, and that the 45 dB LA90 limit is applicable under those agreements.
- An updated Pre-Construction Noise Assessment should be prepared prior to commencement of construction of the project incorporating:
 - Final wind turbine selection, including any relevant noise reduction mechanisms.
 - Final facility layout and design.
 - Background noise monitoring at representative noise-sensitive locations within the predicted 35 dB LA90 contour.
 - Updated assessment of ancillary infrastructure noise, reflecting final equipment selection and layout.
 - Application of a +5 dB tonal adjustment for ancillary infrastructure unless a lower adjustment is justified through objective evidence and analysis and by demonstrating compliance with noise limits as required under the Regulations and as specified in EPA Publication 1826.5, through post-construction noise measurements for ancillary infrastructure.
 - Appropriate noise mitigation measures to ensure compliance with noise limits.

- Clearly outline strategies to demonstrate compliance with General Environmental Duty (GED) obligations under the EP Act as it relates to operational wind turbine noise, ancillary infrastructure as well as construction and commissioning of the facility.
- Include appropriate considerations and mitigation strategies for management of construction and commissioning noise impacts with reference to turbine noise as well as ancillary infrastructure.
- In addition, all other recommendations contained in the final noise assessment report that are not addressed above should be implemented.

It is expected that the above recommendations will be required as conditions on any issued permit.

7. Closing

If you have any further questions or require clarification on specific matters raised in this review, please do not hesitate to contact us.

Sincerely,



Wajahat Bajwa
Environmental Auditor (Appointed Pursuant to the Environment Protection Act 2017)
0416 096 394 | wajahat.bajwa@beconsult.com.au

Attachment 1: Review Response Table

Attachment 2: Pre-Construction Verification Step Checklist

Attachment 3: EPA Publication 1692.1 Pre-Construction Verification Checklist (Appendix A)

Attachment 4: Pre-Construction Predictive Noise Assessment

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ATTACHMENT 1
Review Response Table

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Table 1 Review Response Table

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
1	2.2 p 6	Noise sensitive locations	Assessment appropriately considered noise sensitive locations including relevant involved stakeholders (landowners that have entered into agreement with the WEF). Refer to further commentary below in relation to Natural areas and campground.	Written confirmation should be sought from WEF operator that signed wind turbine noise agreements are in place for properties identified as Involved Stakeholders in the PCPNA.	To be confirmed by MWWF / Virya Energy.	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed.
2	2.3 p 8	Natural areas	Assessment has appropriately identified Natural areas for consideration of noise impacts with respect to provisions of the Environment Reference Standard (ERS).	Nil		Item closed
3	2.3 p 8 Para 2	Campground	The PCNA has identified a public campground at Leaghur State Park on the southern end of Lake Meran about 2 km east of the nearest wind turbine. For assessment of wind turbine noise, definitions of noise sensitive locations in	Assessment of wind turbine noise for identified campground in Leaghur State Park should consider the relevant noise limits in accordance with the Regulation and NZS 6808:2010 (including consideration of HAA).	The report does currently assess noise at the campground (receiver CG1) but not against the HAA noise limits. Resonate to update report to note that HAA could apply to	This matter has been addressed in Section 4.1.2 of the final noise assessment report. On this basis, the item is considered closed.

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			accordance with Section 2.4 of NZS 6808:2010 apply in which campgrounds are also considered a noise sensitive location in some circumstances for which the noise limits in accordance with the Regulations apply. Publication 3011 also notes that the High Amenity Limits (HAA) may also be applied to campgrounds where environmental values outlined in Environment Reference Standard (ERS) relevant to natural areas are relevant. Guidance in Section 3.5 of the Publication 3011 also states the following: Under the Planning and Environment Act 1987 (PE) Act, a responsible authority may consider any relevant ERS before deciding on an application for a planning permit. For example, the environmental value of human tranquillity and enjoyment outdoors in natural areas, its indicators and		campground in Leaghur State Park. However, will also note that: Predicted noise levels are < 35 dB even at maximum turbine sound power level are compliant with HAA limit. As HAA limit only applies up to hub height wind speed of 6 m/s, this is a conservative assessment. NZS 6808:2010 does not require consideration of areas outside of the predicted 35 dB contour for high amenity (refer C5.3.1(a) of NZS 6808:2010). However, in the event that the 35 dB contour were to change in the future, then the campground should be considered as HAA.	

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			objectives within the ERS may be considered during the planning process in relation to 'natural areas'. Based on our review of the Leaghur Camp area (Leaghur State Park), assessment of wind turbine noise to relevant noise limits in accordance with the Regulations and NZS 6808:2010 (including consideration of HAA) should be considered in particular given the camp area is also accessible for overnight camping.			
4	2.3 P 8 Para 3	Natural areas	For all other identified natural areas where more transient daytime activities are identified, provisions of the Environment Reference Standard (ERS) are considered within the PCNA (i.e. environmental value of human tranquillity and enjoyment outdoors in natural areas, its indicators and objectives). This is in line with the provisions of Regulations	Nil		Item closed

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			and guidance in EPA Publication 3011.			
5	2.4 p 8	Wind Turbine Model	Pre-construction assessment has been carried out based on a candidate turbine due to final model not being selected. Assessment indicates this will be confirmed through a competitive tender process after the Project has received planning approval.	Approach is considered acceptable for a preliminary assessment in line with NZS 6808:2010 to demonstrate that facility is capable of compliance with the standard. However, a final pre-construction noise assessment reflecting final turbine selection, facility layout and design should be carried out prior to construction to demonstrate compliance with the standard.	Noted. Understood no action required to current report, and that the recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit.	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed.
6	2.4 p 8,9	Wind turbine sound powers	Assessment notes that project is expected to seek approval for turbines with a height of up to 300 m above ground, rotor diameter in the order of up to 200 m, and a rated power capacity of 6 to 8 MW. The candidate turbine selected for the preliminary assessment is noted to be Vestas V172-7.2MW as a	An updated pre-construction noise assessment reflecting final turbine selection (including any relevant noise reduction mechanism), facility layout and design should be carried out prior to construction to demonstrate compliance with the standard.	Noted. Understood no action required to current report, and that the recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit.	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed.

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			representation of typical range of modern wind turbine sound power levels with a rated power capacity of between 6 and 8 MW. The sound power level adopted is based on a turbine model with serrated trailing edges (STE) as an example of typical noise reduction mechanism. The sound power levels and spectra adopted are reasonable and considered appropriate to represent the typical wind turbine of such specification. However, as per comment above, a final pre-construction noise assessment should be carried out with final turbine selections, associated sound power levels (including any noise reduction mechanism).			
7	2.5 P 9,10	Ancillary infrastructure noise source levels	Project will have ancillary infrastructure including a BESS and electrical infrastructure (terminal and substations).	Updated pre-construction noise assessment should also consider ancillary infrastructure and demonstrate compliance with	Noted. Understood no action required to current report,	An appropriate recommendation has been included in Section 5.3 of this

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			Two location options are considered with a candidate battery module being Telsa Megapack 2 XL. The adopted candidate battery and transformer sound power levels for the assessment of operational noise from ancillary infrastructure for the purpose of the planning approval is adequate.	relevant provisions of the Regulations with final ancillary infrastructure equipment selection and layout.	and that the recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit.	verification report to this effect. Item closed.
8	Section 3 P 11- 18	Legislation, policy and guidelines	Assessment has generally considered appropriate reference to relevant provisions for assessment of Wind Energy Facilities and methodology adopted for wind turbine operational noise complies with the requirements of the NZS 6808:2010.	Nil	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Item closed
9	Section 3 P 11- 18	GED	The General Environmental Duty (section 25 of the Act) obligations apply to WEF including the Wind Turbine	Updated pre-construction assessment should clearly identify strategies and approach that demonstrates compliance with GED		This matter has been addressed in Sections 6.5 and 7 of the final noise assessment report.

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			Noise and associated ancillary infrastructure. Regulations 131C and 131CA Division 5 of Part 5.3 of the Regulations outlines how compliance with noise emission duties under the Act are to be achieved. GED obligations are also applicable to ancillary infrastructure relevant to managing commercial, industrial and trade noise. This means going beyond compliance with noise limits and management of unreasonable noise. It is also noted that noise during construction or commissioning of the facility is also governed by the GED and the unreasonable noise provisions under section 166 EP Act. The PCNA has to some extent discussed the GED obligations, in particular as it relates to wind turbine noise. However, it does not provide a clear explanation how the	obligations as it relates to operational wind turbine noise, ancillary infrastructure as well as construction and commissioning of the facility.	of low noise equipment, site layout and design).	An appropriate recommendation has also been included in Section 5.3 of this verification report to this effect. Item closed.

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			obligations are to be addressed in particular for ancillary infrastructure as well as construction and commissioning of the facility.			
10	3.2.3 P 16	Construction and commissioning	The requirements for WEFs in Division 5 of Part 5.3 of the Regulations do not apply to the construction or commissioning period. However, it is noted that noise during construction or commissioning is governed by the GED and the unreasonable noise provisions under section 166 EP Act apply. Assessment of construction and commissioning noise impacts therefore should be considered with reference to appropriate provision of the EP Act as well as EPA Publication 1834.1 Civil Construction, Building and Demolition Guide, publication 1834.1.	It is recommended that final pre-construction assessment includes appropriate considerations and mitigation strategies for management of construction and commissioning noise from the facility with reference to operational wind turbine noise as well as ancillary infrastructure and: GED obligations & provisions of Section 166 of EP Act. EPA Publication 1834.1 Appropriate management of wind turbine commissioning noise to form part of the Noise Management Plan.	In our experience, it is not normal for Planning Permits to include requirements for formal construction noise assessments as part of Pre-Construction Noise Assessments for wind farm approvals. Rather, a requirement is normally included for development and implementation of a Construction Environmental Management Plan. Suggest that we update the current report to include a recommendation that any Permit include conditions requiring construction noise and vibration management measures to be incorporated into a Construction Environmental Management Plan.	This matter has been addressed in Section 7 of the final noise assessment report. On this basis, the item is considered closed.

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
					We can note that commissioning would be addressed as part of the NMP that is required under the Regulations.	
11	4.1.1 P19	Noise limits – Wind turbine noise	The PCNA has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative approach in the absence of background noise monitoring and assessment. It references Section 7.4 of the Publication 3011 in relation to need for background noise assessment. It notes that the wind farm operator may elect to undertake background noise monitoring (and where justified increase noise limits in accordance with NZS 6808:2010) to be done as part of an updated pre-construction noise assessment or elect to adopt the noise	Nil		Item closed

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			limit of 40 dB LA90 and undertake on/off testing as per the NZS 6808:2010 to confirm compliance with applicable noise limits. Adopted approach is acceptable as a conservative approach and for the purpose of pre-construction noise assessment.			
12	4.1.2 P 19-20	High Amenity Areas (HAA)	VPP Clause 52.32 requires an assessment of whether a high amenity noise limit is applicable under Section 5.3 of the NZS 6808:2010. Further guidance on applicability of High Amenity Area noise limit is provided in Section 5.2 of EPA Publication 3011 as well as Publication 2061. The PCNA indicates that the High Amenity Area noise limit is not applicable to any of the identified nearest noise sensitive locations and within 5 km of the project boundary.	Nil		Item closed

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			The PCNA has adequately assessed the applicability of the HAA noise limit with respect to provisions of the VPP Clause 52.32.			
13	4.1.3 P 20	Noise limits – involved stakeholder dwellings	The PCNA assessment has adopted appropriate wind turbine noise limit of LA90 45 dB for the involved stakeholder dwellings (landowners that have entered into agreement with the WEF).	Written confirmation should be sought from WEF operator that signed wind turbine noise agreements are in place for properties identified as Involved Stakeholders in the PCPNA and that 45 dB LA90 limit is applicable under the agreement.	To be confirmed by MWWF / Virya Energy.	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed.
14	4.2 P 20	Noise limits – ancillary infrastructure	The PCNA has appropriately established noise limits for control of unreasonable noise in accordance with provisions of the Regulations and the EPA Publication 1836.4.	Nil	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Item closed
15	5.1 P 21-22	Wind turbine noise assessment – methodology	Noise prediction methodology adopted is suitable and generally follows the guidance and requirements of the NZS 6808:2010 and guidance	Nil		Item closed

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			provided in EPA Publication 3011. Key elements include: ISO9613-2:2024 prediction algorithm is suitable. Adopted topography and correction factor for concave topography is suitable. Modelling parameters are suitable including ground and air absorption coefficients adopted. Assumed hub height and rotor diameter is reasonable and justification provided on the basis of sensitivity analysis of hub height and rotor diameter is acceptable. Assessment adopts a receiver height of 1.5 m compared to 4 m recommended by Publication 3011. It references previous Australian studies and UK Institute of Acoustics Good Practice Guide as the basis of justification. The justification and approach provided is reasonable and considered to result in similar or slightly more conservative results.			

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
16	5.2 P 22-23	Predicted wind turbine noise	Predicted noise levels at all identified sensitive locations are reported to be below the 40 dB LA90 dB screening wind turbine noise limit with maximum being 37 dB at any location based on the candidate turbine (including the serrated trailing edges (STE) noise reduction). Predictions demonstrate that compliance with the noise limits in accordance with NZS 6808:2010 can be achieved based on the preliminary assessment, layout and candidate turbine. The PCNA acknowledges the predicted compliance are based on a candidate turbine and notes that an updated Pre-Construction Noise Assessment should be prepared to confirm how the selected wind turbine type and layout will achieve compliance with the applicable noise limits.	I agree with the recommendation for an updated Pre-Construction Noise Assessment reflecting final turbine selection (including any relevant noise reduction mechanism), facility layout and design and demonstrating compliance with the standard and applicable noise limits.	Noted. Understood no action required to current report, and that the recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit.	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed.

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
17	5.3 P 23-24	Predicted wind turbine noise – natural areas	Section 5.3 of the PCNA provides discussion of predicted turbine noise levels at identified Natural Areas along with commentary with respect to the expected impact on the ambient noise at these locations. I am satisfied that the expected predicted turbine noise levels are not detrimental to the environmental value of human tranquillity and enjoyment as per the provisions of the ERS. The PCNA also adequately provides an assessment of the predicted turbine noise levels at the identified campground in Leaghur State Park with respect to the relevant NZS 6808:2010 noise limit as well as High Amenity Area Noise Limit.	Nil		Item closed
18	5.4 P 24-25	Predicted wind turbine noise –	The PCNA adequately demonstrates that the	An updated Pre-Construction Noise Assessment reflecting	Noted.	An appropriate recommendation has been

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
		involved stakeholders	predicted wind turbine noise at all identified involved stakeholders are below the 45 LA90 dB requirement including those that are within the project boundary. I note however that predicted compliance is based on the assumed candidate turbine (with noise reduction) as noted previously. Accordingly, compliance with relevant noise limit should be demonstrated following an updated pre-construction assessment as recommended by the PCNA report.	final turbine selection (including any relevant noise reduction mechanism), facility layout and design and demonstrating compliance with the standard and applicable noise limits.	Understood no action required to current report, and that the recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit.	included in Section 5.3 of this verification report to this effect. Item closed
19	5.5 P 25	SACs	The PCNA assessment adopts the approach recommended by EPA Victoria Publication 3011, assuming wind turbine noise levels without special audible characteristics (SACs), in line with NZS 6808:2010. It provides further discussion on infrequent and condition-specific occurrence of SACs, considering it reasonable to exclude them from	Nil	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Item closed

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			preliminary noise assessment, with the understanding that any such characteristics will be addressed through post-construction compliance monitoring as required by the standard.			
20	Appendix C P 39-40	Uncertainty	Assessment and prediction of wind turbine noise should appropriately account for the uncertainty in accordance with NZS 6808:2010. Discussion of wind turbine noise prediction uncertainty is adequately addressed in Appendix C of the PCNA. The assessment considers the uncertainty with predictions to be small taking into account use of ISO 9613-2:2024 algorithm, adopted conservative modelling assumptions and inclusion of uncertainty margin in adopted turbine sound power levels. I agree with the approach adopted and consideration of the uncertainty in the assessment in particular when	Nil	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Item closed

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			compared to the noise limits as adopted by NZS 6808:2010.			
21	Appendix D P 41-43	Wind turbine noise contour	Appendix D of the PCNA adequately nominates wind turbine noise contours including the 35 dB, 40 dB and 45 dB LA90 lines. Report appropriately identifies the noise sensitive locations within the predicted 35 dB LA90 noise contours.	Nil	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Item closed
22		Documentation	The PCNA report provides adequate documentation of information required for prediction of wind turbine noise in accordance with the NZS 6808:2010.	Nil		Item closed
23	5.6 P 25	Summary of wind turbine noise assessment	The PCNA concludes that the project can comply with the minimum applicable noise limit of 40 dB LA90 at the nearest noise-sensitive locations while it acknowledges the assessment is based on a candidate wind	A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection (including any relevant noise reduction mechanism) and design and demonstrating compliance	Noted. Understood no action required to current report, and that the recommendation is for a final Pre-Construction Noise Assessment, which would be	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			turbine and layout that may be subject to further refinement. It recommends that post approval and prior to commencement of construction of the Project: A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection and design. The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010. I agree with the conclusions drawn and recommendations made by PCNA and satisfied that the project has adequately demonstrated that the proposal is capable of compliance with the standard subject to an updated pre-construction noise assessment and inclusion of background	with the standard and applicable noise limits. The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.	expected to be required by a condition on any issued Permit.	

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			noise monitoring supporting the assessment.			
24	6.1 P 26	Ancillary infrastructure – noise prediction methodology	Noise prediction methodology adopted for ancillary infrastructure is suitable and generally follows the guidance and requirements of the EPA Publication 1997. Key elements include: ISO9613-2:2024 prediction algorithm is suitable. Modelling parameters including ground absorption coefficients adopted are suitable. Assumed noise source and receiver heights are suitable. Consideration of tonal adjustment for predicted noise levels is suitable. However, refer to my further commentary with respect to adopted adjustment factor below.	Refer to commentary with respect tonal adjustment.	Noted. Understood no action required to current report. Refer to response below re tonal adjustment.	Item closed. Refer to Item 25 below.

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
25	6.1 P 26	Ancillary infrastructure – tonal adjustment	The assessment applies a +2 dB tonal adjustment for electrical infrastructure noise, referencing prior experience and the expectation that tonal characteristics would be only just perceptible at significant distances. While I agree with the need to account for tonality (given its inherent presence in sources such as transformers and battery modules), I consider that a +5 dB adjustment may be more appropriate at this stage of the assessment. This recommendation is based on the following considerations: Tonal noise components from electrical infrastructure typically occur at lower frequencies (e.g., 100 Hz and harmonics of 50 Hz), which propagate more effectively over distance due to reduced atmospheric absorption, potentially resulting in more prominent tonal features at noise-sensitive receivers.	It is recommended that a +5 dB tonal adjustment be applied to the assessment of ancillary infrastructure noise unless a +2 dB adjustment can be further justified through objective evidence.	While the comment around tonal noise from electrical infrastructure is correct in the context of transformer noise, it is important to note that the transformer noise is actually a relatively minor contributor to the overall predicted noise levels from the ancillary infrastructure. at noise-sensitive receivers. The dominant predicted noise levels are associated with the BESS, with the noise predominantly arising from the cooling systems. Although the cooling systems can have fans that contain some level of tonality (albeit typically relatively low), the fans across multiple Megapacks will operate at a variety of different speeds such that pronounced tonality is not normally a feature of BESS noise in our experience. As such, we consider the +2 dB correction to be justified.	As per Resonate’s response, additional text has been added in Section 6.3 of the final assessment report. Although the Auditor agrees with the response/update to some extent, it is noted that tonal noise can arise from various BESS components— not only the transformers but also fans, inverters, and other modules. The tonal contribution may vary depending on the specific equipment used. Further, while the tonal component may be lower than the overall noise level, it can still be sufficiently prominent to attract a +5 dB adjustment, depending on frequency content, background noise conditions and other influencing factors. The key risk relates to the rural context, where very low background noise levels may exist at night. On this basis, the Auditor considers that a +2 dB adjustment is not

Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			The predicted highest adjusted noise levels (39 dBA day/evening and 33 dBA night) suggest unadjusted levels of 37 and 31 dBA respectively, which, in the context of low rural background noise, particularly at night, may result in tonal characteristics being prominently audible. On the basis of above, it is my opinion that unless further objective evidence is provided to support the +2 dB adjustment (such that supported by background noise measurements and comparison of predicted tonal components), a +5 dB adjustment should be considered to conservatively account for potential tonal audibility.		Resonate to update the report based on the above.	adequately justified without further objective assessment of potential tonal sources associated with the BESS. In particular, given that equipment selections and background noise measurements are not yet available, a more conservative approach is considered advisable. Regardless, the project must comply with the relevant noise limits in accordance with the provisions of the Regulations and the Noise Protocol, which specifically require consideration of the appropriate adjustment factor for tonality. To ensure this matter is addressed appropriately and that the project implements suitable measures to achieve compliance, it is recommended that a planning condition be included requiring the project to demonstrate compliance with the applicable noise limits

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			This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright			through post-construction noise measurements of ancillary infrastructure, as specified in EPA Publication 1826.5. An appropriate recommendation has been included in Section 5.3 of this verification report to this effect Finally, it is noted that compliance with the General Environmental Duty provisions requires the project to go beyond simple adherence to the noise limits set out in EPA Publication 1826.5 (i.e., limits for the control of “unreasonable noise”). Item closed
26	6.2 P 26-27	Ancillary infrastructure – predicted noise levels	The assessment demonstrates that predicted noise levels from ancillary infrastructure comply with the relevant noise limits at the nearest receivers for both layout options, assuming a +2 dB tonal adjustment. However, if a more conservative +5 dB	It is recommended that the Pre-Construction Noise Assessment be updated to reflect the final ancillary infrastructure layout and equipment selection, incorporating appropriate noise mitigation measures to ensure compliance. The	Noted. Understood no action required to current report, and that the final recommendation is for a final Pre-construction Noise Assessment, which would be	Item closed. Refer to Item 25 above.

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			tonal adjustment is applied, predicted levels for Option 1A would exceed the applicable limits by approximately 2–3 dB, while Option B would remain compliant. Despite this potential exceedance, I consider it reasonably practicable to achieve a 2–3 dB reduction in ancillary infrastructure noise through appropriate design-stage mitigation measures. Therefore, I am satisfied that the project remains capable of achieving compliance with the relevant noise limits, provided that such measures are implemented. It is recommended that the Pre-Construction Noise Assessment be updated to reflect the final infrastructure layout and equipment selection and include appropriate mitigation strategies to ensure compliance. This updated assessment should adopt a +5 dB tonal adjustment unless a lower adjustment can be	assessment should apply a +5 dB tonal adjustment unless a lower adjustment can be justified through objective evidence.	expected to be required by a condition on any issued Permit. Refer to earlier response re tonal adjustment. It is not considered that any recommendation for future PCNAs should specify the need for a 5 dB tonal adjustment.	

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			justified through objective evidence, such as background noise measurements demonstrating that tonal characteristics would be just detectable.			
27	6.2 p 27	Ancillary infrastructure – low frequency noise	The assessment presents predicted low frequency noise levels from ancillary infrastructure at the nearest noise-sensitive receivers, with analysis limited to frequencies down to 25 Hz due to the low risk of significant emissions below this range and the absence of manufacturer data. I agree with the assessment's rationale, which aligns with my previous measurement experience indicating low risk of elevated low frequency noise below 25 Hz from electrical infrastructure. I am satisfied that the low frequency noise assessment is appropriate, suitably conservative, and demonstrates that predicted	Nil		Item closed

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			levels are well below relevant threshold values. As such, no low frequency noise impacts are expected, and no further assessment is considered necessary.			
28	6.3 p 28	Ancillary infrastructure – natural areas	Assessment identifies that no additional impacts to natural areas from the ancillary infrastructure noise emissions are expected given significant distances from nearest natural areas for both layout options. I agree with this conclusion and am satisfied that the predicted noise levels are not detrimental to the environmental value of human tranquillity and enjoyment, consistent with the provisions of the Environmental Reference Standard (ERS).	Nil		Item closed
29	6.4 p 28	Ancillary infrastructure assessment summary	The PCNA concludes that the Project can comply with the applicable Noise Protocol noise limits (for management of unreasonable noise) and	An updated Pre-Construction Noise Assessment be prepared to reflect the final ancillary infrastructure layout and equipment selection,	Noted. Understood no action required to current report, and that the	Item closed. Refer to Item 25 above.

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Item	Report Section	Issue	Review comment	Recommendations	Resonate Response	Final review conclusions
			that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design. Given the preliminary nature of the assessment and potential variation in source noise levels, it appropriately recommends that an updated Pre-Construction Noise Assessment be undertaken once final equipment selection and layout are confirmed. I support the conclusions and recommendations of the PCNA and am satisfied that the project is capable of achieving compliance with the relevant noise limits, provided that appropriate mitigation measures are implemented. The updated Pre-Construction Noise Assessment should adopt a +5 dB tonal adjustment for ancillary infrastructure unless a lower adjustment can be justified through objective evidence,	incorporating appropriate noise mitigation measures to ensure compliance with noise limits in accordance with Noise Protocol. The assessment should apply a +5 dB tonal adjustment unless a lower adjustment can be justified through objective evidence.	recommendation is for a final Pre-Construction Noise Assessment, which would be expected to be required by a condition on any issued Permit. Refer to earlier response re tonal adjustment. It is not considered that any recommendation for future PCNAs should specify the need for a 5 dB tonal adjustment	

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			such as background noise measurements demonstrating that tonal characteristics would be just detectable.			

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ATTACHMENT 2

Pre-Construction Verification Step Checklist

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Table 2 Pre-construction verification step Checklist

Item	Step	Review comment	Reference from Information Source	Final comments/ conclusions
1	Familiarisation with the WEF development proposal and planned operation.	Meeting was carried out with relevant stakeholders to understand site operations. Information made available to reviewer including that contained in the final noise assessment report were reviewed along with publicly available information.	The final noise assessment report	Item closed
2	Inspection of the WEF project site and the surrounding environment.		N/A	A site inspection was not conducted by the Auditor, as a site inspection is considered more relevant during the Post-Construction Verification phase. No infrastructure has been constructed during the pre-construction stage. As such, there is generally nothing to observe onsite, and all the information and details the Auditor needs to consider for the verification were made available electronically. Item closed
3	Assessment of the rigour of the process used to identify surrounding noise sensitive locations.	Information made available were reviewed assisted with independent review of nominated sensitive receivers via aerial imagery and public information	Information in the final noise assessment report. Independent review of aerial imagery and publicly available information including: Aerial imagery	Based on the site photographs provided, independent review of aerial imagery and publicly available information and receivers presented in the report, the level of rigour is deemed adequate. Item closed

Item	Step	Review comment	Reference from Information Source	Final comments/ conclusions
			State Planning Map Viewer (VicPlan) including land zoning, parcel and property information	
4	Review of the pre-construction noise assessment considering the WEF development proposal and operations including: • turbine technical specifications and power ratings • tower locations • topography maps and aerial imagery, and • any other relevant factors.	Information made available were reviewed including layout, specification in the report. Locality, topography and site features were reviewed via aerial imagery and publicly available (State Geospatial Datasets)	The final noise assessment report: Section 2.1, 2.2 Section 2 – Figure 1 Section 2.4, 2.5 Appendix A Appendix D Independent review of aerial imagery and publicly available information including: Aerial imagery State Planning Map Viewer (VicPlan) including land zoning, parcel and property information Terrain data from VicPlan	Item closed This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright
5	Review of background noise assessments (where available).	Background noise monitoring was not undertaken as part of the Pre-construction assessment and is to be conducted before commencement of	The final noise assessment report.	Item closed

Item	Step	Review comment	Reference from Information Source	Final comments/ conclusions
		construction and to be included in the updated pre-construction noise assessment report		
6	Technical verification of the predictive noise assessment, including: • methodology applied to conduct the assessment • review manufacturer's or turbine technical reports on representative sound power and frequency spectrums produced by the turbines • noise monitoring equipment and parameters used • interrogated the rigor of the modelling selected parameters and processes • sound modelling programs and input data employed • relevance of a high amenity noise limits; and cumulative noise from other WEF considerations • appropriate and reasonable accounting for uncertainty within the assessment • compliance limits, including where there is a wind turbine noise agreement, specified in the noise assessment report, and	A review of assessment and predictive methodology, results and inputs were carried out in accordance with relevant standard and state provisions supported by Technical Support team.	The final noise assessment report: Section 3 Section 4 Section 5	Item closed

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Item	Step	Review comment	Reference from Information Source	Final comments/ conclusions
	• verification that the assessment was conducted in line with the relevant noise standard.			
7	Review of identified potential noise impacts and any operational plans to manage the impacts (e.g. select turbines operating in reduced power modes during certain wind conditions) that are proposed as part of the WEF permit application.	A review of assessment and predictive methodology, results and mitigation strategy were carried out in accordance with relevant standard and state provisions supported by Technical Support team.	The final noise assessment report: Section 5 Section 6 Section 7	Item closed
8	Require clarification on mapped noise sensitive locations – see section 3.3 for further details.	Review of identified noise sensitive locations and involved stakeholder were carried out. Confirmation from WEF operator as to the properties that hold a noise agreement and that the 45 dB LA90 limit is applicable is to be sought.	The final noise assessment report: Section 2 Section 4 Appendix B Appendix D	An appropriate recommendation has been included in Section 5.3 of this verification report to this effect. Item closed
9	Risk assessment, including a qualitative statement on the risk of non-compliance.			Refer to Section 5.2 of this verification report. Item closed

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ATTACHMENT 3

EPA Publication 1692.1 Pre-Construction Verification Checklist
(Appendix A)

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Table 3 EPA Publication 1692.1 Pre-Construction Verification Checklist (Appendix A)

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
2.4 Definitions	Measurement time: 10min accuracy 1% i.e. 6 secs	The final noise assessment report	Predictive assessment was carried out. Background noise monitoring was not carried out as part of this Pre-construction assessment. Therefore, no measurements were carried out relevant to the final noise assessment report.	N/A
	Noise Limit: not to be exceeded	The final noise assessment report	Provided in Report	YES
	Notional Boundary: A line 20m from any side of a noise sensitive location	N/A	N/A	N/A
	Post-installation sound level: A weighted L90 centile level	The final noise assessment report	Definition Provided/project not yet constructed	N/A
	Cut in speed typical: 4 m per sec. Shut down 25 m per sec	The final noise assessment report: Section 2.4	Predictive assessment adequately considered Sound Power Levels for a candidate wind turbine between 4 m/s to and including wind speeds of above 10 m/s.	YES
3.1	Metric for wind farm sound: A weighted L90 centile level i.e. dB L90 (10min)	The final noise assessment report	The final noise assessment report adequately adopted the applicable sound metrics for assessment of wind turbine noise.	YES
3.2	Determine location of 35 dB Contour	The final noise assessment report:	Appendix D of the final noise assessment report adequately nominates wind turbine noise	YES

