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MUMBLIN WIND FARM
ENVIRONMENTAL NOISE ASSESSMENT

Rp 001 R05 20200546 | 20 November 2025

MARSHALL DAY Acoustics

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EXECUTIVE SUMMARY

This report presents the results of an assessment of environmental noise associated with the Mumblin Wind Farm that is proposed to be developed by Mumblin Wind Farm Pty Ltd. The assessment is based on the proposed wind farm layout comprising 8 multi-megawatt wind turbines and a transformer station.

The planning application for the wind farm seeks approval to develop wind turbines with a maximum tip height of 252 m. The actual wind turbine which would be used at the site would be determined at a later stage in the project, after the project has been granted planning approval. The final selection would be based on a range of design requirements including achieving compliance with the planning permit noise limits at surrounding noise sensitive locations (receivers). In advance of a final selection, this assessment considers 2 candidate wind turbine models that are considered representative of the size and type of wind turbine which could be used at the site. For this purpose, the Vestas V162-6.8 MW and V172-7.2 MW, both with a nominal hub height of 166 m, have been nominated by the proponent.

Operational noise from the proposed wind turbines has been assessed in accordance with the New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS 6808), as required by the *Environment Protection Regulations 2021* and the Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023. The operational wind farm noise assessment considers the base (minimum) noise limits determined in accordance with NZS 6808, accounting for the land zoning of the area.

Manufacturer specification data for the candidate wind turbine models has been used as the basis for the assessment. The specification provides noise emission data in accordance with the international standard referenced in NZS 6808. The noise emission data is consistent with the range of values expected for comparable types of multi megawatt wind turbine models that are being considered for the site.

The noise emission data has been used with international standard ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613-2) to predict the level of noise expected to occur at neighbouring receivers. The ISO 9613-2 standard has been applied using well-established input choices and adjustments, based on research and international guidance, that are specific to wind farm noise assessment.

The results of the noise modelling demonstrate that, for both candidate wind turbine models, the predicted noise levels for the proposed wind turbine layout achieve the base noise limits determined in accordance with NZS 6808 at all neighbouring receivers.

The assessment has also considered the operational noise of a transformer station to be located to the south of the site. Noise levels from the transformer station have been assessed in accordance with EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*, dated September 2025 (the Noise Protocol). The assessment demonstrates that the transformer station can be designed and operated to achieve the noise limits determined in accordance with the Noise Protocol.

Consideration was also given to the general environmental duty as required by the *Environment Protection Act 2017*.

The noise assessment therefore demonstrates that the proposed Mumblin Wind Farm, and the associated transformer station, can be designed and developed to achieve Victorian policy requirements.

MARSHALL DAY Acoustics

TABLE OF CONTENTS

MARSHALL DAY Acoustics

1.0 INTRODUCTION

Mumblin Wind Farm Pty Ltd (the proponent) is proposing to develop a wind farm known as the Mumblin Wind Farm within the Victorian local government area of the Corangamite Shire, approximately 10 kilometres west of Cobden.

The wind farm is proposed to comprise 8 wind turbines and a transformer station. Throughout this report, the term ‘wind farm’ refers to both the wind turbines and the transformer station.

This report presents the results of an assessment of operational wind turbine noise in accordance with the New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS 6808), as required by the *Environment Protection Regulations 2021* (the EP Regulations) and the Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023 (Victorian Wind Energy Guidelines).

Operational noise of the proposed transformer station has been assessed in accordance with EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* dated September 2025 (Noise Protocol), as required by the EP Regulations. As required by the *Environment Protection Act 2017* (EP act), the general environment duty must also be considered.

The noise assessment presented in this report is based on:

- Operational noise limits determined in accordance with NZS 6808 and the Noise Protocol, accounting for local land zoning
- Predicted noise levels for the wind turbines, based on the proposed site layout and 2 candidate wind turbine models that are considered representative of the size and type of wind turbine that the planning application seeks consent for
- Predicted noise levels for the proposed transformer station, based on empirical noise emission data
- A comparison of the predicted noise levels with the applicable base noise limits determined in accordance with NZS 6808 and the noise limits defined by the Noise Protocols
- A review of the predicted noise levels of the transformer station in the context of the general environmental duty of the EP Act.

Acoustic terminology used in this report is presented in Appendix A.

2.0 PROJECT DESCRIPTION

The wind farm is proposed to comprise 8 wind turbines. The coordinates of the proposed wind turbines are tabulated in Appendix B.

The proponent is seeking consent for a wind farm comprising wind turbines extending to a tip height of up to 252 m. Details of the 2 considered candidate wind turbine models are presented in Section 6.2.

A transformer station is also proposed to be located close to the south-most wind turbine (see coordinates in Appendix B).

A total of 199 noise sensitive locations (generally referred to as *receivers* herein) located within 5 km of the proposed wind turbines have been considered in this noise assessment. This includes 8 receivers where a noise agreement is in place or proposed between the landowners and the proponent (subsequently referred to as *stakeholder receivers* herein) and one camping ground on the northeastern side of Lake Elingamite.

The coordinates of the receivers are tabulated in Appendix C.

A site layout plan illustrating the wind turbine layout, transformer station and receivers is provided in Appendix D.

3.0 VICTORIAN LEGISLATION & GUIDELINES

The following publications are relevant to the assessment of operational noise from proposed wind farm developments in Victoria:

- *Environment Protection Act 2017*
- *Environment Reference Standard*
- *Environment Protection Regulations 2021*
- Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023
- New Zealand Standard 6808:2010 *Acoustics – Wind farm noise*
- EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* dated September 2025.

The requirements and guidance of these documents is summarised below. Additional details and extracts from these documents are provided in Appendix E.

Victorian guidelines that are relevant to the assessment are also briefly outlined below.

3.1 Environment Protection Act 2017

The *Environment Protection Act 2017* (EP Act) provides the overarching legislated protection of the environment in Victoria and establishes mandatory requirements for the control of environmental noise. The following key obligations apply under the EP Act:

- A person who is engaging in an activity that may give rise to risks of harm to human health or the environment has a general environmental duty (GED) to minimise the risk of harm, so far as reasonably practicable.
- A person must not, from a place or premises that are not residential premises, emit unreasonable noise or permit unreasonable noise to be emitted.

The risk of harm under the EP Act includes both health and amenity related noise impacts. The EP Act defines environmental noise as unreasonable if it is:

- prescribed to be unreasonable from an assessment against mandatory noise limits (see Sections 3.2 and 3.5); or
- assessed to be unreasonable according to the following factors defined in the EP Act:
  - noise volume, intensity or duration
  - noise character
  - the time, place and other circumstances in which the noise is emitted
  - how often the noise is emitted
  - any prescribed factors relating to the noise (frequency spectrum being a prescribed factor).

3.2 Environment Protection Regulations 2021

The *Environment Protection Regulations 2021* (EP Regulations) give effect to the EP Act by establishing prescriptive requirements for a range of environmental considerations including noise. The noise requirements are defined according to the type of noise generating activity under consideration. The EP Regulations also define the types of noise sensitive areas where these requirements apply and the hours of different assessment time periods (i.e. day, evening and night).

The relevant elements of the EP Regulations are the requirements for the:

- operational noise from commercial, industrial and trade premises (industry)
- operational turbine noise of a wind farm.

The EP Regulations specify that the prediction, measurement, analysis and assessment of operational industry noise within a noise sensitive area must be conducted in accordance with the Noise Protocol (see Section 3.5). Noise from industry is prescribed by the EP Regulations to be unreasonable for the purposes of the EP Act if it exceeds the noise limit determined in accordance with the Noise Protocol.

In relation to wind turbine noise, the EP Regulations specify a range of requirements for the assessment, verification and ongoing management of operational wind turbine noise. Under the EP Regulations, the relevant standard specified for the assessment of wind turbine noise is NZS 6808 (see Section 3.6).

An important element of the EP Regulations with respect to wind turbine noise is the Act compliance note, which provides clarity on how a wind energy facility operator can satisfy the GED under the EP Act. [1] The Act compliance note means that demonstrating compliance with the EP Regulations also demonstrates compliance with the GED under the EP Act.

3.3 Environment Reference Standard

The *Environment Reference Standard* (ERS) was introduced under the EP Act and sets out environmental and human health outcomes that are sought to be achieved and maintained in Victoria. The outcomes are described by the ERS in terms of a collection of environmental values, indicators and objectives.

The environmental values of the ambient sound environment defined by the ERS relate to conditions that are conducive to domestic activities (conversation, recreation and sleep), learning, and appreciation and enjoyment of tranquillity in natural areas. The environmental values in most settings are defined using a quantitative indicator, and the objective for these indicators are defined according to the land use and planning zone. However, for natural areas, the indicator is qualitative and is based on an appraisal of sound quality that is conducive to human tranquillity and enjoyment of natural soundscapes.

Indicators and objectives for the ambient sound in different settings are defined to provide a basis for assessing actual and potential risks to the environment. They also provide a benchmark for comparing the state of the environment, or potential changes to the environment, to desired outcomes. However, the ERS is not a compliance standard. The primary function of the ERS is to provide an environmental assessment reporting benchmark which can be used as a reference point for decision makers to consider whether a proposal or activity is consistent with the environmental values identified in the ERS.

[1] Regulation 6 to the EP Regulations states that if a note at the foot of a provision of the regulations states 'Act compliance' followed by a reference to a section number, the regulation provision sets out the way in which a person's duty or obligation under that section of the EP Act is to be performed in relation to the matters and the extent set out in the regulation provision.

3.4 Planning Guidelines for Development of Wind Energy Facilities

The *Planning Guidelines for Development of Wind Energy Facilities* (Victorian Wind Energy Guidelines) provide advice to responsible authorities, proponents and the community about suitable sites to locate wind energy facilities and to inform planning decisions about a wind energy facility proposal.

The advice includes detailed guidance on consistent methods for the assessment of wind turbine noise at the planning stage of a project. In particular, the Victorian Wind Energy Guidelines specifies that potential operational noise levels associated with proposed wind farm developments are to be assessed in accordance with NZS 6808 (see Section 3.6). Guidance is also provided on how NZS 6808 should be considered in the Victorian regulatory framework.

3.5 EPA Publication 1826.5 (Noise Protocol)

The Noise Protocol defines a procedure for setting noise limits that apply to the operation of industry premises and entertainment venues in Victoria. The noise limits are applicable to the operational stage of the Project. Compliance with the noise limits is mandatory.

The EPA Noise Protocol defines noise limits that are used to assess whether a noise is prescribed to be unreasonable in accordance with the EP Regulations and the EP Act.

The noise limits apply at a 'noise sensitive area', which is defined by the EP Regulations as being *within 10 metres of the outside of the external walls* of buildings including dwellings, hotels, and schools. In rural areas, noise sensitive areas also include land within the boundary of campgrounds, caravan parks and certain types of tourist establishments.

The procedures for setting noise limits are defined separately for urban and rural areas. However, in both cases, the noise limits are defined by considering the land zoning in the area and the noise environment of the receiver. Separate noise limits are defined for the day, evening and night periods.

3.6 NZS 6808

NZS 6808 defines a methodology for assessing operational wind turbine noise levels, including procedures for:

- measuring background noise levels prior to construction of a wind farm
- deriving noise criteria from measured background noise levels
- conducting post-construction measurements of wind farm noise
- assessing the character of the noise produced by the wind farm noise
- assessing post-construction noise measurements to determine compliance with the standard.

The noise criteria defined by NZS 6808 are a combination of a base (minimum) noise limit and noise limits which vary with wind speed and background noise levels. The base limit is a fixed value that is used for conditions when the background noise is low. The noise limit at each integer wind speed is then defined as the base limit or the background level plus 5 dB, whichever value is higher. The limits apply to wind turbine noise levels in the vicinity of noise sensitive locations.

The character of the wind farm sound is also assessed to determine whether adjustments should be applied to account for sounds referred to by the standard as special audible characteristics (SACs). These SACs are defined as tonality, impulsiveness and amplitude modulation. The noise level of the wind farm, adjusted where necessary for the presence of SACs, is then compared with the noise limits at each wind speed to determine the wind farm's compliance.

3.7 Related Victorian guidelines

To support the application and use of the legislation and guidance summarised in the preceding sections, a range of Victorian publications provide additional advice on matters of interpretation and technical assessment requirements. These publications include:

- EPA Publication 1992 *Guide to the Environment Reference Standard,* dated June 2021
- EPA Publication 1996 *Noise guideline – assessing low frequency noise,* dated June 2021
- EPA Publication 1997 *Technical guide: Measuring and analysing industry noise and music noise,* dated June 2021
- EPA webpage *Wind Energy Facility Turbine Noise Regulation Guidelines* (EPA web guide) [2]
- EPA-DTP Publication 3011 *Wind Energy Facility Turbine Noise – Technical Guideline* (Technical Guideline).

These guidelines are non-statutory documents which provide detailed advice for a broad range of technical considerations. Relevant aspects of these guidelines are referenced where appropriate in this assessment.

[2] At the date of preparation of this report, the EPA web guide is not available as a version controlled formal document. This report is based on the EPA webpage version of this publication, last updated on 2 May 2025.

4.0 ASSESSMENT METHOD

4.1 Overview

Based on the legislation and guidelines outlined in Section 3.0, assessing the operational noise levels of the proposed wind turbines and the transformer station involves:

- assessing background noise levels at noise sensitive locations around the wind farm
- assessing the land zoning of the project site and surrounding areas
- establishing suitable noise limits accounting for background noise levels and land zoning
- predicting the level of noise expected to occur as a result of the proposed wind turbines and transformer station
- assessing whether the development can achieve the requirements of Victorian policy and guidelines by comparing the predicted noise levels to the noise limits
- recommending reasonably practicable measures to minimise the risk of noise impact.

4.2 Background noise levels

Background noise level information is used to inform the setting of limits for both the transformer station and the wind turbine components of a wind farm project. However, in rural areas where wind farms are typically developed, the background noise level data is most relevant to the assessment of the wind turbines. This is due to the need to consider the changes in background noise levels and wind turbine noise levels for different wind conditions.

In accordance with the Victorian Wind Energy Guidelines and NZS 6808, background noise level information is used for setting noise limits for the wind turbine component of a wind farm project.

The procedures for determining background noise levels are defined in NZS 6808. The first step in assessing background noise levels involves determining whether background noise measurements are warranted. For this purpose, Section 7.1.4 of the standard provides the following guidance:

> *Background sound level measurements and subsequent analysis to define the relative noise limits should be carried out where wind farm sound levels of 35 dB $L_{A90(10\ min)}$ or higher are predicted for noise sensitive locations, when the wind turbines are at 95% rated power. If there are no noise sensitive locations within the 35 dB $L_{A90(10\ min)}$ predicted wind farm sound level contour then background sound level measurements are not required.*

The initial stage of a background noise monitoring program in accordance with NZS 6808 therefore comprises:

- Preliminary wind turbine noise predictions to identify all receivers where predicted noise levels are higher than 35 dB L_{A90}
- Identification of selected receivers where background noise monitoring should be undertaken prior to development of the wind farm, if required.

If required, the surveys involve measurements of background noise levels at receivers, and simultaneous measurement of wind speeds at the site of the proposed wind farm. The survey typically extends over a period of several weeks to enable a range of wind speeds and directions to be measured.

The results of the survey are then analysed to determine the trend between the background noise levels and site wind speeds at the proposed hub height of the wind turbines. This trend defines the value of the background noise for the different wind speeds in which the wind turbines will operate. At the wind speeds when the background noise level is above 35 dB L_{A90} (or 30 dB L_{A90} in special circumstances where high amenity limits apply), the background noise levels are used to set the noise limits for the wind farm.

4.3 Noise predictions

Operational wind farm noise levels (wind turbines and associated transformer station) are predicted using:

- noise emission data for the wind turbines and associated transformer station
- a 3D digital model of the site and the surrounding environment
- international standards used for the calculation of environmental sound propagation.

The method selected to predict noise levels is International Standard ISO 9613-2: 1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613-2). The prediction method is consistent with the guidance provided by NZS 6808 and has been shown to provide a reliable method of predicting the typical upper levels of the wind turbine noise expected to occur in practice.

The method is generally applied in a comparable manner to both wind turbine and transformer station noise levels. For example, for both types of sources, equivalent ground and atmospheric conditions are used for the calculations. However, when applied to wind turbine noise, additional and specific input choices apply, as detailed below.

Key elements of the noise prediction method are summarised in Table 1. Further discussion of the method and the calculation choices is provided in Appendix H.

Table 1: Noise prediction elements

Detail	Description
Software	Proprietary noise modelling software SoundPLANnoise version 9.0
Method	International Standard ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation* (ISO 9613-2). Adjustments to the ISO 9613-2 method are applied on the basis of the guidance contained in the UK Institute of Acoustics publication *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (UK Institute of Acoustics guidance). The adjustments are applied within the SoundPLANnoise modelling software and relate to the influence of terrain screening and ground effects on sound propagation. Specific details of adjustments are noted below and are discussed in Appendix H.
Source characterisation	Each source of operational noise is modelled as a point source of sound. The total sound of the component of the wind farm being modelled (i.e. the wind turbines or the transformer station) is then calculated on the basis of simultaneous operation of all elements (e.g. all wind turbines) and summing the contribution of each. To model the wind turbine components of the wind farm, the following specific procedures are noted: • Calculations of wind turbine to receiver distances and average sound propagation heights are made on the basis of the point source being located at the position of the hub of the wind turbine. • Calculations of terrain related screening are made on the basis of the point source being located at the maximum tip height of each wind turbine. Further discussion of terrain screening effects is provided below.
Terrain data	10 m resolution within the site and surrounds, obtained from Spatial Datamart Victoria.