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
		Appendix D	contours including the 35 dB, 40 dB and 45 dB LA90 lines. The report appropriately identifies the noise sensitive locations within the predicted 35 dB LA90 noise contours.	
	Determine wind farm noise limits This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	The final noise assessment report: Section 3.1 Section 4.1	The final noise assessment report adequately established relevant noise limits for wind turbine noise. Refer to Review Comments in Appendix A. The report has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative approach in the absence of background noise monitoring and assessment. The final noise assessment report has adopted appropriate wind turbine noise limit of LA90 45 dB for the involved stakeholder dwellings (landowners that have entered into agreement with the WEF).	YES
	Refine predictions at each noise sensitive location	The final noise assessment report	The final noise assessment report adequately presents predicted noise levels at each sensitive location. Predictions demonstrate that compliance with the noise limits can be achieved based on the preliminary assessment, layout and candidate turbine.	YES

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
4.1.1	Audibility This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	The final noise assessment report	Discussion of wind farm audibility is not provided in the final noise assessment report. NZS 6808:2010 does not outline any requirement to limit wind farm noise based on audibility acknowledging audibility is not a appropriate basis for setting noise limits. Audible wind turbine noise can still be at a level that is considered reasonable. Consideration of Special Audible Characteristics have been discussed adequately in the final noise assessment report. Refer to Comments in Appendix A.	YES
4.2	Reverse Sensitivity	N/A	Project is a new wind energy facility. Reverse Sensitivity (new sensitive receivers encroaching on the facility) is not applicable.	N/A-
	Nomination of a 40dB wind farm sound level contour and the 35dB contour.	The final noise assessment report: Appendix D	Appendix D of the final noise assessment report adequately nominates wind turbine noise contours including the 35 dB, 40 dB and 45 dB LA90 lines.	YES
5	Noise limits			
5.1.2	Upper limit at residential location of 40 dB L90	The final noise assessment report: Section 4.1	The final noise assessment report has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative	YES

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
			approach in the absence of background noise monitoring and assessment.	
5.1.4.	The use of a background +5dB limit means that the wind farm sound may be the dominant sound heard at a noise sensitive location for a significant proportion of the time when the wind farm is operating.	N/At	Background noise monitoring was not carried out as part of this Pre-construction assessment. The final noise assessment report has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative approach in the absence of background noise monitoring and assessment.	YES
5.2	Wind farm sounds (as L90 10 min) should not exceed background by more than 5 dB or a level of 40 dB LA90 10min, whichever is the greater at the notional boundary of any noise- sensitive location.			YES
5.3	Background is commonly less than 25dB when predicted to exceed by 10dB or more			N/A
	Higher degree of protection of amenity required	The final noise assessment report	Background noise monitoring was not carried out as part of this Pre-construction assessment. The final noise assessment report has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative approach in the absence of background noise monitoring and assessment. The final noise assessment report has adequately assessed the applicability of the HAA noise limit with respect to provisions of the VPP Clause 52.32.	N/A

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
5.3.2	Lowest stated level is 35dB or 5db above background if above 35db L90 10 min.	The final noise assessment report	Not considered a High Amenity Area.	N/A
5.6.1	Limits apply to cumulative levels of all wind farms.	N/A	No other nearby wind farm	N/A
5.6.2	Staging of a wind farm is not to affect pre-wind farm background readings.	N/A	In consideration of the number of turbines proposed, staging is not considered an issue.	N/A
5.6.3	Where a new wind farm will impact on the same noise sensitive locations as an existing wind farm, the assessment of background sound should exclude wind farm sound generated by all existing wind farms	N/A	No other nearby wind farm	N/A
5.6.4	If predicted wind farm sound levels for a new wind farm are at least 10dB below an existing wind farm, then the cumulative effect shall not be taken into account.	N/A	No other nearby wind farm	N/A
6	Predictions			
6.1.1	Predictions of sound levels from wind farms should be used to determine their environmental noise impact before installation takes place. This includes initial predictions to identify noise sensitive locations that, might be exposed to a wind farm sound level greater than 35dB LA90(10min) at 95% rated power, and then predictions to establish the likely wind farm sound levels at each of these locations.	The final noise assessment report.	Provided in report - The predicted noise levels at all sensitive receivers are below 40 dB LA90 at all noise-sensitive locations, with a maximum predicted wind turbine noise level of 37 dB at any location	YES

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
	No other noise sensitive locations at risk to be within the 35 dB LA90(10min) contour when considering uncertainty of the predictions.			
6.2	Obtain from manufacturer obtained in accord with IEC 61400-11. Requires SPL to be measured against a wind speed of 10m AGL converted to Hub Height	The final noise assessment report.	Yes, obtained and also provided to reviewer for the version to be used.	YES
7.1	Locations			
7.1.2	(a) Has the operator chosen to adopt a noise limit of 40 dB for all wind speeds? (b) Has the operator agreed to conduct on/off testing if required.	The final noise assessment report.	The final noise assessment report has elected to adopt a screening wind turbine noise limit of 40 dB LA90 for all noise sensitive locations and at all operation wind speeds as a conservative approach in the absence of background noise monitoring and assessment On/Off testing is not carried out and considered relevant for the Pre-Construction Assessment.	YES
7.1.3	Have noise sensitive locations been clearly identified?	The final noise assessment report: Section 2: Figure 1 Appendix B	The assessment appropriately considered noise sensitive locations including residential dwellings, natural areas as well as relevant involved stakeholders (landowners that have entered into agreement with the WEF). Coordinates of noise sensitive locations and Maps provided.	YES
7.1.4	Have background sound level measurements been appropriately established and representative of the noise sensitive locations: proximity and character.	N/A	Background noise monitoring was not carried out as part of this Pre-construction assessment.	N/A

NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
	When and where were they taken. Were predictions at 95% rated power made in deriving 35 dB LA90 (10 min.) contour background locations If there are no noise sensitive locations within the 35dB LA90(10min) predicted wind farm sound level contour, then background sound level measurements are not required.		This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	
7.1.5	If there are a group of noise-sensitive location, are the locations selected representative of the group in terms of proximity and character	The final noise assessment report.	Representative assessment locations for noise predictions have been adopted in the report for each relevant noise sensitive locations.	Yes
7.1.6	Selected on wind farm side of buildings. >3.5m from significant reflecting surfaces. Not near streams nor watercourses where possible (or substantiated if not)	The final noise assessment report	Measurements or background monitoring were not carried out as part of this Pre-construction Predictive assessment. Representative assessment locations for noise predictions have been adopted in the report for each relevant noise sensitive locations.	YES
7.2	Sound data			
7.2.1	Made during a representative range of wind speeds and durations from cut-in to rated power. For dual speed turbines, include cut-in wind speed for the higher generating capacity	The final noise assessment report	Predictive assessment adequately considered Sound Power Levels for a candidate wind turbine between 4 m/s to and including wind speeds of above 10 m/s. The adopted candidate wind turbine is considered representative of the expected turbines for the project based on the information provided.	YES

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
C7.2.1	The background and operational wind turbine sound levels should be determined at all integer hub height wind speeds representative of the typical site exposure, including between cut-in of the turbines and the rated power of the turbines.	The final noise assessment report	Background or operational wind turbine measurements are not carried out as part of this Pre-Construction Predictive Assessment. Predicted operational wind turbine noise levels have considered worst case emissions for operating and rated wind speeds.	YES
7.2.2	Sound measured in accordance with NZS6801:2010. Measurement time intervals of 10 minutes.	N/A	Predictive assessment was only carried out. Background noise monitoring was not carried out as part of this Pre-construction assessment.	YES
7.2.3	Instrument used shall meet requirements of Section 5 of NZS6801.	N/A	This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	YES
7.2.3	Microphone protected from extraneous wind sound by wind shield in accordance with NZS 6801.2010. SLM with low noise floor as necessary	N/A		YES
7.2.4	Extraneous sounds caused by events, including precipitation, insects, fauna and so on, should, as far as is practical for an unattended monitoring exercise, be identified and removed from the data set	N/A		YES
7.3	Wind data			
7.3.1	Concurrent measurements of wind speed and direction taken from a known height preferably the wind turbine hub.	N/A	Predictive assessment was only carried out.	N/A

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
7.3.2	If wind speeds are not taken from hub height... predictions may be used from wind shear relationships: at least two heights	N/A	Background noise monitoring was not carried out as part of this Pre-construction assessment.	N/A
7.3.3	Same location and height used for before and after installation where not impacted by turbines.	N/A		N/A
7.3.3	If a high amenity noise limit is applied the wind farm wind speed threshold should be determined at this same wind speed measurement position.	N/A		N/A
7.4	Background measurements			
7.4.1	Background SLM to be plotted against the hub-height wind speeds to obtain a scatter plot	N/A	\	N/A
7.4.1	Use separate scatter plots for different conditions including wind directions and times -of-day if there are markedly different groups in the scatter plot of all valid data	N/A		N/A
7.4.2	Find the regression curve that gives the best correlation coefficient between the sound level and wind speed for each scatter plot and use it to describe the average background sound level at different wind speeds.	N/A		N/A
7.4.2	It may be appropriate to use bin analysis procedure where the fitted regression curve may be influenced by a limited number of data points.	N/A		N/A
7.4.3	If there is a poor correlation between wind speed and sound level, further investigation of wind conditions	N/A		N/A

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
	should be undertaken e.g. wind flow modelling, local knowledge, site observations or local wind monitoring			
7.4.4	Where multiple regressions are indicated and several regression curves obtained, noise limits should be set on the basis of each regression curve derived. Where not practical, use the most stringent regression curve with lowest sound levels	N/A		N/A
7.6	Compliance assessment			
7.6.1	The 35dB wind farm sound level contour shall be predicted and measurements made at noise sensitive locations within this contour.	The final noise assessment report: Appendix D.	The predicted 35 dBA contour has been adequately established and presented in Appendix D of the final noise assessment report.	YES
7.6.2	Compare the best-fit regression lines of the background sound levels and the regression curves of the wind farm sound levels adjusted for any special audible characteristics (at the wind speed at which it is assessed) at each noise- sensitive location.	N/A	Not applicable to pre-construction assessment.	N/A
7.6.3	If background sound levels were not measured prior to installation, it may be necessary to obtain background sound level measurements for limited periods at critical wind speeds. These may be for a limited range of wind speeds and directions while the wind turbines are not operating, i.e. on/off testing to get a representative number of measurements	N/A	Background noise monitoring was not carried out as part of this Pre-construction assessment.	N/A

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
7.6.4	Establishing compliance at one point in time does not negate the need for further testing at a later date.	N/A	Not applicable to pre-construction assessment.	N/A
7.7	ON/OFF testing	N/A	Not applicable to pre-construction assessment.	N/A
8	Documentation			
8.1	Predictions: Any report of wind farm sound level predictions in accordance with this Standard shall refer to this 2010 Standard and provide the following: A map showing the topography (contour lines) in the vicinity of the wind farm, the position of the wind turbines, and noise-sensitive locations Noise sensitive locations for which wind farm sound levels are calculated Wind turbine sound power levels The make and model of the wind turbines The hub-height of the wind turbines Distance of noise sensitive locations from the wind turbines Calculation procedure used Meteorological conditions assumed Air absorption parameters used Ground attenuation parameters used Topography/screening assumed, and	The final noise assessment report: Figure 1 Figure 1 & Appendix B Table 1 & 2 (candidate turbine) Section 2.4 and Table 1 (candidate turbine) Section 2.4 Appendix B Section 5 Section 5 Section 5	Assessment adequately considered and presented the relevant parameters and inputs.	YES

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NZS6808:2010 Section/Clause	NZS 6808:2010 Requirement	Reference from Information Source	Assessment/ Observations / Conclusions	Compliance
	Predicted far-field wind farm sound levels.	Section 5 and Table 10 Section 5 Section 5 and Appendix B		
8.2	Background sound levels. Report of the background sound level measurements and compliance assessments to provide: Description of the sound monitoring equipment including ancillary equipment The location of sound monitoring positions Description of the anemometry equipment including the height AGL of the anemometer Position of wind speed measurements Time and duration of the monitoring period Averaging period for both sound and wind speed measurements Atmospheric conditions: the wind speed and direction at the wind farm position	TN/A	Background noise monitoring was not carried out as part of this Pre-construction assessment.	N/A

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ATTACHMENT 4

Pre-Construction Predictive Noise Assessment

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Resonate

Meering West Wind Farm

Pre-Construction Predictive Noise Assessment

M240298RP1 Revision D

Monday, 1 September 2025

Document Information

Project	Meering West Wind Farm
Client	Aurecon Australasia Pty Ltd
Report title	Pre-Construction Predictive Noise Assessment
Project Number	M240298

Revision Table

Report revision	Date	Description	Author	Reviewer
0	14 May 2025	Draft Issue	Tom Evans	Alec Kuoch
A	28 May 2025	Updated for layout and to address client comments	Tom Evans	Alec Kuoch
B	30 May 2025	Updated ancillary infrastructure layout	Tom Evans	Alec Kuoch
C	3 June 2025	Updated to address client comments	Tom Evans	Alec Kuoch
D	1 September 2025	Updated to address auditor comments	Tom Evans	Alec Kuoch

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The information, findings, and recommendations are based on the conditions and data available at the time of preparation. Any opinions or recommendations expressed are subject to the assumptions, limitations, and conditions as stated. Any reliance on external information has been accepted in good faith as being accurate and valid.

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Adjustment K ₂	The adjustment, K ₂ , is applied under NZS 6808:2010 to any 10-minute sample of wind turbine noise where there is a special audible characteristic present. The value of the adjustment ranges from 1 to 6 dB depending on the type and magnitude of the characteristic.
Aggravated noise	Noise defined by the EP Regulations to exceed the noise limits established under the Noise Protocol by more than 15 dB or to exceed a noise level of 75 dB during the day period, 70 dB during the evening period or 65 dB during the night period.
Ambient noise	The overall environmental noise level at a given location caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, insects, animals and the like. It is typically described by the L _{Aeq} metric.
Amplitude modulation	The modulation, change, of the loudness of wind turbine noise. Wind turbine noise is generally accepted to have a normal level of modulation (blade 'swish') but has been known to occasionally exhibit excessive amplitude modulation which may be described as a 'thumping' noise and could warrant a special audible characteristic penalty.
Background noise	The underlying noise level at a given location, measured in the absence of a noise source under investigation and other industry noise. The background noise is typically described using the L _{A90} metric to reduce the effect of short-term noise sources such as intermittent traffic, lawnmowers, insect, animals and the like.
BESS	Battery Energy Storage System
C-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing at high levels of noise. Because, unlike the A-weighting, the C-weighting does not apply large negative weightings to low frequency noise levels, it is commonly used for the assessment of low frequency noise.
Day period	Monday to Saturday (except public holidays), from 7 am to 6 pm as defined in the Environment Protection EP Regulations.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. People typically perceive a 10 dB increase in sound as a doubling of loudness.
Effective noise level	The level of noise emitted from the commercial, industrial or trade premises and adjusted if appropriate for duration, character and position as defined in Part I, Section B2 of the Noise Protocol.
EP Act	Environment Protection Act 2017
EP Regulations	The Victorian Environment Protection Regulations are subordinate legislation to the Environment Protection Act 2017. They give force to noise limits for commercial, industrial and trade premises.
EPA Victoria	Environment Protection Authority Victoria.
ERS	Environment Reference Standard
Evening period	Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm, as defined in the EP Regulations.

Frequency (Hz)	The number of times a sound pressure wave oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
GED	General Environmental Duty – As defined by Section 25(1) of the EP Act, the GED requires that any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.
Impulsiveness	Transient sound having a peak level of very short duration, typically less than 100 ms. Impulsive sounds are subjectively more annoying than steady sounds.
Involved stakeholder	A dwelling where the landowner has an agreement in place that modifies the applicable noise limit in accordance with Regulation 131B of the EP Regulations.
L _{A90}	A-weighted sound pressure level that is exceeded for 90% of the time interval considered. The L _{A90} metric is used to assess wind turbine noise in Victoria and also to quantify the background noise level in an environment.
L _{Aeq}	The equivalent continuous A-weighted sound pressure level. It is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A-weighted sound pressure level when determined over the same measurement time interval. The L _{Aeq} metric is used to quantify the Effective Noise Level from a commercial, industrial or trade premises.
L _{Ceq}	The equivalent continuous C-weighted sound pressure level.
L _{WA}	Sound Power Level - a measure of the acoustic output of a source, independent of distance and referenced to 10 ⁻¹² W.
Night period	Between 10 pm and 7 am of the following day as defined in the EP Regulations.
Noise Limit	The maximum allowable level of wind turbine noise as established in accordance with NZS 6808:2010. Also refers to the maximum effective noise level allowed in a noise sensitive area for a commercial or industrial premises, as determined in accordance with the Noise Protocol.
Noise Protocol	Environmental Protection Authority Publication 1826.4 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues.
Noise sensitive land use	Refers to a land use that may be sensitive to noise from a construction or operational source. The precise type of sensitive receivers can vary depending on the type of noise source and the legislation or guidelines that apply, but noise sensitive receivers generally include residential land uses (including aged care), educational land uses and hospitals.
NZS 6808:2010	New Zealand Standard NZS 6808:2010 <i>Acoustics – Wind farm noise</i> .
Special audible characteristics	Special Audible Characteristics are unusual characteristics of wind farm sound that make it more likely to cause adverse community response at lower sound levels. Special audible characteristics are defined by NZS 6808:2010 to include tonality, impulsiveness and amplitude modulation.
Tonal adjustment A _{tone}	When noise from a commercial or industrial premises assessed against the Noise Protocol is tonal in nature then an adjustment is applied of +2 dB for just detectable tonal character of the noise or +5 dB for prominent tonal character of the noise, as defined in Part I, Section B3 of the Noise Protocol. In cases where the adjustment is unclear, the objective method defined by the Noise Protocol should be used.

Tonality	A characteristic of a noise where there is a distinctly higher level over a relatively narrow frequency range. Examples include the reversing signal on a truck or the wheel squeal that sometimes occurs when trains move around a curve. A noise exhibiting tonality is subjectively more annoying than a non-tonal noise at the same level.
Unreasonable noise	Noise defined by the EP Regulations to exceed the established noise limits is prescribed to be unreasonable noise.
WTG	Wind Turbine Generator

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Executive summary

Meering West Wind Farm Pty Ltd (MWWF) is proposing development of the Meering West Wind Farm (the Project), a wind energy project to be located within the Murray Renewable Energy Zone at a site approximately 25 km south west of Kerang, Victoria. The Project is proposed to consist of up to 164 wind turbines. The wind energy component will be supported by ancillary infrastructure comprising of collector stations, transmission infrastructure and a Battery Energy Storage System (BESS) of approximately 1000 MWh.

Resonate has been engaged by Aurecon, on behalf of MWWF, to undertake an environmental noise assessment of the Project to address the requirements of the Department of Transport and Planning (DTP) *Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (DTP Guidelines) and *Environment Protection Regulations* (EP Regulations).

Wind turbine noise assessment

Based on the candidate wind turbine selection and proposed 164 wind turbine layout, operational wind turbine noise levels were predicted against the minimum applicable noise limit of 40 dB LA90 that applies under the DTP Guidelines, EP Regulations and New Zealand Standard (NZS) 6808:2010 *Acoustics – Wind farm noise*.

A total of nine noise-sensitive locations were identified within the predicted 35 dB LA90 noise contour with predicted wind turbine noise levels being 37 dB or below at all of these locations. As such, it is expected that the Project can comply with the applicable noise limits under NZS 6808:2010 subject to appropriate turbine selection during detailed design. Predicted wind turbine noise levels at involved stakeholder locations were also below 45 dB in all cases.

As required by the *Environment Reference Standard*, wind turbine noise emissions were also considered at identified natural areas as defined in the Gannawarra and Loddon Planning Schemes in the context of human tranquillity. While wind turbine noise is expected to be audible during periods of higher wind speeds, it is reasonable to expect that there would be wind blowing through vegetation in these natural areas as well at these times to create background noise. One campground was identified within the Leaghur State Park PCRZ, with predicted noise levels at the campground being 31 dB LA90 and 4 dB below the limit recommended for high amenity areas in NZS 6808:2010. No campgrounds were identified within other natural areas such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

Ancillary infrastructure noise assessment

The ancillary infrastructure noise assessment was based on a candidate BESS equipment model and layout, as well as typical transformer sound power levels for anticipated collector station equipment. Two ancillary infrastructure locations were assessed.

The assessment of ancillary infrastructure noise has concluded that the Project can comply with the applicable Noise Protocol noise limits for both locations, and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design. The predicted noise levels comply with the noise limits at the nearest involved stakeholder locations and are 14 dB or more below the applicable noise limits at the nearest non-involved noise-sensitive locations regardless of which location is adopted.

Due to the significant separation distances of over 3.5 km between the ancillary infrastructure sites under consideration and the identified natural areas, it is expected that the level of ancillary infrastructure noise at the identified natural areas would be significantly lower than the wind turbine noise emissions.

Summary and recommendations

This assessment has concluded that the Project has been designed, and can be constructed and operated, in such a way as to manage wind turbine and ancillary infrastructure noise emissions in accordance with applicable legislation, policies and guidelines subject to final equipment selection and detailed design.

The assessment is based on a candidate wind turbine model, ancillary infrastructure selection and layout that may be subject to further refinement post-approval. It is recommended that, prior to the commencement of construction of the Project and in addition to the obligations that exist for wind energy facilities under the EP Regulations:

- A Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.
- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection, wind turbine numbers and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.
- A Pre-Construction Noise Assessment also be prepared for the final ancillary infrastructure selection and design.

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1 Introduction

Meering West Wind Farm Pty Ltd (MWWF) is proposing development of the Meering West Wind Farm (the Project), a wind energy project to be located within the proposed Murray Renewable Energy Zone at a site approximately 25 km south west of Kerang, Victoria. The Project is proposed to consist of up to 164 wind turbines. The wind energy component will be supported by ancillary infrastructure comprising of collector stations, transmission infrastructure and a Battery Energy Storage System (BESS) of approximately 1000 MWh.

Resonate has been engaged by Aurecon, on behalf of MWWF, to undertake an environmental noise assessment of the Project to address the requirements of the Department of Transport and Planning (DTP) *Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (DTP Guidelines) and *Environment Protection Regulations* (EP Regulations).

This report sets out the environmental noise assessment. It:

- identifies applicable legislation, policies and guidelines relating to noise emissions from wind turbine noise and ancillary infrastructure
- establishes applicable noise limits
- presents predicted wind turbine noise and ancillary infrastructure noise at noise sensitive land uses
- assesses predicted noise against the applicable noise limits.

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2 Project description

2.1 Site description

The Project is located within the Loddon and Gannawarra local government areas (LGAs). The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne and around 110 km north of Bendigo and 25 kilometres south-west of Kerang.

The Project encompasses approximately 20,000 ha, with most of the area located within the Shire of Gannawarra with a smaller Project component located within the Shire of Loddon. The landscape is predominantly characterized by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping. The environment is largely flat to gently undulating.

The Project Area is surrounded by small rural localities including Quambatook to the west, Boort to the south-east, and Kerang to the north-east as the nearest regional and community centre for shopping, employment and business services.

The Project Area is predominantly characterised by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping

The proposed layout of the site is shown in Figure 1, with wind turbine coordinates included in Appendix A.

The ancillary infrastructure, consisting of collector stations and the BESS are also shown on Figure 1. Two options are under consideration for the ancillary infrastructure, both of which are assessed in this report.

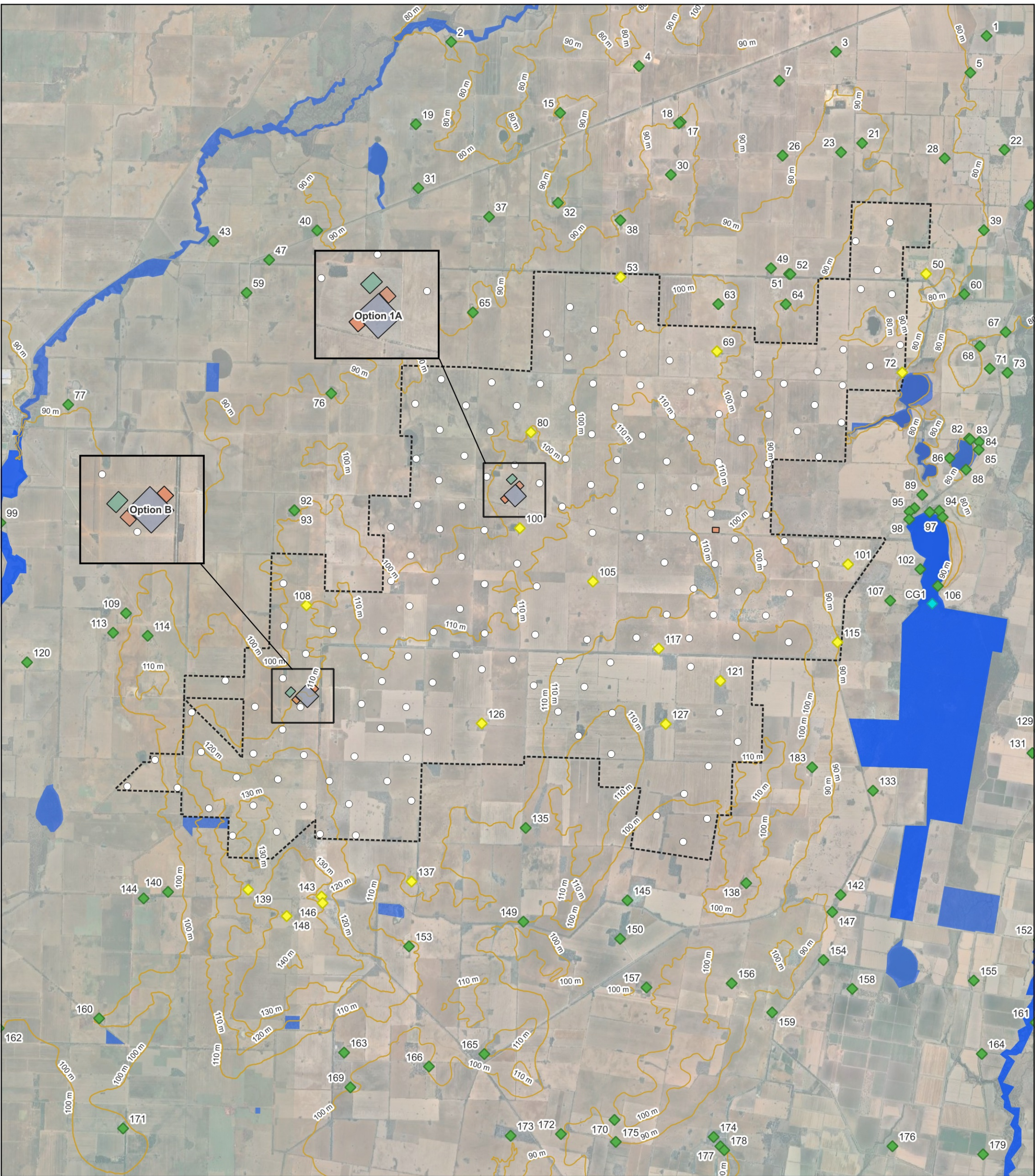
2.2 Noise-sensitive locations

MWWF has provided information on 157 identified noise-sensitive locations around the site that are within 10 km of a proposed WTG location as shown on Figure 1, with coordinates tabulated in Appendix B.

The noise-sensitive locations are located within a Farming Zone as defined by the Gannawarra and Loddon Planning Schemes. The township of Quambatook includes noise-sensitive locations within a Township Zone, but these noise-sensitive locations are over 8 km from the nearest Project turbine and are therefore well outside of the predicted 35 dB LA90 noise contour from the Project as documented in this report.

A total of 18 involved landowner houses, including two unoccupied houses, have also been identified within and around the site boundary as shown on Figure 1. It is understood there would be an agreement in place with the owners of each of these dwellings to allow higher wind turbine noise limits. The coordinates of these involved landowner houses are tabulated in Appendix B.

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MEERING WEST WIND FARM

Meering West, VIC

Figure 1: Project area and surrounding areas

Legend

- Project area
- WTG
- Ancillary Infrastructure
 - BESS (Indicative location)
 - Substation BESS (Indicative location)
 - Terminal station (Indicative location)
- Topographical contour
- Dwelling
 - Landowner
 - Noise-Sensitive Location
 - Campground
- ERS Natural Area
 - Natural Area (PCRZ)

0 2 4 6 km

Datum GDA20 MGA Zone 54

PROJECT NUMBER M240298
DRAWN BY TE
DATE June 2025
CLIENT Aurecon
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2.3 Natural areas

The *Environment Reference Standard* (ERS) (refer Section 3.1.2) requires consideration of the potential for noise and vibration to impact on human tranquility and enjoyment outdoors in natural areas. The ERS defines natural areas as:

National parks, state parks, state forests, nature conservation reserves, wildlife reserves and environmentally significant areas and landscapes outside metropolitan Melbourne that are identified in a planning scheme.

The largest natural area identified within the Gannawarra and Loddon Planning Schemes is the Leaghur State Park Public Conservation and Resource Zone (PCRZ), approximately 2 km m east of the nearest wind turbine (being WTG76). From a review of information regarding Leaghur State Park, a public campground is located on the southern end of Lake Meran and is considered relevant for the assessment of human tranquility. The site is shown on Figure 1 with coordinates included in Appendix B.

A number of other natural areas exist around the Project boundary as shown on Figure 1 including:

- Great Spectacle Lake and Little Spectacle Lake PCRZ adjacent to the eastern boundary
- Round Lake and Tobacco Lake PCRZ approximately 2 km from the eastern boundary
- Little Lake PCRZ approximately 3 km from the eastern boundary
- Quambatook I208 Bushland Reserve PCRZ adjacent to the southwest boundary
- Gredgwin Bushland Reserve PCRZ approximately 1.km south of the southern boundary.

No defined camping areas were identified within these areas, such that human occupancy is expected to be limited to transient daytime activities such as recreational hunting.

2.4 Wind turbine model

At this stage of the Project, the wind turbine model that will be used has not been confirmed and would be confirmed through a competitive tender process after the Project has received planning approval. Based on the information supplied by MWWF, it is understood that the planning permit application will seek approval for turbines with a height of up to 300 m above ground. Wind turbines will have a rotor diameter in the order of up to 200 m and a rated power capacity of 6 to 8 MW.

A candidate turbine has been selected for this assessment that is considered representative of the typical range of modern wind turbine sound power levels with a rated power capacity of between 6 and 8 MW. The candidate wind turbine is a Vestas V172-7.2MW. Sound power levels have been based on Vestas specification documents.¹

The overall sound power levels with hub height wind speed for the Vestas V172-7.2MW are summarised in Table 1, with this preliminary assessment based on the model with serrated trailing edges (STE)². STE are one example of noise reduction mechanisms available to wind farm operators and have been included in this assessment to demonstrate the typical effect of such mechanism.

¹ Sound power levels have been based on a V172-7.2MW WTG with serrated trailing edges as detailed in Vestas specification document 0180-4980 V01 *Sound Performance Specification EnVentus V172-7.2MW*. No uncertainty has been applied as, based on discussions with Vestas, it is understood that the sound power levels incorporate an uncertainty factor and align with warranted sound power levels.

² STEs can be attached to wind turbine blades to reduce trailing edge turbulence and, as a result, reduce sound power levels in the order of 2-3 dB.

Table 1 Wind turbine sound power levels with wind speed

Turbine	Sound power level in dB L _{WA} for hub height wind speed in m/s							
	3	4	5	6	7	8	9	≥ 10
V172-7.2MW with STE	97.6	97.6	97.7	99.5	102.2	105.0	107.1	107.8

As is normal for modern pitch-controlled wind turbines, the sound power levels for the Vestas V172-7.2MW wind turbine increase from the cut-in wind speed before levelling off at a wind speed close to the wind speed at which the turbines reach rated power. This noise assessment has been based on the maximum sound power level, with the assumed sound power level spectrum, and incorporating the 1 dB uncertainty factor based on the supplied specification, presented in Table 2.

Table 2 Wind turbine sound power level spectrum

Turbine	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
V172-7.2MW with STE	78.3	89.8	96.8	101.4	100.4	101	99.9	98.3	107.8

2.5 Ancillary infrastructure

The Project will include ancillary infrastructure including a BESS and electrical infrastructure at collector and terminal stations, with two options (Option 1A and Option B) under consideration as shown in Figure 1.

As with the wind turbines, selections for the ancillary infrastructure, including BESS, has not been made at this stage of the Project.

For the electrical infrastructure and the collector substation and terminal station, the preliminary design³ has two main transformers, assumed to have a rating of 500 MVA each, supported by associated smaller earthing transformers and switchgear. The transformer models have not been selected at this stage, so a sound power level aligned with the standard level specified in AS/NZS 60076.10:2009 *Power transformers – Determination of sound levels* has been adopted for the main 500 MVA transformers, with other associated equipment expected to be significantly quieter based on previous experience. The sound power level for the transformer is shown in Table 3 with a typical transformer noise spectrum based on previous Resonate measurements. It is noted that transformers with a lower MVA rating would have a lower permissible sound power level under AS/NZS 60076.10:2009.

Table 3 Octave band sound power levels for 500 MVA transformer

Transformer	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
Per 500 MVA transformer	78.1	82.9	90.9	98.4	100.8	93	90.2	83	103.7

³ GridLink BESS 220/33kV Collector Substation – General Arrangement Drawing MWWF-EP-DWG-GNA-05-011 dated 5 August 2024

For the BESS model, this assessment has been based on a candidate battery module being the Tesla Megapack 2 XL and the preliminary design for the BESS.⁴ Based on the Project's proposed BESS capacity, this assessment has been based on a total of 288 megapacks for the BESS site.

Tesla specified sound power levels for a 9-fan Megapack running at 60% and 40% fan capacity are shown in Table 4. It is noted that the sound power levels from the Tesla Megapacks incorporate noise from various sources including batteries, inverters and fans. The overall sound power levels are controlled by the fans and based on previous experience with Tesla systems it has been assumed that the BESS would operate at a worst case 60% during Day / Evening and 40% during Night.

Table 4 BESS sound power levels

BESS unit	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
Per Megapack at 60%	53.6	66.8	72.1	90.7	87.2	89.6	89.2	86.4	96.0
Per Megapack at 40%	53.8	67.0	72.3	82.7	81.8	83.9	83.6	80.6	89.8

It is noted that additional equipment would generally be installed at a BESS site including smaller capacity transformers that support the batteries. Based on prior experience, the sound power levels of these transformers are significantly lower than (more than 10 dB below) those of the battery units and the noise emissions from the BESS will be controlled by the Megapacks. As such, this noise assessment has been based on noise emissions from the Megapacks controlling the overall noise emissions from the BESS.

It is noted that the assumed sound power levels above are considered typical of the highest sound power levels that would be anticipated for ancillary infrastructure.

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⁴ GridLink Meering West 500MW BESS – BESS Overall General Arrangement Drawing MWWF-BS-DWG-GNA-01-001-(B) dated 26 September 2024

3 Legislation, policy and guidelines

3.1 Legislation and policy

3.1.1 EP Act

The *Environment Protection Act 2017* (EP Act) includes environmental obligations and protections for all Victorians and establishes Victoria's focus for environment protection and human health as a prevention-based approach. The cornerstone of the EP Act is the general environmental duty (GED), which states:

A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

In the context of the EP Act, 'reasonably practicable' measures mean putting in controls to eliminate the risk of harm to human health and the environment so far as reasonably practicable. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. A number of matters must be considered in deciding what is reasonably practicable in the circumstances:

- the likelihood of those risks eventuating
- the degree of harm that would result if those risks eventuated
- what the person concerned knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks
- the availability and suitability of ways to eliminate or reduce those risks
- the cost of eliminating or reducing those risks.

EPA Victoria Publication 1856: *Reasonably practicable* explains that, when dealing with a common risk or harm, it is possible to demonstrate that the risk has been reduced so far as reasonably practicable if well-established effective practices or controls have been adopted to eliminate or manage risk. Where well-established practices or controls do not exist, then it is necessary to show that effective controls have been assessed and adopted.

The EP Act also prohibits the emission of unreasonable noise and aggravated noise. The Act provides a definition for 'Unreasonable noise' in two parts. Section 3(1)(a) states that noise that is unreasonable having regard to the following:

- its volume, intensity or duration
- its character
- the time, place and other circumstances in which it is emitted
- how often it is emitted
- any prescribed factor.

Section 3(1)(b) states that noise is unreasonable noise if it is prescribed to be so. Under the EP Regulations, noise that exceeds noise limits established for wind turbine noise or ancillary infrastructure noise is prescribed to be unreasonable noise.

3.1.2 Environment Reference Standard

The *Environment Reference Standard* (ERS) exists under the Act and specifies reference standards that reflect the environmental values that the Victorian community wants to achieve and maintain. A reference standard is not a compliance standard which a duty holder, such as Proponent, must achieve, but is intended to inform planning decisions. A reference standard set in the ERS may be taken into account by any decision maker, where it is helpful, to assist with making an environment protection decision.

Part 3 of the ERS documents environmental values of the ambient sound environment and indicators and objectives for the ambient sound environment that are intended to support these values. Table 5 presents the environmental values of the ambient sound environment and Table 6 presents the supporting indicators and objectives.

Table 5 Environmental values of the ambient sound environment

Environmental value	Description of environmental value
Sleep during the night	An ambient sound environment that supports minimal sleep disruption at night
Domestic or recreational activities	An ambient sound environment that supports recreational and domestic activities in a residential setting
Normal conversation	An ambient sound environment that allows for a normal conversation indoors without the need to raise voices
Child learning and development	An ambient sound environment that supports cognitive development and learning in children
Human tranquillity and enjoyment outdoors in natural areas	An ambient sound environment that allows for the appreciation and enjoyment of the environment for its natural condition and the restorative benefits of tranquil soundscapes in natural areas
Musical entertainment	An ambient sound environment that recognises the community's demand for a wide range of musical entertainment

Table 6 Indicators and objectives of the ambient sound environment

Land use category	Indicator	Objective
Category 1: An urban form with distinctive features or characteristics of taller buildings, high commercial and residential intensity and high site coverage. For example, Industrial Zone 1, Industrial Zone 2, Port Zone, Road 1 Zone, Capital City Zone and Docklands Zone.	Outdoor $L_{Aeq,8h}$	55 dB
	Outdoor $L_{Aeq,16h}$	60 dB
Category 2: Medium rise building form with a strong urban or commercial character. For example, Industrial Zone 3, Commercial Zones, Activity Centre Zone, Mixed Use Zone and Road Zone 2.	Outdoor $L_{Aeq,8h}$	50 dB
	Outdoor $L_{Aeq,16h}$	55 dB
Category 3: Lower rise building form including lower density residential development and detached housing, typical or suburban residential settings or in towns of district or regional significance. For example, Residential Growth Zone, General Residential Zone, Neighbourhood Residential Zone, Urban Floodway Zone, Public Park and Recreation Zone and Urban Growth Zone.	Outdoor $L_{Aeq,8h}$	40 dB
	Outdoor $L_{Aeq,16h}$	50 dB
Category 4: Lower density or sparse populations with settlements that include smaller hamlets, villages and small towns that are generally unsuited for further expansion. Land uses include primary industry and farming. For example, Low Density Residential Zone, Township Zone, Rural Living Zone, Green Wedge A Zone, Rural Conservation Zone,	Outdoor $L_{Aeq,8h}$	35 dB
	Outdoor $L_{Aeq,16h}$	40 dB

Land use category	Indicator	Objective
Public Conservation and Resource Zone, Green Wedge Zone, Farming Zone and Rural Activity Zone.		
Category 5: Unique combinations of landscape, biodiversity and geodiversity. These natural areas typically provide undisturbed species habitat.	Qualitative	A sound quality that is conducive to human tranquillity and enjoyment having regard to the ambient natural soundscape.

The Project is considered to be located in a Category 4 area for the purposes of the ERS.

3.1.3 EP Regulations

The *Environment Protection Regulations* (EP Regulations) are subordinate legislation that support the Act. The EP Regulations establish requirements for the Project that are relevant to operational wind turbine noise and ancillary infrastructure noise, described under the EP Regulations as noise from commercial, industrial and trade premises.

Wind turbine noise

Division 5 of Part 5.3 of the EP Regulations sets out that the assessment of wind turbine noise in Victoria for any wind energy facility with an authorising document issued on or after 1 January 2011, or amended to do so, must be carried out in accordance with NZS 6808:2010. By achieving compliance with the NZS 6808:2010 noise limits, as well as the other relevant requirements of the EP Regulations, Regulation 131C advises that a wind farm operator is able to demonstrate compliance with the GED with respect to wind turbine noise emissions.

The requirement to comply with the NZS 6808:2010 noise limits does not apply at dwellings on the wind farm site (as these are excluded from the definition of noise sensitive location by NZS 6808:2010) nor at dwellings with which an appropriate agreement is in place between the landowner and wind farm operator under Regulation 131A, collectively referred to as involved landowner houses in this case. In the case of an involved landowner who has an agreement in place, the noise limit is increased to 45 dB LA90 or the background sound level plus 5 dB, whichever is the greater when assessed in accordance with NZS 6808:2010.

The EP Regulations also establish a number of requirements that are relevant to an operational, rather than proposed, wind energy facility, including:

- A requirement for a post-construction noise assessment to be conducted by a suitably qualified and experienced acoustician within 12 months of operations commencing.
- A requirement for a wind energy facility operator to prepare an implement a Noise Management Plan.
- A requirement for a wind energy facility operator to provide an annual statement to EPA Victoria detailing noise complaints, evidence that operating modes have been complied with, and details of maintenance activities and any noise remediation actions.
- A requirement for a wind energy facility operator to engage a suitably qualified and experienced acoustic consultant to undertake monitoring procedures every five years from the start of operation to ensure that the wind turbine noise complies with the noise limits or, if the assessment is conducted at an alternative monitoring location, the applicable alternative monitoring point criteria.

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Commercial, industrial and trade premises

Division 3 of Part 5.3 of the EP Regulations set out that the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with the Noise Protocol, both in terms of establishing noise limits as noise sensitive areas and in terms of the measurement of noise from the subject premises. With respect to the Project, these requirements apply to noise associated with ancillary infrastructure including the on-site collector stations and BESS, as well as noise generated by the concrete batching plants during the construction phase.

Noise sensitive areas for ancillary infrastructure are defined in the EP Regulations as:

- The area within 10m of the external walls of dwellings (including residential care facilities but excluding caretaker's houses), residential buildings and noise sensitive residential uses.
- The area within 10m outside the external walls of any dormitories, wards, bedrooms and living rooms of caretaker's houses, hospitals, hotels, motels, residential hotels specialist disability accommodation, corrective institutions, tourist establishments, retirement villages and residential villages.
- The area within 10m outside the external walls of classrooms or other rooms in which learning occurs at childcare centres, kindergartens, primary schools and secondary schools.
- Within the boundary of tourist establishments, campgrounds and caravan parks that are located in rural areas.

Note that, in this report, the term noise sensitive receiver has been used to describe the above uses and, where considering noise that is subject to the EP Regulations is consistent with the term noise sensitive area.

The EP Regulations also define Day, Evening and Night time periods for the assessment of noise, reproduced in Table 7.

Table 7 Time periods for operational noise assessment

Time period	Details
Day	Weekdays and Saturdays, 7 am to 6 pm
Evening	Weekdays and Saturdays, 6 pm to 10 pm Sundays and public holidays, 7 am to 10 pm
Night	10 pm to 7 am any day

Under the EP Regulations, noise that exceeds the noise limits is prescribed to be unreasonable noise. While the EP Regulations state that noise limits must be established in accordance with the Noise Protocol, Regulation 118(2) sets base noise limits that are the lowest decibel value that may be set as a noise limit for urban and rural areas across different times of day. Regulation 118(3) also states that the night period noise limit must not exceed 55 dB LAeq,30min.

The EP Regulations also define frequency spectrum as a prescribed factor for the purposes of establishing unreasonable noise under Section 3(1)(a) of the Act. EPA Victoria Publication 1996 provides detailed guidance on the assessment of low frequency noise for the purposes of establishing whether unreasonable noise is being produced. EPA Victoria Publication 1996 is discussed further in Section 3.2.6.

3.1.4 Gannawarra and Loddon Planning Schemes

The Victoria Planning Provisions set out standard provisions that form the framework of the Gannawarra and Loddon Planning Schemes that the Project must address, including provisions that relate to noise management.

Clause 13.05-1S Noise Management has an objective to assist the management of noise effects on sensitive land uses and sets out the following strategy:

Ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions.

Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area.

Clause 13.05-1S identifies the EP Act, the EP Regulations, Noise Protocol and the ERS as relevant considerations in meeting the objective.

Clause 13.07-1S Land Use Compatibility also sets out an objective that has relevance to noise emissions, with an objective to protect community amenity, human health and safety while facilitating appropriate commercial, industrial, infrastructure or other uses with potential adverse off-site impacts. Clause 13.07-1S does not identify policies or guidelines that are relevant to noise emissions, but it is expected that the objective would be able to be addressed through consideration of the EP Act, the EP Regulations, Noise Protocol and the ERS as for Clause 13.05-1S.

Clause 52.32 of the Gannawarra and Loddon Planning Schemes address wind energy facilities such as the Project. In particular, Clause 52.32-6 states that the responsible authority should consider the following decision guidelines:

- DTP Guidelines
- NZS 6808:2010.

3.2 Guidelines and standards

3.2.1 DTP Guidelines

The DTP Guidelines are the relevant planning guidelines for wind farms in Victoria and state that, with respect to operational noise:

A wind energy facility must comply with the noise limits in the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (the Standard).

This requirement is equivalent to that imposed by the EP Regulations.

The DTP Guidelines require that any planning permit application for a wind energy facility be accompanied by a pre-construction (predictive) noise assessment report prepared by a suitably qualified and experienced acoustician that:

- Reports on a pre-construction (predictive) noise assessment conducted following NZS 6808:2010.
- Provides an assessment of whether the proposed facility will comply with the noise limits.
- Where the proposed facility will be the subject of a wind turbine noise agreement under the EP Regulations, specifies the premises of the landowner (including any particular buildings) to which the agreement relates and provides an assessment of whether the proposed wind energy facility will comply with the modified noise limit for that facility specified in the agreement.
- Is prepared on the basis that the relevant noise standard will be NZS 6808:2010 and includes an assessment of whether a high amenity noise limit is applicable under Section 5.3 of NZS 6808:2010.

With respect to involved landowner houses, the DTP Guidelines recommend a base noise target of 45 dB LA90, consistent with the requirements of the EP Regulations.

3.2.2 NZS 6808:2010

NZS 6808:2010 defines acceptable limits for wind farm noise at noise-sensitive locations as:

- For most locations:
 - a base noise limit of 40 dB L_{A90} or
 - the background noise level plus 5 dB
 whichever is the greater for the given hub height wind speed.
- For locations in High Amenity areas and for wind conditions when low background sound levels are common at a noise sensitive location:
 - a base noise limit of 35 dB L_{A90} or
 - the background noise level plus 5 dB
 whichever is the greater for the given hub height wind speed. For locations in High Amenity areas at higher wind speed conditions, the same noise limits apply as for all other locations (i.e. base limit of 40 dB L_{A90}).

NZS 6808:2010 also prescribes measurement procedures for background noise and operational wind turbine noise.

3.2.3 EPA Victoria Publication 2061

EPA Victoria Publication 2061 provides guidance on the application of the wind turbine noise provisions of the EP Regulations, including NZS 6808:2010, in Victoria.

Key aspects of EPA Victoria Publication 2061 that are applicable to this assessment are:

- The noise limits established under the EP Regulations and NZS 6808:2010 do not apply during construction or commissioning of a wind energy facility.
- High amenity noise limits:
 - should apply to a dwelling located in the following zones predominantly intended for residential development: Low Density Residential Zone (LDRZ), Township Zone (TZ), Rural Living Zone (RLZ), Green Wedge A Zone (GWAZ) and Rural Conservation Zone (RCZ)
 - should not apply to the Farming Zone (FZ)
 - should not be applied in any location where background sound levels are already affected by other specific sources such as road traffic noise
 - only applies for wind energy facility hub height wind speeds up to and including 6 m/s
 - is applicable only when there is no agreement made in accordance with Regulation 131A, i.e. is not applicable to involved stakeholder dwellings.
- The noise limits at a noise sensitive receiver are applicable to the cumulative sound level of all wind energy facilities affecting that receiver.

3.2.4 EPA Victoria Publication 3011

EPA Victoria Publication 3011 was released in December 2024 and provides guidance on the measurement of background and operational wind turbine noise, prediction of wind turbine noise and preparations of pre-construction (predictive) noise assessment reports. The guidance supplements that provided in EPA Victoria Publication 2061.

EPA Victoria Publication 3011 also provides guidance on the application of noise limits. It notes that, although no formal noise limits apply to dwellings on the wind farm site, EPA Victoria considers it good practice to set limits consistent with the limits specified under the EP Regulations for dwellings with an individual agreement, being a base limit of 45 dB L_{A90} .

3.2.5 Noise Protocol

EPA Victoria has prepared the Noise Protocol to specify methodologies for establishing noise limits for operational noise sources and for assessing noise levels against the noise limits. Compliance with the noise limits defined by the Noise Protocol is required by the EP Regulations and is expected to assist with meeting the GED during the operational phase of the Project.

The Noise Protocol is relevant to this assessment as it provides a method for the measurement of background noise, and details how noise limits for operational noise from ancillary infrastructure are to be established based on existing land zoning and background noise levels. The Noise Protocol is not applicable to the majority of construction noise and not applicable to noise associated with decommissioning. It is, however, applicable to noise associated with concrete batching plants during construction as these represent sources that may operate at a single location for an extended period of time that are deemed sufficiently similar to commercial or industrial premises.

The Noise Protocol defines different procedures for establishing noise limits depending on whether the noise sensitive receiver is located within a major urban area or rural areas. Major urban areas are defined as those locations within Melbourne's urban growth boundary or within defined areas around major regional centres. The Project and surrounding areas are located outside of the defined major urban areas and therefore the rural area methodologies require consideration.

For rural areas, the Noise Protocol primarily defines noise limits dependent on the following:

- Time of day. The same time periods are applied as for urban areas (Table 7).
- Land zoning of both the noise source and noise sensitive receiver used to determine the Zone Level.
- A distance adjustment applied to the Zone Level where a noise sensitive receiver is in a different zone to a noise source.
- Type of noise source. Specific limits are set for certain noise sources, such as utilities and earth resources.

The determination of the noise limits throughout the noise and vibration study area will vary depending on the factors above. For the Project, the noise limits for ancillary infrastructure must be established in accordance with Section 2.6 of the Noise Protocol, which applies to utilities in rural areas. For concrete batching plants, noise limits have been established using the method for commercial, industrial and trade premises.

Background noise levels may be taken into account in establishing noise limits in rural areas where the noise sensitive receiver is located within a 'background relevant area.' Background relevant areas are those rural areas where background levels may be higher than usual and include areas where road traffic is a significant audible source. This is not considered to be relevant to the Project, which is in an area removed from significant sources of background noise.

3.2.6 EPA Victoria Publication 1996

EPA Victoria Publication 1996 provides guidance on the assessment of low frequency noise from commercial, industrial and trade premises. As frequency spectrum is a separate prescribed factor under the Act, operational sources with the potential to produce a higher relative level of low frequency noise should be separately assessed against this guidance in addition to the noise limits applicable under the EP Regulations.

EPA Victoria Publication 1996 specifically excludes the assessment of wind turbine noise, noting that wind turbine noise is assessed against NZS 6808:2010 which states that it gives due consideration to low frequency noise from wind turbine noise.

EPA Victoria Publication 1996 defines low frequency noise as that occurring between the frequency range of 10 Hz and 160 Hz. It provides noise thresholds, in one-third octave bands, with levels above the threshold indicating a

potential risk of problematic low frequency noise that would require further consideration, investigation and potentially mitigation.

Table 8 presents the low frequency noise thresholds for predictions and measurements conducted outdoors. The outdoor threshold levels are based on indoor thresholds with an assumed façade noise reduction, as specified by EPA Victoria Publication 1996. For the purposes of this assessment, the outdoor thresholds have been adopted. Should a risk of exceedance be identified, then measures to mitigate the risk so far as reasonably practicable should be implemented prior to any further investigation against the indoor thresholds.

Table 8 Outdoor low frequency noise thresholds

Outdoor noise level in dB L _{eq} at one-third octave band centre frequency in Hz												
10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
92	89	86	77	69	61	54	50	50	48	48	46	44

EPA Victoria Publication 1996 notes that predictions of low frequency noise from proposed premises can be problematic and of low accuracy due to uncertainty around the source levels and limitations on some prediction methods in the low frequency range. Therefore, calculations should only be used as a screening tool to assess the risk, and uncertainty appropriately considered as part of the assessment.

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4 Noise limits

4.1 Wind turbine noise

4.1.1 Noise-sensitive locations

As the noise predictions conducted for the Project, and as presented within this report, demonstrate that predicted wind turbine noise levels at noise-sensitive locations are no higher than 40 dB LA90, no background noise monitoring has been conducted at this stage of the Project. Accordingly, the minimum applicable wind turbine noise limit of 40 dB LA90 has been adopted at all operating wind speeds for this assessment as a conservative approach.

Section 7.4 of EPA Victoria Publication 3011 provides the following guidance with respect to the need for background noise monitoring at this stage of a wind energy facility:

The background sound levels, and operational wind turbine noise are required to be measured to confirm compliance with the noise limits.

Full sound level measurements are not required if, in accordance with section 7.1.2 of NZS 6808:2010, the WEF developer elects to adopt a WEF noise limit of 40 dBLA90(10 min) at all operating wind speeds and conducts on/off compliance tests (except if SACs are detected).

Background sound level measurements adopted for the post-construction compliance analysis should be from within approximately 5 years of the post-construction measurements. Where necessary, additional pre-construction background sound level measurements should be undertaken to provide contemporary background sound level measurements prior to construction of the WEF. It is not expected that new background sound level measurements would be required for preparation of the annual statement (Reg.131F) or Wind turbine noise monitoring undertaken under regulation Reg.131G.

Consistent with the above and the conservative approach adopted in this assessment by adopting the minimum applicable noise limit of 40 dB LA90, it is expected that, should the Project be approved, the wind farm operator would either:

- Commission background noise monitoring as per NZS 6808:2010 to establish background noise levels and, if justified by the background noise monitoring, noise limits that are higher than 40 dB LA90. This would typically be done as part of an updated pre-construction noise assessment that considers the final selected wind turbine model and layout, and would typically occur within five years of the planned timeframe for post-construction measurements as per the recommendations of EPA Victoria Publication 3011.
- Elect to undertake on/off testing as per NZS 6808:2010 to confirm compliance with the applicable noise limits.

4.1.2 High amenity noise limit

As per the requirements of the DTP Guidelines and NZS 6808:2010, consideration must be given as to whether there are high amenity areas (as defined by NZS 6808:2010) relevant to the Project.

With respect to high amenity areas, the definition of high amenity areas is relevant to the New Zealand planning system and not directly translatable to Victorian planning schemes. However, the approach of the Victorian Civil and Administrative Tribunal (VCAT) in their determination on the Cherry Tree Wind Farm was that areas allocated for farming use would not be considered to be High Amenity. The DTP Guidelines reference the Cherry Tree Wind Farm decision with respect to High Amenity areas.

Further Victorian guidance was provided by the Planning Panel for the Golden Plains Wind Farm, where it was deemed that noise-sensitive land uses located in a TZ and LDRZ should be deemed high amenity, but that those noise-sensitive land uses in FZ were not high amenity areas for the purposes of NZS 6808:2010.

The above VCAT and Planning Panel conclusions have since been supplemented by EPA Victoria Guidelines 2061 and 3011, which state that high amenity noise limits:

- Should apply to any non-involved dwellings in LDRZ, TZ, RLZ, GWAZ and RCZ.
- Should not apply to any dwellings in a FZ.

The Gannawarra and Loddon Planning Schemes define the area in which the Project and nearest noise-sensitive locations are located as a FZ. Therefore, the high amenity noise limit is not applicable to the nearest noise-sensitive locations. There are no zones that would be considered to be high amenity in accordance with the definition of EPA Victoria Guidelines 2061 within 5 km of the Project boundary.

Under the ERS, which sets an environmental value of human tranquillity and enjoyment outdoors in natural areas, it is possible that consideration could be given to the public campground in Leaghur State Park as a high amenity area. However, the campground is outside of the predicted 35 dB L_{A90} noise contour from the Project and, therefore, is not required to be considered for the application of high amenity as per C5.3.1(a) of NZS 6808:2010. It is noted that, with predicted noise levels below 35 dB L_{A90} at the maximum wind turbine sound power level, compliance would be predicted with the high amenity limit (which would only apply up to a wind speed of 6 m/s) regardless.

4.1.3 Involved stakeholder dwellings

The 17 identified involved stakeholder dwellings are located within the Project site boundary. NZS 6808:2010 excludes dwellings on a wind farm site from the definition of noise-sensitive location and, therefore, no noise limits are applied under NZS 6808:2010.

For the purposes of this assessment, predicted noise levels at these dwellings have been presented and compared against the 45 dB noise target recommended by the DTP Guidelines.

4.2 Ancillary infrastructure

The ancillary infrastructure sites are all located in a Farming Zone under the relevant planning scheme, as are the nearest noise-sensitive locations to each site. Therefore, the applicable noise limits, as defined for utilities where the noise source and receiver in a Farming Zone by the Noise Protocol, are as set out in Table 9.

Table 9 Noise limits for ancillary infrastructure

Phase	Description	Noise limit, dB $L_{Aeq,30min}$
Day	Weekdays and Saturdays, 7 am to 6 pm	45
Evening	Weekdays and Saturdays, 6 pm to 10 pm Sundays and public holidays, 7 am to 10 pm	39
Night	10 pm to 7 am any day	34

It is noted that, unlike for wind turbine noise, there is no exemption for ancillary infrastructure noise limits under the EP Regulations. Therefore, these noise limits should be complied with at both noise-sensitive locations and involved stakeholder locations.

5 Wind turbine noise assessment

5.1 Noise prediction methodology

To predict wind turbine noise levels from the Project, an environmental noise model has been developed in SoundPlan version 9.1 environmental noise prediction software. The noise model implements the ISO 9613-2:2024⁵ prediction algorithm.

In accordance with standard prediction procedures for wind farm noise as set out in ISO 9613-2:2024, predictions have been undertaken on the basis of the following parameters consistent with the recommendations of EPA Victoria Publication 3011:

- topography, as sourced from the DTP Spatial Datamart on 21 March 2025
- ground absorption factor of 50% representing mixed reflective and absorptive ground
- Project wind turbine locations as per the coordinates detailed in Appendix A received 26 May 2025
- noise-sensitive locations as per the coordinates detailed in Appendix B
- 190 m hub height Project turbines with a rotor diameter of 172 m and sound power levels as per Table 2
- sensitive receivers at 4 m above ground as per the recommendations of ISO 9613-2:2024
- a +3 dB correction applied to the predicted noise levels from any wind turbine where concave topography is predicted between it and the receiver location as defined by the UK Institute of Acoustics *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (Good Practice Guide)
- temperature of 10°C and relative humidity of 70%
- sound propagating downwind, meteorological correction $C_{met} = 0$
- topographical shielding limited to 2 dB, assessed based on the wind turbine tip height.

With respect to the assumed hub height and rotor diameter of the turbines, it is noted that the hub height is understood to be typical of the highest hub height that would likely be considered for the Project, and the rotor diameter has been selected based on the candidate turbine. A sensitivity analysis was conducted to consider combinations of hub height and rotor diameter that combined to a tip height of 300 m (the maximum being considered), but it was found that there was no increase in predicted wind turbine noise level relative to the assumed hub height and rotor diameter in this assessment.

The air absorption values from ISO 9613-2:2024 have been adopted for the purposes of predicting noise levels from the Project. Air absorption is dependent on the assumed temperature and humidity and therefore the relevant air absorption values for this assessment are shown in Table 10.