Detail	Description
Terrain effects (wind turbine-specific procedures)	Adjustments for the effects of terrain are determined and applied on the basis of the UK Institute of Acoustics guidance and research outlined in Appendix H. • Valley effects: +3 dB is applied to the calculated noise level of a wind turbine when a significant valley exists between the wind turbine and calculation point. A significant valley is determined to exist when the actual mean sound propagation height between the wind turbine and calculation point is 50 % greater than would occur if the ground were flat. • Terrain screening effects: only calculated if the terrain blocks line of sight between the maximum tip height of the wind turbine and the calculation point. The value of the screening effect is limited to a maximum value of -2 dB. The project is located in a relatively flat area characterised by little variations in ground elevation between the wind turbines and surrounding receivers, with the exception of a hill to the northwest of the project. Based on comparison of predicted noise levels with and without terrain elevation data included, calculated terrain effects range between -2.0 dB and +0.1 dB for receivers within 5 km of the proposed wind turbines. For reference purposes, the ground elevations at the wind turbines and receivers are tabled in Appendix B and Appendix C respectively. The topography of the site is depicted in the elevation map provided in Appendix F.
Ground conditions	Ground factor of G = 0.5 on the basis of the UK Institute of Acoustics guidance and research outlined in Appendix H. The ground around the site corresponds to acoustically soft conditions (G = 1) according to ISO 9613-2. The adopted value of G = 0.5 assumes that 50 % of the ground cover is acoustically hard (G = 0) to account for variations in ground porosity and provide a cautious representation of ground effects.
Atmospheric conditions	Temperature 10 °C / relative humidity 70 % / atmospheric pressure: 101.325 kPa These represent conditions which result in relatively low levels of atmospheric sound absorption. The calculations are based on sound speed profiles which increase the propagation of sound from each wind turbine to each receiver, whether as a result of thermal inversions or wind directed toward each calculation point. [3]

[3] The sound speed profile defines the rate of change in the speed of sound with increasing height above ground

Detail	Description
Receiver heights	1.5 m above ground level Specific to wind turbine noise predictions, the UK Institute of Acoustics guidance refers to receiver heights of 4 m, and this guidance has subsequently been documented in international standards and, most recently, the EPA-DTP Publication 3011 *Wind Energy Facility Turbine Noise – Technical Guideline* dated 20 December 2024 (Technical Guideline). The UK Institute of Acoustics guidance was written as a complete approach to the prediction of wind turbine noise in the context of the regulatory requirements in the UK. Specifically, the method is for the prediction of the L_{A90} wind turbine noise levels for short-term downwind conditions. Conceptually, this is directly relevant to a planning stage assessment of a wind farm under NZS 6808, as the assessment is intended to represent typical worst case L_{A90} noise levels of a wind farm. However, an important technical detail is that application of the complete method is incompatible with NZS 6808. This is because the UK Institute of Acoustics guidance specifies that the calculation should include subtraction of 2 dB to account for the difference between the equivalent noise level that the sound power level of the turbines is determined from, and the L_{A90} noise measurement metric. However, NZS 6808 specifically states that predictions based on the sound power levels, without adjustment between L_{Aeq} and L_{A90} noise levels, shall be taken as representative of the L_{A90} noise levels. As a result, adoption of a 4 m receiver height in the context of an NZS 6808 assessment would result in a significantly more conservative assessment than an assessment based on the complete prediction method outlined in the UK Institute of Acoustics guidance. For this reason, noise predictions in Australia have generally been based on a lower prediction height of 1.5 m, but without any adjustment between L_{Aeq} and L_{A90} noise levels. The difference between predicted noise levels at 1.5 m and 4 m varies between sites but is generally comparable to the 2 dB value factored in the UK Institute of Acoustics guidance. As a result, the effect of a lower receiver height is balanced out by not applying an L_{Aeq} to L_{A90} correction, resulting in similar predicted noise levels.

5.0 EXISTING NOISE ENVIRONMENT

The noise modelling results that are subsequently presented in Section 6.4 indicates that predicted noise levels are above 35 dB L_{A90} at one non-stakeholder receiver (Receiver 176). Therefore, in accordance with NZS 6808, background noise monitoring should be undertaken at this receiver.

It is noted that consent to undertake background noise monitoring was not granted at Receiver 176. As such, noise monitoring was undertaken at Receiver 98 (stakeholder in the Project), located approximately 200 m southwest across Retallacks Road. This location was considered representative of the noise environment at Receiver 176.

Background noise monitoring was carried out at 2 receivers from 8 June to 27 July 2023.

Prior to construction of the wind farm, background noise monitoring may be undertaken at additional receivers, should consent be provided.

The noise monitoring, analysis procedures and results are detailed in the Background Noise Report. [4] The data presented in Table 2 summarises the background noise levels determined in accordance with NZS 6808 for the all-time and night-time periods. The data in these tables is provided for the key wind speeds relevant to the assessment of wind farm noise. The results for all surveyed wind speeds are illustrated in the graphical data provided for each receiver in the appendices of the Background Noise Report.

Table 2: Background noise levels, dB L_{A90}

Location	Hub height wind speed, m/s [1]												
	3	4	5	6	7	8	9	10	11	12	13	14	15
All-time period													
59	- [2]	- [2]	37.8	37.9	38.0	38.2	38.5	39.0	39.6	40.3	41.1	42.1	43.1
98 (S)	- [2]	- [2]	38.8	38.9	39.1	39.5	40.1	40.8	41.6	42.5	43.5	44.5	45.7
Night period													
59	- [2]	- [2]	- [2]	32.0	32.0	32.4	33.1	34.0	35.1	36.4	37.9	39.5	41.2
98 (S)	- [2]	- [2]	- [2]	29.8	29.9	30.4	31.3	32.5	34.0	35.7	37.6	39.7	41.9

1 166 m above ground level at 671095 E, 5753816 N (MGA 94 Zone 54)

2 Outside valid wind speed range of the regression analysis

(S) Stakeholder receiver

The applicable base (minimum) noise limits determined in accordance with NZS 6808 have been adopted for this assessment. This approach is conservative, as the background noise monitoring results only increases the noise limits above the applicable base limit values.

4 MDA report Rp 002 20200546 *Mumblin Wind Farm – Background noise monitoring*, dated 27 May 2024 (Background Noise Report)

6.0 WIND TURBINE ASSESSMENT

6.1 Noise limits

6.1.1 High amenity

In accordance with NZS 6808, an assessment is required for all receivers located within the predicted 35 dB L_{A90} contour to determine whether a high amenity noise limit may be justified. As detailed in Section E5.4 of Appendix E, this is based on a two-step approach comprising:

1. A land zoning review to determine whether the planning guidance for the area warrants consideration of a high amenity noise limit. If it does, then the second step should be considered
2. A review of the relationship between the background noise levels and predicted noise levels, using the calculation set out in clause C5.3.1.

Based on the predicted noise level contours presented subsequently in Section 6.4, and the zoning map for the area presented in Appendix G, the area within the predicted 35 dB L_{A90} contour is identified as Farming Zone. In addition, as discussed in Section 5.0, only one non-stakeholder receiver (Receiver 176) is located within the predicted 35 dB L_{A90} contour.

Consistent with the guidance from EPA web guide, Section 5.2 of the Technical Guideline states that the high amenity limit in Victoria 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), and Green Wedge A Zone (GWAZ).
- not apply to dwellings in the Farming Zone (FZ).
- not be applied in any location where background sound levels are already affected by other specific sources such as road traffic noise, based on Section 5.3.1 of NZS 6808.
- only apply for WEF wind speeds up to and including 6 m/s during evening and night-times.
- be applicable only when there is no agreement made in accordance with regulation 131A.

Based on the above, the high amenity noise limit is not justified for the proposed wind farm.

6.1.2 Stakeholder receivers

The definition of noise sensitive locations in NZS 6808 specifically excludes stakeholder dwellings located within a wind farm site boundary. Further, Section E5.2 of Appendix E provides details of the statutory context of NZS 6808, and indicates the method is not intended to be applied to stakeholder receivers outside the site boundary where a noise agreement exists between the occupants and the proponent of the development.

However, consistent with the Victorian Wind Energy Guidelines, Regulation 131B of the EP Regulations specifies a noise limit for stakeholder receivers of 45 dB L_{A90} or background noise (L_{A90}) + 5 dB, whichever is the greater, where a noise agreement between the owner or operator of a wind energy facility and a landowner is made on or after 1 November 2021.

The proponent advised that there are no stakeholder receivers outside the Project boundary with noise agreements in place or proposed between the landowners and the proponent.

Further, consistent with the Victorian Wind Energy Guidelines, it is recommended that wind turbine noise levels not exceed a reference level of 45 dB L_{A90} or background noise (L_{A90}) +5 dB at stakeholder receivers within the Project boundary.

6.1.3 Applicable noise limits

Accounting for the conclusions of the assessment of high amenity detailed in the previous section, the applicable noise limits are detailed in Table 3.

Table 3: Applicable noise limits, dB L_{A90}

Receiver status	Noise limit
Non-stakeholder	40 dB or background L_{A90} + 5 dB, whichever is the greater
Stakeholder with a noise agreement	45 dB or background L_{A90} + 5 dB, whichever is the greater
Stakeholder within the project boundary	Not applicable Reference level of 45 dB or background L_{A90} + 5 dB, whichever is the greater

6.2 Candidate wind turbine models

The final wind turbine model for the site would be selected after a tender process to procure the supply of wind turbines. The final selection would be based on a range of design requirements including achieving compliance with any planning permit noise limits at surrounding receivers.

Accordingly, to assess the proposed wind farm at this stage in the project, it is necessary to consider a candidate wind turbine model that is representative of the size and type of wind turbines being considered. The purpose of the candidate wind turbine is to assess the viability of achieving compliance with the applicable noise limits, based on noise emission levels that are typical of the size of wind turbines being considered for the site.

For this assessment, the proponent nominated 2 candidate wind turbine models, as detailed in Table 4.

These models are variable speed wind turbines, with the speed of rotation and the amount of power generated by the wind turbines being regulated by control systems which vary the pitch of the wind turbine blades (the angular orientation of the blade relative to its axis).

This assessment has been based on the wind turbines operating in unconstrained modes of generation (i.e. without noise reduced operating modes) and with blade serrations. Blade serrations are now routinely used to reduce wind turbine noise emissions, and it is understood that their use is now the market standard for wind turbines being offered in the Australian market.

Table 4: Selected candidate wind turbine models

Item	V162-6.8 MW	V172-7.2 MW
Make	Vestas	Vestas
Model	V162	V172
Rotor diameter	162 m	172 m
Operating mode	PO6800 [1]	PO7200 [2]
Rated power	6.8 MW	7.2 MW
Hub height	166 m	166 m
Blade serrations	Yes	Yes

1 'PO6800' is a manufacturer designation which indicates an unconstrained, Power Optimised mode of operation to achieve a rated power of 6.8 MW (i.e. without noise curtailment)

2 'PO7200' is a manufacturer designation which indicates an unconstrained, Power Optimised mode of operation to achieve a rated power of 7.2 MW (i.e. without noise curtailment)

The hub height detailed above is suitable for noise assessment purposes. It is our understanding that the final hub height of the selected wind turbine model may differ slightly. However, the magnitude of the potential changes is expected to be minor and inconsequential with respect to predicted noise levels at receivers. Irrespective, revised noise modelling would be conducted for the final wind turbine layout, model selection and hub height to verify compliance. The results of the revised noise modelling would be documented in the noise management plan required under regulation 131E of the EP Regulations.

6.3 Wind turbine noise emissions

6.3.1 Sound power levels

The noise emissions of the wind turbines are described in terms of the sound power level for different wind speeds. The sound *power* level is a measure of the total sound energy produced by each wind turbine and is distinct from the sound *pressure* level which depends on a range of factors such as the distance from the wind turbine.

Sound power level data for the candidate wind turbine models, including sound frequency characteristics, has been sourced from the manufacturers' documents listed in Table 5.

Table 5: Candidate wind turbine model specification documents

Model	Document No.	Date	Title
V162-6.8 MW	0111-1246_03	13 Jan 2023	*Third octave noise emission EnVentus™ V162-6.8MW 50/60 Hz*
V172-7.2 MW	0128-4336_01	29 Nov 2024	*Third octave noise emission EnVentus™ V172*

Based on the data sourced from the manufacturer's documentation, the noise modelling undertaken for this assessment involved conversion of third octave band levels to octave band levels (where applicable), and adjustment by addition of +1.0 dB at each wind speed to provide a margin for typical values of test uncertainty.

For each candidate wind turbine model, the overall A-weighted sound power levels (including the +1.0 dB addition) as a function of hub height wind speed are presented in Table 6 with the octave band values presented in Table 7. These represent the total noise emissions of each candidate wind turbine model, including the secondary contribution of ancillary plant associated with each wind turbine (e.g. cooling fans).

Table 6: Sound power levels (including the +1.0 dB addition) versus hub height wind speed, dB L_{WA}

	Hub height wind speed, m/s											
Model	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**≥15**
V162-6.8 MW	95.0	95.0	96.0	99.3	102.5	104.3	104.3	104.4	104.8	105.1	105.3	105.5
V172-7.2 MW	98.6	98.7	100.5	103.2	106.0	108.1	108.8	108.8	108.8	108.8	108.8	108.8

Table 7: Octave band sound power levels, dB L_{WA}

	Octave band centre frequency, Hz									
Model	**31.5**	**63**	**125**	**250**	**500**	**1,000**	**2,000**	**4,000**	**8,000**	**Total**
V162-6.8 MW [1]	76.0	88.5	96.4	99.7	100.2	98.7	94.2	86.7	76.0	105.5
V172-7.2 MW [2]	79.3	90.8	97.8	102.4	101.4	102.0	100.9	99.3	86.5	108.8

1 Based on one-third octave band levels at 15 m/s

2 Based on one-third octave band levels at 10 m/s

These sound power levels are also illustrated in Appendix J.

The values presented above are indicative of the noise emissions which can achieved by a range of comparable multi-megawatt wind turbine options on the market.

Some of the larger turbines presently on the market indicate the potential for higher noise emissions. However, the options for larger turbines are currently limited and the available data is insufficient to reach conclusions about representative emissions. In this respect, industry research into the noise emission characteristics of a range of wind turbine models has shown that there is not a clear relationship between sound power levels and a wind turbine's size or power output.[5] In practice, the sound power levels of a wind turbine are influenced by a range of factors, including the wind turbine size and power output, and other important factors such as the blade design and rotational speed of the wind turbine. Therefore, while wind turbine sizes and power ratings of contemporary wind turbines have increased, the noise emissions of the wind turbines have remained generally comparable to, or lower than, previous generations of wind turbines as a result of design improvements (notably, measures to reduce the speed of rotation of the wind turbines, and enhanced blade design features such as serrations for noise control).

Based on the above, the noise emissions presented in Table 6 and Table 7 are suitable for a planning stage assessment of the wind farm. However, if the Project is ultimately approved, the noise modelling would need to be updated to:

- reflect the sound power levels of the final layout, hub height and wind turbine model selected for the Project
- assess compliance with the noise limits specified in the conditions of approval
- determine the mitigation strategies which would apply with the selected wind turbine, if required.

6.3.2 Special audible characteristics

Special audible characteristics relate to potential tonality, amplitude modulation and impulsiveness of a wind turbine.

Information concerning potential tonality is often limited at the planning stage of a wind farm, and test data for tonality is presently unavailable for the selected candidate wind turbine model. However, the occurrence of tonality in the noise of contemporary multi-megawatt wind turbine designs is unusual. This is supported by evidence of operational wind farms in Australia which indicates that the occurrence of tonality at receivers is atypical.

Amplitude modulation and impulsiveness are not able to be predicted, however the evidence of operational wind farms in Australia indicates that their occurrence is limited and atypical.

Given the above, adjustments for special audible characteristics have not been applied to the predicted noise levels presented in this assessment. This is consistent with the recommendations of the Technical Guideline which states that it is not necessary to apply a penalty for special audible characteristics during the prediction of wind farm noise levels.

Notwithstanding this, the subject of special audible characteristics would be addressed in subsequent assessment stages for the project, following approval of the wind farm, and again following construction of the wind farm.

[5] Van den Berg, Frits & Koppen, Erik & Boon, Jaap & Ekelschot-Smink, Madelon. - *Sound power of onshore wind turbines and its spectral distribution. Sound & Vibration. 59* - 2025

6.4 Predicted noise levels

Sound levels in environmental assessment work are typically reported to the nearest integer to reflect the practical use of measurement and prediction data. However, in the case of wind farm layout design, significant layout modifications may only give rise to fractional changes in the predicted noise level. This is a result of the relatively large number of sources influencing the total predicted noise level, as well as the typical separating distances between the wind turbine locations and surrounding assessment positions. It is therefore necessary to consider the predicted noise levels at a finer resolution than can be perceived or measured in practice. It is for this reason that the levels presented in this section are reported to one decimal place.

Noise levels from the proposed wind farm have been predicted using the sound power level data detailed in Section 6.3.1 for the selected candidate wind turbine models and are summarised in Table 8 for the hub height wind speed which results in the highest predicted noise levels.

The locations of the predicted 35 dB and 40 dB L_{A90} noise contours are illustrated in Figure 1 and Figure 2, for each candidate wind turbine model, corresponding to the hub height wind speeds which results in the highest predicted noise levels.

Predicted noise levels for each integer wind speed are tabulated in Appendix I for each candidate wind turbine model and all considered receivers, including receivers where the highest predicted noise level is below 30 dB L_{A90}.