Table 10 Air absorption attenuation coefficients

Conditions	Atmospheric attenuation in dB/km for octave band centre frequency in Hz							
	63	125	250	500	1000	2000	4000	8000
Temperature 10°C Rel humidity 70%	0.1	0.4	1.0	1.9	3.7	9.7	32.8	117

⁵ International Standard 9613-2:2024 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors*

The noise prediction methodology adopted is expected to result in wind turbine noise predictions that are approximately 1.5 to 2 dB higher than would be measured when applying the wind turbine noise measurement methodology specified by NZS 6808:2010. This is because:

- A previous Australian study⁶ conducted by Resonate staff has shown that wind turbine noise predictions using a receiver height of 1.5 m above ground accurately predict downwind noise levels for Australian sites with relatively flat topography when using the wind turbine noise measurement methods applied in Australia that use the L_{A90} metric as per NZS 6808:2010.
- Increasing the receiver height to 4 m as recommended by ISO 9613-2:2024 increases the predicted noise levels by approximately 1.5 dB in comparison to predictions using a receiver height of 1.5 m.
- The receiver height of 4 m is understood to be based on the recommendations of the Good Practice Guide. However, the Good Practice Guide also recommends that 2 dB be subtracted from predicted noise levels to adjust predicted L_{Aeq} noise levels to the assessed L_{A90} noise levels. This correction has conservatively not been adopted for this assessment.

A detailed discussion of uncertainty with respect to the adopted noise prediction methodology is provided in Appendix C.

5.2 Predicted noise levels at noise-sensitive locations

Predicted Project wind turbine noise levels for each noise-sensitive location are presented in Appendix B. A noise contour map showing the wind turbine noise predictions is included in Appendix D.

NZS 6808:2010 requires that consideration be given to sensitive receivers within the 35 dB L_{A90} noise contour. Based on the wind turbine noise predictions from the Project, a total of nine noise-sensitive locations were identified within the 35 dB L_{A90} predicted noise contour for the Vestas V172-7.2MW turbine. The predicted noise levels at these locations are shown in Table 11.

Table 11 Predicted wind turbine noise levels at noise-sensitive locations within 35 dB L_{A90} noise contour

Noise-sensitive location	Distance to nearest wind turbine, m	Predicted Project noise level, dB L_{A90}	Minimum noise limit, dB L_{A90}
49	2485	35	40
51	2076	36	40
52	2042	36	40
62	2083	37	40
63	2083	37	40
64	2048	37	40
65	1982	36	40
92	2070	35	40
93	2065	35	40

⁶ Evans T & Cooper J, 2012, *Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms*, Acoustics Australia, vol. 40, no. 1, pp 28-36.

The predicted noise levels at all sensitive receivers are below 40 dB L_{A90} at all noise-sensitive locations, with a maximum predicted wind turbine noise level of 37 dB at any location.

It is noted that these predictions are based on candidate wind turbine selections that are considered to be representative of the current range of turbines, and this is reflected in the range of predicted wind farm noise levels. As the Project develops post-approval and the wind turbine type and layout is confirmed, an updated Pre-Construction Noise Assessment should be prepared to confirm how the selected wind turbine type and layout will achieve compliance with the applicable noise limits.

5.3 Predicted noise levels at natural areas

The natural areas identified in Section 2.3 are shown on the wind turbine noise contour maps included in Appendix D, with Figure D2 showing predicted noise contour maps with the identified natural areas. Table 12 provides a discussion of the predicted wind turbine noise levels at each of the natural areas.

Table 12 Predicted wind turbine noise levels at natural areas

Area	Discussion
Leaghur State Park PCRZ including campground CG1	Predicted wind turbine noise levels are typically 30 dB L_{A90} or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. For the campground area CG1 at the south end of Lake Meran, where people may congregate for the longest period of time, the predicted noise levels are 31 dB L_{A90} at the maximum wind turbine sound power level. This is 9 dB lower than the equivalent limit that applies to residential land uses. Additionally, even if the campground were to be considered a potential high amenity area under NZS 6808:2010, the predicted noise levels even at maximum wind turbine sound power output are 4 dB below the high amenity limit of 35 dB.
Great Spectacle Lake and Little Spectacle Lake PCRZ	The majority of the PCRZ sits outside of the predicted 40 dB L_{A90} noise contour, with a small area to the west extending to the 45 dB L_{A90} noise contour. This level of noise is expected to be audible within the PCRZ, however would be limited to times of higher wind speeds, when it is reasonable to expect that there would be wind blowing through vegetation in the reserve as well to create background noise. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Round Lake and Tobacco Lake PCRZ	Predicted wind turbine noise levels at 35 dB L_{A90} or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

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Area	Discussion
Little Lake PCRZ	Predicted wind turbine noise levels at 33 dB L_{A90} or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Quambatook I208 Bushland Reserve PCRZ	The PCRZ sits between the predicted 40 dB L_{A90} noise contour at its western end and extend towards the 50 dB L_{A90} noise contour at its eastern end where it is within 400 m of the nearest Project wind turbines. This level of noise is expected to be audible within the PCRZ, however would be limited to times of higher wind speeds, when it is reasonable to expect that there would be wind blowing through vegetation in the reserve as well to create background noise. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Gredgwin Bushland Reserve PCRZ	Predicted wind turbine noise levels at 35 dB L_{A90} or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

5.4 Predicted noise levels at involved stakeholders

Predicted Project wind turbine noise levels for each involved stakeholder location are presented in Table 13. A noise contour map showing the wind turbine noise predictions is included in Appendix D.

Table 13 Predicted wind turbine noise levels at involved stakeholders

Involved stakeholder	Distance to nearest wind turbine, m	Predicted Project noise level, dB L _{A90}	DTP Guidelines recommended target noise level, dB L _{A90}
50	1113	38	45
53	1518	38	45
69	1316	41	45
80	838	44	45
100	993	44	45
101 ¹	671	42	45
105	1364	41	45
108	857	43	45
115	1367	37	45
117 ¹	693	44	45
121	883	42	45

Involved stakeholder	Distance to nearest wind turbine, m	Predicted Project noise level, dB LA90	DTP Guidelines recommended target noise level, dB LA90
126	1515	40	45
127	1527	40	45
137	1573	35	45
139	1573	36	45
143	1750	36	45
146	1931	35	45

(1) It is understood that this house is currently unlivable but has been assessed regardless.

The predicted noise levels at all involved stakeholders are below the 45 dB LA90 noise target recommended by the DTP Guidelines. It is noted that a number of these involved stakeholder locations are within the Project boundary such that they are not considered as noise-sensitive locations by NZS 6808:2010, however predicted noise levels remain below 45 dB regardless.

5.5 Special audible characteristics

NZS 6808:2010 advises that, if wind turbine noise levels exhibit special audible characteristics such as tonality, impulsiveness and amplitude modulation, then a penalty should be applied to the noise level. Consistent with the recommended approach of EPA Victoria Publication 3011, the predictions shown in this assessment are based on the wind turbine noise levels at residences containing no characteristics that would attract a penalty in accordance with NZS 6808:2010.

Special audible characteristics are not possible to assess in detail at this preliminary stage as information is generally not available from turbine manufacturers. In the relatively unusual event that special audible characteristics are detectable at residences, the occurrence will also involve a complex relationship between the wind turbine noise and the background noise environment that is best assessed through measurements.

Special audible characteristics from wind farms at residences are, in our experience, a relatively uncommon occurrence in Australia and, where they have occurred, they have generally occurred infrequently and under specific conditions. As such, it is considered reasonable to assume that they will not occur for the purposes of this preliminary noise assessment.

Should the Project be approved, special audible characteristics would need to be considered during any post-construction compliance monitoring for the Project, as is required by NZS 6808:2010. In the event that special audible characteristics are detected, the site will need to achieve compliance with the noise limits including the appropriate penalty for the detected characteristics when assessed in accordance with NZS 6808:2010.

5.6 Summary and recommendations

The assessment of wind turbine noise has concluded that the Project can comply with the minimum applicable noise limit of 40 dB LA90 at the nearest noise-sensitive locations.

The assessment is based on a candidate wind turbine model and layout that may be subject to further refinement post-approval. In accordance with EPA Victoria Publication 3011 it is recommended that prior to the commencement of construction of the Project:

- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB L_{A90} noise contour consistent with NZS 6808:2010.

In addition to the above, it is noted that compliance with the EP Regulations will also necessitate:

- A post-construction noise assessment to be conducted for the Project by a suitably qualified and experienced acoustician within 12 months of operations commencing.
- MWWF to prepare and implement a Noise Management Plan prior to the commencement of operation.
- MWWF to provide annual statements to EPA Victoria once the Project commences operation detailing noise complaints, evidence that operating modes have been complied with, and details of maintenance activities and any noise remediation actions.
- MWWF to engage a suitably qualified and experienced acoustic consultant to undertake monitoring procedures every five years from the start of operation to ensure that the wind turbine noise complies with the noise limits or, if the assessment is conducted at an alternative monitoring location, the applicable alternative monitoring point criteria.

As per Regulation 131C of the EP Regulations, compliance with the NZS 6808:2010 noise limits and the above items would demonstrate compliance with the GED with respect to wind turbine noise emissions.

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6 Ancillary infrastructure noise assessment

6.1 Noise prediction methodology

To predict wind turbine noise levels from the Project, an environmental noise model has been developed in SoundPlan version 9.1 environmental noise prediction software. The noise model implements the ISO 9613-2:2024 prediction algorithm.

In accordance with standard prediction procedures for wind farm noise as set out in ISO 9613-2:2024, predictions have been undertaken on the basis of the following parameters:

- topography, as sourced from the DTP Spatial Datamart on 21 March 2025
- ground absorption factor of 0% around the BESS and substation site representing reflective ground such as paving or concrete
- ground absorption factor of 70% representing 70% absorptive and 30% reflective ground, considered typical of rural grassland and farming areas in Victoria
- ancillary infrastructure sites as shown on Figure 1, with both Option 1A and Option 2 assessed
- noise-sensitive locations as per the coordinates detailed in Appendix B
- sound power levels for ancillary infrastructure as per Table 3 and Table 4
- transformers located centrally within each collector station modelled at a height of 4 m above ground level
- battery packs distributed across the BESS area and modelled at a height of 3.3 m above ground level based on the Tesla Megapack 2XL recommendations
- sensitive receivers at 1.5 m above ground
- temperature of 10°C and relative humidity of 70%
- sound propagating downwind, meteorological correction $C_{met} = 0$
- a +2 dB tonal adjustment has been applied with consideration of previous experience of tonal noise from electrical infrastructure and the likelihood of it only being just perceptible at significant distance.

6.2 Predicted noise levels at residential land uses

Table 14 presents the highest predicted noise levels from the ancillary infrastructure sites, for both Option 1A and Option B, at any involved stakeholder dwelling and any non-involved noise-sensitive location without an involvement in the Project.

Table 14 Highest predicted noise levels for ancillary infrastructure

Time period	Highest predicted noise levels	Noise limit, dB $L_{Aeq,30min}$
Option 1A		
Day / Evening	Involved stakeholder, Receiver ID 100: 39 dB $L_{Aeq,30min}$	39 (Evening)
	Non-involved noise sensitive location, Receiver ID 65: 23 dB $L_{Aeq,30min}$	39 (Evening)
Night	Involved stakeholder, Receiver ID 100: 33 dB $L_{Aeq,30min}$	34
	Non-involved noise sensitive location, Receiver ID 65: 18 dB $L_{Aeq,30min}$	34
Option B		
Day / Evening	Involved stakeholder, Receiver ID 108: 33 dB $L_{Aeq,30min}$	39 (Evening)
	Non-involved noise sensitive location, Receiver ID 114: 25 dB $L_{Aeq,30min}$	39 (Evening)

Time period	Highest predicted noise levels	Noise limit, dB L _{Aeq,30min}
Night	Involved stakeholder, Receiver ID 108: 28 dB L _{Aeq,30min}	34
	Non-involved noise sensitive location, Receiver ID 114: 20 dB L _{Aeq,30min}	34

The predicted noise levels for both options are compliant with the applicable noise limits at the nearest involved stakeholders and are 14 dB or more below the applicable noise limits at the nearest non-involved receiver.

Option B results in a greater margin of predicted noise level compliance at the nearest involved stakeholder locations due to a greater separation distance to the nearest involved stakeholder dwelling. It is noted that involved stakeholders would not necessarily be subject to any exemption from the noise limits under the EP Regulations for ancillary infrastructure noise and, therefore, it is assumed that compliance with the noise limits would be necessary at involved stakeholder dwellings.

6.3 Noise character

6.3.1 Tonality

The assessment presented in Section 6.2 is based on a +2 dB tonal adjustment being applied to the predicted noise levels, typical of BESS infrastructure in our experience. BESS noise at distance is typically dominated by noise associated by cooling systems which do not tend to have a significant tonal component.

While transformer noise can contain tonal noise at 100 Hz, and harmonics such as 200 Hz, that could attract a higher tonal penalty in isolation, the predicted noise levels from the BESS and transformers based on this preliminary assessment indicate that, for Option 1A and for Receiver 100 with the highest predicted noise levels:

- The predicted noise level from the transformer is more than 9 dB below the predicted noise level from the BESS in the 125 Hz and 250 Hz octave bands during Day / Evening.
- The predicted noise level from the transformer is more than 3 dB below the predicted noise level from the BESS in the 125 Hz and 250 Hz octave bands during Night.

As such, tonal noise from the transformer at 100 Hz and harmonics is not expected to be prominent when the BESS is operating at typical maximum capacity and overall noise levels are at their highest, and the +2 dB tonal adjustment for just detectable tonality is considered appropriate at this stage of the assessment. It is noted that this would need to be reviewed as part of the detailed design noise assessment recommended in Section 6.5.

Note that, at times when the wind turbines are operating, the noise level from the wind turbines would be expected to mask any tonal noise from the ancillary infrastructure such that no tonal adjustment would apply to noise from ancillary infrastructure. At these times, no tonal adjustment would be expected to apply, and the ancillary infrastructure noise predictions would therefore be lower.

6.3.2 Low frequency noise

Table 15 presents the predicted low frequency noise levels for ancillary infrastructure when the Noise Protocol noise limit is achieved compares them to the outdoor low frequency noise thresholds from EPA Victoria Publication 1996. The predictions are shown for the nearest involved stakeholder dwellings for each option (Receiver 100 for Option 1A and Receiver 108 for Option B), and the predicted low frequency noise levels for the more distant non-involved noise-sensitive locations would be significantly lower. The assessment has only been carried out to a frequency of 25 Hz

due to the lower risk of low frequency noise below 25 Hz for electrical infrastructure, and because there is no manufacturer data for frequencies below this.

Table 15 Highest predicted low frequency noise levels for ancillary infrastructure at Receiver ID 100

Situation	Outdoor noise level in dB L _{eq} at one-third octave band centre frequency in Hz												
	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Option 1A – Receiver 100													
Threshold	92	89	86	77	69	61	54	50	50	48	48	46	44
Day / Evening	- ¹	- ¹	- ¹	- ¹	47	47	47	46	46	46	35	35	35
Night	- ¹	- ¹	- ¹	- ¹	44	44	44	43	43	43	34	34	34
Option B – Receiver 108													
Threshold	92	89	86	77	69	61	54	50	50	48	48	46	44
Day / Evening	- ¹	- ¹	- ¹	- ¹	43	43	43	42	42	42	30	30	30
Night	- ¹	- ¹	- ¹	- ¹	40	40	40	39	39	39	29	29	29

(1) No manufacturer data at these frequencies. However, low risk of problematic low frequency noise in this range given predicted overall noise levels at other frequencies.

Based on the ancillary infrastructure noise assessment, it is expected that ancillary infrastructure for the Project can be designed such that environmental noise levels are below the applicable noise limits and in a manner such that there is a low risk of problematic low frequency noise as defined by EPA Victoria Publication 1996.

6.4 Predicted noise levels at natural areas

Noise levels from the ancillary infrastructure at natural areas are expected to be significantly lower than that from wind turbine noise (discussed in Section 5.3) considering that the ancillary infrastructure is over 8 km (Option 1A) or over 3.5 km (Option B) from the nearest identified natural areas. As such, no additional impact is anticipated to natural areas from the ancillary infrastructure noise emissions.

6.5 Summary and recommendations

The assessment of ancillary infrastructure noise has concluded that the Project can comply with the applicable Noise Protocol noise limits and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design.

As required by the GED, noise emissions from ancillary infrastructure should be reduced so far as reasonably practicable. This would need to be addressed through detailed design, and may include any or all of the following measures:

- Maximising the distance between major ancillary infrastructure noise sources and noise sensitive locations.
- Considering the sound power level, and any information on noise character such as tonality, of BESS equipment in procurement decisions.
- Selection of transformers with reduced maximum sound power levels if deemed reasonably practicable to do so.
- Using existing site features or other available noise barriers (e.g. fire walls) to provide acoustic shielding between ancillary infrastructure and noise sensitive locations.

- Constructing new shielding features, such as earth berms or noise barriers where reasonably practicable to do so.

Due to the preliminary nature of this assessment, and the variation that can exist in sound power levels for BESS equipment in particular, it is recommended that an updated Pre-Construction Noise Assessment for ancillary infrastructure be prepared once the detailed design and selection of the ancillary infrastructure is confirmed. This assessment would recommend measures to avoid unreasonable noise and assist in addressing the GED.

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7 Construction and commissioning noise

7.1 Construction phase

The GED and unreasonable noise provisions under the EP Act apply to noise generated during the Project construction phase, however the noise limits under the EP Regulations do not.

Neither the DTP Guidelines nor the Gannawarra and Loddon Planning Schemes require an assessment of construction phase noise for a Planning Permit application and, therefore, a detailed assessment of construction noise is outside of the scope of this assessment. However, in our experience and considering the normally large separation distances to noise sensitive areas around wind energy projects, construction phase noise can normally be effectively managed through the application of typical measures such as the following:

- Carrying out works in accordance with guidance set out in EPA Victoria Publication 1834.1 *Civil construction, building and demolition guide* (EPA Victoria Publication 1834.1).
- Scheduling works during Normal Working Hours, being from 7 am to 6 pm Mondays to Friday and 7 am to 1 pm Saturdays where practicable.
- Ensuring out of hours works meet the definitions of Unavoidable Works, Managed-Impact Works or Low Noise Impact Work as set out in EPA Victoria Publication 1834.1.
- Planning works to avoid or minimise impacts so far as reasonably practicable, including locating site compounds and laydown areas away from residential receivers and natural areas.
- Planning site access routes to minimise truck traffic on non-arterial roads near residential receivers.
- Selecting quieter construction methods where reasonable and feasible to do so.
- Considering the noise generated by construction plant and equipment in procurement and rental decisions.
- Using non-tonal reversing beepers where noise from reversing activities may be audible at residential receivers.
- Maintaining equipment and vehicles in good working condition.
- Providing training on noise reduction measures to staff as part of the staff induction.
- Confirming noise mitigation and management measures being implemented on site to staff during pre-start briefings.
- Providing prior notification of works to potentially affected land uses.
- Consulting with residential receivers to determine any times at which they may be more sensitive to noise and avoiding noisy works during those times.
- Assessing noise associated with fixed concrete batching plants and implementing controls such that noise emissions remain below the applicable Noise Protocol noise limits during operating hours.

It is recommended that, prior to construction of the Project commencing, a Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.

7.2 Commissioning phase

Noise associated with wind turbine commissioning is not subject to the noise limits set under the EP Regulations as per EPA Victoria Publication 3011. However, the GED and unreasonable noise provisions under the EP Act apply.

EPA Victoria Publication 3011 notes that:

During the period between any wind turbine first generating power and the post-construction compliance assessment, the WEF operator should ensure that the wind turbine sound levels are consistent with the sound levels modelled as part of the approval process. During commissioning, to help manage risks of non-compliance where predicted wind farm sound levels

are close to the noise limits, it is good practice to conduct initial wind turbine sound level measurements following the operation of the first turbines to verify the predicted levels.

Measures to assess and manage wind turbine noise during commissioning would need to be incorporated into the Noise Management Plan to be prepared to address the EP Regulations.

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8 Conclusion

This report presents an environmental noise assessment of the proposed Meering West Wind Farm, considering operational wind turbine noise and ancillary infrastructure noise.

Based on the candidate wind turbine selection and proposed 164 wind turbine layout, operational wind turbine noise levels were predicted and assessed against the minimum applicable noise limit of 40 dB LA90 that applies under the DTP Guidelines, EP Regulations and NZS 6808:2010. A total of nine noise-sensitive locations were identified within the predicted 35 dB LA90 noise contour with predicted wind turbine noise levels being 37 dB or below at all of these locations. As such, it is expected that the Project is capable of complying with the applicable noise limits under NZS 6808:2010 subject to appropriate turbine selection during detailed design. Predicted wind turbine noise levels at involved stakeholder locations were also below 45 dB in all cases.

The assessment of ancillary infrastructure noise has concluded that the Project is capable of complying with the applicable Noise Protocol noise limits for both ancillary infrastructure options assessed, and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design.

Wind turbine noise emissions and ancillary infrastructure noise was also considered at identified natural areas as defined in the Gannawarra and Loddon Planning Schemes. While wind turbine noise is expected to be audible during periods of higher wind speeds, it is reasonable to expect that there would be wind blowing through vegetation in the natural areas as well at these times to create background noise. One campground was identified at Lake Meran, as part of the Leaghur State Park PCRZ, with predicted noise levels at the campground being 31 dB LA90 and 4 dB below the limit recommended for high amenity areas in NZS 6808:2010 even with the wind turbines operating at their maximum sound power level. No campgrounds were identified within other natural areas such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

The assessment is based on a candidate wind turbine model, ancillary infrastructure selection and layout that may be subject to further refinement post-approval. It is recommended that, prior to the commencement of construction of the Project and in addition to the obligations that exist for wind energy facilities under the EP Regulations:

- A Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.
- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.
- A Pre-Construction Noise Assessment also be prepared for the final ancillary infrastructure selection and design.

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Appendix A—Wind turbine coordinates

Table A1 Project WTG coordinates as GDA2020 MGA Zone 54

ID	Easting	Northing	ID	Easting	Northing
WTG1	752161	6035160	WTG30	741725	6030025
WTG2	751202	6034633	WTG31	744476	6029986
WTG3	751811	6033825	WTG32	743276	6029955
WTG4	751349	6033292	WTG33	747378	6029798
WTG5	752217	6033150	WTG34	748763	6029776
WTG6	743210	6032792	WTG35	746059	6029746
WTG7	745188	6032219	WTG36	750807	6029560
WTG8	743887	6032156	WTG37	739572	6029356
WTG9	742562	6032050	WTG38	749569	6029317
WTG10	752449	6031730	WTG39	740987	6029315
WTG11	750857	6031601	WTG40	743821	6029233
WTG12	744706	6031484	WTG41	745232	6029194
WTG13	743170	6031377	WTG42	746585	6029129
WTG14	745999	6031296	WTG43	748009	6029112
WTG15	748477	6030920	WTG44	740260	6028628
WTG16	751601	6031136	WTG45	750174	6028601
WTG17	750135	6030988	WTG46	738912	6028547
WTG18	739613	6030771	WTG47	743093	6028545
WTG19	741024	6030683	WTG48	744532	6028510
WTG20	743857	6030649	WTG49	745919	6028467
WTG21	749194	6030643	WTG50	747367	6028447
WTG22	742378	6030639	WTG51	748747	6028400
WTG23	750838	6030602	WTG52	741668	6028372
WTG24	745182	6030601	WTG53	740882	6028042
WTG25	746601	6030425	WTG54	739549	6027941
WTG26	748081	6030354	WTG55	742362	6027860
WTG27	738885	6030083	WTG56	743800	6027814
WTG28	750057	6030050	WTG57	745194	6027779
WTG29	740301	6030035	WTG58	746692	6027750

ID	Easting	Northing	ID	Easting	Northing
WTG59	748030	6027629	WTG91	749353	6024783
WTG61	738947	6027253	WTG92	737309	6024465
WTG62	740193	6027214	WTG93	738724	6024424
WTG63	742995	6027203	WTG94	740137	6024345
WTG64	744435	6027096	WTG95	741666	6024308
WTG65	745972	6027057	WTG96	745918	6024182
WTG66	747162	6027009	WTG97	747228	6024179
WTG67	748702	6026975	WTG98	748690	6024157
WTG68	738204	6026628	WTG99	735212	6023863
WTG69	739574	6026577	WTG100	736581	6023750
WTG70	740820	6026546	WTG101	737997	6023739
WTG71	743842	6026474	WTG102	739397	6023698
WTG72	745179	6026347	WTG103	740826	6023656
WTG73	746666	6026320	WTG104	742241	6023622
WTG74	747826	6026284	WTG105	747865	6023562
WTG75	749209	6026241	WTG106	745073	6023538
WTG76	750684	6026189	WTG107	746545	6023521
WTG77	738757	6025839	WTG108	743690	6023482
WTG78	740179	6025799	WTG109	749328	6023413
WTG79	745854	6025641	WTG110	734515	6023121
WTG80	748635	6025631	WTG111	735826	6023085
WTG81	741737	6025611	WTG112	740022	6023056
WTG82	747266	6025601	WTG113	738683	6023010
WTG83	750084	6025595	WTG114	737472	6023005
WTG84	738211	6025123	WTG115	741611	6022923
WTG85	739451	6025112	WTG116	742927	6022885
WTG86	735197	6025058	WTG117	744342	6022845
WTG87	740824	6025037	WTG118	746589	6022725
WTG88	742281	6024976	WTG119	740748	6022653
WTG89	746671	6024910	WTG120	735182	6022402
WTG90	747921	6024827	WTG121	733575	6022338

ID	Easting	Northing	ID	Easting	Northing
WTG122	737956	6022322	WTG144	731607	6020118
WTG123	739370	6022282	WTG145	744367	6020282
WTG124	742200	6022201	WTG146	747088	6019942
WTG125	743615	6022161	WTG147	733888	6019627
WTG126	737382	6021684	WTG148	735045	6019574
WTG127	734404	6021606	WTG149	736484	6019525
WTG128	738632	6021595	WTG150	738101	6019522
WTG129	735674	6021596	WTG151	730833	6019378
WTG130	742880	6021467	WTG152	732234	6019338
WTG131	732632	6021449	WTG153	746405	6019166
WTG132	747392	6021447	WTG154	737031	6018881
WTG133	744396	6021431	WTG155	734356	6018841
WTG134	737920	6021006	WTG156	735760	6018834
WTG135	735171	6020967	WTG157	738777	6018976
WTG136	739239	6020908	WTG158	733116	6018763
WTG137	743451	6020792	WTG159	745633	6018555
WTG138	747907	6020622	WTG160	747049	6018468
WTG139	732898	6020341	WTG161	735014	6018105
WTG140	734358	6020292	WTG162	736221	6018043
WTG141	735772	6020253	WTG163	733778	6017997
WTG142	737186	6020215	WTG164	737224	6018004
WTG143	738649	6020175	WTG165	746379	6017825

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Appendix B—Receiver locations and predicted wind turbine noise levels

Table B1 Noise-sensitive location and involved stakeholder coordinates as GDA2020 MGA Zone 54, and predicted wind turbine noise levels

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
1	Noise-sensitive location	754864	6040379	5877	40	23
2	Noise-sensitive location	739892	6040212	8128	40	24
3	Noise-sensitive location	750653	6039936	5008	40	26
4	Noise-sensitive location	745140	6039535	7014	40	26
5	Noise-sensitive location	754411	6039350	4756	40	25
6	Noise-sensitive location	760795	6039284	9568	40	20
7	Noise-sensitive location	749065	6039125	4974	40	27
8	Noise-sensitive location	757544	6039096	6668	40	23
9	Noise-sensitive location	757317	6039046	6456	40	23
10	Noise-sensitive location	758647	6038877	7475	40	22
11	Noise-sensitive location	759742	6038439	8260	40	21
12	Noise-sensitive location	759527	6038423	8056	40	22
13	Noise-sensitive location	759949	6038404	8436	40	21
14	Noise-sensitive location	757897	6038228	6505	40	23
15	Noise-sensitive location	742939	6038224	5439	40	27
16	Noise-sensitive location	758344	6037992	6800	40	23
17	Noise-sensitive location	746313	6037970	5860	40	28
18	Noise-sensitive location	746260	6037938	5818	40	28
19	Noise-sensitive location	738905	6037906	6685	40	26
20	Noise-sensitive location	759421	6037507	7630	40	22
21	Noise-sensitive location	751384	6037377	2349	40	31
22	Noise-sensitive location	755364	6037191	3792	40	27
23	Noise-sensitive location	750795	6037122	2390	40	31
24	Noise-sensitive location	757981	6037069	6125	40	24
25	Noise-sensitive location	749160	6037030	3148	40	30
26	Noise-sensitive location	749160	6037030	3148	40	30

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
27	Noise-sensitive location	758274	6037021	6390	40	24
28	Noise-sensitive location	753693	6036953	2358	40	30
29	Noise-sensitive location	761204	6036633	9162	40	21
30	Noise-sensitive location	746035	6036493	4357	40	30
31	Noise-sensitive location	738971	6036120	5388	40	28
32	Noise-sensitive location	742879	6035707	2934	40	31
33	Noise-sensitive location	759770	6035670	7626	40	23
34	Noise-sensitive location	756085	6035634	3952	40	27
35	Noise-sensitive location	760436	6035556	8284	40	22
36	Noise-sensitive location	760028	6035435	7872	40	23
37	Noise-sensitive location	740951	6035317	3388	40	31
38	Noise-sensitive location	744623	6035219	2808	40	33
39	Noise-sensitive location	754788	6034942	2636	40	31
40	Noise-sensitive location	736143	6034934	5420	40	28
41	Noise-sensitive location	757474	6034685	5334	40	26
42	Noise-sensitive location	759452	6034637	7310	40	23
43	Noise-sensitive location	733238	6034636	7254	40	26
44	Noise-sensitive location	760165	6034633	8021	40	23
45	Noise-sensitive location	757981	6034565	5850	40	25
46	Noise-sensitive location	756615	6034554	4495	40	27
47	Noise-sensitive location	734800	6034110	5736	40	27
49	Noise-sensitive location	748835	6033877	2485	40	35
51	Noise-sensitive location	749339	6033717	2054	40	36
52	Noise-sensitive location	749380	6033710	2012	40	36
54	Noise-sensitive location	757178	6033626	4984	40	27
55	Noise-sensitive location	757381	6033583	5182	40	26
56	Noise-sensitive location	757022	6033530	4820	40	27
57	Noise-sensitive location	757291	6033517	5087	40	27
58	Noise-sensitive location	756674	6033435	4466	40	28
59	Noise-sensitive location	734168	6033188	5647	40	27

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
60	Noise-sensitive location	754242	6033152	2025	40	34
61	Noise-sensitive location	757611	6033022	5322	40	26
62	Noise-sensitive location	747361	6032873	2083	40	37
63	Noise-sensitive location	747361	6032873	2083	40	37
64	Noise-sensitive location	749249	6032869	2048	40	37
65	Noise-sensitive location	740497	6032640	2017	40	36
66	Noise-sensitive location	759041	6032391	6625	40	25
67	Noise-sensitive location	755398	6032091	2971	40	31
68	Noise-sensitive location	754678	6031694	2230	40	33
70	Noise-sensitive location	758094	6031201	5670	40	26
71	Noise-sensitive location	754952	6031068	2589	40	32
73	Noise-sensitive location	755448	6030952	3099	40	30
74	Noise-sensitive location	763648	6030773	11240	40	20
75	Noise-sensitive location	757504	6030451	5215	40	27
76	Noise-sensitive location	736536	6030374	2367	40	34
77	Noise-sensitive location	729180	6030059	7824	40	25
78	Noise-sensitive location	757170	6029835	5087	40	27
81	Noise-sensitive location	756985	6029231	5179	40	27
82	Noise-sensitive location	754374	6029112	3250	40	32
83	Noise-sensitive location	754411	6029084	3294	40	32
84	Noise-sensitive location	754660	6029016	3501	40	31
85	Noise-sensitive location	754645	6028798	3663	40	31
86	Noise-sensitive location	753830	6028564	3183	40	33
88	Noise-sensitive location	754289	6028241	3724	40	31
89	Noise-sensitive location	753065	6027536	2736	40	34
90	Noise-sensitive location	759224	6027294	8098	40	24
91	Noise-sensitive location	752849	6027166	2376	40	34
92	Noise-sensitive location	735502	6027105	2070	40	35
93	Noise-sensitive location	735507	6027099	2065	40	35
94	Noise-sensitive location	753541	6027090	2996	40	32

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
95	Noise-sensitive location	752708	6027067	2207	40	34
96	Noise-sensitive location	753275	6027052	2731	40	33
97	Noise-sensitive location	753637	6026910	3040	40	32
98	Noise-sensitive location	752700	6026852	2123	40	34
99	Noise-sensitive location	727283	6026757	7535	40	25
102	Noise-sensitive location	753011	6025456	2440	40	33
103	Noise-sensitive location	761020	6025442	10363	40	23
104	Noise-sensitive location	758457	6025354	7818	40	25
106	Noise-sensitive location	753501	6024986	3064	40	31
107	Noise-sensitive location	752170	6024573	2196	40	34
109	Noise-sensitive location	730796	6024221	3325	40	31
110	Noise-sensitive location	757800	6024208	7387	40	25
111	Noise-sensitive location	757892	6024189	7481	40	25
112	Noise-sensitive location	762055	6023985	11583	40	21
113	Noise-sensitive location	730434	6023676	3129	40	31
114	Noise-sensitive location	731402	6023591	2470	40	34
118	Noise-sensitive location	756755	6022883	6913	40	26
119	Noise-sensitive location	758949	6022874	8905	40	24
120	Noise-sensitive location	728028	6022848	4462	40	28
124	Noise-sensitive location	724776	6021936	6575	40	24
125	Noise-sensitive location	757952	6021848	8466	40	24
128	Noise-sensitive location	725446	6021000	5626	40	25
129	Noise-sensitive location	756340	6020937	7437	40	25
130	Noise-sensitive location	757202	6020857	8279	40	25
131	Noise-sensitive location	756146	6020308	7492	40	25
133	Noise-sensitive location	751688	6019255	4021	40	30
134	Noise-sensitive location	756840	6018787	8823	40	24
135	Noise-sensitive location	741975	6018213	2972	40	34
136	Noise-sensitive location	757931	6017587	10391	40	23
138	Noise-sensitive location	748142	6016668	2106	40	33

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
140	Noise-sensitive location	731971	6016422	2397	40	33
141	Noise-sensitive location	721765	6016395	9546	40	20
142	Noise-sensitive location	750782	6016341	4297	40	28
144	Noise-sensitive location	731289	6016242	3045	40	32
145	Noise-sensitive location	744820	6016186	2262	40	33
147	Noise-sensitive location	750550	6015861	4365	40	28
149	Noise-sensitive location	741911	6015590	4614	40	30
150	Noise-sensitive location	744616	6015112	3235	40	30
151	Noise-sensitive location	757208	6015108	10700	40	22
152	Noise-sensitive location	756323	6015087	9871	40	22
153	Noise-sensitive location	738710	6014900	3442	40	31
154	Noise-sensitive location	750304	6014516	5120	40	26
155	Noise-sensitive location	754506	6013942	8723	40	23
156	Noise-sensitive location	747737	6013864	4187	40	27
157	Noise-sensitive location	745352	6013750	4202	40	28
158	Noise-sensitive location	751107	6013710	6254	40	25
159	Noise-sensitive location	748867	6013050	5384	40	26
160	Noise-sensitive location	730043	6012884	6332	40	25
161	Noise-sensitive location	756237	6012767	10813	40	21
162	Noise-sensitive location	727237	6012608	7666	40	23
163	Noise-sensitive location	736895	6011926	6087	40	27
164	Noise-sensitive location	754732	6011891	10114	40	22
165	Noise-sensitive location	740817	6011886	7095	40	26
166	Noise-sensitive location	739269	6011537	6783	40	26
167	Noise-sensitive location	723829	6011502	10540	40	20
168	Noise-sensitive location	721972	6011185	12068	40	18
169	Noise-sensitive location	737072	6010954	7052	40	25
170	Noise-sensitive location	744457	6010042	8017	40	24
171	Noise-sensitive location	730713	6009804	8748	40	23
172	Noise-sensitive location	742961	6009647	8864	40	24

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
173	Noise-sensitive location	741554	6009598	9456	40	24
174	Noise-sensitive location	747230	6009565	8304	40	23
175	Noise-sensitive location	744494	6009428	8606	40	23
176	Noise-sensitive location	752232	6009307	10335	40	21
177	Noise-sensitive location	747419	6009305	8583	40	23
178	Noise-sensitive location	747527	6009195	8706	40	22
179	Noise-sensitive location	754766	6009078	12118	40	20
180	Noise-sensitive location	747514	6008035	9856	40	22
181	Noise-sensitive location	743671	6007927	10262	40	22
182	Noise-sensitive location	747197	6007898	9961	40	22
183	Noise-sensitive location	749986	6019911	2197	40	33
CG1	Lake Meran campsite	753345	6024490	3157	40	31
50	Involved landowner	753173	6033720	1113	45	38
53	Involved landowner	744630	6033631	1518	45	38
69	Involved landowner	747323	6031552	1316	45	41
80	Involved landowner	742121	6029286	838	45	44
100	Involved landowner	741811	6026602	993	45	43
101	Involved landowner	750989	6025591	671	45	42
105	Involved landowner	743855	6025110	1364	45	41
108	Involved landowner	735843	6024443	857	45	43
115	Involved landowner	750695	6023410	1367	45	37
117	Involved landowner	745695	6023233	693	45	44
121	Involved landowner	747419	6022329	883	45	42
126	Involved landowner	740745	6021138	1515	45	40
127	Involved landowner	745891	6021121	1527	45	40
137	Involved landowner	738782	6016714	2016	45	35
139	Involved landowner	734213	6016486	1573	45	36
143	Involved landowner	736264	6016293	1750	45	36
146	Involved landowner	736295	6016113	1931	45	35
148	Involved landowner	735291	6015748	2373	45	34

Appendix C—Wind turbine noise prediction uncertainty

Introduction

Appendix C of NZS 6808:2010 recommends that an assessment of uncertainty be included in any noise assessment conducted under the Standard. The discussion in NZS 6808:2010 relates primarily to measurement uncertainty, which is not relevant to this assessment. However, some discussion of the uncertainty associated with the predicted noise levels can be provided at the design stage.

Uncertainty in the predicted wind farm noise levels is a result of two main factors:

- uncertainty inherent in the prediction methodology
- uncertainty in the assumed sound power levels of the wind turbines.

Uncertainty in other inputs, such as the position of wind turbines and the location of residences, may also exist but are likely to have an insignificant impact on the prediction uncertainty as small changes in position do not result in any noticeable change in predicted noise levels when the distance between source and receiver is over 1 km.

Uncertainty in predictions

ISO 9613-2:2024, the basis of the prediction methodology adopted in this report, provides a discussion on general uncertainty associated with the propagation algorithm and advises a typical accuracy of overall A-weighted noise levels of ± 3 dB at distances of up to 1 km from the source. It does not advise on the accuracy of predictions at distances further than this.

With respect to wind turbine noise specifically, Annex D7 of ISO 9613-2:2024 states the following:

The recommendations described in this annex are consistent with predicting the most probable value that would be measured with the modelled environmental conditions (e.g., wind speed dependent sound power level). Different studies have compared in detail measurements of operational turbines and predictions with different parameters and the current consensus is that for propagation over porous ground conditions:

- modelling with $G=0$ with positive adjustments on the source levels (e.g. uncertainty margin) can overstate measured levels;
- modelling with $G=0,5$ without positive adjustments can understate the measured values.

In considering the above, it should be noted that the ISO 9613-2 accuracy must be understood in the context of how wind turbine noise is measured and assessed in Victoria. Given the use of NZS 6808:2010, the following factors reduce the uncertainty of wind farm noise predictions or tend the predictions towards conservatism thereby reducing the likelihood of any under-prediction:

- ISO 9613-2:2024 is based on the prediction of L_{Aeq} noise levels and not L_{A90} noise levels, whereas NZS 6808:2010 requires the assessment of L_{A90} noise levels. It is commonly accepted for wind turbine noise that the L_{Aeq} level will be in the order of 2 dB above the L_{A90} noise level, such that predictions using ISO 9613-2:2024 without any adjustment for this factor would tend towards conservatism. No adjustment factor has been applied in this assessment to account for that.
- NZS 6808:2010 requires that wind farm noise levels are assessed based on a large number of 10-minute data points (at least 1440 data points) that are correlated with wind speed, with an average noise level determined for each wind speed. In practice, this reduces the uncertainty associated with predictions due to the large number of data points that would be collected and averaged during any measurement campaign. A study

performed on Australian wind farms⁷ that examined the difference between predicted noise levels using ISO 9613-2 with a receiver height of 1.5 m and measured downwind noise levels in general accordance with NZS 6808:2010 found that the predictions were within ± 1 dB for sloping or relatively flat sites when appropriate prediction parameters were used.

- The predictions are based on downwind conditions – that is, where the residence is downwind of the nearest wind turbines. NZS 6808:2010 does not specifically require the assessment to be carried out for downwind conditions unless measured noise levels are clearly higher under these conditions and so, if compliance measurements include periods where there are some crosswind or upwind conditions, then the measured noise level would be lower. This may increase the conservatism of the predictions.

Uncertainty in sound power levels

Sound power levels of wind turbines are quantified in accordance with measurement standard IEC 61400-11 Edition 3.0 *Wind turbines – Part 11: Acoustic noise measurement techniques* (IEC 61400-11). The measurement process includes quantification of the uncertainty in the sound power level at each wind speed as documented in IEC 61400-11, this uncertainty is typically small and in the order of 1 dB or lower.

Uncertainty factors have been included in the assumed sound power levels in this noise assessment to account for this potential error in accordance with advice from the wind turbine suppliers.

Summary

Appendix C of NZS 6808:2010 states that, when comparing a sound level with the applicable noise limit, the sound level is deemed to comply if the sound level is equal to or less than the limit. It should be deemed not to comply if the sound level is greater than the noise limit, regardless of the uncertainty. It also advises that, where compliance or non-compliance is 'marginal and contested', steps should be taken to reduce the uncertainty, where practical.

Given the methods by which wind turbine noise is measured in Victoria and previous assessments of wind turbine noise modelling accuracy, the uncertainty associated with the predicted noise levels is considered small. Assumptions in the prediction methodology tend to be conservative and therefore may offset any uncertainty, tending towards over prediction of noise levels at residences, and the assumed wind turbine sound power levels for the candidate models include a factor for uncertainty in accordance with the supplier advice.

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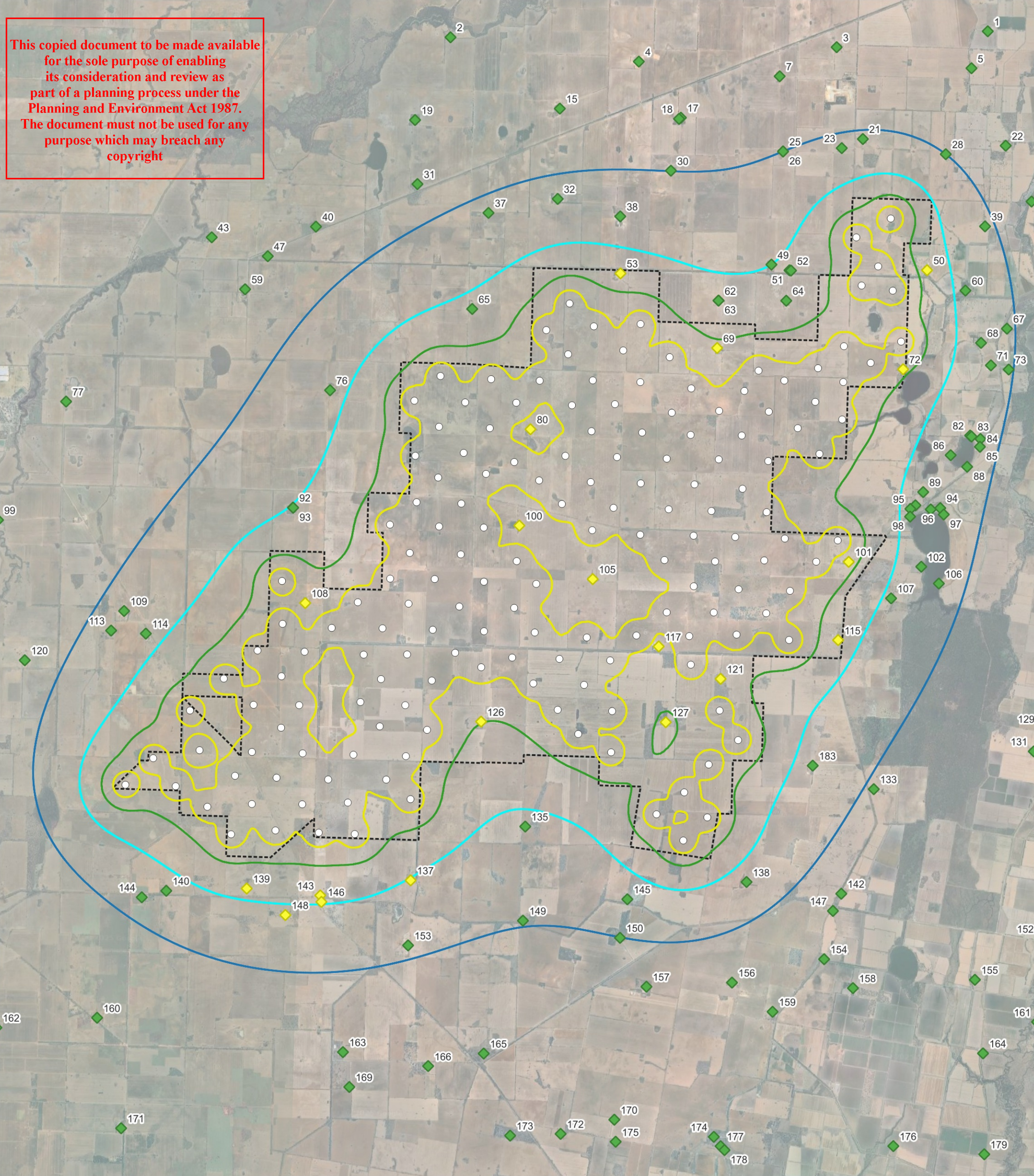
⁷ Evans T & Cooper J, 2012, *Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms*, Acoustics Australia, vol. 40, no. 1, pp 28-36.

Appendix D—Wind turbine noise contour maps

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MEERING WEST WIND FARM

Meering West, VIC
Figure D1: Predicted wind turbine noise levels and noise-sensitive locations based on Vestas V172-7.2MW WTG

PROJECT NUMBER M240298
DRAWN BY TE
DATE June 2025
CLIENT Aurecon
AERIAL IMAGERY (c) Google

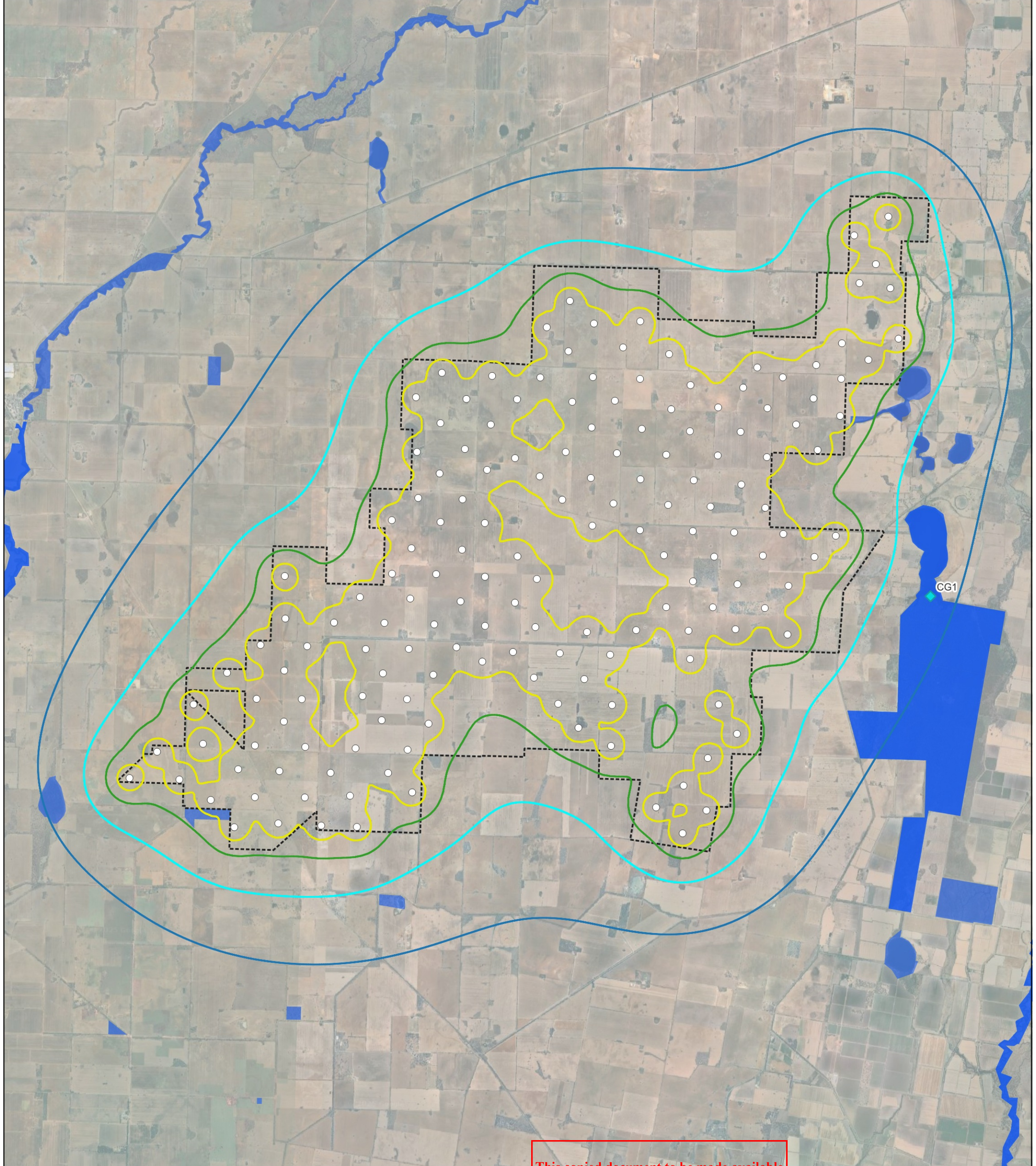
Legend

- Project area
- WTG
- Dwelling
- Landowner
- Noise-Sensitive Location
- Predicted wind turbine noise level, dB LA90
 - 30 dB
 - 35 dB
 - 40 dB
 - 45 dB

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MEERING WEST WIND FARM
Meering West, VIC
Figure D2: Predicted wind turbine noise levels and natural areas based on Vestas V172-7.2MW WTG

PROJECT NUMBER	M240298
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DATE	June 2025
CLIENT	Aurecon
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Legend

- Project area
- WTG
- Campground
- ERS Natural Area
- Natural Area (PCRZ)
- Predicted wind turbine noise level, dB LA90
 - 30 dB
 - 35 dB
 - 40 dB
 - 45 dB

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Datum GDA20 MGA Zone 54

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ATTACHMENT 2

Pre-Construction Predictive Noise Assessment (April 2026)

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Meering West Wind Farm

Pre-Construction Predictive Noise Assessment

M240298RP1 Revision E

Thursday, 23 April 2026

Document Information

Project	Meering West Wind Farm
Client	Aurecon Australasia Pty Ltd
Report title	Pre-Construction Predictive Noise Assessment
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Revision Table

Report revision	Date	Description	Author	Reviewer
0	14 May 2025	Draft Issue	Tom Evans	Alec Kuoch
A	28 May 2025	Updated for layout and to address client comments	Tom Evans	Alec Kuoch
B	30 May 2025	Updated ancillary infrastructure layout	Tom Evans	Alec Kuoch
C	3 June 2025	Updated to address client comments	Tom Evans	Alec Kuoch
D	1 September 2025	Updated to address auditor comments	Tom Evans	Alec Kuoch
E	23 April 2026	Updated for new WTG layout and parameters.	Tom Evans	Alec Kuoch

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Adjustment K ₂	The adjustment, K ₂ , is applied under NZS 6808:2010 to any 10-minute sample of wind turbine noise where there is a special audible characteristic present. The value of the adjustment ranges from 1 to 6 dB depending on the type and magnitude of the characteristic.
Aggravated noise	Noise defined by the EP Regulations to exceed the noise limits established under the Noise Protocol by more than 15 dB or to exceed a noise level of 75 dB during the day period, 70 dB during the evening period or 65 dB during the night period.
Ambient noise	The overall environmental noise level at a given location caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, insects, animals and the like. It is typically described by the L _{Aeq} metric.
Amplitude modulation	The modulation, change, of the loudness of wind turbine noise. Wind turbine noise is generally accepted to have a normal level of modulation (blade 'swish') but has been known to occasionally exhibit excessive amplitude modulation which may be described as a 'thumping' noise and could warrant a special audible characteristic penalty.
Background noise	The underlying noise level at a given location, measured in the absence of a noise source under investigation and other industry noise. The background noise is typically described using the L _{A90} metric to reduce the effect of short-term noise sources such as intermittent traffic, lawnmowers, insect, animals and the like.
BESS	Battery Energy Storage System
C-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing at high levels of noise. Because, unlike the A-weighting, the C-weighting does not apply large negative weightings to low frequency noise levels, it is commonly used for the assessment of low frequency noise.
Day period	Monday to Saturday (except public holidays), from 7 am to 6 pm as defined in the Environment Protection EP Regulations.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. People typically perceive a 10 dB increase in sound as a doubling of loudness.
Effective noise level	The level of noise emitted from the commercial, industrial or trade premises and adjusted if appropriate for duration, character and position as defined in Part I, Section B2 of the Noise Protocol.
EP Act	Environment Protection Act 2017
EP Regulations	The Victorian Environment Protection Regulations are subordinate legislation to the Environment Protection Act 2017. They give force to noise limits for commercial, industrial and trade premises.
EPA Victoria	Environment Protection Authority Victoria.
ERS	Environment Reference Standard
Evening period	Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm, as defined in the EP Regulations.

Frequency (Hz)	The number of times a sound pressure wave oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/ton), but slow movements mean the frequency (pitch/ton) is low. 1 Hz is equal to 1 cycle per second.
GED	General Environmental Duty – As defined by Section 25(1) of the EP Act, the GED requires that any person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.
Impulsiveness	Transient sound having a peak level of very short duration, typically less than 100 ms. Impulsive sounds are subjectively more annoying than steady sounds.
Involved stakeholder	A dwelling where the landowner has an agreement in place that modifies the applicable noise limit in accordance with Regulation 131B of the EP Regulations.
L _{A90}	A-weighted sound pressure level that is exceeded for 90% of the time interval considered. The L _{A90} metric is used to assess wind turbine noise in Victoria and also to quantify the background noise level in an environment.
L _{Aeq}	The equivalent continuous A-weighted sound pressure level. It is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A-weighted sound pressure level when determined over the same measurement time interval. The L _{Aeq} metric is used to quantify the Effective Noise Level from a commercial, industrial or trade premises.
L _{Ceq}	The equivalent continuous C-weighted sound pressure level.
L _{WA}	Sound Power Level - a measure of the acoustic output of a source, independent of distance and referenced to 10 ⁻¹² W.
Night period	Between 10 pm and 7 am of the following day as defined in the EP Regulations.
Noise Limit	The maximum allowable level of wind turbine noise as established in accordance with NZS 6808:2010. Also refers to the maximum effective noise level allowed in a noise sensitive area for a commercial or industrial premises, as determined in accordance with the Noise Protocol.
Noise Protocol	Environmental Protection Authority Publication 1826.4 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues.
Noise sensitive land use	Refers to a land use that may be sensitive to noise from a construction or operational source. The precise type of sensitive receivers can vary depending on the type of noise source and the legislation or guidelines that apply, but noise sensitive receivers generally include residential land uses (including aged care), educational land uses and hospitals.
NZS 6808:2010	New Zealand Standard NZS 6808:2010 <i>Acoustics – Wind farm noise</i> .
Special audible characteristics	Special Audible Characteristics are unusual characteristics of wind farm sound that make it more likely to cause adverse community response at lower sound levels. Special audible characteristics are defined by NZS 6808:2010 to include tonality, impulsiveness and amplitude modulation.
Tonal adjustment A _{tone}	When noise from a commercial or industrial premises assessed against the Noise Protocol is tonal in nature then an adjustment is applied of +2 dB for just detectable tonal character of the noise or +5 dB for prominent tonal character of the noise, as defined in Part I, Section B3 of the Noise Protocol. In cases where the adjustment is unclear, the objective method defined by the Noise Protocol should be used.

Tonality	A characteristic of a noise where there is a distinctly higher level over a relatively narrow frequency range. Examples include the reversing signal on a truck or the wheel squeal that sometimes occurs when trains move around a curve. A noise exhibiting tonality is subjectively more annoying than a non-tonal noise at the same level.
Unreasonable noise	Noise defined by the EP Regulations to exceed the established noise limits is prescribed to be unreasonable noise.
WTG	Wind Turbine Generator

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Executive summary

Meering West Wind Farm Pty Ltd (MWWF) is proposing development of the Meering West Wind Farm (the Project), a wind energy project to be located within the Murray Renewable Energy Zone at a site approximately 25 km south west of Kerang, Victoria. The Project is proposed to consist of up to 164 wind turbines. The wind energy component will be supported by ancillary infrastructure comprising of collector stations, transmission infrastructure and a Battery Energy Storage System (BESS) of approximately 1000 MWh.

Resonate has been engaged by Aurecon, on behalf of MWWF, to undertake an environmental noise assessment of the Project to address the requirements of the Department of Transport and Planning (DTP) *Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (DTP Guidelines) and *Environment Protection Regulations* (EP Regulations).

Wind turbine noise assessment

Based on the candidate wind turbine selection and proposed 164 wind turbine layout, operational wind turbine noise levels were predicted against the minimum applicable noise limit of 40 dB LA90 that applies under the DTP Guidelines, EP Regulations and New Zealand Standard (NZS) 6808:2010 *Acoustics – Wind farm noise*.

A total of nine noise-sensitive locations were identified within the predicted 35 dB LA90 noise contour with predicted wind turbine noise levels being 37 dB or below at all of these locations. As such, it is expected that the Project can comply with the applicable noise limits under NZS 6808:2010 subject to appropriate turbine selection during detailed design. Predicted wind turbine noise levels at involved stakeholder locations were also below 45 dB in all cases.

As required by the *Environment Reference Standard*, wind turbine noise emissions were also considered at identified natural areas as defined in the Gannawarra and Loddon Planning Schemes in the context of human tranquillity. While wind turbine noise is expected to be audible during periods of higher wind speeds, it is reasonable to expect that there would be wind blowing through vegetation in these natural areas as well at these times to create background noise. One campground was identified within the Leaghur State Park PCRZ, with predicted noise levels at the campground being 31 dB LA90 and 4 dB below the limit recommended for high amenity areas in NZS 6808:2010. No campgrounds were identified within other natural areas such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

Ancillary infrastructure noise assessment

The ancillary infrastructure noise assessment was based on a candidate BESS equipment model and layout, as well as typical transformer sound power levels for anticipated collector station equipment. Two ancillary infrastructure locations were assessed.

The assessment of ancillary infrastructure noise has concluded that the Project can comply with the applicable Noise Protocol noise limits for both locations, and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design. The predicted noise levels comply with the noise limits at the nearest involved stakeholder locations and are 14 dB or more below the applicable noise limits at the nearest non-involved noise-sensitive locations regardless of which location is adopted.

Due to the significant separation distances of over 3.5 km between the ancillary infrastructure sites under consideration and the identified natural areas, it is expected that the level of ancillary infrastructure noise at the identified natural areas would be significantly lower than the wind turbine noise emissions.

Summary and recommendations

This assessment has concluded that the Project has been designed, and can be constructed and operated, in such a way as to manage wind turbine and ancillary infrastructure noise emissions in accordance with applicable legislation, policies and guidelines subject to final equipment selection and detailed design.

The assessment is based on a candidate wind turbine model, ancillary infrastructure selection and layout that may be subject to further refinement post-approval. It is recommended that, prior to the commencement of construction of the Project and in addition to the obligations that exist for wind energy facilities under the EP Regulations:

- A Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.
- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection, wind turbine numbers and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.
- A Pre-Construction Noise Assessment also be prepared for the final ancillary infrastructure selection and design.