Table 8: Highest predicted noise level at receivers with predicted levels 30 dB L_{A90} or above, dB L_{A90}

Receiver	V162-6.8 MW	V172-7.2 MW
Non-stakeholder receivers		
26	29.5	32.4
27	29.2	32.1
28	27.5	30.6
35	27.4	30.4
37	27.3	30.4
57	27.9	30.9
58	27.4	30.4
59	30.2	33.1
60	30.0	32.9
62	28.9	31.9
63	28.7	31.6
64	27.6	30.6
65	27.7	30.7
73	29.4	32.3
74	29.6	32.6
75	27.9	31.0
76	28.9	31.9
77	28.1	31.2

Receiver	V162-6.8 MW	V172-7.2 MW
78	28.1	31.2
83	29.6	32.7
96	27.6	30.7
99	29.9	32.8
100	30.6	33.5
101	30.7	33.6
102	27.4	30.4
103	29.5	32.5
104	27.8	30.9
105	29.7	32.7
107	27.7	30.7
176	33.0	35.9
225	30.3	33.3
Stakeholder receivers within the Project boundary		
61 (S)	31.1	34.0
79 (S)	34.6	37.4
80 (S)	33.9	36.7
81 (S)	32.1	34.9
82 (S)	30.8	33.7
98 (S)	33.1	36.0
177 (S)	31.9	34.8
178 (S)	35.4	38.2

(S) Stakeholder

The results presented in Table 8 demonstrate that wind turbine noise levels associated with the Project are predicted to comply with the noise limits for all receivers for both candidate wind turbine models.

Specifically, the predicted operational wind turbine noise levels are:

- below the applicable base noise limit of 40 dB L_{A90} at all non-stakeholder receivers by at least 7.0 dB and 4.1 dB, for the V162-6.8 MW and V172-7.2 MW model respectively
- below the reference base noise level of 45 dB L_{A90} at all stakeholder receivers within the Project boundary by at least 9.6 dB and 6.8 dB, for the V162-6.8 MW and V172-7.2 MW model respectively.

Figure 1: Highest predicted noise level contours, dB L_{A90} – V162-6.8 MW

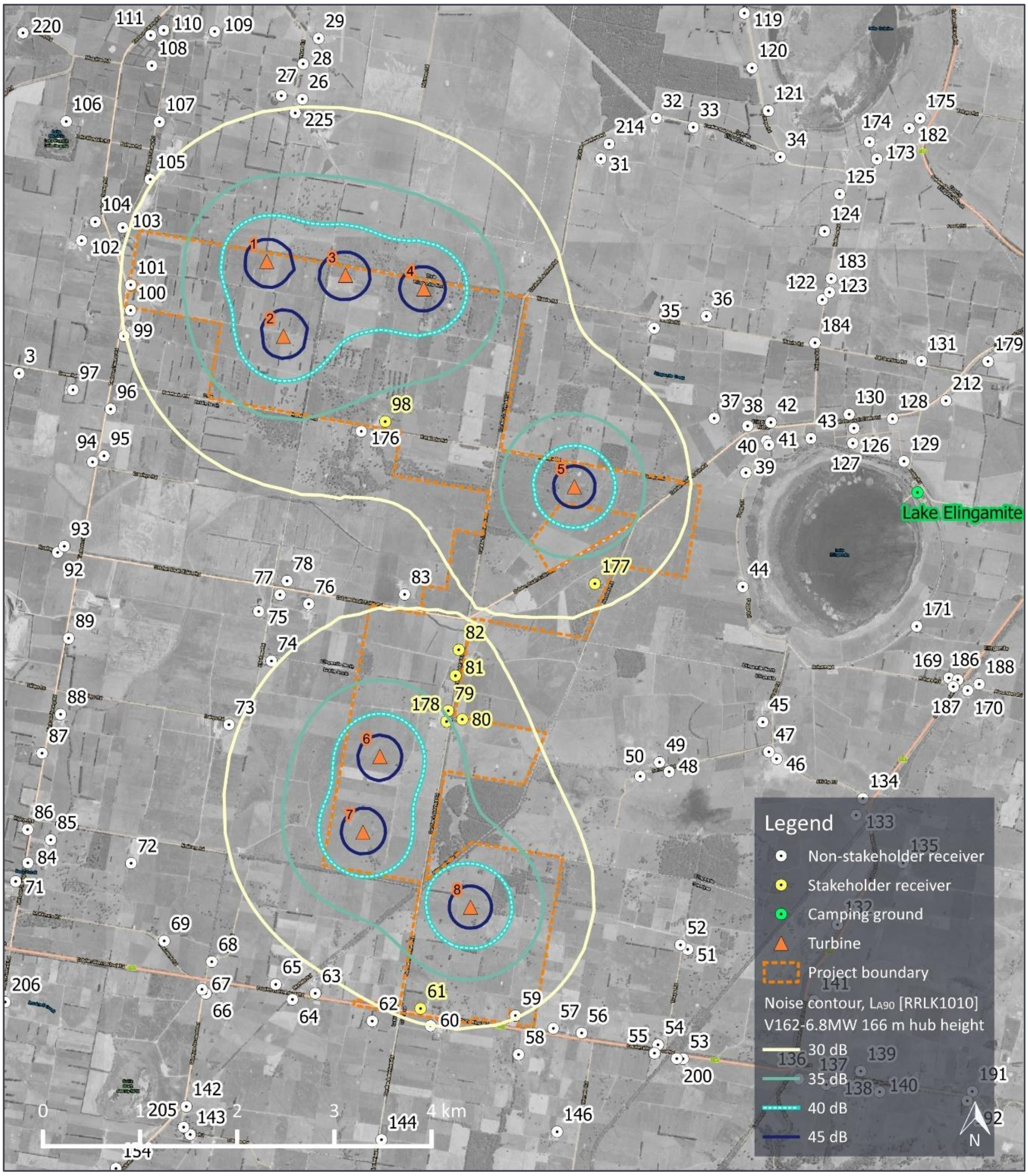
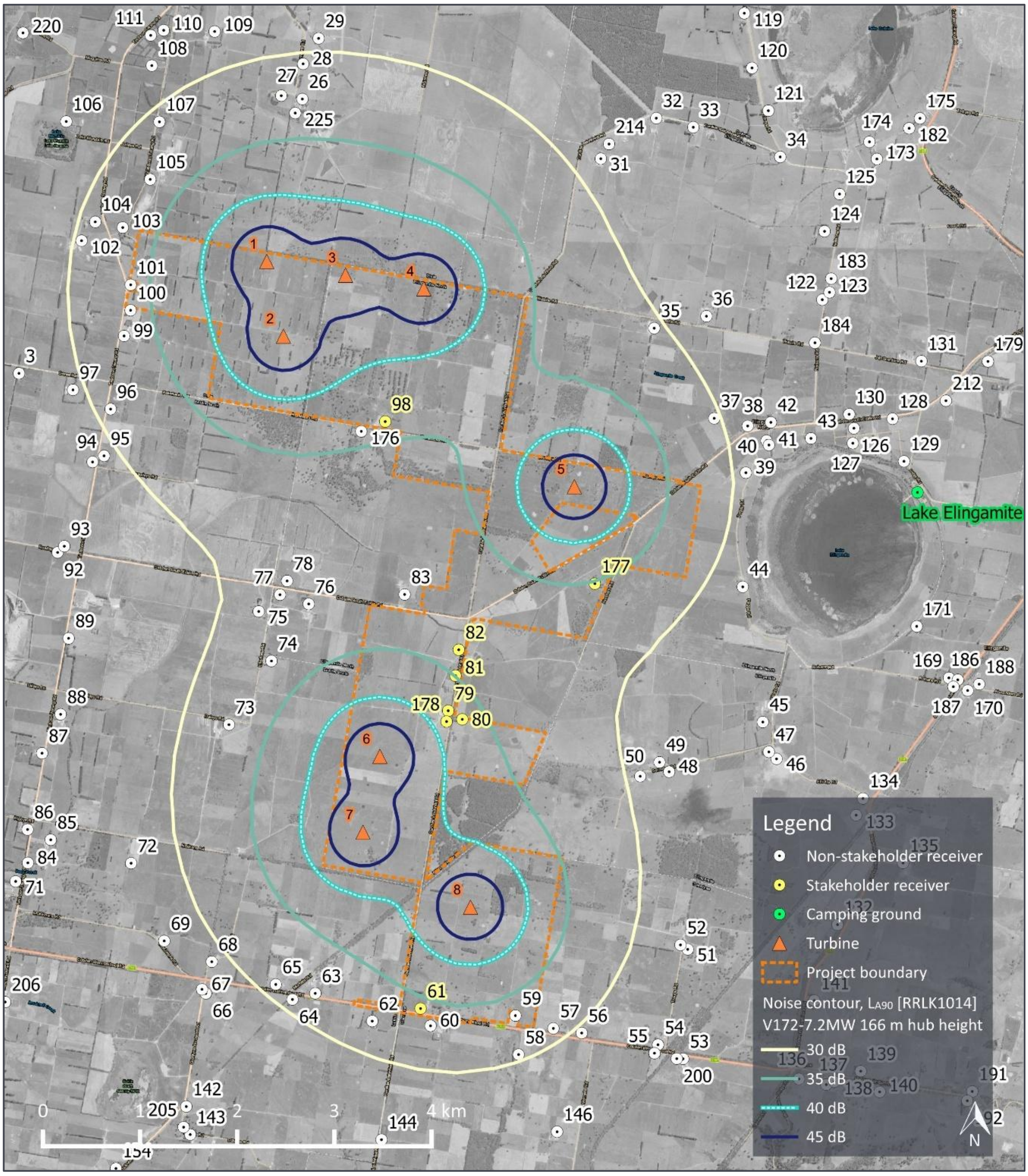


Figure 2: Highest predicted noise level contours, dB L_{A90} – V172-7.2 MW



6.5 Cumulative assessment

To our knowledge, the nearest approved and/or operating wind farm is the Timboon West Wind Farm (approximately 20 km to the south).

Due to the significant separating distance, cumulative assessment of noise levels from the Mumblin Wind Farm and other surrounding wind farm(s) is not warranted.

7.0 TRANSFORMER STATION NOISE ASSESSMENT

7.1 Noise limits

The procedure for determining the noise limits according to the Noise Protocol depends on whether the noise source or the receivers are located in a rural or urban area.

The procedures for rural areas, applicable for the subject site, are based on determining the zone levels according to the land zoning of the area in which the noise source and receivers are located. These zone levels are then adjusted, where appropriate, for a range of factors.

The zone levels are determined on the basis of the transformer station and surrounding residential receivers both being located on land designated as Farming Zone (FZ) (see land zoning map in Appendix G).

Considering that the land zoning is continuous between the transformer station and the receivers, a distance adjustment is not applicable.

Adjustments for 'background relevant areas' are not warranted in this instance, as the background noise levels during the relevant assessment conditions for the transformer station (i.e. low wind speeds) are expected to be relatively low; adjustments for background noise levels are therefore not warranted in this instance.

Based on the above and considering that the transformer station would be defined in the Victorian Planning Provisions as a *utility*, the noise limits applicable at the nearest receivers, are summarised in Table 9.

Table 9: Noise Protocol time periods and noise limits, dB ENL [6]

Period	Day of week	Start time	End time	Noise limit
Day	Monday- Saturday	0700 hrs	1800 hrs	45
Evening	Monday- Saturday	1800 hrs	2200 hrs	39
	Sunday, Public holidays	0700 hrs	2200 hrs	
Night	Monday-Sunday	2200 hrs	0700 hrs	34

As the transformer station is proposed to operate 24 hours a day and 7 days a week, meeting the applicable night-time noise limit of 34 dB ENL, infers meeting the noise limits during all other time periods.

[6] ENL is the effective noise level of commercial or industrial noise determined in accordance with the Noise Protocol. This is L_{Aeq} noise level over a half-hour period, adjusted for the character of the noise. Adjustments are made for tonality, intermittency, and impulsiveness.

7.2 Transformer noise emissions

The transformers and any associated cooling equipment will be the main sources of noise located within the transformer station.

At this stage in the project, specific details of the transformer make and model are yet to be determined. However, to provide a basis for assessing the feasibility of the transformer station, the proponent advised that a single transformer rated to 90 MVA is proposed.

In lieu of manufacturer sound power level data for a specific transformer selection, reference has been made to AS 60076-10 which provides a method for estimating transformer sound power levels.[7] Specifically, Annex ZA from AS 60076-10 has been used to determine an estimated sound power level of 93 dB L_{WA}.

The sound power levels include the noise from ancillary plant such as cooling plant.

AS 60076-10 does not provide estimated sound frequency spectra for transformer noise emissions. However, the noise emissions of transformers typically exhibit tonal characteristics which must be accounted for in the noise assessment. This is addressed in subsequent sections of the report.

7.3 Predicted noise levels

Predicted noise levels have been determined on the basis of:

- the indicative equipment noise emission data detailed in Section 7.2
- the ISO 9613-2 noise prediction method described in Section 4.3.

An adjustment of +2 dB has then been applied to the predicted noise levels to account for the potential tonal characteristics of transformer noise. The relevance and magnitude of the adjustment in practice is dependent on several variables. This is discussed below.

The predicted noise level from the transformer station at the nearest receiver (Receiver 61), located approximately 820 m to the southwest, is 23 dB ENL (including the +2 dB adjustment for potential tonality).

The predicted effective noise levels are below the noise limits applicable to the day, evening and night periods by a significant margin. The following contextual notes are provided:

- The predicted effective noise level is at least 11 dB below the night-time noise limit
- The predicted effective noise level is very low and would be comparable to or less than background noise levels in many instances. The adjustment for tonality is therefore not expected to be applicable as the noise of the transformer is not likely to be audible.

These results indicate that noise levels from the proposed transformer station associated with the wind farm are unlikely to be a significant design consideration. However, noise levels should be reviewed at the time when equipment selections are finalised, accounting for manufacturer noise emission data.

Further, the low predicted noise level indicates the noise the transformer station is unlikely to represent a risk of harm to the environment as a result of noise. The general environmental duty under the EP Act is therefore expected to be addressed by selecting a transformer with noise emissions equivalent to, or lower than, the AS 60076-10 empirical values referenced in this assessment. Given that actual noise emission values for contemporary transformer designs are usually lower than the empirical values of the standard, this is considered a reasonably practicable noise mitigation measure of the purposes of the EP Act.

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[7] AS 60076-10:2023 *Power transformers – Part 10: Determination of sound levels (IEC 60076-10:2016 (ED. 2.0) MOD)*

8.0 RECOMMENDED NOISE MANAGEMENT MEASURES

Providing that the operator of a wind farm complies with the requirements of Regulation 131C, their obligations with respect to the general environmental duty (GED) under the EP Act will be addressed with regard to wind turbine noise.

Specifically, to address the GED under the EP Act with respect to wind turbine noise, the operator of the wind farm:

- Must ensure that wind turbine noise complies with NZS 6808
- Must implement all applicable actions under Division 5.3 of the EP Regulations to manage and review wind turbine noise from the facility, including:
  - preparation of a noise management plan
  - conducting noise compliance testing when the wind farm begins operating
  - preparing annual compliance statements
  - conducting verification wind turbine noise monitoring every 5 years.

In addition to the above, the following noise management measures should be implemented as part of the subsequent stages of development:

- The transformer equipment should be specified and selected to achieve noise emissions not exceeding the empirical values specified in AS 60076-10
- A detailed noise assessment should be prepared by a qualified acoustic consultant, prior to construction, to inform the noise management plan required under regulation 131E of the EP Regulations, addressing:
  - the final wind turbine selection and layout
  - the final location and equipment selection for the transformer station
  - compliance with the applicable noise limits at surrounding receivers
  - recommendation of reasonably practicable noise mitigation measures to control noise from the transformer station.
- Development of reasonably practicable construction noise mitigation and management measures to be documented in a construction environmental management plan, prior to construction.

9.0 SUMMARY

An assessment of operational noise for the proposed Mumblin Wind Farm has been carried out. The assessment is based on the proposed wind farm layout comprising 8 multi-megawatt wind turbines and a transformer station.

Operational noise associated with the proposed wind turbines has been assessed in accordance with the New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS 6808), as required by the *Environment Protection Regulations 2021* and the Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023.

Noise modelling was carried out based on 2 candidate wind turbine models (Vestas V162-6.8 MW and V172-7.2 MW) which have been selected by the proponent as being representative of the size and type of wind turbines which could be used at the site.

The results of the modelling demonstrate that the proposed wind turbines are predicted to achieve compliance with the applicable noise limits determined in accordance with NZS 6808 for both candidate wind turbine models.

The assessment has also considered operational noise associated with the proposed transformer station. These noise levels have been assessed in accordance with Victorian EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* dated September 2025 (Noise Protocol). The assessment demonstrates that the transformer station is expected to result in noise levels significantly lower than the noise limits determined in accordance with the Noise Protocol.

Consideration was also given to the general environmental duty, as required by the *Environment Protection Act 2017*.

The noise assessment therefore demonstrates that the proposed Mumblin Wind Farm can be designed and developed to achieve Victorian policy requirements for operational noise.