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1 Introduction

Meering West Wind Farm Pty Ltd (MWWF) is proposing development of the Meering West Wind Farm (the Project), a wind energy project to be located within the proposed Murray Renewable Energy Zone at a site approximately 25 km south west of Kerang, Victoria. The Project is proposed to consist of up to 164 wind turbines. The wind energy component will be supported by ancillary infrastructure comprising of collector stations, transmission infrastructure and a Battery Energy Storage System (BESS) of approximately 1000 MWh.

Resonate has been engaged by Aurecon, on behalf of MWWF, to undertake an environmental noise assessment of the Project to address the requirements of the Department of Transport and Planning (DTP) *Planning Guidelines for the Development of Wind Energy Facilities in Victoria* (DTP Guidelines) and *Environment Protection Regulations* (EP Regulations).

This report sets out the environmental noise assessment. It:

- identifies applicable legislation, policies and guidelines relating to noise emissions from wind turbine noise and ancillary infrastructure
- establishes applicable noise limits
- presents predicted wind turbine noise and ancillary infrastructure noise at noise sensitive land uses
- assesses predicted noise against the applicable noise limits.

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2 Project description

2.1 Site description

The Project is located within the Loddon and Gannawarra local government areas (LGAs). The Meering West Wind Farm is situated in Northern Victoria, approximately 250 km north of Melbourne and around 110 km north of Bendigo and 25 kilometres south-west of Kerang.

The Project encompasses approximately 20,000 ha, with most of the area located within the Shire of Gannawarra with a smaller Project component located within the Shire of Loddon. The landscape is predominantly characterized by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping. The environment is largely flat to gently undulating.

The Project Area is surrounded by small rural localities including Quambatook to the west, Boort to the south-east, and Kerang to the north-east as the nearest regional and community centre for shopping, employment and business services.

The Project Area is predominantly characterised by agricultural land, featuring cropped fields that are well-maintained and utilised mostly for dryland cropping

The proposed layout of the site is shown in Figure 1, with wind turbine coordinates included in Appendix A.

The ancillary infrastructure, consisting of collector stations and the BESS are also shown on Figure 1. Two options are under consideration for the ancillary infrastructure, both of which are assessed in this report.

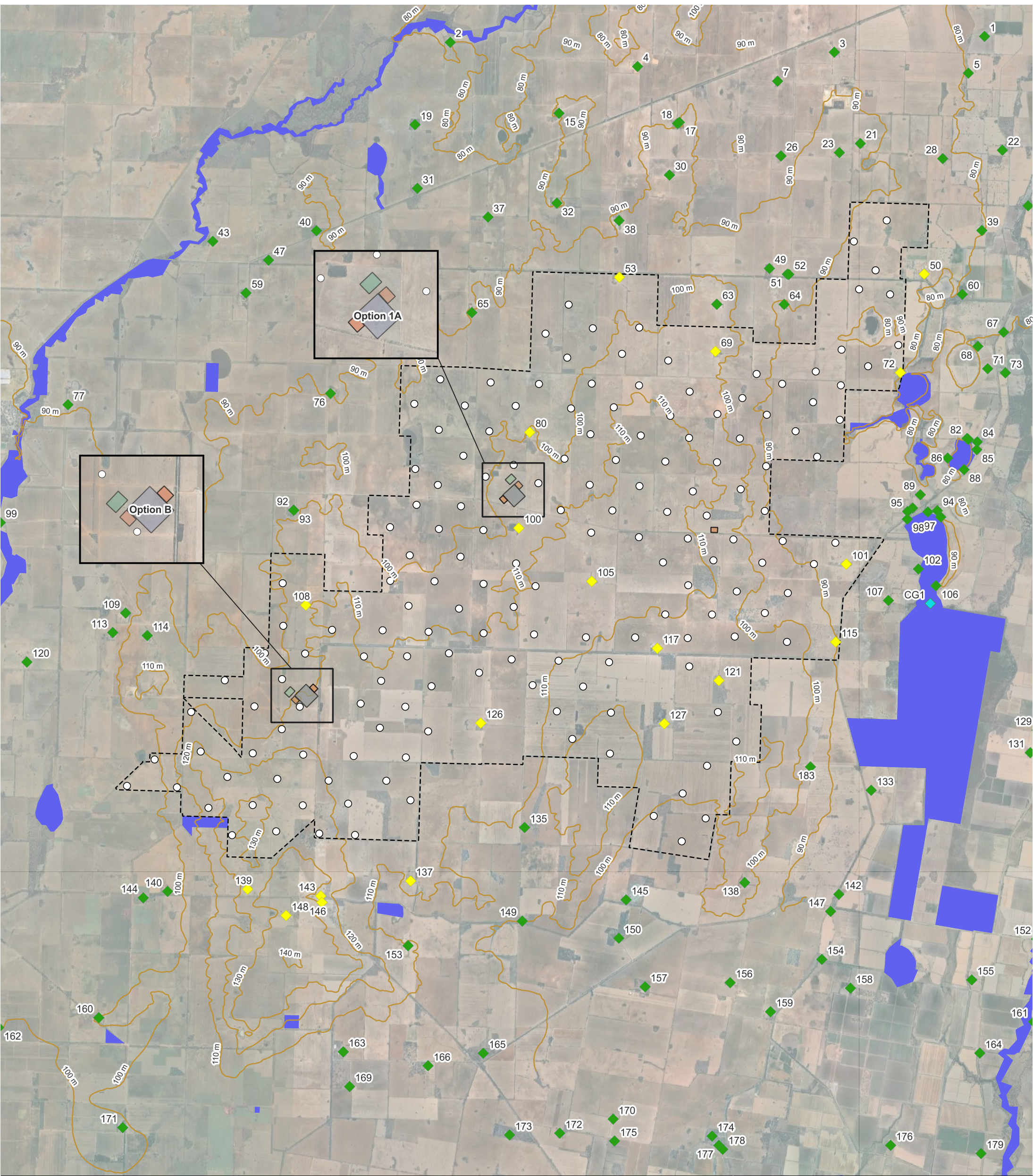
2.2 Noise-sensitive locations

MWWF has provided information on 157 identified noise-sensitive locations around the site that are within 10 km of a proposed WTG location as shown on Figure 1, with coordinates tabulated in Appendix B.

The noise-sensitive locations are located within a Farming Zone as defined by the Gannawarra and Loddon Planning Schemes. The township of Quambatook includes noise-sensitive locations within a Township Zone, but these noise-sensitive locations are over 8 km from the nearest Project turbine and are therefore well outside of the predicted 35 dB L_{A90} noise contour from the Project as documented in this report.

A total of 18 involved landowner houses, including two unoccupied houses, have also been identified within and around the site boundary as shown on Figure 1. It is understood there would be an agreement in place with the owners of each of these dwellings to allow higher wind turbine noise limits. The coordinates of these involved landowner houses are tabulated in Appendix B.

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MEERING WEST WIND FARM

Meering West, VIC

Figure 1: Project area and surrounding areas

PROJECT NUMBER

M240298

DRAWN BY

TE

DATE

June 2025

CLIENT

Aurecon

AERIAL IMAGERY

(c) Google

Legend

Project area

WTG

Ancillary Infrastructure

BESS (Indicative location)

Substation BESS (Indicative location)

Terminal station (Indicative location)

Topographical contour

Dwelling

Landowner

Noise-Sensitive Location

Campground

ERS Natural Area

Natural Area (PCRZ)

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Datum GDA20 MGA Zone 54

2

4

6 km

Resonate

2.3 Natural areas

The *Environment Reference Standard* (ERS) (refer Section 3.1.2) requires consideration of the potential for noise and vibration to impact on human tranquility and enjoyment outdoors in natural areas. The ERS defines natural areas as:

National parks, state parks, state forests, nature conservation reserves, wildlife reserves and environmentally significant areas and landscapes outside metropolitan Melbourne that are identified in a planning scheme.

The largest natural area identified within the Gannawarra and Loddon Planning Schemes is the Leaghur State Park Public Conservation and Resource Zone (PCRZ), approximately 2 km east of the nearest wind turbine (being WTG76). From a review of information regarding Leaghur State Park, a public campground is located on the southern end of Lake Meran and is considered relevant for the assessment of human tranquility. The site is shown on Figure 1 with coordinates included in Appendix B.

A number of other natural areas exist around the Project boundary as shown on Figure 1 including:

- Great Spectacle Lake and Little Spectacle Lake PCRZ adjacent to the eastern boundary
- Round Lake and Tobacco Lake PCRZ approximately 2 km from the eastern boundary
- Little Lake PCRZ approximately 3 km from the eastern boundary
- Quambatook I208 Bushland Reserve PCRZ adjacent to the southwest boundary
- Gredgwin Bushland Reserve PCRZ approximately 1.km south of the southern boundary.

No defined camping areas were identified within these areas, such that human occupancy is expected to be limited to transient daytime activities such as recreational hunting.

2.4 Wind turbine model

At this stage of the Project, the wind turbine model that will be used has not been confirmed and would be confirmed through a competitive tender process after the Project has received planning approval. Based on the information supplied by MWWF, it is understood that the planning permit application will seek approval for turbines with a height of up to 280 m above ground. Wind turbines will have a rotor diameter of up to 172 m and a rated power capacity of 6 to 8 MW.

A candidate turbine has been selected for this assessment that is considered representative of the typical range of modern wind turbine sound power levels with a rated power capacity of between 6 and 8 MW. The candidate wind turbine is a Vestas V172-7.2MW. Sound power levels have been based on Vestas specification documents.¹

The overall sound power levels with hub height wind speed for the Vestas V172-7.2MW are summarised in Table 1, with this preliminary assessment based on the model with serrated trailing edges (STE)². STE are one example of noise reduction mechanisms available to wind farm operators and have been included in this assessment to demonstrate the typical effect of such mechanism.

¹ Sound power levels have been based on a V172-7.2MW WTG with serrated trailing edges as detailed in Vestas specification document 0180-4980 V01 *Sound Performance Specification EnVentus V172-7.2MW*. No uncertainty has been applied as, based on discussions with Vestas, it is understood that the sound power levels incorporate an uncertainty factor and align with warranted sound power levels.

² STEs can be attached to wind turbine blades to reduce trailing edge turbulence and, as a result, reduce sound power levels in the order of 2-3 dB.

Table 1 Wind turbine sound power levels with wind speed

Turbine	Sound power level in dB L _{WA} for hub height wind speed in m/s							
	3	4	5	6	7	8	9	≥ 10
V172-7.2MW with STE	97.6	97.6	97.7	99.5	102.2	105.0	107.1	107.8

As is normal for modern pitch-controlled wind turbines, the sound power levels for the Vestas V172-7.2MW wind turbine increase from the cut-in wind speed before levelling off at a wind speed close to the wind speed at which the turbines reach rated power. This noise assessment has been based on the maximum sound power level, with the assumed sound power level spectrum, and incorporating the 1 dB uncertainty factor based on the supplied specification, presented in Table 2.

Table 2 Wind turbine sound power level spectrum

Turbine	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
V172-7.2MW with STE	78.3	89.8	96.8	101.4	100.4	101	99.9	98.3	107.8

2.5 Ancillary infrastructure

The Project will include ancillary infrastructure including a BESS and electrical infrastructure at collector and terminal stations, with two options (Option 1A and Option B) under consideration as shown in Figure 1.

As with the wind turbines, selections for the ancillary infrastructure, including BESS, has not been made at this stage of the Project.

For the electrical infrastructure and the collector substation and terminal station, the preliminary design³ has two main transformers, assumed to have a rating of 500 MVA each, supported by associated smaller earthing transformers and switchgear. The transformer models have not been selected at this stage, so a sound power level aligned with the standard level specified in AS/NZS 60076.10:2009 *Power transformers – Determination of sound levels* has been adopted for the main 500 MVA transformers, with other associated equipment expected to be significantly quieter based on previous experience. The sound power level for the transformer is shown in Table 3 with a typical transformer noise spectrum based on previous Resonate measurements. It is noted that transformers with a lower MVA rating would have a lower permissible sound power level under AS/NZS 60076.10:2009.

Table 3 Octave band sound power levels for 500 MVA transformer

Transformer	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
Per 500 MVA transformer	78.1	82.9	90.9	98.4	100.8	93	90.2	83	103.7

³ GridLink BESS 220/33kV Collector Substation – General Arrangement Drawing MWWF-EP-DWG-GNA-05-011 dated 5 August 2024

For the BESS model, this assessment has been based on a candidate battery module being the Tesla Megapack 2 XL and the preliminary design for the BESS.⁴ Based on the Project's proposed BESS capacity, this assessment has been based on a total of 288 megapacks for the BESS site.

Tesla specified sound power levels for a 9-fan Megapack running at 60% and 40% fan capacity are shown in Table 4. It is noted that the sound power levels from the Tesla Megapacks incorporate noise from various sources including batteries, inverters and fans. The overall sound power levels are controlled by the fans and based on previous experience with Tesla systems it has been assumed that the BESS would operate at a worst case 60% during Day / Evening and 40% during Night.

Table 4 BESS sound power levels

BESS unit	Sound power level in dB L _{WA} at octave band centre frequency in Hz								Overall
	31.5	63	125	250	500	1000	2000	4000	dB L _{WA}
Per Megapack at 60%	53.6	66.8	72.1	90.7	87.2	89.6	89.2	86.4	96.0
Per Megapack at 40%	53.8	67.0	72.3	82.7	81.8	83.9	83.6	80.6	89.8

It is noted that additional equipment would generally be installed at a BESS site including smaller capacity transformers that support the batteries. Based on prior experience, the sound power levels of these transformers are significantly lower than (more than 10 dB below) those of the battery units and the noise emissions from the BESS will be controlled by the Megapacks. As such, this noise assessment has been based on noise emissions from the Megapacks controlling the overall noise emissions from the BESS.

It is noted that the assumed sound power levels above are considered typical of the highest sound power levels that would be anticipated for ancillary infrastructure.

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⁴ GridLink Meering West 500MW BESS – BESS Overall General Arrangement Drawing MWWF-BS-DWG-GNA-01-001-(B) dated 26 September 2024

3 Legislation, policy and guidelines

3.1 Legislation and policy

3.1.1 EP Act

The *Environment Protection Act 2017* (EP Act) includes environmental obligations and protections for all Victorians and establishes Victoria's focus for environment protection and human health as a prevention-based approach. The cornerstone of the EP Act is the general environmental duty (GED), which states:

A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

In the context of the EP Act, 'reasonably practicable' measures mean putting in controls to eliminate the risk of harm to human health and the environment so far as reasonably practicable. If eliminating the risk of harm is not reasonably practicable, then the risk of harm must be reduced so far as reasonably practicable. A number of matters must be considered in deciding what is reasonably practicable in the circumstances:

- the likelihood of those risks eventuating
- the degree of harm that would result if those risks eventuated
- what the person concerned knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks
- the availability and suitability of ways to eliminate or reduce those risks
- the cost of eliminating or reducing those risks.

EPA Victoria Publication 1856: *Reasonably practicable* explains that, when dealing with a common risk or harm, it is possible to demonstrate that the risk has been reduced so far as reasonably practicable if well-established effective practices or controls have been adopted to eliminate or manage risk. Where well-established practices or controls do not exist, then it is necessary to show that effective controls have been assessed and adopted.

The EP Act also prohibits the emission of unreasonable noise and aggravated noise. The Act provides a definition for 'Unreasonable noise' in two parts. Section 3(1)(a) states that noise that is unreasonable having regard to the following:

- its volume, intensity or duration
- its character
- the time, place and other circumstances in which it is emitted
- how often it is emitted
- any prescribed factor.

Section 3(1)(b) states that noise is unreasonable noise if it is prescribed to be so. Under the EP Regulations, noise that exceeds noise limits established for wind turbine noise or ancillary infrastructure noise is prescribed to be unreasonable noise.

3.1.2 Environment Reference Standard

The *Environment Reference Standard* (ERS) exists under the Act and specifies reference standards that reflect the environmental values that the Victorian community wants to achieve and maintain. A reference standard is not a compliance standard which a duty holder, such as Proponent, must achieve, but is intended to inform planning decisions. A reference standard set in the ERS may be taken into account by any decision maker, where it is helpful, to assist with making an environment protection decision.

Part 3 of the ERS documents environmental values of the ambient sound environment and indicators and objectives for the ambient sound environment that are intended to support these values. Table 5 presents the environmental values of the ambient sound environment and Table 6 presents the supporting indicators and objectives.

Table 5 Environmental values of the ambient sound environment

Environmental value	Description of environmental value
Sleep during the night	An ambient sound environment that supports minimal sleep disruption at night
Domestic or recreational activities	An ambient sound environment that supports recreational and domestic activities in a residential setting
Normal conversation	An ambient sound environment that allows for a normal conversation indoors without the need to raise voices
Child learning and development	An ambient sound environment that supports cognitive development and learning in children
Human tranquillity and enjoyment outdoors in natural areas	An ambient sound environment that allows for the appreciation and enjoyment of the environment for its natural condition and the restorative benefits of tranquil soundscapes in natural areas
Musical entertainment	An ambient sound environment that recognises the community's demand for a wide range of musical entertainment

Table 6 Indicators and objectives of the ambient sound environment

Land use category	Indicator	Objective
Category 1: An urban form with distinctive features or characteristics of taller buildings, high commercial and residential intensity and high site coverage. For example, Industrial Zone 1, Industrial Zone 2, Port Zone, Road 1 Zone, Capital City Zone and Docklands Zone.	Outdoor $L_{Aeq,8h}$	55 dB
	Outdoor $L_{Aeq,16h}$	60 dB
Category 2: Medium rise building form with a strong urban or commercial character. For example, Industrial Zone 3, Commercial Zones, Activity Centre Zone, Mixed Use Zone and Road Zone 2.	Outdoor $L_{Aeq,8h}$	50 dB
	Outdoor $L_{Aeq,16h}$	55 dB
Category 3: Lower rise building form including lower density residential development and detached housing, typical or suburban residential settings or in towns of district or regional significance. For example, Residential Growth Zone, General Residential Zone, Neighbourhood Residential Zone, Urban Floodway Zone, Public Park and Recreation Zone and Urban Growth Zone.	Outdoor $L_{Aeq,8h}$	40 dB
	Outdoor $L_{Aeq,16h}$	50 dB
Category 4: Lower density or sparse populations with settlements that include smaller hamlets, villages and small towns that are generally unsuited for further expansion. Land uses include primary industry and farming. For example, Low Density Residential Zone, Township Zone, Rural Living Zone, Green Wedge A Zone, Rural Conservation Zone,	Outdoor $L_{Aeq,8h}$	35 dB
	Outdoor $L_{Aeq,16h}$	40 dB

Land use category	Indicator	Objective
Public Conservation and Resource Zone, Green Wedge Zone, Farming Zone and Rural Activity Zone.		
Category 5: Unique combinations of landscape, biodiversity and geodiversity. These natural areas typically provide undisturbed species habitat.	Qualitative	A sound quality that is conducive to human tranquillity and enjoyment having regard to the ambient natural soundscape.

The Project is considered to be located in a Category 4 area for the purposes of the ERS.

3.1.3 EP Regulations

The *Environment Protection Regulations* (EP Regulations) are subordinate legislation that support the Act. The EP Regulations establish requirements for the Project that are relevant to operational wind turbine noise and ancillary infrastructure noise, described under the EP Regulations as noise from commercial, industrial and trade premises.

Wind turbine noise

Division 5 of Part 5.3 of the EP Regulations sets out that the assessment of wind turbine noise in Victoria for any wind energy facility with an authorising document issued on or after 1 January 2011, or amended to do so, must be carried out in accordance with NZS 6808:2010. By achieving compliance with the NZS 6808:2010 noise limits, as well as the other relevant requirements of the EP Regulations, Regulation 131C advises that a wind farm operator is able to demonstrate compliance with the GED with respect to wind turbine noise emissions.

The requirement to comply with the NZS 6808:2010 noise limits does not apply at dwellings on the wind farm site (as these are excluded from the definition of noise sensitive location by NZS 6808:2010) nor at dwellings with which an appropriate agreement is in place between the landowner and wind farm operator under Regulation 131A, collectively referred to as involved landowner houses in this case. In the case of an involved landowner who has an agreement in place, the noise limit is increased to 45 dB LA90 or the background sound level plus 5 dB, whichever is the greater when assessed in accordance with NZS 6808:2010.

The EP Regulations also establish a number of requirements that are relevant to an operational, rather than proposed, wind energy facility, including:

- A requirement for a post-construction noise assessment to be conducted by a suitably qualified and experienced acoustician within 12 months of operations commencing.
- A requirement for a wind energy facility operator to prepare and implement a Noise Management Plan.
- A requirement for a wind energy facility operator to provide an annual statement to EPA Victoria detailing noise complaints, evidence that operating modes have been complied with, and details of maintenance activities and any noise remediation actions.
- A requirement for a wind energy facility operator to engage a suitably qualified and experienced acoustic consultant to undertake monitoring procedures every five years from the start of operation to ensure that the wind turbine noise complies with the noise limits or, if the assessment is conducted at an alternative monitoring location, the applicable alternative monitoring point criteria.

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Commercial, industrial and trade premises

Division 3 of Part 5.3 of the EP Regulations set out that the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with the Noise Protocol, both in terms of establishing noise limits as noise sensitive areas and in terms of the measurement of noise from the subject premises. With respect to the Project, these requirements apply to noise associated with ancillary infrastructure including the on-site collector stations and BESS, as well as noise generated by the concrete batching plants during the construction phase.

Noise sensitive areas for ancillary infrastructure are defined in the EP Regulations as:

- The area within 10m of the external walls of dwellings (including residential care facilities but excluding caretaker's houses), residential buildings and noise sensitive residential uses.
- The area within 10m outside the external walls of any dormitories, wards, bedrooms and living rooms of caretaker's houses, hospitals, hotels, motels, residential hotels specialist disability accommodation, corrective institutions, tourist establishments, retirement villages and residential villages.
- The area within 10m outside the external walls of classrooms or other rooms in which learning occurs at childcare centres, kindergartens, primary schools and secondary schools.
- Within the boundary of tourist establishments, campgrounds and caravan parks that are located in rural areas.

Note that, in this report, the term noise sensitive receiver has been used to describe the above uses and, where considering noise that is subject to the EP Regulations is consistent with the term noise sensitive area.

The EP Regulations also define Day, Evening and Night time periods for the assessment of noise, reproduced in Table 7.

Table 7 Time periods for operational noise assessment

Time period	Details
Day	Weekdays and Saturdays, 7 am to 6 pm
Evening	Weekdays and Saturdays, 6 pm to 10 pm Sundays and public holidays, 7 am to 10 pm
Night	10 pm to 7 am any day

Under the EP Regulations, noise that exceeds the noise limits is prescribed to be unreasonable noise. While the EP Regulations state that noise limits must be established in accordance with the Noise Protocol, Regulation 118(2) sets base noise limits that are the lowest decibel value that may be set as a noise limit for urban and rural areas across different times of day. Regulation 118(3) also states that the night period noise limit must not exceed 55 dB $L_{Aeq,30min}$.

The EP Regulations also define frequency spectrum as a prescribed factor for the purposes of establishing unreasonable noise under Section 3(1)(a) of the Act. EPA Victoria Publication 1996 provides detailed guidance on the assessment of low frequency noise for the purposes of establishing whether unreasonable noise is being produced. EPA Victoria Publication 1996 is discussed further in Section 3.2.6.

3.1.4 Gannawarra and Loddon Planning Schemes

The Victoria Planning Provisions set out standard provisions that form the framework of the Gannawarra and Loddon Planning Schemes that the Project must address, including provisions that relate to noise management. Clause 13.05-1S Noise Management has an objective to assist the management of noise effects on sensitive land uses and sets out the following strategy:

Ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions.

Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area.

Clause 13.05-1S identifies the EP Act, the EP Regulations, Noise Protocol and the ERS as relevant considerations in meeting the objective.

Clause 13.07-1S Land Use Compatibility also sets out an objective that has relevance to noise emissions, with an objective to protect community amenity, human health and safety while facilitating appropriate commercial, industrial, infrastructure or other uses with potential adverse off-site impacts. Clause 13.07-1S does not identify policies or guidelines that are relevant to noise emissions, but it is expected that the objective would be able to be addressed through consideration of the EP Act, the EP Regulations, Noise Protocol and the ERS as for Clause 13.05-1S.

Clause 52.32 of the Gannawarra and Loddon Planning Schemes address wind energy facilities such as the Project. In particular, Clause 52.32-6 states that the responsible authority should consider the following decision guidelines:

- DTP Guidelines
- NZS 6808:2010.

3.2 Guidelines and standards

3.2.1 DTP Guidelines

The DTP Guidelines are the relevant planning guidelines for wind farms in Victoria and state that, with respect to operational noise:

A wind energy facility must comply with the noise limits in the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (the Standard).

This requirement is equivalent to that imposed by the EP Regulations.

The DTP Guidelines require that any planning permit application for a wind energy facility be accompanied by a pre-construction (predictive) noise assessment report prepared by a suitably qualified and experienced acoustician that:

- Reports on a pre-construction (predictive) noise assessment conducted following NZS 6808:2010.
- Provides an assessment of whether the proposed facility will comply with the noise limits.
- Where the proposed facility will be the subject of a wind turbine noise agreement under the EP Regulations, specifies the premises of the landowner (including any particular buildings) to which the agreement relates and provides an assessment of whether the proposed wind energy facility will comply with the modified noise limit for that facility specified in the agreement.
- Is prepared on the basis that the relevant noise standard will be NZS 6808:2010 and includes an assessment of whether a high amenity noise limit is applicable under Section 5.3 of NZS 6808:2010.

With respect to involved landowner houses, the DTP Guidelines recommend a base noise target of 45 dB LA90, consistent with the requirements of the EP Regulations.

3.2.2 NZS 6808:2010

NZS 6808:2010 defines acceptable limits for wind farm noise at noise-sensitive locations as:

- For most locations:
 - a base noise limit of 40 dB L_{A90} or
 - the background noise level plus 5 dB
 whichever is the greater for the given hub height wind speed.
- For locations in High Amenity areas and for wind conditions when low background sound levels are common at a noise sensitive location:
 - a base noise limit of 35 dB L_{A90} or
 - the background noise level plus 5 dB
 whichever is the greater for the given hub height wind speed. For locations in High Amenity areas at higher wind speed conditions, the same noise limits apply as for all other locations (i.e. base limit of 40 dB L_{A90}).

NZS 6808:2010 also prescribes measurement procedures for background noise and operational wind turbine noise.

3.2.3 EPA Victoria Publication 2061

EPA Victoria Publication 2061 provides guidance on the application of the wind turbine noise provisions of the EP Regulations, including NZS 6808:2010, in Victoria.

Key aspects of EPA Victoria Publication 2061 that are applicable to this assessment are:

- The noise limits established under the EP Regulations and NZS 6808:2010 do not apply during construction or commissioning of a wind energy facility.
- High amenity noise limits:
 - should apply to a dwelling located in the following zones predominantly intended for residential development: Low Density Residential Zone (LDRZ), Township Zone (TZ), Rural Living Zone (RLZ), Green Wedge A Zone (GWAZ) and Rural Conservation Zone (RCZ)
 - should not apply to the Farming Zone (FZ)
 - should not be applied in any location where background sound levels are already affected by other specific sources such as road traffic noise
 - only applies for wind energy facility hub height wind speeds up to and including 6 m/s
 - is applicable only when there is no agreement made in accordance with Regulation 131A, i.e. is not applicable to involved stakeholder dwellings.
- The noise limits at a noise sensitive receiver are applicable to the cumulative sound level of all wind energy facilities affecting that receiver.

3.2.4 EPA Victoria Publication 3011

EPA Victoria Publication 3011 was released in December 2024 and provides guidance on the measurement of background and operational wind turbine noise, prediction of wind turbine noise and preparations of pre-construction (predictive) noise assessment reports. The guidance supplements that provided in EPA Victoria Publication 2061.

EPA Victoria Publication 3011 also provides guidance on the application of noise limits. It notes that, although no formal noise limits apply to dwellings on the wind farm site, EPA Victoria considers it good practice to set limits consistent with the limits specified under the EP Regulations for dwellings with an individual agreement, being a base limit of 45 dB L_{A90} .

3.2.5 Noise Protocol

EPA Victoria has prepared the Noise Protocol to specify methodologies for establishing noise limits for operational noise sources and for assessing noise levels against the noise limits. Compliance with the noise limits defined by the Noise Protocol is required by the EP Regulations and is expected to assist with meeting the GED during the operational phase of the Project.

The Noise Protocol is relevant to this assessment as it provides a method for the measurement of background noise, and details how noise limits for operational noise from ancillary infrastructure are to be established based on existing land zoning and background noise levels. The Noise Protocol is not applicable to the majority of construction noise and not applicable to noise associated with decommissioning. It is, however, applicable to noise associated with concrete batching plants during construction as these represent sources that may operate at a single location for an extended period of time that are deemed sufficiently similar to commercial or industrial premises.

The Noise Protocol defines different procedures for establishing noise limits depending on whether the noise sensitive receiver is located within a major urban area or rural areas. Major urban areas are defined as those locations within Melbourne's urban growth boundary or within defined areas around major regional centres. The Project and surrounding areas are located outside of the defined major urban areas and therefore the rural area methodologies require consideration.

For rural areas, the Noise Protocol primarily defines noise limits dependent on the following:

- Time of day. The same time periods are applied as for urban areas (Table 7).
- Land zoning of both the noise source and noise sensitive receiver used to determine the Zone Level.
- A distance adjustment applied to the Zone Level where a noise sensitive receiver is in a different zone to a noise source.
- Type of noise source. Specific limits are set for certain noise sources, such as utilities and earth resources.

The determination of the noise limits throughout the noise and vibration study area will vary depending on the factors above. For the Project, the noise limits for ancillary infrastructure must be established in accordance with Section 2.6 of the Noise Protocol, which applies to utilities in rural areas. For concrete batching plants, noise limits have been established using the method for commercial, industrial and trade premises.

Background noise levels may be taken into account in establishing noise limits in rural areas where the noise sensitive receiver is located within a 'background relevant area.' Background relevant areas are those rural areas where background levels may be higher than usual and include areas where road traffic is a significant audible source. This is not considered to be relevant to the Project, which is in an area removed from significant sources of background noise.

3.2.6 EPA Victoria Publication 1996

EPA Victoria Publication 1996 provides guidance on the assessment of low frequency noise from commercial, industrial and trade premises. As frequency spectrum is a separate prescribed factor under the Act, operational sources with the potential to produce a higher relative level of low frequency noise should be separately assessed against this guidance in addition to the noise limits applicable under the EP Regulations.

EPA Victoria Publication 1996 specifically excludes the assessment of wind turbine noise, noting that wind turbine noise is assessed against NZS 6808:2010 which states that it gives due consideration to low frequency noise from wind turbine noise.

EPA Victoria Publication 1996 defines low frequency noise as that occurring between the frequency range of 10 Hz and 160 Hz. It provides noise thresholds, in one-third octave bands, with levels above the threshold indicating a

potential risk of problematic low frequency noise that would require further consideration, investigation and potentially mitigation.

Table 8 presents the low frequency noise thresholds for predictions and measurements conducted outdoors. The outdoor threshold levels are based on indoor thresholds with an assumed façade noise reduction, as specified by EPA Victoria Publication 1996. For the purposes of this assessment, the outdoor thresholds have been adopted. Should a risk of exceedance be identified, then measures to mitigate the risk so far as reasonably practicable should be implemented prior to any further investigation against the indoor thresholds.

Table 8 Outdoor low frequency noise thresholds

Outdoor noise level in dB L _{eq} at one-third octave band centre frequency in Hz												
10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
92	89	86	77	69	61	54	50	50	48	48	46	44

EPA Victoria Publication 1996 notes that predictions of low frequency noise from proposed premises can be problematic and of low accuracy due to uncertainty around the source levels and limitations on some prediction methods in the low frequency range. Therefore, calculations should only be used as a screening tool to assess the risk, and uncertainty appropriately considered as part of the assessment.

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4 Noise limits

4.1 Wind turbine noise

4.1.1 Noise-sensitive locations

As the noise predictions conducted for the Project, and as presented within this report, demonstrate that predicted wind turbine noise levels at noise-sensitive locations are no higher than 40 dB LA90, no background noise monitoring has been conducted at this stage of the Project. Accordingly, the minimum applicable wind turbine noise limit of 40 dB LA90 has been adopted at all operating wind speeds for this assessment as a conservative approach.

Section 7.4 of EPA Victoria Publication 3011 provides the following guidance with respect to the need for background noise monitoring at this stage of a wind energy facility:

The background sound levels, and operational wind turbine noise are required to be measured to confirm compliance with the noise limits.

Full sound level measurements are not required if, in accordance with section 7.1.2 of NZS 6808:2010, the WEF developer elects to adopt a WEF noise limit of 40 dBLA90(10 min) at all operating wind speeds and conducts on/off compliance tests (except if SACs are detected).

Background sound level measurements adopted for the post-construction compliance analysis should be from within approximately 5 years of the post-construction measurements. Where necessary, additional pre-construction background sound level measurements should be undertaken to provide contemporary background sound level measurements prior to construction of the WEF. It is not expected that new background sound level measurements would be required for preparation of the annual statement (Reg.131F) or Wind turbine noise monitoring undertaken under regulation Reg.131G.

Consistent with the above and the conservative approach adopted in this assessment by adopting the minimum applicable noise limit of 40 dB LA90, it is expected that, should the Project be approved, the wind farm operator would either:

- Commission background noise monitoring as per NZS 6808:2010 to establish background noise levels and, if justified by the background noise monitoring, noise limits that are higher than 40 dB LA90. This would typically be done as part of an updated pre-construction noise assessment that considers the final selected wind turbine model and layout, and would typically occur within five years of the planned timeframe for post-construction measurements as per the recommendations of EPA Victoria Publication 3011.
- Elect to undertake on/off testing as per NZS 6808:2010 to confirm compliance with the applicable noise limits.

4.1.2 High amenity noise limit

As per the requirements of the DTP Guidelines and NZS 6808:2010, consideration must be given as to whether there are high amenity areas (as defined by NZS 6808:2010) relevant to the Project.

With respect to high amenity areas, the definition of high amenity areas is relevant to the New Zealand planning system and not directly translatable to Victorian planning schemes. However, the approach of the Victorian Civil and Administrative Tribunal (VCAT) in their determination on the Cherry Tree Wind Farm was that areas allocated for farming use would not be considered to be High Amenity. The DTP Guidelines reference the Cherry Tree Wind Farm decision with respect to High Amenity areas.

Further Victorian guidance was provided by the Planning Panel for the Golden Plains Wind Farm, where it was deemed that noise-sensitive land uses located in a TZ and LDRZ should be deemed high amenity, but that those noise-sensitive land uses in FZ were not high amenity areas for the purposes of NZS 6808:2010.

The above VCAT and Planning Panel conclusions have since been supplemented by EPA Victoria Guidelines 2061 and 3011, which state that high amenity noise limits:

- Should apply to any non-involved dwellings in LDRZ, TZ, RLZ, GWAZ and RCZ.
- Should not apply to any dwellings in a FZ.

The Gannawarra and Loddon Planning Schemes define the area in which the Project and nearest noise-sensitive locations are located as a FZ. Therefore, the high amenity noise limit is not applicable to the nearest noise-sensitive locations. There are no zones that would be considered to be high amenity in accordance with the definition of EPA Victoria Guidelines 2061 within 5 km of the Project boundary.

Under the ERS, which sets an environmental value of human tranquillity and enjoyment outdoors in natural areas, it is possible that consideration could be given to the public campground in Leaghur State Park as a high amenity area. However, the campground is outside of the predicted 35 dB L_{A90} noise contour from the Project and, therefore, is not required to be considered for the application of high amenity as per C5.3.1(a) of NZS 6808:2010. It is noted that, with predicted noise levels below 35 dB L_{A90} at the maximum wind turbine sound power level, compliance would be predicted with the high amenity limit (which would only apply up to a wind speed of 6 m/s) regardless.

4.1.3 Involved stakeholder dwellings

The 17 identified involved stakeholder dwellings are located within the Project site boundary. NZS 6808:2010 excludes dwellings on a wind farm site from the definition of noise-sensitive location and, therefore, no noise limits are applied under NZS 6808:2010.

For the purposes of this assessment, predicted noise levels at these dwellings have been presented and compared against the 45 dB noise target recommended by the DTP Guidelines.

4.2 Ancillary infrastructure

The ancillary infrastructure sites are all located in a Farming Zone under the relevant planning scheme, as are the nearest noise-sensitive locations to each site. Therefore, the applicable noise limits, as defined for utilities where the noise source and receiver in a Farming Zone by the Noise Protocol, are as set out in Table 9.

Table 9 Noise limits for ancillary infrastructure

Phase	Description	Noise limit, dB $L_{Aeq,30min}$
Day	Weekdays and Saturdays, 7 am to 6 pm	45
Evening	Weekdays and Saturdays, 6 pm to 10 pm Sundays and public holidays, 7 am to 10 pm	39
Night	10 pm to 7 am any day	34

It is noted that, unlike for wind turbine noise, there is no exemption for ancillary infrastructure noise limits under the EP Regulations. Therefore, these noise limits should be complied with at both noise-sensitive locations and involved stakeholder locations.

5 Wind turbine noise assessment

5.1 Noise prediction methodology

To predict wind turbine noise levels from the Project, an environmental noise model has been developed in SoundPlan version 9.1 environmental noise prediction software. The noise model implements the ISO 9613-2:2024⁵ prediction algorithm.

In accordance with standard prediction procedures for wind farm noise as set out in ISO 9613-2:2024, predictions have been undertaken on the basis of the following parameters consistent with the recommendations of EPA Victoria Publication 3011:

- topography, as sourced from the DTP Spatial Datamart on 21 March 2025
- ground absorption factor of 50% representing mixed reflective and absorptive ground
- Project wind turbine locations as per the coordinates detailed in Appendix A received 26 May 2025
- noise-sensitive locations as per the coordinates detailed in Appendix B
- 194 m hub height Project turbines with a rotor diameter of 172 m and sound power levels as per Table 2
- sensitive receivers at 4 m above ground as per the recommendations of ISO 9613-2:2024
- a +3 dB correction applied to the predicted noise levels from any wind turbine where concave topography is predicted between it and the receiver location as defined by the UK Institute of Acoustics *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise* (Good Practice Guide)
- temperature of 10°C and relative humidity of 70%
- sound propagating downwind, meteorological correction $C_{met} = 0$
- topographical shielding limited to 2 dB, assessed based on the wind turbine tip height.

The air absorption values from ISO 9613-2:2024 have been adopted for the purposes of predicting noise levels from the Project. Air absorption is dependent on the assumed temperature and humidity and therefore the relevant air absorption values for this assessment are shown in Table 10.

Table 10 Air absorption attenuation coefficients

Conditions	Atmospheric attenuation in dB/km for octave band centre frequency in Hz							
	63	125	250	500	1000	2000	4000	8000
Temperature 10°C Rel humidity 70%	0.1	0.4	1.0	1.9	3.7	9.7	32.8	117

The noise prediction methodology adopted is expected to result in wind turbine noise predictions that are approximately 1.5 to 2 dB higher than would be measured when applying the wind turbine noise measurement methodology specified by NZS 6808:2010. This is because:

⁵ International Standard 9613-2:2024 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors*

- A previous Australian study⁶ conducted by Resonate staff has shown that wind turbine noise predictions using a receiver height of 1.5 m above ground accurately predict downwind noise levels for Australian sites with relatively flat topography when using the wind turbine noise measurement methods applied in Australia that use the L_{A90} metric as per NZS 6808:2010.
- Increasing the receiver height to 4 m as recommended by ISO 9613-2:2024 increases the predicted noise levels by approximately 1.5 dB in comparison to predictions using a receiver height of 1.5 m.
- The receiver height of 4 m is understood to be based on the recommendations of the Good Practice Guide. However, the Good Practice Guide also recommends that 2 dB be subtracted from predicted noise levels to adjust predicted L_{Aeq} noise levels to the assessed L_{A90} noise levels. This correction has conservatively not been adopted for this assessment.

A detailed discussion of uncertainty with respect to the adopted noise prediction methodology is provided in Appendix C.

5.2 Predicted noise levels at noise-sensitive locations

Predicted Project wind turbine noise levels for each noise-sensitive location are presented in Appendix B. A noise contour map showing the wind turbine noise predictions is included in Appendix D.

NZS 6808:2010 requires that consideration be given to sensitive receivers within the 35 dB L_{A90} noise contour. Based on the wind turbine noise predictions from the Project, a total of nine noise-sensitive locations were identified within the 35 dB L_{A90} predicted noise contour for the Vestas V172-7.2MW turbine. The predicted noise levels at these locations are shown in Table 11.

Table 11 Predicted wind turbine noise levels at noise-sensitive locations within 35 dB L_{A90} noise contour

Noise-sensitive location	Distance to nearest wind turbine, m	Predicted Project noise level, dB L_{A90}	Minimum noise limit, dB L_{A90}
49	2485	35	40
51	2076	36	40
52	2042	36	40
62	2010	37	40
63	2010	37	40
64	1803	37	40
65	1982	36	40
92	2070	35	40
93	2065	35	40

The predicted noise levels at all sensitive receivers are below 40 dB L_{A90} at all noise-sensitive locations, with a maximum predicted wind turbine noise level of 37 dB at any location.

⁶ Evans T & Cooper J, 2012, *Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms*, Acoustics Australia, vol. 40, no. 1, pp 28-36.

It is noted that these predictions are based on candidate wind turbine selections that are considered to be representative of the current range of turbines, and this is reflected in the range of predicted wind farm noise levels. As the Project develops post-approval and the wind turbine type and layout is confirmed, an updated Pre-Construction Noise Assessment should be prepared to confirm how the selected wind turbine type and layout will achieve compliance with the applicable noise limits.

5.3 Predicted noise levels at natural areas

The natural areas identified in Section 2.3 are shown on the wind turbine noise contour maps included in Appendix D, with Figure D2 showing predicted noise contour maps with the identified natural areas. Table 12 provides a discussion of the predicted wind turbine noise levels at each of the natural areas.

Table 12 Predicted wind turbine noise levels at natural areas

Area	Discussion
Leaghur State Park PCRZ including campground CG1	Predicted wind turbine noise levels are typically 30 dB LA90 or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. For the campground area CG1 at the south end of Lake Meran, where people may congregate for the longest period of time, the predicted noise levels are 31 dB LA90 at the maximum wind turbine sound power level. This is 9 dB lower than the equivalent limit that applies to residential land uses. Additionally, even if the campground were to be considered a potential high amenity area under NZS 6808:2010, the predicted noise levels even at maximum wind turbine sound power output are 4 dB below the high amenity limit of 35 dB.
Great Spectacle Lake and Little Spectacle Lake PCRZ	The majority of the PCRZ sits outside of the predicted 40 dB LA90 noise contour, with a small area to the west extending to the 45 dB LA90 noise contour. This level of noise is expected to be audible within the PCRZ, however would be limited to times of higher wind speeds, when it is reasonable to expect that there would be wind blowing through vegetation in the reserve as well to create background noise. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Round Lake and Tobacco Lake PCRZ	Predicted wind turbine noise levels at 35 dB LA90 or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Little Lake PCRZ	Predicted wind turbine noise levels at 33 dB LA90 or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

Area	Discussion
Quambatook I208 Bushland Reserve PCRZ	The PCRZ sits between the predicted 40 dB LA90 noise contour at its western end and extend towards the 50 dB LA90 noise contour at its eastern end where it is within 400 m of the nearest Project wind turbines. This level of noise is expected to be audible within the PCRZ, however would be limited to times of higher wind speeds, when it is reasonable to expect that there would be wind blowing through vegetation in the reserve as well to create background noise. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.
Gredgwin Bushland Reserve PCRZ	Predicted wind turbine noise levels at 35 dB LA90 or below. While wind turbine noise levels may be audible at times when the hub height wind speed is high, this level of noise is expected to be lower than the typical ambient noise levels in the PCRZ, particularly with wind blowing through the vegetation in the PCRZ. No campground was identified within the PCRZ such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

5.4 Predicted noise levels at involved stakeholders

Predicted Project wind turbine noise levels for each involved stakeholder location are presented in Table 13. A noise contour map showing the wind turbine noise predictions is included in Appendix D.

Table 13 Predicted wind turbine noise levels at involved stakeholders

Involved stakeholder	Distance to nearest wind turbine, m	Predicted Project noise level, dB LA90	DTP Guidelines recommended target noise level, dB LA90
50	1113	38	45
53	1518	38	45
69	1231	41	45
80	838	44	45
100	993	43	45
101 ¹	671	42	45
105	1364	41	45
108	857	43	45
115	1367	37	45
117 ¹	693	44	45
121	883	42	45
126	1513	40	45
127	1527	40	45
137	1573	35	45
139	1573	36	45

Involved stakeholder	Distance to nearest wind turbine, m	Predicted Project noise level, dB LA90	DTP Guidelines recommended target noise level, dB LA90
143	1750	36	45
146	1931	35	45

(1) It is understood that this house is currently unlivable but has been assessed regardless.

The predicted noise levels at all involved stakeholders are below the 45 dB LA90 noise target recommended by the DTP Guidelines. It is noted that a number of these involved stakeholder locations are within the Project boundary such that they are not considered as noise-sensitive locations by NZS 6808:2010, however predicted noise levels remain below 45 dB regardless.

5.5 Special audible characteristics

NZS 6808:2010 advises that, if wind turbine noise levels exhibit special audible characteristics such as tonality, impulsiveness and amplitude modulation, then a penalty should be applied to the noise level. Consistent with the recommended approach of EPA Victoria Publication 3011, the predictions shown in this assessment are based on the wind turbine noise levels at residences containing no characteristics that would attract a penalty in accordance with NZS 6808:2010.

Special audible characteristics are not possible to assess in detail at this preliminary stage as information is generally not available from turbine manufacturers. In the relatively unusual event that special audible characteristics are detectable at residences, the occurrence will also involve a complex relationship between the wind turbine noise and the background noise environment that is best assessed through measurements.

Special audible characteristics from wind farms at residences are, in our experience, a relatively uncommon occurrence in Australia and, where they have occurred, they have generally occurred infrequently and under specific conditions. As such, it is considered reasonable to assume that they will not occur for the purposes of this preliminary noise assessment.

Should the Project be approved, special audible characteristics would need to be considered during any post-construction compliance monitoring for the Project, as is required by NZS 6808:2010. In the event that special audible characteristics are detected, the site will need to achieve compliance with the noise limits including the appropriate penalty for the detected characteristics when assessed in accordance with NZS 6808:2010.

5.6 Summary and recommendations

The assessment of wind turbine noise has concluded that the Project can comply with the minimum applicable noise limit of 40 dB LA90 at the nearest noise-sensitive locations.

The assessment is based on a candidate wind turbine model and layout that may be subject to further refinement post-approval. In accordance with EPA Victoria Publication 3011 it is recommended that prior to the commencement of construction of the Project:

- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.

In addition to the above, it is noted that compliance with the EP Regulations will also necessitate:

- A post-construction noise assessment to be conducted for the Project by a suitably qualified and experienced acoustician within 12 months of operations commencing.
- MWWF to prepare and implement a Noise Management Plan prior to the commencement of operation.
- MWWF to provide annual statements to EPA Victoria once the Project commences operation detailing noise complaints, evidence that operating modes have been complied with, and details of maintenance activities and any noise remediation actions.
- MWWF to engage a suitably qualified and experienced acoustic consultant to undertake monitoring procedures every five years from the start of operation to ensure that the wind turbine noise complies with the noise limits or, if the assessment is conducted at an alternative monitoring location, the applicable alternative monitoring point criteria.

As per Regulation 131C of the EP Regulations, compliance with the NZS 6808:2010 noise limits and the above items would demonstrate compliance with the GED with respect to wind turbine noise emissions.

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6 Ancillary infrastructure noise assessment

6.1 Noise prediction methodology

To predict wind turbine noise levels from the Project, an environmental noise model has been developed in SoundPlan version 9.1 environmental noise prediction software. The noise model implements the ISO 9613-2:2024 prediction algorithm.

In accordance with standard prediction procedures for wind farm noise as set out in ISO 9613-2:2024, predictions have been undertaken on the basis of the following parameters:

- topography, as sourced from the DTP Spatial Datamart on 21 March 2025
- ground absorption factor of 0% around the BESS and substation site representing reflective ground such as paving or concrete
- ground absorption factor of 70% representing 70% absorptive and 30% reflective ground, considered typical of rural grassland and farming areas in Victoria
- ancillary infrastructure sites as shown on Figure 1, with both Option 1A and Option 2 assessed
- noise-sensitive locations as per the coordinates detailed in Appendix B
- sound power levels for ancillary infrastructure as per Table 3 and Table 4
- transformers located centrally within each collector station modelled at a height of 4 m above ground level
- battery packs distributed across the BESS area and modelled at a height of 3.3 m above ground level based on the Tesla Megapack 2XL recommendations
- sensitive receivers at 1.5 m above ground
- temperature of 10°C and relative humidity of 70%
- sound propagating downwind, meteorological correction $C_{met} = 0$
- a +2 dB tonal adjustment has been applied with consideration of previous experience of tonal noise from electrical infrastructure and the likelihood of it only being just perceptible at significant distance.

6.2 Predicted noise levels at residential land uses

Table 14 presents the highest predicted noise levels from the ancillary infrastructure sites, for both Option 1A and Option B, at any involved stakeholder dwelling and any non-involved noise-sensitive location without an involvement in the Project.

Table 14 Highest predicted noise levels for ancillary infrastructure

Time period	Highest predicted noise levels	Noise limit, dB $L_{Aeq,30min}$
Option 1A		
Day / Evening	Involved stakeholder, Receiver ID 100: 39 dB $L_{Aeq,30min}$	39 (Evening)
	Non-involved noise sensitive location, Receiver ID 65: 23 dB $L_{Aeq,30min}$	39 (Evening)
Night	Involved stakeholder, Receiver ID 100: 33 dB $L_{Aeq,30min}$	34
	Non-involved noise sensitive location, Receiver ID 65: 18 dB $L_{Aeq,30min}$	34
Option B		
Day / Evening	Involved stakeholder, Receiver ID 108: 33 dB $L_{Aeq,30min}$	39 (Evening)
	Non-involved noise sensitive location, Receiver ID 114: 25 dB $L_{Aeq,30min}$	39 (Evening)

Time period	Highest predicted noise levels	Noise limit, dB L _{Aeq,30min}
Night	Involved stakeholder, Receiver ID 108: 28 dB L _{Aeq,30min}	34
	Non-involved noise sensitive location, Receiver ID 114: 20 dB L _{Aeq,30min}	34

The predicted noise levels for both options are compliant with the applicable noise limits at the nearest involved stakeholders and are 14 dB or more below the applicable noise limits at the nearest non-involved receiver.

Option B results in a greater margin of predicted noise level compliance at the nearest involved stakeholder locations due to a greater separation distance to the nearest involved stakeholder dwelling. It is noted that involved stakeholders would not necessarily be subject to any exemption from the noise limits under the EP Regulations for ancillary infrastructure noise and, therefore, it is assumed that compliance with the noise limits would be necessary at involved stakeholder dwellings.

6.3 Noise character

6.3.1 Tonality

The assessment presented in Section 6.2 is based on a +2 dB tonal adjustment being applied to the predicted noise levels, typical of BESS infrastructure in our experience. BESS noise at distance is typically dominated by noise associated by cooling systems which do not tend to have a significant tonal component.

While transformer noise can contain tonal noise at 100 Hz, and harmonics such as 200 Hz, that could attract a higher tonal penalty in isolation, the predicted noise levels from the BESS and transformers based on this preliminary assessment indicate that, for Option 1A and for Receiver 100 with the highest predicted noise levels:

- The predicted noise level from the transformer is more than 9 dB below the predicted noise level from the BESS in the 125 Hz and 250 Hz octave bands during Day / Evening.
- The predicted noise level from the transformer is more than 3 dB below the predicted noise level from the BESS in the 125 Hz and 250 Hz octave bands during Night.

As such, tonal noise from the transformer at 100 Hz and harmonics is not expected to be prominent when the BESS is operating at typical maximum capacity and overall noise levels are at their highest, and the +2 dB tonal adjustment for just detectable tonality is considered appropriate at this stage of the assessment. It is noted that this would need to be reviewed as part of the detailed design noise assessment recommended in Section 6.5.

Note that, at times when the wind turbines are operating, the noise level from the wind turbines would be expected to mask any tonal noise from the ancillary infrastructure such that no tonal adjustment would apply to noise from ancillary infrastructure. At these times, no tonal adjustment would be expected to apply, and the ancillary infrastructure noise predictions would therefore be lower.

6.3.2 Low frequency noise

Table 15 presents the predicted low frequency noise levels for ancillary infrastructure when the Noise Protocol noise limit is achieved compares them to the outdoor low frequency noise thresholds from EPA Victoria Publication 1996. The predictions are shown for the nearest involved stakeholder dwellings for each option (Receiver 100 for Option 1A and Receiver 108 for Option B), and the predicted low frequency noise levels for the more distant non-involved noise-sensitive locations would be significantly lower. The assessment has only been carried out to a frequency of 25 Hz

due to the lower risk of low frequency noise below 25 Hz for electrical infrastructure, and because there is no manufacturer data for frequencies below this.

Table 15 Highest predicted low frequency noise levels for ancillary infrastructure at Receiver ID 100

Situation	Outdoor noise level in dB L _{eq} at one-third octave band centre frequency in Hz												
	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Option 1A – Receiver 100													
Threshold	92	89	86	77	69	61	54	50	50	48	48	46	44
Day / Evening	- ¹	- ¹	- ¹	- ¹	47	47	47	46	46	46	35	35	35
Night	- ¹	- ¹	- ¹	- ¹	44	44	44	43	43	43	34	34	34
Option B – Receiver 108													
Threshold	92	89	86	77	69	61	54	50	50	48	48	46	44
Day / Evening	- ¹	- ¹	- ¹	- ¹	43	43	43	42	42	42	30	30	30
Night	- ¹	- ¹	- ¹	- ¹	40	40	40	39	39	39	29	29	29

- (1) No manufacturer data at these frequencies. However, low risk of problematic low frequency noise in this range given predicted overall noise levels at other frequencies.

Based on the ancillary infrastructure noise assessment, it is expected that ancillary infrastructure for the Project can be designed such that environmental noise levels are below the applicable noise limits and in a manner such that there is a low risk of problematic low frequency noise as defined by EPA Victoria Publication 1996.

6.4 Predicted noise levels at natural areas

Noise levels from the ancillary infrastructure at natural areas are expected to be significantly lower than that from wind turbine noise (discussed in Section 5.3) considering that the ancillary infrastructure is over 8 km (Option 1A) or over 3.5 km (Option B) from the nearest identified natural areas. As such, no additional impact is anticipated to natural areas from the ancillary infrastructure noise emissions.

6.5 Summary and recommendations

The assessment of ancillary infrastructure noise has concluded that the Project can comply with the applicable Noise Protocol noise limits and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design.

As required by the GED, noise emissions from ancillary infrastructure should be reduced so far as reasonably practicable. This would need to be addressed through detailed design, and may include any or all of the following measures:

- Maximising the distance between major ancillary infrastructure noise sources and noise sensitive locations.
- Considering the sound power level, and any information on noise character such as tonality, of BESS equipment in procurement decisions.
- Selection of transformers with reduced maximum sound power levels if deemed reasonably practicable to do so.
- Using existing site features or other available noise barriers (e.g. fire walls) to provide acoustic shielding between ancillary infrastructure and noise sensitive locations.

- Constructing new shielding features, such as earth berms or noise barriers where reasonably practicable to do so.

Due to the preliminary nature of this assessment, and the variation that can exist in sound power levels for BESS equipment in particular, it is recommended that an updated Pre-Construction Noise Assessment for ancillary infrastructure be prepared once the detailed design and selection of the ancillary infrastructure is confirmed. This assessment would recommend measures to avoid unreasonable noise and assist in addressing the GED.

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7 Construction and commissioning noise

7.1 Construction phase

The GED and unreasonable noise provisions under the EP Act apply to noise generated during the Project construction phase, however the noise limits under the EP Regulations do not.

Neither the DTP Guidelines nor the Gannawarra and Loddon Planning Schemes require an assessment of construction phase noise for a Planning Permit application and, therefore, a detailed assessment of construction noise is outside of the scope of this assessment. However, in our experience and considering the normally large separation distances to noise sensitive areas around wind energy projects, construction phase noise can normally be effectively managed through the application of typical measures such as the following:

- Carrying out works in accordance with guidance set out in EPA Victoria Publication 1834.1 *Civil construction, building and demolition guide* (EPA Victoria Publication 1834.1).
- Scheduling works during Normal Working Hours, being from 7 am to 6 pm Mondays to Friday and 7 am to 1 pm Saturdays where practicable.
- Ensuring out of hours works meet the definitions of Unavoidable Works, Managed-Impact Works or Low Noise Impact Work as set out in EPA Victoria Publication 1834.1.
- Planning works to avoid or minimise impacts so far as reasonably practicable, including locating site compounds and laydown areas away from residential receivers and natural areas.
- Planning site access routes to minimise truck traffic on non-arterial roads near residential receivers.
- Selecting quieter construction methods where reasonable and feasible to do so.
- Considering the noise generated by construction plant and equipment in procurement and rental decisions.
- Using non-tonal reversing beepers where noise from reversing activities may be audible at residential receivers.
- Maintaining equipment and vehicles in good working condition.
- Providing training on noise reduction measures to staff as part of the staff induction.
- Confirming noise mitigation and management measures being implemented on site to staff during pre-start briefings.
- Providing prior notification of works to potentially affected land uses.
- Consulting with residential receivers to determine any times at which they may be more sensitive to noise and avoiding noisy works during those times.
- Assessing noise associated with fixed concrete batching plants and implementing controls such that noise emissions remain below the applicable Noise Protocol noise limits during operating hours.

It is recommended that, prior to construction of the Project commencing, a Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.

7.2 Commissioning phase

Noise associated with wind turbine commissioning is not subject to the noise limits set under the EP Regulations as per EPA Victoria Publication 3011. However, the GED and unreasonable noise provisions under the EP Act apply.

EPA Victoria Publication 3011 notes that:

During the period between any wind turbine first generating power and the post-construction compliance assessment, the WEF operator should ensure that the wind turbine sound levels are consistent with the sound levels modelled as part of the approval process. During commissioning, to help manage risks of non-compliance where predicted wind farm sound levels

are close to the noise limits, it is good practice to conduct initial wind turbine sound level measurements following the operation of the first turbines to verify the predicted levels.

Measures to assess and manage wind turbine noise during commissioning would need to be incorporated into the Noise Management Plan to be prepared to address the EP Regulations.

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8 Conclusion

This report presents an environmental noise assessment of the proposed Meering West Wind Farm, considering operational wind turbine noise and ancillary infrastructure noise.

Based on the candidate wind turbine selection and proposed 164 wind turbine layout, operational wind turbine noise levels were predicted and assessed against the minimum applicable noise limit of 40 dB LA90 that applies under the DTP Guidelines, EP Regulations and NZS 6808:2010. A total of nine noise-sensitive locations were identified within the predicted 35 dB LA90 noise contour with predicted wind turbine noise levels being 37 dB or below at all of these locations. As such, it is expected that the Project is capable of complying with the applicable noise limits under NZS 6808:2010 subject to appropriate turbine selection during detailed design. Predicted wind turbine noise levels at involved stakeholder locations were also below 45 dB in all cases.

The assessment of ancillary infrastructure noise has concluded that the Project is capable of complying with the applicable Noise Protocol noise limits for both ancillary infrastructure options assessed, and that the risk of problematic low frequency noise can be managed through appropriate equipment selection and site design.

Wind turbine noise emissions and ancillary infrastructure noise was also considered at identified natural areas as defined in the Gannawarra and Loddon Planning Schemes. While wind turbine noise is expected to be audible during periods of higher wind speeds, it is reasonable to expect that there would be wind blowing through vegetation in the natural areas as well at these times to create background noise. One campground was identified at Lake Meran, as part of the Leaghur State Park PCRZ, with predicted noise levels at the campground being 31 dB LA90 and 4 dB below the limit recommended for high amenity areas in NZS 6808:2010 even with the wind turbines operating at their maximum sound power level. No campgrounds were identified within other natural areas such that people would only be expected to be in the area for limited periods of time and carrying out recreational activities.