APPENDIX A GLOSSARY OF TERMINOLOGY

Term	Definition	Abbreviation
Amplitude modulation	Sound that is characterised by a rhythmic and higher than normal rise and fall in sound level at regular intervals.	-
A-weighting	A method of adjusting sound levels to reflect the human ear's varied sensitivity to different frequencies of sound.	See discussion below this table.
A-weighted 90th centile	The A-weighted pressure level that is exceeded for 90 % of a defined measurement period. It is used to describe the underlying background sound level in the absence of a source of sound that is being investigated, as well as the sound level of steady, or semi steady, sound sources.	L_{A90}
A-weighted average noise level	The equivalent continuous (time-averaged) A-weighted sound level.	L_{Aeq}
Decibel	The unit of sound level.	dB
Hertz	The unit for describing the frequency of a sound in terms of the number of cycles per second.	Hz
Impulsiveness	Sound that is characterised by a distinct and very rapid rise in sound level (e.g. a car door closing or the impact sound of a hammer)	-
Octave Band	A range of frequencies. Octave bands are referred to by their logarithmic centre frequencies, these being 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz for the audible range of sound.	-
Sound power level	A measure of the total sound energy emitted by a source, expressed in decibels.	L_W
Sound pressure level	A measure of the level of sound expressed in decibels.	L_p
Special Audible Characteristics	A term used to define a set group of Sound characteristics that increase the likelihood of adverse reaction to the sound. The characteristics comprise tonality, impulsiveness and amplitude modulation.	SAC
Tonality	A characteristic to describe sounds which are composed of distinct and narrow groups of audible sound frequencies (e.g. whistling or humming sounds).	-

The basic quantities used within this document to describe noise adopt the conventions outlined in ISO 1996-1:2016 *Acoustics - Description measurement and assessment of environmental noise – Basic quantities and assessment procedures*. Accordingly, all frequency weighted sound pressure levels are expressed as decibels (dB) in this report. For example, sound pressure levels measured using an "A" frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels such as dBA or dB(A) are therefore not used within this report.

APPENDIX B SOURCE COORDINATES

The following table sets out the coordinates of the proposed wind turbine layout (Reference 20230731), supplied by the proponent on 3 August 2023.

Table 10: Wind turbine coordinates – MGA 94 zone 54

Wind turbine	Easting, m	Northing, m	Terrain elevation, m
T1	669,442	5,755,885	130
T2	669,614	5,755,115	130
T3	670,254	5,755,744	128
T4	671,059	5,755,604	125
T5	672,610	5,753,566	130
T6	670,607	5,750,787	130
T7	670,433	5,750,006	130
T8	671,541	5,749,233	130

The following table sets out the coordinates of the proposed transformer station (Reference 20220330), supplied by the proponent on 30 March 2022.

Table 11: Transformer station coordinates – MGA 94 zone 54

Item	Easting, m	Northing, m	Terrain elevation, m
Transformer station	671,018	5,749,011	130

APPENDIX C RECEIVER COORDINATES

The following table sets out the 199 assessed receivers located within 5 km of the proposed wind turbines considered in the environmental noise assessment, and their distance to the nearest wind turbine.
This includes 8 stakeholders and one camping ground.

(Data reference 20220523, supplied by the proponent on 23 May 2022).

Table 12: Receivers within 5 km of the proposed wind turbines – MGA 94 zone 54

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
Non-stakeholder receivers					
1	666,278	5,752,927	120	3,993	T2
2	666,466	5,753,544	117	3,522	T2
3	666,890	5,754,733	144	2,755	T2
4	666,663	5,754,834	147	2,968	T2
5	665,880	5,754,887	124	3,703	T1
6	665,950	5,755,065	135	3,590	T1
7	665,906	5,755,046	133	3,638	T1
8	666,588	5,755,075	152	2,971	T1
9	664,833	5,755,154	110	4,669	T1
10	666,599	5,756,788	162	2,987	T1
11	666,455	5,757,213	161	3,273	T1
12	666,513	5,757,537	161	3,367	T1
13	666,290	5,757,413	154	3,506	T1
14	666,188	5,757,452	149	3,615	T1
15	665,806	5,757,534	134	3,996	T1
16	665,756	5,757,651	126	4,090	T1
18	666,531	5,747,056	110	4,895	T7
19	666,531	5,747,364	110	4,715	T7
20	666,611	5,747,497	110	4,575	T7
21	666,731	5,748,141	110	4,148	T7
22	666,315	5,748,784	114	4,299	T7
23	666,510	5,748,787	112	4,112	T7
24	666,663	5,749,322	120	3,835	T7
25	665,876	5,749,035	120	4,662	T7
26	669,809	5,757,558	163	1,721	T1
27	669,592	5,757,593	177	1,722	T1
28	669,817	5,757,921	167	2,076	T1

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
29	669,976	5,758,183	153	2,365	T1
30	669,429	5,758,858	137	2,978	T1
31	672,883	5,756,944	120	2,269	T4
32	673,454	5,757,361	123	2,975	T4
33	673,836	5,757,268	126	3,241	T4
34	674,730	5,756,962	130	3,918	T4
35	673,433	5,755,198	130	1,835	T5
36	673,971	5,755,321	130	2,227	T5
37	674,051	5,754,269	130	1,612	T5
38	674,396	5,754,191	130	1,899	T5
39	674,377	5,753,709	130	1,780	T5
40	674,589	5,754,039	136	2,042	T5
41	674,614	5,753,994	137	2,056	T5
42	674,634	5,754,228	138	2,136	T5
43	675,047	5,754,063	140	2,493	T5
44	674,345	5,752,533	140	2,025	T5
45	674,551	5,751,141	131	3,111	T5
46	674,693	5,750,762	131	3,497	T5
47	674,614	5,750,834	131	3,392	T5
48	673,587	5,750,629	130	2,482	T8
49	673,488	5,750,727	130	2,459	T8
50	673,288	5,750,582	130	2,214	T8
51	673,778	5,748,800	130	2,285	T8
52	673,703	5,748,845	130	2,203	T8
53	673,730	5,747,672	130	2,694	T8
54	673,472	5,747,817	130	2,400	T8
55	673,436	5,747,730	130	2,424	T8
56	672,686	5,747,938	130	1,737	T8
57	672,394	5,747,985	129	1,521	T8
58	672,036	5,747,716	122	1,604	T8
59	672,003	5,748,117	122	1,219	T8
60	671,129	5,748,012	127	1,299	T8
62	670,529	5,748,060	130	1,558	T8

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
63	669,942	5,748,346	130	1,738	T7
64	669,707	5,748,283	130	1,877	T7
65	669,535	5,748,438	130	1,814	T7
66	668,815	5,748,346	123	2,324	T7
67	668,776	5,748,388	123	2,322	T7
68	668,876	5,748,672	124	2,057	T7
69	668,387	5,748,886	120	2,339	T7
70	666,707	5,749,366	120	3,784	T7
71	666,856	5,749,499	120	3,616	T7
72	668,046	5,749,687	120	2,414	T7
73	669,053	5,751,114	123	1,596	T6
74	669,491	5,751,770	123	1,496	T6
75	669,360	5,752,280	122	1,952	T6
76	669,874	5,752,357	124	1,740	T6
77	669,579	5,752,452	123	1,964	T6
78	669,652	5,752,594	123	2,051	T6
83	670,862	5,752,455	127	1,695	T6
84	666,982	5,749,690	120	3,469	T7
85	667,217	5,749,928	120	3,221	T7
86	666,979	5,750,034	120	3,458	T7
87	667,128	5,750,820	120	3,407	T7
88	667,319	5,751,221	120	3,320	T6
89	667,402	5,752,003	129	3,432	T6
90	666,923	5,752,258	147	3,929	T2
91	667,484	5,752,356	127	3,489	T2
92	667,289	5,752,888	122	3,224	T2
93	667,357	5,752,952	120	3,131	T2
94	667,649	5,753,820	121	2,359	T2
95	667,767	5,753,883	122	2,227	T2
96	667,834	5,754,365	128	1,939	T2
97	667,447	5,754,562	129	2,243	T2
99	667,973	5,755,118	130	1,649	T2
100	668,040	5,755,382	137	1,498	T1

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
101	668,041	5,755,645	145	1,431	T1
102	667,535	5,756,099	180	1,926	T1
103	667,959	5,756,235	163	1,533	T1
104	667,676	5,756,293	171	1,820	T1
105	668,242	5,756,731	190	1,477	T1
106	667,378	5,757,327	180	2,524	T1
107	668,337	5,757,323	190	1,821	T1
108	668,259	5,757,903	188	2,345	T1
109	668,906	5,758,254	180	2,434	T1
110	668,381	5,758,267	163	2,612	T1
111	668,247	5,758,214	161	2,623	T1
112	668,564	5,758,526	145	2,788	T1
113	668,352	5,758,631	143	2,959	T1
114	668,583	5,759,178	118	3,497	T1
115	668,697	5,759,844	112	4,032	T1
116	668,903	5,760,445	110	4,595	T1
117	668,823	5,760,365	110	4,526	T1
118	668,832	5,760,455	110	4,613	T1
119	674,361	5,758,442	140	4,357	T4
120	674,440	5,757,879	140	4,078	T4
121	674,609	5,757,438	134	3,999	T4
122	675,164	5,755,491	132	3,203	T5
123	675,238	5,755,567	131	3,308	T5
124	675,187	5,756,196	130	3,686	T5
125	675,342	5,756,579	130	4,071	T5
126	675,490	5,754,167	147	2,947	T5
127	675,478	5,754,013	150	2,908	T5
128	675,888	5,754,265	145	3,355	T5
129	676,005	5,753,826	150	3,409	T5
130	675,440	5,754,311	140	2,931	T5
131	676,184	5,754,858	140	3,804	T5
132	675,321	5,749,054	130	3,788	T8
133	675,512	5,750,182	130	4,086	T8

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
134	675,583	5,750,354	130	4,198	T8
135	675,996	5,749,689	130	4,481	T8
136	674,923	5,747,465	130	3,820	T8
137	675,204	5,747,406	130	4,097	T8
138	675,287	5,747,437	130	4,157	T8
139	675,560	5,747,545	130	4,362	T8
140	675,755	5,747,331	123	4,626	T8
141	675,081	5,748,272	130	3,672	T8
142	668,614	5,747,181	127	3,365	T7
143	668,654	5,746,892	120	3,590	T7
144	670,624	5,746,839	107	2,569	T8
145	670,431	5,746,154	102	3,277	T8
146	672,433	5,746,921	120	2,484	T8
147	672,480	5,746,172	105	3,111	T8
148	672,590	5,746,322	108	3,098	T8
149	673,253	5,745,936	120	3,718	T8
150	670,538	5,745,468	100	3,899	T8
151	670,418	5,745,198	96	4,191	T8
152	667,848	5,746,240	112	4,570	T7
153	667,582	5,746,300	110	4,679	T7
154	667,889	5,746,542	116	4,301	T7
155	666,066	5,750,254	114	4,377	T7
158	665,981	5,751,626	120	4,704	T6
159	665,873	5,751,784	120	4,840	T6
163	669,686	5,745,091	100	4,541	T8
169	676,468	5,751,596	138	4,335	T5
170	676,661	5,751,466	137	4,566	T5
171	676,136	5,752,127	150	3,812	T5
172	677,246	5,752,545	138	4,750	T5
173	675,726	5,756,941	130	4,597	T5
174	675,649	5,757,117	130	4,677	T5
176	670,416	5,754,136	130	1,276	T2
179	676,870	5,754,856	140	4,454	T5

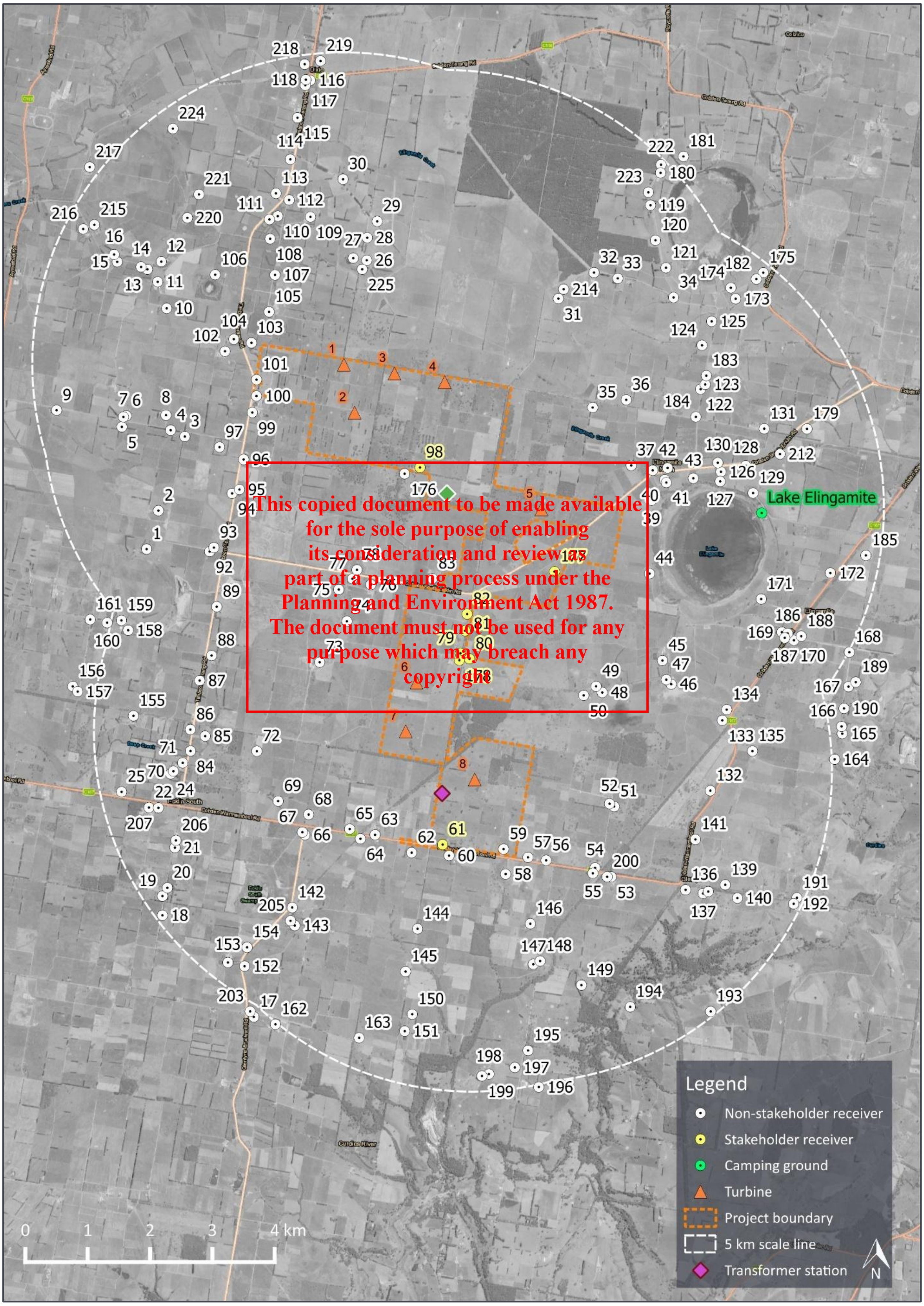
Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
180	674,522	5,758,960	140	4,825	T4
183	675,256	5,755,708	130	3,408	T5
184	675,088	5,755,047	135	2,892	T5
186	676,560	5,751,576	138	4,426	T5
187	676,514	5,751,505	138	4,418	T5
188	676,779	5,751,531	137	4,642	T5
194	674,035	5,745,588	53	4,420	T8
195	672,395	5,744,888	116	4,431	T8
197	672,184	5,744,616	120	4,664	T8
198	671,768	5,744,510	116	4,731	T8
199	671,657	5,744,480	114	4,757	T8
200	673,665	5,747,673	130	2,640	T8
201	673,526	5,747,704	130	2,511	T8
202	673,548	5,747,893	130	2,419	T8
205	668,586	5,746,968	123	3,559	T7
206	666,747	5,748,257	110	4,083	T7
207	666,467	5,748,770	112	4,155	T7
208	667,029	5,750,275	120	3,419	T7
209	667,459	5,752,316	128	3,503	T6
212	676,437	5,754,451	141	3,932	T5
214	672,967	5,757,095	120	2,427	T4
215	665,440	5,758,128	120	4,591	T1
216	665,260	5,758,060	120	4,717	T1
218	668,813	5,760,702	110	4,861	T1
219	669,067	5,760,755	110	4,887	T1
220	666,932	5,758,240	158	3,446	T1
221	667,117	5,758,615	167	3,590	T1
222	674,529	5,759,090	140	4,922	T4
223	674,326	5,758,649	140	4,469	T4
224	666,699	5,759,670	127	4,677	T1
225	669,736	5,757,414	159	1,566	T1
Camping ground	676,145	5,753,508	130	3,539	T5

Receiver ID	Easting, m	Northing, m	Terrain elevation, m	Distance to the nearest wind turbine, m	Nearest wind turbine
Stakeholder receivers within the Project boundary					
61 (S)	671,026	5,748,190	130	1,175	T8
79 (S)	671,311	5,751,257	130	863	T6
80 (S)	671,456	5,751,169	130	946	T6
81 (S)	671,386	5,751,619	130	1,152	T6
82 (S)	671,420	5,751,886	130	1,376	T6
98 (S)	670,663	5,754,236	130	1,378	T2
177 (S)	672,821	5,752,566	130	1,035	T5
178 (S)	671,294	5,751,146	130	793	T6

(S) Stakeholder receiver

APPENDIX D SITE LAYOUT PLAN

Figure 3: Proposed wind turbine layout and receivers



APPENDIX E VICTORIAN REGULATIONS AND GUIDELINES

The following publications are relevant to the assessment of operational noise from proposed renewable energy projects in Victoria:

- *Environment Protection Act 2017*
- *Environment Protection Regulations 2021*
- *Environment Reference Standard* published 25 May 2021, and as amended by *Environment Reference Standard No. S158 Gazette* dated 29 March 2022
- Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023
- NZS 6808:2010 *Acoustics – Wind farm noise*
- EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* dated September 2025.

The relevant publication for the assessment of construction noise in Victoria is the EPA Publication 1834.2 *Civil construction, building and demolition guide*, dated September 2025.

There is no standard or regulation that specifies criteria for the control of construction vibration levels in Victoria. In lieu of Victorian guidance for construction vibration, reference is made to NSW guidance documents.

Details of the guidance and noise criteria provided by the above publications are provided in the following sections.

E1 Environment Protection Act 2017

The *Environment Protection Act 2017* (EP Act) provides the overarching legislative framework for the protection of the environment in Victoria.

The EP Act establishes a general environmental duty to minimise the risks of harm to human health or the environment from pollution or waste, including noise related amenity impacts, so far as reasonably practicable.

The EP Act also prohibits the emission of unreasonable noise from commercial and industrial trade premises. Specifically, the EP Act states that:

> *A person must not, from a place or premises that are not residential premises—*
>
> *(a) emit an unreasonable noise; or*
>
> *(b) permit an unreasonable noise to be emitted*

Under the EP Act, unreasonable noise means noise that:

> *(a) is unreasonable having regard to the following—*
>
> > *(i) its volume, intensity or duration;*
> >
> > *(ii) its character;*
> >
> > *(iii) the time, place and other circumstances in which it is emitted;*
> >
> > *(iv) how often it is emitted;*
> >
> > *(v) any prescribed factors; or*
>
> *(b) is prescribed to be unreasonable noise:*

Further information about noises that are prescribed to be unreasonable is separately defined in regulations made under the EP Act (see next section).

E2 Environment Protection Regulations 2021

The *Environment Protection Regulations 2021* (EP Regulations) give effect to the EP Act by establishing prescriptive requirements for a range of environmental considerations including noise.

The following sections provide details of the requirements for wind turbine noise and industry noise.

E2.1 Wind turbine noise

Part 5.3 Division 5 of the EP Regulations nominates NZS 6808 as the relevant standard for assessing operational wind turbine noise in Victoria and introduces additional measures to demonstrate compliance post-construction.

Specifically, the EP Regulations outline the following:

- Noise agreements

  An owner or operator of a wind energy facility may enter into a written agreement with a landowner to modify the noise limits.

  If a noise agreement is made after 1 November 2021, an increased base noise limit of 45 dB L_{A90} would apply. If a noise agreement was made prior to 1 November 2021, the noise limit can be modified as specified in the noise agreement.

- Wind energy facility operators' duties

  Regulation 131C establishes a duty to manage and review wind turbine noise by taking all applicable actions set in Division 5 of the EP Act.

  Regulation 131CA establishes a duty to comply with the noise limit (or the alternative monitoring point criterion if wind turbine noise is being assessed at an alternative monitoring point) determined in accordance with NZS 6808 and any applicable noise agreement.

  Providing that the operator of a wind farm complies with the requirements of regulations 131C and 131CA, their duty with respect to the general environmental duty under the EP Act has been addressed.

Details of the types of receivers to be assessed, the noise limits and the technical procedures for assessing compliance with the noise limits are separately defined in NZS 6808 (see further information in Section E5).

In accordance with the EP Regulations, noise levels from a wind farm are prescribed to be *unreasonable* for the purposes of the EP Act, if they exceed the relevant applicable noise limits.

E2.2 Industry noise

In relation to noise from commercial, industrial and trade premises (industry), the EP Regulations specify that the prediction, measurement, assessment or analysis of noise within a noise sensitive area must be conducted in accordance with the Noise Protocol (see Section E6). Noise from industry is prescribed by the EP Regulations to be unreasonable for the purposes of the EP Act if it exceeds a noise limit or alternative assessment criterion determined in accordance with the Noise Protocol.

The noise limits apply at locations referred to as noise sensitive areas which are defined by the EP Regulations as:

(a) that part of the land within the boundary of a parcel of land that is—

(i) within 10 metres of the outside of the external walls of any of the following buildings—

(A) a dwelling (including a residential care facility but not including a caretaker's house);

(B) a residential building;

(C) a noise sensitive residential use[8]; or

(ii) within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings—

(A) a caretaker's house;

(B) a hospital;

(C) a hotel;

(D) a residential hotel;

(E) a motel;

(F) a specialist disability accommodation;

(G) a corrective institution;

(H) a tourist establishment;

(I) a retirement village;

(J) a residential village; or

(iii) within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours)—

(A) a child care centre;

(B) a kindergarten;

(C) a primary school;

(D) a secondary school; or

(b) subject to paragraph (c), in the case of a rural area only, that part of the land within the boundary of—

(i) a tourist establishment; or

(ii) a campground; or

(iii) a caravan park; or

[8] *Noise sensitive residential use* […] *means a community care accommodation, dependent person's unit, dwelling, residential aged care facility, residential village, retirement village or rooming house*

(c) *despite paragraph (b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue—*

(i) a tourist establishment;

(ii) a campground;

(iii) a caravan park;

E3 Environment Reference Standard

The *Environment Reference Standard* (ERS) is a legislative instrument made under the EP Act which sets out environmental values for ambient sound that are sought to be achieved and maintained in Victoria and standards to support those values. The indicators and objectives within the standard provide a benchmark for comparing desired outcomes to the actual state of the environment, and a basis for assessing actual and potential risks to the environmental values.

The ERS is an environmental benchmark. It brings together a collection of environmental values, indicators and objectives that describe environmental and human health outcomes to be achieved or maintained in the whole or in parts of Victoria. These values, indicators and objectives are used to assess and report on changing environmental conditions by providing a reference point for decision makers to consider whether a proposal or activity is consistent with the environmental values identified in the ERS. The ERS also allows decision makers to evaluate potential impacts on human health and the environment that may result from a proposal or activity. The ERS does not specify requirements that must be met by environmental managers or other duty holders.

The ERS is primarily relevant for aspects of the environment that are not the subject of prescriptive regulation. These aspects include the noise from commercial premises and construction activities in natural areas, or the additional noise from public roads as a result of traffic associated with commercial activities.

Further, in the situations where the ERS is a relevant consideration, it is important to note that the ERS is not a compliance standard. Specifically, the values listed within the ERS are not prescribed noise limits, nor are they design criteria for proposed development.

Indicators and objectives within the ERS are generally not relevant considerations where they relate to an aspect of the environment that is the subject of prescriptive regulation. For example, the ambient sound indicators and objectives will not be relevant when considering noise from wind turbines and commercial, industrial and trade premises at noise sensitive areas, as defined in the EP Regulations. This is because noise in these circumstances is regulated by specific provisions and noise limits in the EP Regulations and the associated Noise Protocol and NZS 6808.

The environmental values presented in the ERS and a description of each is provided in Table 13.

Table 13: Environmental values of the ambient sound environment

Environmental value	Description of environmental value
Sleep during the night	An ambient sound environment that supports sleep during the night
Domestic and 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 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.

The ERS land use categories and their descriptions are provided in Table 14.

Table 14: Land use categories for the ambient sound environment

Land use category	General description	Planning zones
Category I	An urban form with distinctive features or characteristics of taller buildings, high commercial and residential intensity and high site coverage.	Industrial Zone 1 (IN1Z) Industrial Zone 2 (IN2Z) Port Zone (PZ) Road 1 Zone (RDZ1) Capital City Zone (CCZ) Docklands Zone (DZ)
Category II	Medium rise building form with a strong urban or commercial character. Typically contains mixed land uses including activity centres and larger consolidated sites, and an active public realm.	Industrial Zone 3 (IN3Z) Commercial 1 Zone (C1Z) Commercial 2 Zone (C2Z) Commercial 3 Zone (C3Z) Activity Centre Zone (ACZ) Mixed Use Zone (MUZ) Road 2 Zone (RDZ2)
Category III	Lower rise building form including lower density residential development and detached housing typical of suburban residential settings or in towns of district or regional significance.	Residential Growth Zone (RGZ) General Residential Zone (GRZ) Neighbourhood Residential Zone (NRZ) Urban Floodway Zone (UFZ) Public Park and Recreation Zone (PPRZ) Urban Growth Zone (UGZ) [1]
Category IV	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.	Low Density Residential Zone (LDRZ) Township Zone (TZ) Rural Living Zone (RLZ) Green Wedge A Zone (GWAZ) Rural Conservation Zone (RCZ) Public Conservation and Resource Zone (PCRZ) Green Wedge Zone (GWZ) Farming Zone (FZ) Rural Activity Zone (RAZ)

Land use category	General description	Planning zones
Category V	Unique combinations of landscape, biodiversity and geodiversity. These natural areas typically provide undisturbed species habitat and enable people to see and interact with native vegetation and wildlife.	Natural areas are classified as land within Category V irrespective of the planning zones that apply to that land.
Category I, II, III or IV depending on surrounding land uses and the intent of the specific planning zone (which may have a diversity of uses) as specified in a schedule to the planning zone		Comprehensive Development Zone (CDZ) Priority Development Zone (PDZ) Special Use Zone (SUZ) Public Use Zone (PUZ)

1 Urban Growth Zone (UGZ) is a Category III land use until the relevant precinct structure plan is adopted, at which time the approved land uses will determine the land use category.

The ERS indicators and objectives relevant to each land use category are described in Table 15.

Table 15: Indicators and objectives for the ambient sound environment

Land use category	Indicators	Objectives
Category I	Outdoor $L_{Aeq,8h}$ from 2200 hrs to 0600 hrs	55 dB L_{Aeq}
	Outdoor $L_{Aeq,16hr}$ from 0600 hrs to 2200 hrs	60 dB L_{Aeq}
Category II	Outdoor $L_{Aeq,8h}$ from 2200 hrs to 0600 hrs	50 dB L_{Aeq}
	Outdoor $L_{Aeq,16hr}$ from 0600 hrs to 2200 hrs	55 dB L_{Aeq}
Category III	Outdoor $L_{Aeq,8h}$ from 2200 hrs to 0600 hrs	40 dB L_{Aeq}
	Outdoor $L_{Aeq,16hr}$ from 0600 hrs to 2200 hrs	50 dB L_{Aeq}
Category IV	Outdoor $L_{Aeq,8h}$ from 2200 hrs to 0600 hrs	35 dB L_{Aeq}
	Outdoor $L_{Aeq,16hr}$ from 0600 hrs to 2200 hrs	40 dB L_{Aeq}
Category V	Qualitative	A sound quality that is conducive to human tranquillity and enjoyment having regard to the ambient natural soundscape

Natural areas are a land-use category for which the ERS details desired outcomes in terms of noise level to be achieved or maintained in Victoria. 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*.

E4 Victorian Wind Energy Guidelines

The Victorian Department of Transport and Planning publication *Planning Guidelines for Development of Wind Energy Facilities* dated September 2023 (Victorian Wind Energy Guidelines) provide advice to responsible authorities, proponents and the community about suitable sites to locate wind energy facilities and to inform planning decisions about a wind energy facility proposal.

The Victorian Wind Energy Guidelines set out:

- *a framework to provide a consistent and balanced approach to the assessment of wind energy projects across the state*
- *a set of consistent operational performance standards to inform the assessment and operation of a wind energy facility project*
- *guidance as to how planning permit application requirements might be met*
- *a framework for the regulation of wind turbine noise.*

Section 4.3.2 of the Victorian Wind Energy Guidelines outlines the application requirements for a wind energy facility. Specifically, to following written reports are required to be submitted to address potential noise impacts:

- *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 New Zealand Standard NZS6808:2010, Acoustics – Wind Farm Noise*
  - *provides an assessment of whether the proposed wind energy facility will comply with the noise limit for that facility*
  - *where the proposed wind energy facility will be the subject of a wind turbine noise agreement under the Environment Protection Regulations 2021, specifies the premises of the relevant 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 the New Zealand Standard NZS6808:2010, Acoustics – Wind Farm Noise and includes an assessment of whether a high amenity noise limit is applicable under Section 5.3 of the standard.*
- *A report prepared by an environmental auditor appointed under Part 8.3 of the Environment Protection Act 2017 that verifies whether or not the pre-construction (predictive) noise assessment was conducted under New Zealand Standard NZS6808:2010, Acoustics – Wind Farm Noise*

Section 5 of the Victorian Wind Energy Guidelines outlines the key criteria for evaluating the planning merits of a wind energy facility. The following guidance is provided for the assessment of noise levels from proposed new wind farm developments:

> *A wind energy facility must comply with the noise limits in the New Zealand Standard NZS 6808:2010 Acoustics – Wind Farm Noise (the Standard).* […]
>
> *The Standard specifies a general 40 decibel limit (40 dB $L_{A90(10min)}$) for wind energy facility sound levels outdoors at noise sensitive locations, or that the sound level should not exceed the background sound level by more than five decibels (referred to as 'background sound level +5 dB'), whichever is the greater.* […]
>
> *Noise sensitive locations are defined in the Standard as, "The location of a noise sensitive activity, associated with a habitable space or education space in a building not on a wind farm site", and include:*
>
> - *any part of land zoned predominantly for residential use*
> - *residential land uses included in the accommodation group at clause 73.03, Land use terms of the VPP and all planning schemes*
> - *education and child care uses included in the child care centre group and education centre group at clause 73.03 of the of the VPP and all planning schemes.*
>
> *A 45-decibel limit is recommended for stakeholder dwellings. A stakeholder dwelling is a dwelling located on the same land as the wind energy facility, or one that has an agreement with the wind energy facility to exceed the noise limit.* […]
>
> *Under Section 5.3 of the Standard, a 'high amenity noise limit' of 35 decibels may be justified in special circumstances. All wind energy facility applications must be assessed using Section 5.3 of the Standard to determine whether a high amenity noise limit is justified for specific locations, following procedures outlined in 5.3.1 of the Standard. Guidance can be found on this issue in the VCAT determination for the Cherry Tree Wind Farm.*[9]
>
> *Measurement and compliance assessment methods are set out in the Standard. The assessment must be made without relying on noise reduction operation modes to achieve compliance.*

Based on the above, receivers within the Project boundary and/or with a noise agreement are referred to herein as *stakeholder receivers*.

Clause 73.03 of the Victoria Planning Provisions (VPP) defines *Accommodation* as *land used to accommodate persons* and lists the following uses:

- *Camping and caravan park*
- *Corrective institution*
- *Dependent person's unit*
- *Dwelling*
- *Group accommodation*
- *Host farm*
- *Residential aged care facility*
- *Residential building*
- *Residential village*
- *Retirement village*

Consideration must also be given to whether a high amenity noise limit is warranted to reflect special circumstances at specific locations.

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9 *Cherry Tree Wind Farm v Mitchell Shire Council* (2013)

E5 NZS 6808

NZS 6808 provides methods for the prediction, measurement, and assessment of sound from wind turbines. The following sections provide an overview of the objectives of NZS 6808 and the key elements of the standard's assessment procedures.

E5.1 Objectives

The foreword of NZS 6808 provides guidance about the objectives of the noise limits outlined within the standard:

> *Wind farm sound may be audible at times at noise sensitive locations, and this Standard does not set limits that provide absolute protection for residents from audible wind farm sound. Guidance is provided on noise limits that are considered reasonable for protecting sleep and amenity from wind farm sound received at noise sensitive locations.*

The *Outcome Statement* of NZS 6808 then goes on to provide information about the objective of the standard in a planning context:

> *This Standard provides suitable methods for the prediction, measurement, and assessment of sound from wind turbines. In the context of the* [New Zealand] *Resource Management Act, application of this Standard will provide reasonable protection of health and amenity at noise sensitive locations.*

Section C1.1 of the standard provides further information about the intent of the standard, which is:

> [...] *to avoid adverse noise effects on people caused by the operation of wind farms while enabling sustainable management of natural wind resources.*

Based on the objectives outlined above, NZS 6808 addresses health and amenity considerations at noise sensitive locations by specifying noise limits which are to be used to assess wind farm noise.

E5.2 Noise sensitive locations

The provisions of NZS 6808 are intended to protect noise sensitive locations (also generally referred to as *receivers* herein) that existed before the development of a wind farm. Noise sensitive locations are defined by the Standard as:

> *The location of a noise sensitive activity, associated with a habitable space or education space in a building not on the wind farm site. Noise sensitive locations include:*
>
> *(a) Any part of land zoned predominantly for residential use in a district plan;*
>
> *(b) Any point within the notional boundary of buildings containing spaces defined in (c) to (f);*
>
> *(c) Any habitable space in a residential building including rest homes or groups of buildings for the elderly or people with disabilities ...*
>
> *(d) Teaching areas and sleeping rooms in educational institutions ...*
>
> *(e) Teaching areas and sleeping rooms in buildings for licensed kindergartens, childcare, and day-care centres; and*
>
> *(f) Temporary accommodation including in hotels, motels, hostels, halls of residence, boarding houses, and guest houses.*
>
> *In some instances holiday cabins and camping grounds might be considered as noise sensitive locations. Matters to be considered include whether it is an established activity with existing rights.*

For the purposes of an assessment according to the Standard, the notional boundary is defined as:

> *A line 20 metres from any side of a dwelling or other building used for a noise sensitive activity or the legal boundary where this is closer to such a building.*

NZS 6808 was prepared to provide methods of assessment in the statutory context of New Zealand. Specifically, NZS 6808 notes that in the context of the New Zealand Resource Management Act, application of the Standard will provide reasonable protection of health and amenity at noise sensitive locations. This is an important point of context, as the New Zealand Resource Act states:

> *(3)(a)(ii): A consent authority must not, when considering an application, have regard to any effect on a person who has given written approval to the application.*

Based on the above definitions and statutory context, noise predictions are normally prepared for stakeholder receivers irrespective of whether they are inside or outside of the Project boundary. However, the noise limits specified in the Standard are not applied to these locations on account of their participation with the Project.