The assessment is based on a candidate wind turbine model, ancillary infrastructure selection and layout that may be subject to further refinement post-approval. It is recommended that, prior to the commencement of construction of the Project and in addition to the obligations that exist for wind energy facilities under the EP Regulations:

- A Construction Noise Management Plan be developed to identify measures to be implemented to reduce the impact of construction noise so far as reasonably practicable. The Construction Noise Management Plan should sit as a sub-plan to the Construction Environmental Management Plan and should be implemented during construction.
- A Pre-Construction Noise Assessment be prepared that reflects the final wind turbine selection and design.
- The Pre-Construction Noise Assessment should include background noise monitoring conducted at representative noise-sensitive locations within the predicted 35 dB LA90 noise contour consistent with NZS 6808:2010.
- A Pre-Construction Noise Assessment also be prepared for the final ancillary infrastructure selection and design.

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Appendix A—Wind turbine coordinates

Table A1 Project WTG coordinates as GDA2020 MGA Zone 54

ID	Easting	Northing	ID	Easting	Northing
WTG1	6035159	752160	WTG30	6030025	741725
WTG2	6034633	751202	WTG31	6029986	744476
WTG3	6033825	751811	WTG32	6029955	743276
WTG4	6033220	751367	WTG33	6029798	747378
WTG5	6033150	752217	WTG34	6029776	748763
WTG6	6032790	743210	WTG35	6029746	746059
WTG7	6032219	745188	WTG36	6029558	750806
WTG8	6032154	743886	WTG37	6029356	739572
WTG9	6032050	742562	WTG38	6029317	749569
WTG10	6031730	752449	WTG39	6029315	740987
WTG11	6031676	750859	WTG40	6029235	743817
WTG12	6031484	744706	WTG41	6029194	745232
WTG13	6031377	743170	WTG42	6029129	746585
WTG14	6031296	745999	WTG43	6029112	748009
WTG15	6031224	748510	WTG44	6028628	740260
WTG16	6031136	751601	WTG45	6028601	750174
WTG17	6031130	750245	WTG46	6028545	738912
WTG18	6030771	739613	WTG47	6028545	743093
WTG19	6030730	741028	WTG48	6028510	744532
WTG20	6030649	743857	WTG49	6028467	745919
WTG21	6030643	749194	WTG50	6028447	747367
WTG22	6030639	742378	WTG51	6028399	748746
WTG23	6030602	750838	WTG52	6028372	741668
WTG24	6030601	745182	WTG53	6028042	740882
WTG25	6030425	746601	WTG54	6027940	739548
WTG26	6030353	748080	WTG55	6027860	742362
WTG27	6030083	738885	WTG56	6027814	743800
WTG28	6030049	750056	WTG57	6027779	745194
WTG29	6030035	740301	WTG58	6027748	746692

ID	Easting	Northing	ID	Easting	Northing
WTG59	6027627	748029	WTG91	6024783	749353
WTG61	6027257	738709	WTG92	6024465	737309
WTG62	6027214	740193	WTG93	6024424	738724
WTG63	6027202	742995	WTG94	6024345	740137
WTG64	6027096	744435	WTG95	6024307	741665
WTG65	6027057	745972	WTG96	6024182	745918
WTG66	6027008	747162	WTG97	6024179	747228
WTG67	6026974	748701	WTG98	6024155	748690
WTG68	6026628	738204	WTG99	6023863	735212
WTG69	6026577	739574	WTG100	6023750	736581
WTG70	6026546	740820	WTG101	6023739	737997
WTG71	6026474	743842	WTG102	6023696	739396
WTG72	6026347	745179	WTG103	6023656	740826
WTG73	6026299	746792	WTG104	6023622	742241
WTG74	6026284	747826	WTG105	6023562	747865
WTG75	6026241	749209	WTG106	6023538	745073
WTG76	6026189	750684	WTG107	6023521	746522
WTG77	6025839	738757	WTG108	6023481	743690
WTG78	6025799	740179	WTG109	6023413	749328
WTG79	6025641	745854	WTG110	6023100	734628
WTG80	6025631	748635	WTG111	6023085	735826
WTG81	6025611	741737	WTG112	6023054	740021
WTG82	6025610	747264	WTG113	6023010	738683
WTG83	6025595	750084	WTG114	6023005	737472
WTG84	6025123	738211	WTG115	6022923	741611
WTG85	6025112	739451	WTG116	6022885	742927
WTG86	6025058	735197	WTG117	6022845	744342
WTG87	6025037	740824	WTG118	6022725	746589
WTG88	6024976	742281	WTG119	6022651	740748
WTG89	6024974	746632	WTG120	6022400	735181
WTG90	6024827	747921	WTG121	6022338	733575

ID	Easting	Northing	ID	Easting	Northing
WTG122	6022322	737956	WTG144	6020118	731607
WTG123	6022281	739370	WTG145	6020026	744349
WTG124	6022201	742200	WTG146	6019942	747088
WTG125	6022161	743615	WTG147	6019626	733887
WTG126	6021684	737382	WTG148	6019574	735045
WTG127	6021606	734404	WTG149	6019525	736484
WTG128	6021595	738632	WTG150	6019487	737895
WTG129	6021594	735805	WTG151	6019378	730833
WTG130	6021467	742880	WTG152	6019338	732234
WTG131	6021449	732632	WTG153	6019166	746405
WTG132	6021447	747392	WTG154	6018881	737031
WTG133	6021431	744396	WTG155	6018841	734356
WTG134	6021006	737920	WTG156	6018834	735760
WTG135	6020967	735171	WTG157	6018766	738585
WTG136	6020906	739238	WTG158	6018763	733116
WTG137	6020791	743450	WTG159	6018553	745633
WTG138	6020622	747907	WTG160	6018468	747049
WTG139	6020341	732898	WTG161	6018105	735014
WTG140	6020292	734358	WTG162	6018043	736221
WTG141	6020253	735772	WTG163	6017997	733778
WTG142	6020215	737186	WTG164	6017986	737857
WTG143	6020175	738649	WTG165	6017836	746323

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Appendix B—Receiver locations and predicted wind turbine noise levels

Table B1 Noise-sensitive location and involved stakeholder coordinates as GDA2020 MGA Zone 54, and predicted wind turbine noise levels

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
1	Noise-sensitive location	754864	6040379	5879	40	23
2	Noise-sensitive location	739892	6040212	8130	40	24
3	Noise-sensitive location	750653	6039936	5009	40	26
4	Noise-sensitive location	745140	6039535	7015	40	26
5	Noise-sensitive location	754411	6039350	4757	40	25
6	Noise-sensitive location	760795	6039284	9569	40	20
7	Noise-sensitive location	749065	6039125	4974	40	27
8	Noise-sensitive location	757544	6039096	6670	40	23
9	Noise-sensitive location	757317	6039046	6457	40	23
10	Noise-sensitive location	758647	6038877	7477	40	22
11	Noise-sensitive location	759742	6038439	8261	40	21
12	Noise-sensitive location	759527	6038423	8057	40	22
13	Noise-sensitive location	759949	6038404	8438	40	21
14	Noise-sensitive location	757897	6038228	6506	40	23
15	Noise-sensitive location	742939	6038224	5440	40	27
16	Noise-sensitive location	758344	6037992	6802	40	23
17	Noise-sensitive location	746313	6037970	5860	40	28
18	Noise-sensitive location	746260	6037938	5818	40	28
19	Noise-sensitive location	738905	6037906	6686	40	26
20	Noise-sensitive location	759421	6037507	7631	40	22
21	Noise-sensitive location	751384	6037377	2350	40	31
22	Noise-sensitive location	755364	6037191	3794	40	27
23	Noise-sensitive location	750795	6037122	2391	40	31
24	Noise-sensitive location	757981	6037069	6126	40	24
25	Noise-sensitive location	749160	6037030	3148	40	30
26	Noise-sensitive location	749160	6037030	3148	40	30

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
27	Noise-sensitive location	758274	6037021	6391	40	23
28	Noise-sensitive location	753693	6036953	2360	40	30
29	Noise-sensitive location	761204	6036633	9163	40	21
30	Noise-sensitive location	746035	6036493	4357	40	30
31	Noise-sensitive location	738971	6036120	5388	40	28
32	Noise-sensitive location	742879	6035707	2935	40	31
33	Noise-sensitive location	759770	6035670	7627	40	23
34	Noise-sensitive location	756085	6035634	3953	40	27
35	Noise-sensitive location	760436	6035556	8285	40	22
36	Noise-sensitive location	760028	6035435	7872	40	23
37	Noise-sensitive location	740951	6035317	3389	40	31
38	Noise-sensitive location	744623	6035219	2810	40	33
39	Noise-sensitive location	754788	6034942	2636	40	31
40	Noise-sensitive location	736143	6034934	5420	40	28
41	Noise-sensitive location	757474	6034685	5335	40	26
42	Noise-sensitive location	759452	6034637	7310	40	23
43	Noise-sensitive location	733238	6034636	7254	40	26
44	Noise-sensitive location	760165	6034633	8022	40	23
45	Noise-sensitive location	757981	6034565	5851	40	25
46	Noise-sensitive location	756615	6034554	4495	40	27
47	Noise-sensitive location	734800	6034110	5736	40	27
49	Noise-sensitive location	748835	6033877	2485	40	35
51	Noise-sensitive location	749339	6033717	2076	40	36
52	Noise-sensitive location	749380	6033710	2042	40	36
54	Noise-sensitive location	757178	6033626	4984	40	27
55	Noise-sensitive location	757381	6033583	5182	40	26
56	Noise-sensitive location	757022	6033530	4820	40	27
57	Noise-sensitive location	757291	6033517	5087	40	27
58	Noise-sensitive location	756674	6033435	4466	40	28
59	Noise-sensitive location	734168	6033188	5647	40	27

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
60	Noise-sensitive location	754242	6033152	2025	40	34
61	Noise-sensitive location	757611	6033022	5322	40	26
62	Noise-sensitive location	747361	6032873	2010	40	37
63	Noise-sensitive location	747361	6032873	2010	40	37
64	Noise-sensitive location	749249	6032869	1803	40	37
65	Noise-sensitive location	740497	6032640	1982	40	36
66	Noise-sensitive location	759041	6032391	6625	40	25
67	Noise-sensitive location	755398	6032091	2971	40	31
68	Noise-sensitive location	754678	6031694	2230	40	33
70	Noise-sensitive location	758094	6031201	5670	40	26
71	Noise-sensitive location	754952	6031068	2589	40	32
73	Noise-sensitive location	755448	6030952	3099	40	30
74	Noise-sensitive location	763648	6030773	11240	40	20
75	Noise-sensitive location	757504	6030451	5215	40	27
76	Noise-sensitive location	736536	6030374	2367	40	34
77	Noise-sensitive location	729180	6030059	7824	40	25
78	Noise-sensitive location	757170	6029835	5087	40	27
81	Noise-sensitive location	756985	6029231	5179	40	27
82	Noise-sensitive location	754374	6029112	3250	40	32
83	Noise-sensitive location	754411	6029084	3294	40	32
84	Noise-sensitive location	754660	6029016	3501	40	31
85	Noise-sensitive location	754645	6028798	3663	40	31
86	Noise-sensitive location	753830	6028564	3183	40	33
88	Noise-sensitive location	754289	6028241	3724	40	31
89	Noise-sensitive location	753065	6027536	2736	40	34
90	Noise-sensitive location	759224	6027294	8098	40	24
91	Noise-sensitive location	752849	6027166	2376	40	34
92	Noise-sensitive location	735502	6027105	2070	40	35
93	Noise-sensitive location	735507	6027099	2065	40	35
94	Noise-sensitive location	753541	6027090	2996	40	32

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
95	Noise-sensitive location	752708	6027067	2207	40	34
96	Noise-sensitive location	753275	6027052	2731	40	33
97	Noise-sensitive location	753637	6026910	3040	40	32
98	Noise-sensitive location	752700	6026852	2123	40	34
99	Noise-sensitive location	727283	6026757	7535	40	25
102	Noise-sensitive location	753011	6025456	2440	40	33
103	Noise-sensitive location	761020	6025442	10363	40	22
104	Noise-sensitive location	758457	6025354	7818	40	25
106	Noise-sensitive location	753501	6024986	3064	40	31
107	Noise-sensitive location	752170	6024573	2196	40	34
109	Noise-sensitive location	730796	6024221	3325	40	31
110	Noise-sensitive location	757800	6024208	7387	40	25
111	Noise-sensitive location	757892	6024189	7481	40	25
112	Noise-sensitive location	762055	6023985	11583	40	21
113	Noise-sensitive location	730434	6023676	3129	40	31
114	Noise-sensitive location	731402	6023591	2470	40	34
118	Noise-sensitive location	756755	6022883	6913	40	26
119	Noise-sensitive location	758949	6022874	8905	40	24
120	Noise-sensitive location	728028	6022848	4462	40	28
124	Noise-sensitive location	724776	6021936	6575	40	24
125	Noise-sensitive location	757952	6021848	8466	40	24
128	Noise-sensitive location	725446	6021000	5626	40	25
129	Noise-sensitive location	756340	6020937	7437	40	25
130	Noise-sensitive location	757202	6020857	8279	40	25
131	Noise-sensitive location	756146	6020308	7492	40	25
133	Noise-sensitive location	751688	6019255	4021	40	30
134	Noise-sensitive location	756840	6018787	8823	40	24
135	Noise-sensitive location	741975	6018213	2970	40	34
136	Noise-sensitive location	757931	6017587	10391	40	23
138	Noise-sensitive location	748142	6016668	2106	40	33

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
140	Noise-sensitive location	731971	6016422	2397	40	33
141	Noise-sensitive location	721765	6016395	9546	40	20
142	Noise-sensitive location	750782	6016341	4297	40	28
144	Noise-sensitive location	731289	6016242	3045	40	32
145	Noise-sensitive location	744820	6016186	2232	40	33
147	Noise-sensitive location	750550	6015861	4365	40	28
149	Noise-sensitive location	741911	6015590	4599	40	30
150	Noise-sensitive location	744616	6015112	3214	40	30
151	Noise-sensitive location	757208	6015108	10700	40	22
152	Noise-sensitive location	756323	6015087	9871	40	22
153	Noise-sensitive location	738710	6014900	3202	40	31
154	Noise-sensitive location	750304	6014516	5120	40	26
155	Noise-sensitive location	754506	6013942	8723	40	23
156	Noise-sensitive location	747737	6013864	4216	40	27
157	Noise-sensitive location	745352	6013750	4200	40	28
158	Noise-sensitive location	751107	6013710	6254	40	25
159	Noise-sensitive location	748867	6013050	5420	40	26
160	Noise-sensitive location	730043	6012884	6332	40	25
161	Noise-sensitive location	756237	6012767	10813	40	21
162	Noise-sensitive location	727237	6012608	7666	40	23
163	Noise-sensitive location	736895	6011926	6136	40	27
164	Noise-sensitive location	754732	6011891	10114	40	22
165	Noise-sensitive location	740817	6011886	6780	40	26
166	Noise-sensitive location	739269	6011537	6602	40	26
167	Noise-sensitive location	723829	6011502	10540	40	20
168	Noise-sensitive location	721972	6011185	12068	40	18
169	Noise-sensitive location	737072	6010954	7076	40	25
170	Noise-sensitive location	744457	6010042	8014	40	24
171	Noise-sensitive location	730713	6009804	8748	40	23
172	Noise-sensitive location	742961	6009647	8852	40	24

ID	Status	Easting	Northing	Distance to nearest wind turbine, m	Minimum noise limit, dB LA90	Predicted wind turbine noise level, dB LA90
173	Noise-sensitive location	741554	6009598	9167	40	24
174	Noise-sensitive location	747230	6009565	8320	40	23
175	Noise-sensitive location	744494	6009428	8604	40	23
176	Noise-sensitive location	752232	6009307	10376	40	21
177	Noise-sensitive location	747419	6009305	8601	40	23
178	Noise-sensitive location	747527	6009195	8724	40	22
179	Noise-sensitive location	754766	6009078	12155	40	20
180	Noise-sensitive location	747514	6008035	9873	40	22
181	Noise-sensitive location	743671	6007927	10257	40	22
182	Noise-sensitive location	747197	6007898	9976	40	22
183	Noise-sensitive location	749986	6019911	2197	40	33
CG1	Lake Meran campsite	753345	6024490	3157	40	31
50	Involved landowner	753173	6033720	1113	45	38
53	Involved landowner	744630	6033631	1518	45	38
69	Involved landowner	747323	6031552	1231	45	41
80	Involved landowner	742121	6029286	838	45	44
100	Involved landowner	741811	6026602	993	45	43
101	Involved landowner	750989	6025591	671	45	42
105	Involved landowner	743855	6025110	1364	45	41
108	Involved landowner	735843	6024443	857	45	43
115	Involved landowner	750695	6023410	1367	45	37
117	Involved landowner	745695	6023233	693	45	44
121	Involved landowner	747419	6022329	883	45	42
126	Involved landowner	740745	6021138	1513	45	40
127	Involved landowner	745891	6021121	1527	45	40
137	Involved landowner	738782	6016714	1573	45	35
139	Involved landowner	734213	6016486	1573	45	36
143	Involved landowner	736264	6016293	1750	45	36
146	Involved landowner	736295	6016113	1931	45	35
148	Involved landowner	735291	6015748	2373	40	34

Appendix C—Wind turbine noise prediction uncertainty

Introduction

Appendix C of NZS 6808:2010 recommends that an assessment of uncertainty be included in any noise assessment conducted under the Standard. The discussion in NZS 6808:2010 relates primarily to measurement uncertainty, which is not relevant to this assessment. However, some discussion of the uncertainty associated with the predicted noise levels can be provided at the design stage.

Uncertainty in the predicted wind farm noise levels is a result of two main factors:

- uncertainty inherent in the prediction methodology
- uncertainty in the assumed sound power levels of the wind turbines.

Uncertainty in other inputs, such as the position of wind turbines and the location of residences, may also exist but are likely to have an insignificant impact on the prediction uncertainty as small changes in position do not result in any noticeable change in predicted noise levels when the distance between source and receiver is over 1 km.

Uncertainty in predictions

ISO 9613-2:2024, the basis of the prediction methodology adopted in this report, provides a discussion on general uncertainty associated with the propagation algorithm and advises a typical accuracy of overall A-weighted noise levels of ± 3 dB at distances of up to 1 km from the source. It does not advise on the accuracy of predictions at distances further than this.

With respect to wind turbine noise specifically, Annex D7 of ISO 9613-2:2024 states the following:

The recommendations described in this annex are consistent with predicting the most probable value that would be measured with the modelled environmental conditions (e.g., wind speed dependent sound power level). Different studies have compared in detail measurements of operational turbines and predictions with different parameters and the current consensus is that for propagation over porous ground conditions:

- modelling with $G=0$ with positive adjustments on the source levels (e.g. uncertainty margin) can overstate measured levels;
- modelling with $G=0,5$ without positive adjustments can understate the measured values.

In considering the above, it should be noted that the ISO 9613-2 accuracy must be understood in the context of how wind turbine noise is measured and assessed in Victoria. Given the use of NZS 6808:2010, the following factors reduce the uncertainty of wind farm noise predictions or tend the predictions towards conservatism thereby reducing the likelihood of any under-prediction:

- ISO 9613-2:2024 is based on the prediction of L_{Aeq} noise levels and not L_{A90} noise levels, whereas NZS 6808:2010 requires the assessment of L_{A90} noise levels. It is commonly accepted for wind turbine noise that the L_{Aeq} level will be in the order of 2 dB above the L_{A90} noise level, such that predictions using ISO 9613-2:2024 without any adjustment for this factor would tend towards conservatism. No adjustment factor has been applied in this assessment to account for that.
- NZS 6808:2010 requires that wind farm noise levels are assessed based on a large number of 10-minute data points (at least 1440 data points) that are correlated with wind speed, with an average noise level determined for each wind speed. In practice, this reduces the uncertainty associated with predictions due to the large number of data points that would be collected and averaged during any measurement campaign. A study

performed on Australian wind farms⁷ that examined the difference between predicted noise levels using ISO 9613-2 with a receiver height of 1.5 m and measured downwind noise levels in general accordance with NZS 6808:2010 found that the predictions were within ± 1 dB for sloping or relatively flat sites when appropriate prediction parameters were used.

- The predictions are based on downwind conditions – that is, where the residence is downwind of the nearest wind turbines. NZS 6808:2010 does not specifically require the assessment to be carried out for downwind conditions unless measured noise levels are clearly higher under these conditions and so, if compliance measurements include periods where there are some crosswind or upwind conditions, then the measured noise level would be lower. This may increase the conservatism of the predictions.

Uncertainty in sound power levels

Sound power levels of wind turbines are quantified in accordance with measurement standard IEC 61400-11 Edition 3.0 *Wind turbines – Part 11: Acoustic noise measurement techniques* (IEC 61400-11). The measurement process includes quantification of the uncertainty in the sound power level at each wind speed as documented in IEC 61400 11, this uncertainty is typically small and in the order of 1 dB or lower.

Uncertainty factors have been included in the assumed sound power levels in this noise assessment to account for this potential error in accordance with advice from the wind turbine suppliers.

Summary

Appendix C of NZS 6808:2010 states that, when comparing a sound level with the applicable noise limit, the sound level is deemed to comply if the sound level is equal to or less than the limit. It should be deemed not to comply if the sound level is greater than the noise limit, regardless of the uncertainty. It also advises that, where compliance or non-compliance is 'marginal and contested', steps should be taken to reduce the uncertainty, where practical.

Given the methods by which wind turbine noise is measured in Victoria and previous assessments of wind turbine noise modelling accuracy, the uncertainty associated with the predicted noise levels is considered small. Assumptions in the prediction methodology tend to be conservative and therefore may offset any uncertainty, tending towards over prediction of noise levels at residences, and the assumed wind turbine sound power levels for the candidate models include a factor for uncertainty in accordance with the supplier advice.

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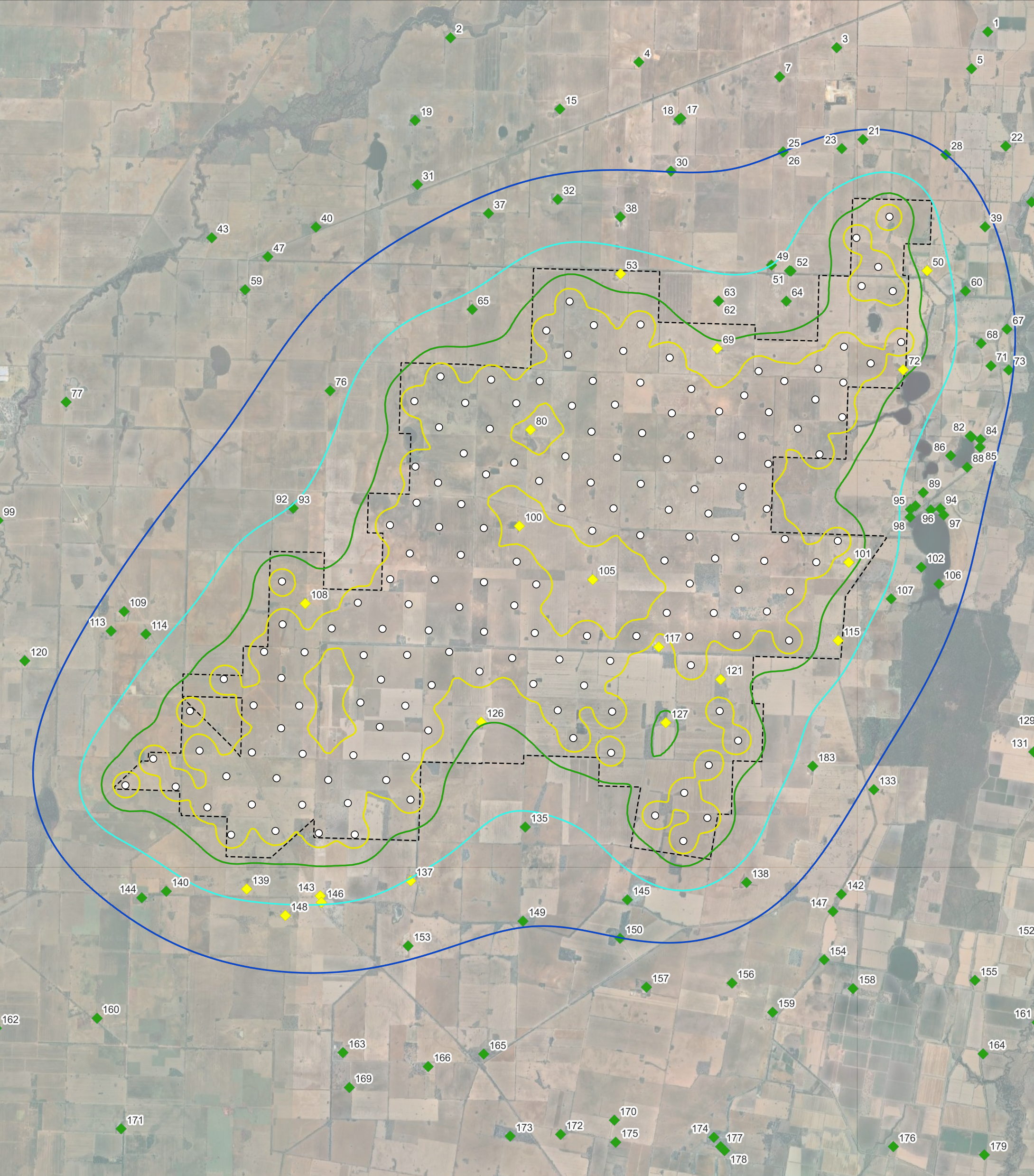
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⁷ Evans T & Cooper J, 2012, *Comparison of predicted and measured wind farm noise levels and implications for assessments of new wind farms*, Acoustics Australia, vol. 40, no. 1, pp 28-36.

Appendix D—Wind turbine noise contour maps

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MEERING WEST WIND FARM

Meering West, VIC

Figure D1: Predicted wind turbine noise levels and noise-sensitive locations based on Vestas V172-7.2MW WTG

PROJECT NUMBER	M240298
DRAWN BY	TE
DATE	April 2026
CLIENT	Aurecon
AERIAL IMAGERY	(c) Google

Legend

- Project area
- WTG
- Dwelling
- Landowner
- Noise-Sensitive Location
- Predicted wind turbine noise level, dB LA90
- 30 dB
- 35 dB
- 40 dB
- 45 dB

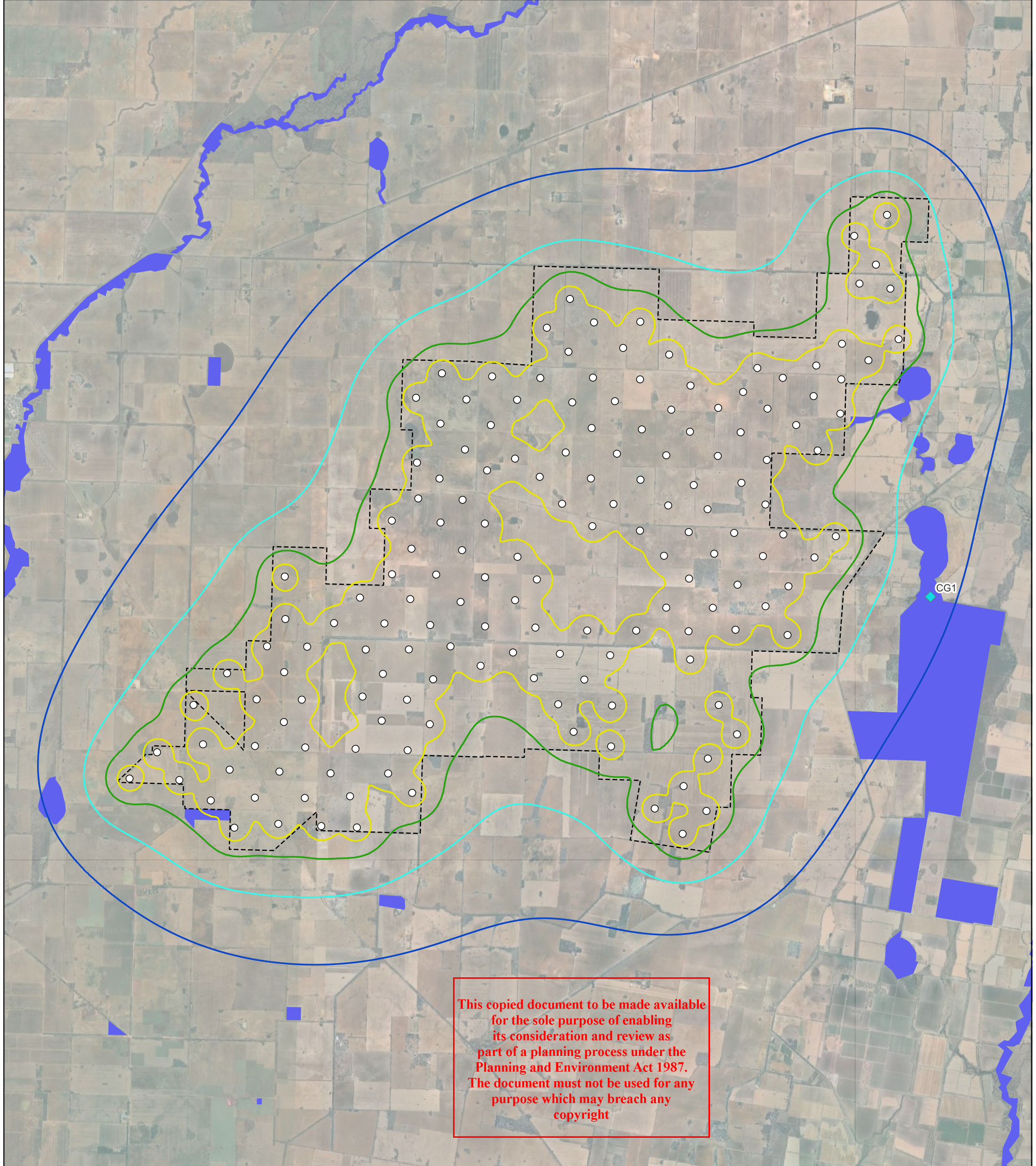
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0 2 4 6 km

Datum GDA20 MGA Zone 54

Resonate



MEERING WEST WIND FARM
Meering West, VIC
Figure D2: Predicted wind turbine noise levels and natural areas based on Vestas V172-7.2MW WTG

PROJECT NUMBER

M240298

DRAWN BY

TE

DATE

April 2026

CLIENT

Aurecon

AERIAL IMAGERY

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Legend

Project area

WTG

Campground

ERS Natural Area

Natural Area (PCRZ)

Predicted wind turbine noise level, dB LA90

30 dB

35 dB

40 dB

45 dB

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0246 km

Datum GDA20 MGA Zone 54

Resonate