E5.3 Noise limit

Section 5.2 *Noise limit* of NZS 6808 defines acceptable noise limits as follows:

> *As a guide to the limits of acceptability at a noise sensitive location, at any wind speed wind farm sound levels ($L_{A90(10\ min)}$) should not exceed the background sound level by more than 5 dB, or a level of 40 dB $L_{A90(10\ min)}$, whichever is the greater.*

This arrangement of limits requires the noise associated with a wind farm to be restricted to a permissible margin above background noise, except in instances when both the background and source noise levels are low. In this respect, the criteria indicate that it is not necessary to continue to adhere to a margin above background when the background noise levels are below the range of 30-35 dB.

The criteria specified in NZS 6808 apply to the combined noise level of all wind farms influencing the environment at a receiver. Specifically, section 5.6.1 states:

> *The noise limits … should apply to the cumulative sound level of all wind farms affecting any noise sensitive location.*

E5.4 High amenity

Section 5.3.1 of NZS 6808 states that the base noise limit of 40 dB L_{A90} is *appropriate for protection of sleep, health, and amenity of residents at most noise sensitive locations*. It goes on to note that the application of a high amenity noise limit may require additional consideration:

> […] *In special circumstances at some noise sensitive locations a more stringent noise limit may be justified to afford a greater degree of protection of amenity during evening and night-time. A high amenity noise limit should be considered where a plan promotes a higher degree of protection of amenity related to the sound environment of a particular area, for example where evening and night-time noise limits in the plan for general sound sources are more stringent than 40 dB $L_{Aeq(15\ min)}$ or 40 dBA L_{10}. A high amenity noise limit should not be applied in any location where background sound levels, assessed in accordance with section 7, are already affected by other specific sources, such as road traffic sound.*

The definition of the high amenity noise limit provided in NZS 6808 is specific to New Zealand planning legislation and guidelines. A degree of interpretation is therefore required when determining how to apply the concept of high amenity in Victoria, as informed by the Victorian Wind Energy Guidelines, EPA webpage *Wind Energy Facility Turbine Noise Regulation Guidelines* (EPA web guide) and EPA-DTP Publication 3011 *Wind Energy Facility Turbine Noise – Technical Guideline* dated 20 December 2024 (Technical Guideline).[10]

[10] At the date of preparation of this report, the EPA web guide is not available as a version controlled formal document. This report is based on the EPA webpage version of this publication, last updated on 2 May 2025.

In accordance with Section 5.3 of NZS 6808, if a high amenity noise limit is justified, wind farm noise levels (L_{A90}) during evening and nigh-time periods should not exceed the background noise level (L_{A90}) by more than 5 dB or 35 dB L_{A90}, whichever is the greater. The standard recommends that this reduced noise limit would typically apply for wind speeds below 6 m/s at hub height. A high amenity noise limit is not applicable during the daytime period.

The method for assessing the applicability of the high amenity noise limit, detailed in NZS 6808, is a two-step approach as follows:

1. Determination of whether the planning guidance for the area warrants consideration of a high amenity noise limit

   First and foremost, for a high amenity noise limit to be considered, the land zoning of a receiver must promote a higher degree of acoustic amenity.

2. Evaluation of whether a high amenity noise limit is justified

   Following the guidance presented in C5.3.1, if the planning guidance for the area warrants consideration of a high amenity noise limit, and the receiver is located within the predicted 35 dB L_{A90} noise contour, then a calculation should be undertaken to determine whether background noise levels are sufficiently low.

E5.5 Special audible characteristics

Section 5.4.2 of NZS 6808 requires the following:

> *Wind turbine sound levels with special audible characteristics (such as tonality, impulsiveness and amplitude modulation) shall be adjusted by arithmetically adding up to +6dB to the measured level at the noise sensitive location.*

Notwithstanding this, the standard requires that wind farms be designed with no special audible characteristics at nearby residential properties while concurrently noting in Section 5.4.1 that:

> […] *as special audible characteristics cannot always be predicted, consideration shall be given to whether there are any special audible characteristics of the wind farm sound when comparing measured levels with noise limits.*

NZS 6808 emphasises assessment of special audible characteristics during the post-construction measurement phase of a project. An indication of the potential for tonality to be a characteristic of the noise emission from the assessed turbine model is sometimes available from tonality audibility assessments conducted as part of manufacturer turbine noise emission testing. However, this data is frequently not available at the planning stage of an assessment.

E6 EPA Publication 1826.5 (Noise Protocol)

EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol) sets noise limits that apply to commercial, industrial and trade premises and entertainment venues in Victoria. Compliance with the noise limits is mandatory under the EP Act.

The proposed on-site transformer station are considered a *commercial, industrial and trade premises* under the EP Act.

The Noise Protocol prescribes noise limits that are used to assess whether a noise is prescribed to be unreasonable in accordance with the EP Regulations. The noise limits apply at a noise sensitive area, which is defined in Section 4 of the EP Regulations as being *within 10 metres of the outside of the external walls* of buildings including dwellings, hotels, schools. In rural areas only, noise sensitive areas also include land within the boundaries of tourist establishments, campgrounds, and caravan parks.

The procedures for setting noise limits are defined separately for urban and rural areas. However, in both cases, the noise limits are defined by considering the land zoning in the area and the noise environment of the receiver. The noise limits are defined separately for day, evening and night periods.

In contrast to NZS 6808 and Part 5.3 Division 5 of the EP Regulations, the Noise Protocol does not differentiate between stakeholder and non-stakeholder receivers.

The measurement and analysis procedures outlined in the Noise Protocol include adjustments which are to be applied to noise that is characterised by audible tones, impulses or intermittency.

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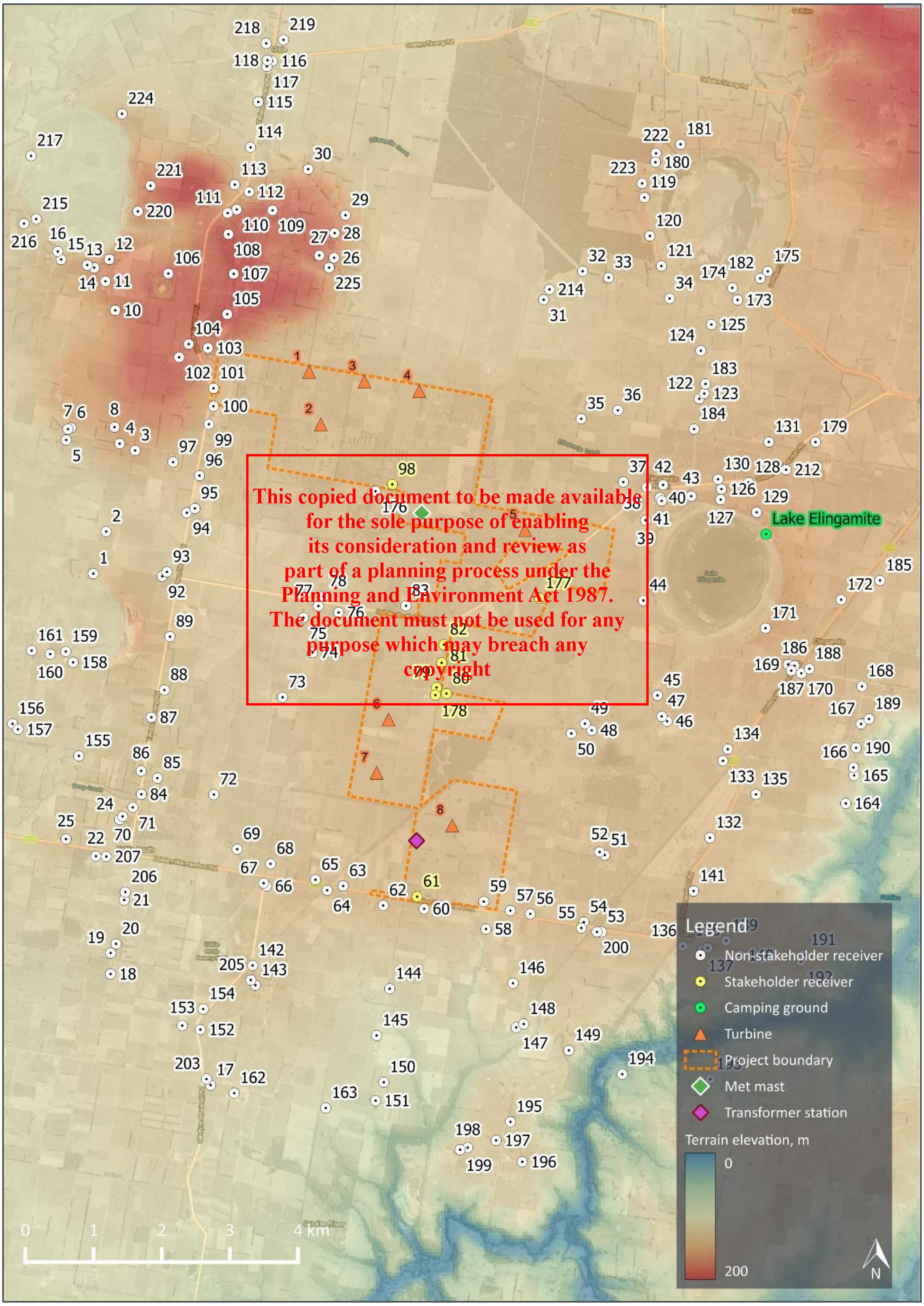
APPENDIX F SITE TOPOGRAPHY

Figure 4: Terrain elevation map for the wind farm and surrounding area



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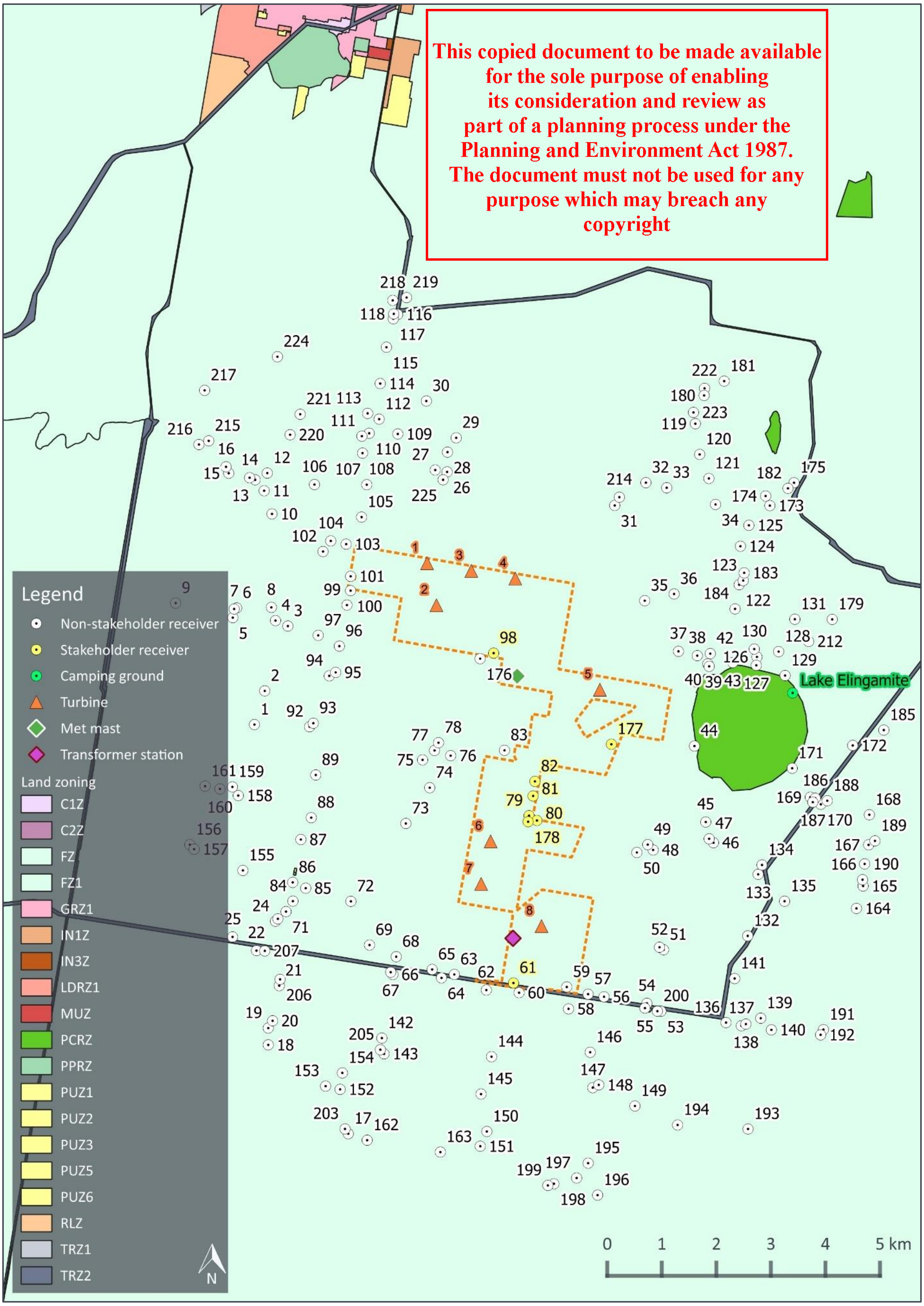
APPENDIX G ZONING MAP

Figure 5: Zoning map for the wind farm and surrounding area



APPENDIX H NOISE PREDICTION MODEL

H1 Wind turbine noise predictions

In Australia, wind turbine noise predictions are typically calculated using ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation* (ISO 9613-2:1996) with a set of conservative assumptions tailored to wind farm assessment, as detailed in UK Institute of Acoustics publication *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (the UK Institute of Acoustics guidance).

A revised version of the standard, ISO 9613-2:2024, was published earlier in 2024 based on broadly equivalent procedures to ISO 9613-2:1996, subject to refinements, clarifications, and supplementary advice for different types of sources. [11] Notably, ISO 9613-2:2024 introduces an informative annex on wind turbine noise modelling to reflect the recommendations of the UK Institute of Acoustics guidance.

This standard has recently been superseded by the standard ISO-9613-2:2024 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors*. At the date of preparing this report, MDA is reviewing the implementation of ISO-9613-2:2024 in SoundPLANnoise. This is a standard quality assurance process undertaken by MDA before using any revised noise modelling standard.

The core elements of the two versions (particularly with respect to wind farm noise modelling), are similar, and proprietary software options already implement the UK Institute of Acoustics guidance with respect to ISO 9613-2:1996.

On this basis ISO 9613-2:1996 continues to be used and referenced in Australia and has been chosen as the most appropriate method to calculate the level of broadband A-weighted wind farm noise expected to occur at surrounding receptor locations. This method is considered the most robust and widely used international method for the prediction of wind farm noise.

The use of this standard is supported by international research publications, measurement studies conducted by MDA and direct reference to the standard in NZS 6808:2010 *Acoustics – Wind farm noise*, the South Australian EPA *Wind farms environmental noise guidelines* and the Queensland *Planning Guideline - State code 23: Wind farm development*.

The standard specifies an engineering method for calculating noise at a known distance from a variety of sources under meteorological conditions favourable to sound propagation. The standard defines favourable conditions as downwind propagation where the source blows from the source to the receiver within an angle of ±45 degrees from a line connecting the source to the receiver, at wind speeds between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above the ground. Equivalently, the method accounts for average propagation under a well-developed moderate ground based thermal inversion. In this respect, it is noted that at the wind speeds relevant to noise emissions from wind turbines, atmospheric conditions do not favour the development of thermal inversions throughout the propagation path from the source to the receiver.

[11] ISO 9613-2:2024 *Acoustics — Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors*

To calculate far-field noise levels according to ISO 9613-2:1996, the noise emissions of each wind turbine are firstly characterised in the form of octave band frequency levels. A series of octave band attenuation factors are then calculated for a range of effects including:

- geometric divergence
- air absorption
- reflecting obstacles
- screening
- vegetation
- ground reflections.

The octave band attenuation factors are then applied to the noise emission data to determine the corresponding octave band and total calculated noise level at receivers.

Calculating the attenuation factors for each effect requires a relevant description of the environment into which the sound propagation such as the physical dimensions of the environment, atmospheric conditions and the characteristics of the ground between the source and the receiver.

Wind farm noise propagation has been the subject of considerable research in recent years. These studies have provided support for the reliability of engineering methods such as ISO 9613-2:1996 when a certain set of input parameters are chosen in combination. Specifically, the studies to date tend to support that the assignment of a ground absorption factor of G = 0.5 for the source, middle and receiver ground regions between a wind farm and a calculation point tends to provide a reliable representation of the upper noise levels expected in practice, when modelled in combination with other key assumptions; specifically all wind turbines operating at identical wind speeds, emitting sound levels equal to the test measured levels plus a margin for uncertainty (or guaranteed values), at a temperature of 10 °C and relative humidity of 70 % to 80 %, with specific adjustments for screening and ground effects as a result of the ground terrain profile.

In support of the use of ISO 9613-2:1996 and the choice of G = 0.5 as an appropriate ground characterisation, the following references are noted:

- A factor of G = 0.5 is frequently applied in Australia for general environmental noise modelling purposes as a way of accounting for the potential mix of ground porosity which may occur in regions of dry/compacted soils or in regions where persistent damp conditions may be relevant
- NZS 6808 refers to ISO 9613-2:1996 as an appropriate prediction method for wind farm noise, and notes that soft ground conditions should be characterised by a ground factor of G = 0.5
- In 1998, a comprehensive study (commonly cited as the Joule Report), part funded by the European Commission found that the ISO 9613-2:1996 model provided a robust representation of upper noise levels which may occur in practice, and provided a closer agreement between predicted and measured noise levels than alternative methods such as CONCAWE and ENM. Specifically, the report indicated the ISO 9613-2:1996 method generally tends to marginally over predict noise levels expected in practice

- The UK Institute of Acoustics journal dated March/April 2009 published a joint agreement between practitioners in the field of wind farm noise assessment (the UK IOA 2009 joint agreement), including consultants routinely employed on behalf of both developers and community opposition groups, and indicated the ISO 9613-2:1996 method as the appropriate standard and specifically designated G = 0.5 as the appropriate ground characterisation. This agreement was subsequently reflected in the recommendations detailed in the UK Institute of Acoustics publication *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (UK Institute of Acoustics guidance). It is noted that these publications refer to predictions made at receiver heights of 4 m. Predictions in Australia are generally based on a lower prediction height of 1.5 m which tends to result in higher ground attenuation for a given ground factor, however conversely, predictions in Australia do not generally incorporate a -2 dB factor (as applied in the UK) to represent the relationship between L_{Aeq} and L_{A90} noise levels. The result is that these differences tend to balance out to a comparable approach and thus supports the use of G = 0.5 in the context of Australian prediction methods.

A range of measurement and prediction studies for wind farms in which MDA' staff have been involved in have provided further support for the use of ISO 9613-2:1996 and G = 0.5 as an appropriate representation of typical upper noise levels expected to occur in practice. [12,]

The findings of these studies demonstrate the suitability of the ISO 9613-2:1996 method to predict the propagation of wind turbine noise for:

- The types of noise source heights associated with a modern wind farm, extending the scope of application of the method beyond the 30 m maximum source heights considered in the original ISO 9613-2:1996
- The types of environments in which wind farms are typically developed, and the range of atmospheric conditions and wind speeds typically observed around wind farm sites. Importantly, this supports the extended scope of application to wind speeds in excess of 5 m/s.

In addition to the choice of ground factor referred to above, adjustments to ISO 9613-2:1996 for screening and valleys effects are applied based on recommendations of the Joule Report, UK IOA 2009 joint agreement and the UK IOA Good Practice Guide. The following adjustments are applied to the calculations:

- Screening effects as a result of terrain are limited to 2 dB.
- Screening effects are assessed based on each wind turbine being represented by a single noise source located at the maximum tip height of the wind turbine rotor.
- An adjustment of 3 dB is added to the predicted noise contribution of a wind turbine if the terrain between the wind turbine and receiver in question is characterised by a significant valley. A significant valley is defined as a situation where the mean sound propagation height is at least 50 % greater than it would be otherwise over flat ground.

The adjustments detailed above are implemented in the wind turbine calculation procedure of the SoundPLANnoise 9.0 software used to conduct the noise modelling. The software uses these definitions in conjunction with the digital terrain model of the site to evaluate the path between each wind turbine and receiver pairing, and then subsequently applies the adjustments to each wind turbine's predicted noise contribution where appropriate.

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[12] Bullmore, Adcock, Jiggins & Cand – *Wind Farm Noise Predictions: The Risks of Conservatism*; Presented at the Second International Meeting on Wind turbine Noise in Lyon, France September 2007.
Bullmore, Adcock, Jiggins & Cand – *Wind Farm Noise Predictions and Comparisons with Measurements*; Presented at the Third International Meeting on Wind turbine Noise in Aalborg, Denmark June 2009
Delaire, Griffin, & Walsh – *Comparison of predicted wind farm noise emission and measured post-construction noise levels at the Portland Wind Energy Project in Victoria, Australia*; Presented at the Fourth International Meeting on Wind turbine Noise in Rome, April 2011.

H2 Uncertainty

Guidance on uncertainty in wind farm noise assessment is provided in Appendix C of NZS 6808.

The guidance in Appendix C is designated as *informative*, meaning that the content is only for information and its provisions do not form part of the mandatory requirements of the standard. Notwithstanding this, Appendix C notes that it is good practice to state the uncertainty and confidence level for all sound levels.

Uncertainty in environmental noise modelling is typically addressed in one of two ways:

1. Mean predicted noise levels: selection of mean input values and modelling parameters to calculate a mean predicted noise level. The combined uncertainty relating to the inputs and prediction method is then assessed and used to consider how noise levels in practice could differ from the predicted noise levels.
2. Upper predicted noise levels: selection of conservative input values and modelling parameters to calculate the upper predicted noise levels, inherently accounting for uncertainty in the modelling. Noise levels in practice are then expected to be lower than predicted by the modelling.

NZS 6808 Appendix C notes that uncertainty should be determined in accordance with the procedures outlined in Craven and Kerry. [13] However, the procedures referenced in Craven and Kerry are primarily applicable to measurements rather than noise modelling. The procedures are also based on the calculation of uncertainty values which are more relevant when considering mean assessment values.

The approach to uncertainty adopted for this assessment is based on calculation of upper predicted noise levels. This approach is consistent with the UK Institute of Acoustics guidance on wind turbine noise modelling which addresses uncertainty by describing procedures for the calculation of upper predicted noise levels based on conservative input selections. With this approach, it is not necessary to apply uncertainty margins to the predicted noise levels. Noise levels associated with operation of the wind farm when measured and assessed in accordance with NZS 6808 are expected to be lower than the predictions. This finding is supported by extensive post-construction noise compliance monitoring undertaken at wind farm sites across Australia. Further, Appendix C notes that when comparing a sound level with an applicable noise limit, the sound level should be deemed to comply if it is equal to or less than the noise limit and does not specify the addition or subtraction of uncertainties.

Notwithstanding the above, the elements of the modelling which may give rise to uncertainty can be considered in the context of the framework outlined in Craven and Kerry. Specifically, the procedures in Craven and Kerry suggest considering uncertainty in sections related to source, transmission and receiver. The source and transmission considerations are directly relevant to noise modelling and are discussed further below. The section related to receiver uncertainty in Craven and Kerry is solely concerned with measurement related uncertainties (e.g. instrumentation uncertainty and background noise influences) and is therefore not relevant to the noise modelling.

Source uncertainties (sound power levels)

The source levels of each wind turbine are characterised in terms of the sound power levels determined in accordance with IEC 61400-11. The results of sound power testing in accordance with this standard are typically characterised by an uncertainty margin of approximately ±1 dB. To reflect this, the sound power data sourced from the manufacturer’s documentation has been factored in the noise modelling as follows:

- The manufacturer data has been adjusted by the addition of +1 dB at all wind speeds.
- All turbines are assumed to simultaneously emit sound power levels at the uncertainty adjusted values.

[13] Craven, N J, and Kerry, G. *A good practice guide on the sources and magnitude of uncertainty arising in the practical measurement of environmental noise*. University of Salford. 2001

Uncertainty relating to the frequency characteristics of the wind turbine's noise emissions was also addressed by identifying the wind speed with the most unfavourable spectrum profile (i.e. the spectrum profile which would result in the highest predicted noise levels) and then applying the same profile to every wind speed.

Transmission uncertainties (prediction method)

The ISO 9613-2:1996 prediction method indicates an uncertainty margin of the order of ±3 dB in relation to calculated noise levels at distances between 100 m and 1,000 m for situations with an average propagation height between 5 m and 30 m (noting the information provided earlier in this appendix regarding the validation work undertaken to support the application of ISO 9613-2:1996 to greater propagation heights). However, the uncertainty margins are noted for a prediction in accordance with the inputs described in ISO 9613-2:1996. A strict application of ISO 9613-2:1996 would involve designating a ground factor of G = 1 (instead of the more conservative G = 0.5 ground factor used in the calculations) to represent the porous ground conditions around the site which ISO 9613-2:1996 defines as follows:

> ***Porous ground****, which includes ground covered by grass, trees or other vegetation, and all other ground surfaces suitable for the growth of vegetation, such as farming land. For porous ground G = 1.*

A prediction based on a ground factor of G = 1, instead of G = 0.5 used in the modelling, would typically result in predicted noise levels approximately 3 dB lower, thus effectively offsetting the quoted uncertainty margin. This also does not account for the other conservative aspects of the model, such as the assumption that each receiver is simultaneously downwind of every wind turbine at all times and consistent atmospheric conditions which result in minimal atmospheric absorption.

It is not possible to specify exact uncertainty margins for the conservative prediction approach adopted for the assessment. However, based on experience and the published studies referenced earlier in this appendix, the uncertainty in short term measured noise levels under downwind conditions is typically of the order of ±2 dB. This reduces to reduces to ±1 dB or less when comparing predictions with measured noise levels determined in accordance with NZS 6808 which are based on the analysis of aggregated data for a range of atmospheric conditions.

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APPENDIX I TABULATED PREDICTED NOISE LEVEL DATA

Table 16: Predicted noise levels, dB L_{A90} – V162-6.8 MW

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
Non-stakeholder receivers												
1	10.2	10.2	11.2	14.5	17.7	19.5	19.5	19.6	20.0	20.3	20.5	20.7
2	11.2	11.2	12.2	15.5	18.7	20.5	20.5	20.6	21.0	21.3	21.5	21.7
3	13.7	13.7	14.7	18.0	21.2	23.0	23.0	23.1	23.5	23.8	24.0	24.2
4	13.0	13.0	14.0	17.3	20.5	22.3	22.3	22.4	22.8	23.1	23.3	23.5
5	10.4	10.4	11.4	14.7	17.9	19.7	19.7	19.8	20.2	20.5	20.7	20.9
6	10.7	10.7	11.7	15.0	18.2	20.0	20.0	20.1	20.5	20.8	21.0	21.2
7	10.5	10.5	11.5	14.8	18.0	19.8	19.8	19.9	20.3	20.6	20.8	21.0
8	12.8	12.8	13.8	17.1	20.3	22.1	22.1	22.2	22.6	22.9	23.1	23.3
9	7.7	7.7	8.7	12.0	15.2	17.0	17.0	17.1	17.5	17.8	18.0	18.2
10	12.0	12.0	13.0	16.3	19.5	21.3	21.3	21.4	21.8	22.1	22.3	22.5
11	11.0	11.0	12.0	15.3	18.5	20.3	20.3	20.4	20.8	21.1	21.3	21.5
12	10.6	10.6	11.6	14.9	18.1	19.9	19.9	20.0	20.4	20.7	20.9	21.1
13	10.1	10.1	11.1	14.4	17.6	19.4	19.4	19.5	19.9	20.2	20.4	20.6
14	9.6	9.6	10.6	13.9	17.1	18.9	18.9	19.0	19.4	19.7	19.9	20.1
15	8.6	8.6	9.6	12.9	16.1	17.9	17.9	18.0	18.4	18.7	18.9	19.1
16	8.0	8.0	9.0	12.3	15.5	17.3	17.3	17.4	17.8	18.1	18.3	18.5
18	6.3	6.3	7.3	10.6	13.8	15.6	15.6	15.7	16.1	16.4	16.6	16.8
19	6.7	6.7	7.7	11.0	14.2	16.0	16.0	16.1	16.5	16.8	17.0	17.2
20	7.0	7.0	8.0	11.3	14.5	16.3	16.3	16.4	16.8	17.1	17.3	17.5
21	8.1	8.1	9.1	12.4	15.6	17.4	17.4	17.5	17.9	18.2	18.4	18.6
22	7.9	7.9	8.9	12.2	15.4	17.2	17.2	17.3	17.7	18.0	18.2	18.4
23	8.4	8.4	9.4	12.7	15.9	17.7	17.7	17.8	18.2	18.5	18.7	18.9
24	9.3	9.3	10.3	13.6	16.8	18.6	18.6	18.7	19.1	19.4	19.6	19.8
25	7.2	7.2	8.2	11.5	14.7	16.5	16.5	16.6	17.0	17.3	17.5	17.7
26	19.0	19.0	20.0	23.3	26.5	28.3	28.3	28.4	28.8	29.1	29.3	29.5
27	18.7	18.7	19.7	23.0	26.2	28.0	28.0	28.1	28.5	28.8	29.0	29.2
28	17.0	17.0	18.0	21.3	24.5	26.3	26.3	26.4	26.8	27.1	27.3	27.5
29	15.7	15.7	16.7	20.0	23.2	25.0	25.0	25.1	25.5	25.8	26.0	26.2
30	10.7	10.7	11.7	15.0	18.2	20.0	20.0	20.1	20.5	20.8	21.0	21.2

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
31	15.1	15.1	16.1	19.4	22.6	24.4	24.4	24.5	24.9	25.2	25.4	25.6
32	12.3	12.3	13.3	16.6	19.8	21.6	21.6	21.7	22.1	22.4	22.6	22.8
33	11.5	11.5	12.5	15.8	19.0	20.8	20.8	20.9	21.3	21.6	21.8	22.0
34	9.8	9.8	10.8	14.1	17.3	19.1	19.1	19.2	19.6	19.9	20.1	20.3
35	16.9	16.9	17.9	21.2	24.4	26.2	26.2	26.3	26.7	27.0	27.2	27.4
36	14.7	14.7	15.7	19.0	22.2	24.0	24.0	24.1	24.5	24.8	25.0	25.2
37	16.8	16.8	17.8	21.1	24.3	26.1	26.1	26.2	26.6	26.9	27.1	27.3
38	15.2	15.2	16.2	19.5	22.7	24.5	24.5	24.6	25.0	25.3	25.5	25.7
39	15.7	15.7	16.7	20.0	23.2	25.0	25.0	25.1	25.5	25.8	26.0	26.2
40	14.4	14.4	15.4	18.7	21.9	23.7	23.7	23.8	24.2	24.5	24.7	24.9
41	14.3	14.3	15.3	18.6	21.8	23.6	23.6	23.7	24.1	24.4	24.6	24.8
42	14.0	14.0	15.0	18.3	21.5	23.3	23.3	23.4	23.8	24.1	24.3	24.5
43	12.4	12.4	13.4	16.7	19.9	21.7	21.7	21.8	22.2	22.5	22.7	22.9
44	14.6	14.6	15.6	18.9	22.1	23.9	23.9	24.0	24.4	24.7	24.9	25.1
45	12.0	12.0	13.0	16.3	19.5	21.3	21.3	21.4	21.8	22.1	22.3	22.5
46	11.4	11.4	12.4	15.7	18.9	20.7	20.7	20.8	21.2	21.5	21.7	21.9
47	11.7	11.7	12.7	16.0	19.2	21.0	21.0	21.1	21.5	21.8	22.0	22.2
48	14.7	14.7	15.7	19.0	22.2	24.0	24.0	24.1	24.5	24.8	25.0	25.2
49	15.0	15.0	16.0	19.3	22.5	24.3	24.3	24.4	24.8	25.1	25.3	25.5
50	15.8	15.8	16.8	20.1	23.3	25.1	25.1	25.2	25.6	25.9	26.1	26.3
51	13.5	13.5	14.5	17.8	21.0	22.8	22.8	22.9	23.3	23.6	23.8	24.0
52	13.9	13.9	14.9	18.2	21.4	23.2	23.2	23.3	23.7	24.0	24.2	24.4
53	11.5	11.5	12.5	15.8	19.0	20.8	20.8	20.9	21.3	21.6	21.8	22.0
54	12.7	12.7	13.7	17.0	20.2	22.0	22.0	22.1	22.5	22.8	23.0	23.2
55	12.6	12.6	13.6	16.9	20.1	21.9	21.9	22.0	22.4	22.7	22.9	23.1
56	16.0	16.0	17.0	20.3	23.5	25.3	25.3	25.4	25.8	26.1	26.3	26.5
57	17.4	17.4	18.4	21.7	24.9	26.7	26.7	26.8	27.2	27.5	27.7	27.9
58	16.9	16.9	17.9	21.2	24.4	26.2	26.2	26.3	26.7	27.0	27.2	27.4
59	19.7	19.7	20.7	24.0	27.2	29.0	29.0	29.1	29.5	29.8	30.0	30.2
60	19.5	19.5	20.5	23.8	27.0	28.8	28.8	28.9	29.3	29.6	29.8	30.0
62	18.4	18.4	19.4	22.7	25.9	27.7	27.7	27.8	28.2	28.5	28.7	28.9
63	18.2	18.2	19.2	22.5	25.7	27.5	27.5	27.6	28.0	28.3	28.5	28.7

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
64	17.1	17.1	18.1	21.4	24.6	26.4	26.4	26.5	26.9	27.2	27.4	27.6
65	17.2	17.2	18.2	21.5	24.7	26.5	26.5	26.6	27.0	27.3	27.5	27.7
66	14.4	14.4	15.4	18.7	21.9	23.7	23.7	23.8	24.2	24.5	24.7	24.9
67	14.4	14.4	15.4	18.7	21.9	23.7	23.7	23.8	24.2	24.5	24.7	24.9
68	15.6	15.6	16.6	19.9	23.1	24.9	24.9	25.0	25.4	25.7	25.9	26.1
69	14.2	14.2	15.2	18.5	21.7	23.5	23.5	23.6	24.0	24.3	24.5	24.7
70	9.4	9.4	10.4	13.7	16.9	18.7	18.7	18.8	19.2	19.5	19.7	19.9
71	9.9	9.9	10.9	14.2	17.4	19.2	19.2	19.3	19.7	20.0	20.2	20.4
72	14.1	14.1	15.1	18.4	21.6	23.4	23.4	23.5	23.9	24.2	24.4	24.6
73	18.9	18.9	19.9	23.2	26.4	28.2	28.2	28.3	28.7	29.0	29.2	29.4
74	19.1	19.1	20.1	23.4	26.6	28.4	28.4	28.5	28.9	29.2	29.4	29.6
75	17.4	17.4	18.4	21.7	24.9	26.7	26.7	26.8	27.2	27.5	27.7	27.9
76	18.4	18.4	19.4	22.7	25.9	27.7	27.7	27.8	28.2	28.5	28.7	28.9
77	17.6	17.6	18.6	21.9	25.1	26.9	26.9	27.0	27.4	27.7	27.9	28.1
78	17.6	17.6	18.6	21.9	25.1	26.9	26.9	27.0	27.4	27.7	27.9	28.1
83	19.1	19.1	20.1	23.4	26.6	28.4	28.4	28.5	28.9	29.2	29.4	29.6
84	10.4	10.4	11.4	14.7	17.9	19.7	19.7	19.8	20.2	20.5	20.7	20.9
85	11.3	11.3	12.3	15.6	18.8	20.6	20.6	20.7	21.1	21.4	21.6	21.8
86	10.6	10.6	11.6	14.9	18.1	19.9	19.9	20.0	20.4	20.7	20.9	21.1
87	11.3	11.3	12.3	15.6	18.8	20.6	20.6	20.7	21.1	21.4	21.6	21.8
88	11.9	11.9	12.9	16.2	19.4	21.2	21.2	21.3	21.7	22.0	22.2	22.4
89	12.3	12.3	13.3	16.6	19.8	21.6	21.6	21.7	22.1	22.4	22.6	22.8
90	11.2	11.2	12.2	15.5	18.7	20.5	20.5	20.6	21.0	21.3	21.5	21.7
91	12.6	12.6	13.6	16.9	20.1	21.9	21.9	22.0	22.4	22.7	22.9	23.1
92	12.6	12.6	13.6	16.9	20.1	21.9	21.9	22.0	22.4	22.7	22.9	23.1
93	12.9	12.9	13.9	17.2	20.4	22.2	22.2	22.3	22.7	23.0	23.2	23.4
94	15.2	15.2	16.2	19.5	22.7	24.5	24.5	24.6	25.0	25.3	25.5	25.7
95	15.7	15.7	16.7	20.0	23.2	25.0	25.0	25.1	25.5	25.8	26.0	26.2
96	17.1	17.1	18.1	21.4	24.6	26.4	26.4	26.5	26.9	27.2	27.4	27.6
97	15.8	15.8	16.8	20.1	23.3	25.1	25.1	25.2	25.6	25.9	26.1	26.3
99	19.4	19.4	20.4	23.7	26.9	28.7	28.7	28.8	29.2	29.5	29.7	29.9
100	20.1	20.1	21.1	24.4	27.6	29.4	29.4	29.5	29.9	30.2	30.4	30.6

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
101	20.2	20.2	21.2	24.5	27.7	29.5	29.5	29.6	30.0	30.3	30.5	30.7
102	16.9	16.9	17.9	21.2	24.4	26.2	26.2	26.3	26.7	27.0	27.2	27.4
103	19.0	19.0	20.0	23.3	26.5	28.3	28.3	28.4	28.8	29.1	29.3	29.5
104	17.3	17.3	18.3	21.6	24.8	26.6	26.6	26.7	27.1	27.4	27.6	27.8
105	19.2	19.2	20.2	23.5	26.7	28.5	28.5	28.6	29.0	29.3	29.5	29.7
106	13.7	13.7	14.7	18.0	21.2	23.0	23.0	23.1	23.5	23.8	24.0	24.2
107	17.2	17.2	18.2	21.5	24.7	26.5	26.5	26.6	27.0	27.3	27.5	27.7
108	14.6	14.6	15.6	18.9	22.1	23.9	23.9	24.0	24.4	24.7	24.9	25.1
109	14.5	14.5	15.5	18.8	22.0	23.8	23.8	23.9	24.3	24.6	24.8	25.0
110	11.6	11.6	12.6	15.9	19.1	20.9	20.9	21.0	21.4	21.7	21.9	22.1
111	11.5	11.5	12.5	15.8	19.0	20.8	20.8	20.9	21.3	21.6	21.8	22.0
112	11.0	11.0	12.0	15.3	18.5	20.3	20.3	20.4	20.8	21.1	21.3	21.5
113	11.1	11.1	12.1	15.4	18.6	20.4	20.4	20.5	20.9	21.2	21.4	21.6
114	10.4	10.4	11.4	14.7	17.9	19.7	19.7	19.8	20.2	20.5	20.7	20.9
115	8.9	8.9	9.9	13.2	16.4	18.2	18.2	18.3	18.7	19.0	19.2	19.4
116	7.4	7.4	8.4	11.7	14.9	16.7	16.7	16.8	17.2	17.5	17.7	17.9
117	7.6	7.6	8.6	11.9	15.1	16.9	16.9	17.0	17.4	17.7	17.9	18.1
118	7.4	7.4	8.4	11.7	14.9	16.7	16.7	16.8	17.2	17.5	17.7	17.9
119	8.2	8.2	9.2	12.5	15.7	17.5	17.5	17.6	18.0	18.3	18.5	18.7
120	9.0	9.0	10.0	13.3	16.5	18.3	18.3	18.4	18.8	19.1	19.3	19.5
121	9.4	9.4	10.4	13.7	16.9	18.7	18.7	18.8	19.2	19.5	19.7	19.9
122	10.7	10.7	11.7	15.0	18.2	20.0	20.0	20.1	20.5	20.8	21.0	21.2
123	10.4	10.4	11.4	14.7	17.9	19.7	19.7	19.8	20.2	20.5	20.7	20.9
124	9.7	9.7	10.7	14.0	17.2	19.0	19.0	19.1	19.5	19.8	20.0	20.2
125	8.9	8.9	9.9	13.2	16.4	18.2	18.2	18.3	18.7	19.0	19.2	19.4
126	10.8	10.8	11.8	15.1	18.3	20.1	20.1	20.2	20.6	20.9	21.1	21.3
127	10.9	10.9	11.9	15.2	18.4	20.2	20.2	20.3	20.7	21.0	21.2	21.4
128	9.6	9.6	10.6	13.9	17.1	18.9	18.9	19.0	19.4	19.7	19.9	20.1
129	9.4	9.4	10.4	13.7	16.9	18.7	18.7	18.8	19.2	19.5	19.7	19.9
130	10.9	10.9	11.9	15.2	18.4	20.2	20.2	20.3	20.7	21.0	21.2	21.4
131	8.5	8.5	9.5	12.8	16.0	17.8	17.8	17.9	18.3	18.6	18.8	19.0
132	8.8	8.8	9.8	13.1	16.3	18.1	18.1	18.2	18.6	18.9	19.1	19.3

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
133	9.0	9.0	10.0	13.3	16.5	18.3	18.3	18.4	18.8	19.1	19.3	19.5
134	8.9	8.9	9.9	13.2	16.4	18.2	18.2	18.3	18.7	19.0	19.2	19.4
135	7.7	7.7	8.7	12.0	15.2	17.0	17.0	17.1	17.5	17.8	18.0	18.2
136	8.0	8.0	9.0	12.3	15.5	17.3	17.3	17.4	17.8	18.1	18.3	18.5
137	7.3	7.3	8.3	11.6	14.8	16.6	16.6	16.7	17.1	17.4	17.6	17.8
138	7.2	7.2	8.2	11.5	14.7	16.5	16.5	16.6	17.0	17.3	17.5	17.7
139	6.8	6.8	7.8	11.1	14.3	16.1	16.1	16.2	16.6	16.9	17.1	17.3
140	5.7	5.7	6.7	10.0	13.2	15.0	15.0	15.1	15.5	15.8	16.0	16.2
141	8.7	8.7	9.7	13.0	16.2	18.0	18.0	18.1	18.5	18.8	19.0	19.2
142	10.6	10.6	11.6	14.9	18.1	19.9	19.9	20.0	20.4	20.7	20.9	21.1
143	9.9	9.9	10.9	14.2	17.4	19.2	19.2	19.3	19.7	20.0	20.2	20.4
144	12.7	12.7	13.7	17.0	20.2	22.0	22.0	22.1	22.5	22.8	23.0	23.2
145	10.0	10.0	11.0	14.3	17.5	19.3	19.3	19.4	19.8	20.1	20.3	20.5
146	12.3	12.3	13.3	16.6	19.8	21.6	21.6	21.7	22.1	22.4	22.6	22.8
147	9.9	9.9	10.9	14.2	17.4	19.2	19.2	19.3	19.7	20.0	20.2	20.4
148	10.0	10.0	11.0	14.3	17.5	19.3	19.3	19.4	19.8	20.1	20.3	20.5
149	8.0	8.0	9.0	12.3	15.5	17.3	17.3	17.4	17.8	18.1	18.3	18.5
150	8.0	8.0	9.0	12.3	15.5	17.3	17.3	17.4	17.8	18.1	18.3	18.5
151	7.2	7.2	8.2	11.5	14.7	16.5	16.5	16.6	17.0	17.3	17.5	17.7
152	7.1	7.1	8.1	11.4	14.6	16.4	16.4	16.5	16.9	17.2	17.4	17.6
153	6.8	6.8	7.8	11.1	14.3	16.1	16.1	16.2	16.6	16.9	17.1	17.3
154	7.7	7.7	8.7	12.0	15.2	17.0	17.0	17.1	17.5	17.8	18.0	18.2
155	8.4	8.4	9.4	12.7	15.9	17.7	17.7	17.8	18.2	18.5	18.7	18.9
158	8.8	8.8	9.8	13.1	16.3	18.1	18.1	18.2	18.6	18.9	19.1	19.3
159	8.7	8.7	9.7	13.0	16.2	18.0	18.0	18.1	18.5	18.8	19.0	19.2
163	6.6	6.6	7.6	10.9	14.1	15.9	15.9	16.0	16.4	16.7	16.9	17.1
169	7.7	7.7	8.7	12.0	15.2	17.0	17.0	17.1	17.5	17.8	18.0	18.2
170	7.2	7.2	8.2	11.5	14.7	16.5	16.5	16.6	17.0	17.3	17.5	17.7
171	8.7	8.7	9.7	13.0	16.2	18.0	18.0	18.1	18.5	18.8	19.0	19.2
172	6.4	6.4	7.4	10.7	13.9	15.7	15.7	15.8	16.2	16.5	16.7	16.9
173	7.7	7.7	8.7	12.0	15.2	17.0	17.0	17.1	17.5	17.8	18.0	18.2
174	7.6	7.6	8.6	11.9	15.1	16.9	16.9	17.0	17.4	17.7	17.9	18.1

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
176	22.5	22.5	23.5	26.8	30.0	31.8	31.8	31.9	32.3	32.6	32.8	33.0
179	6.9	6.9	7.9	11.2	14.4	16.2	16.2	16.3	16.7	17.0	17.2	17.4
180	7.1	7.1	8.1	11.4	14.6	16.4	16.4	16.5	16.9	17.2	17.4	17.6
183	10.1	10.1	11.1	14.4	17.6	19.4	19.4	19.5	19.9	20.2	20.4	20.6
184	11.4	11.4	12.4	15.7	18.9	20.7	20.7	20.8	21.2	21.5	21.7	21.9
186	7.5	7.5	8.5	11.8	15.0	16.8	16.8	16.9	17.3	17.6	17.8	18.0
187	7.5	7.5	8.5	11.8	15.0	16.8	16.8	16.9	17.3	17.6	17.8	18.0
188	7.0	7.0	8.0	11.3	14.5	16.3	16.3	16.4	16.8	17.1	17.3	17.5
194	4.2	4.2	5.2	8.5	11.7	13.5	13.5	13.6	14.0	14.3	14.5	14.7
195	6.2	6.2	7.2	10.5	13.7	15.5	15.5	15.6	16.0	16.3	16.5	16.7
197	5.7	5.7	6.7	10.0	13.2	15.0	15.0	15.1	15.5	15.8	16.0	16.2
198	5.6	5.6	6.6	9.9	13.1	14.9	14.9	15.0	15.4	15.7	15.9	16.1
199	5.6	5.6	6.6	9.9	13.1	14.9	14.9	15.0	15.4	15.7	15.9	16.1
200	11.7	11.7	12.7	16.0	19.2	21.0	21.0	21.1	21.5	21.8	22.0	22.2
201	12.2	12.2	13.2	16.5	19.7	21.5	21.5	21.6	22.0	22.3	22.5	22.7
202	12.7	12.7	13.7	17.0	20.2	22.0	22.0	22.1	22.5	22.8	23.0	23.2
205	10.0	10.0	11.0	14.3	17.5	19.3	19.3	19.4	19.8	20.1	20.3	20.5
206	8.3	8.3	9.3	12.6	15.8	17.6	17.6	17.7	18.1	18.4	18.6	18.8
207	8.3	8.3	9.3	12.6	15.8	17.6	17.6	17.7	18.1	18.4	18.6	18.8
208	10.9	10.9	11.9	15.2	18.4	20.2	20.2	20.3	20.7	21.0	21.2	21.4
209	12.5	12.5	13.5	16.8	20.0	21.8	21.8	21.9	22.3	22.6	22.8	23.0
212	8.1	8.1	9.1	12.4	15.6	17.4	17.4	17.5	17.9	18.2	18.4	18.6
214	14.4	14.4	15.4	18.7	21.9	23.7	23.7	23.8	24.2	24.5	24.7	24.9
215	7.1	7.1	8.1	11.4	14.6	16.4	16.4	16.5	16.9	17.2	17.4	17.6
216	6.9	6.9	7.9	11.2	14.4	16.2	16.2	16.3	16.7	17.0	17.2	17.4
218	6.8	6.8	7.8	11.1	14.3	16.1	16.1	16.2	16.6	16.9	17.1	17.3
219	6.9	6.9	7.9	11.2	14.4	16.2	16.2	16.3	16.7	17.0	17.2	17.4
220	10.3	10.3	11.3	14.6	17.8	19.6	19.6	19.7	20.1	20.4	20.6	20.8
221	9.6	9.6	10.6	13.9	17.1	18.9	18.9	19.0	19.4	19.7	19.9	20.1
222	6.9	6.9	7.9	11.2	14.4	16.2	16.2	16.3	16.7	17.0	17.2	17.4
223	8.0	8.0	9.0	12.3	15.5	17.3	17.3	17.4	17.8	18.1	18.3	18.5
224	6.5	6.5	7.5	10.8	14.0	15.8	15.8	15.9	16.3	16.6	16.8	17.0

Receiver	Hub-height wind speed, m/s											
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
225	19.8	19.8	20.8	24.1	27.3	29.1	29.1	29.2	29.6	29.9	30.1	30.3
Camping ground	9.0	9.0	10.0	13.3	16.5	18.3	18.3	18.4	18.8	19.1	19.3	19.5
Stakeholder receivers within the Project boundary												
61 (S)	20.6	20.6	21.6	24.9	28.1	29.9	29.9	30.0	30.4	30.7	30.9	31.1
79 (S)	24.1	24.1	25.1	28.4	31.6	33.4	33.4	33.5	33.9	34.2	34.4	34.6
80 (S)	23.4	23.4	24.4	27.7	30.9	32.7	32.7	32.8	33.2	33.5	33.7	33.9
81 (S)	21.6	21.6	22.6	25.9	29.1	30.9	30.9	31.0	31.4	31.7	31.9	32.1
82 (S)	20.3	20.3	21.3	24.6	27.8	29.6	29.6	29.7	30.1	30.4	30.6	30.8
98 (S)	22.6	22.6	23.6	26.9	30.1	31.9	31.9	32.0	32.4	32.7	32.9	33.1
177 (S)	21.4	21.4	22.4	25.7	28.9	30.7	30.7	30.8	31.2	31.5	31.7	31.9
178 (S)	24.9	24.9	25.9	29.2	32.4	34.2	34.2	34.3	34.7	35.0	35.2	35.4

(S) Stakeholder receiver

Table 17: Predicted noise levels, dB L_{A90} – V172-7.2 MW

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
Non-stakeholder receivers												
1	14.1	14.2	16.0	18.7	21.5	23.6	24.3	24.3	24.3	24.3	24.3	24.3
2	15.0	15.1	16.9	19.6	22.4	24.5	25.2	25.2	25.2	25.2	25.2	25.2
3	17.3	17.4	19.2	21.9	24.7	26.8	27.5	27.5	27.5	27.5	27.5	27.5
4	16.6	16.7	18.5	21.2	24.0	26.1	26.8	26.8	26.8	26.8	26.8	26.8
5	14.2	14.3	16.1	18.8	21.6	23.7	24.4	24.4	24.4	24.4	24.4	24.4
6	14.5	14.6	16.4	19.1	21.9	24.0	24.7	24.7	24.7	24.7	24.7	24.7
7	14.3	14.4	16.2	18.9	21.7	23.8	24.5	24.5	24.5	24.5	24.5	24.5
8	16.4	16.5	18.3	21.0	23.8	25.9	26.6	26.6	26.6	26.6	26.6	26.6
9	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
10	15.7	15.8	17.6	20.3	23.1	25.2	25.9	25.9	25.9	25.9	25.9	25.9
11	14.7	14.8	16.6	19.3	22.1	24.2	24.9	24.9	24.9	24.9	24.9	24.9
12	14.4	14.5	16.3	19.0	21.8	23.9	24.6	24.6	24.6	24.6	24.6	24.6
13	13.9	14.0	15.8	18.5	21.3	23.4	24.1	24.1	24.1	24.1	24.1	24.1
14	13.4	13.5	15.3	18.0	20.8	22.9	23.6	23.6	23.6	23.6	23.6	23.6
15	12.5	12.6	14.4	17.1	19.9	22.0	22.7	22.7	22.7	22.7	22.7	22.7
16	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
18	10.4	10.5	12.3	15.0	17.8	19.9	20.6	20.6	20.6	20.6	20.6	20.6
19	10.8	10.9	12.7	15.4	18.2	20.3	21.0	21.0	21.0	21.0	21.0	21.0
20	11.1	11.2	13.0	15.7	18.5	20.6	21.3	21.3	21.3	21.3	21.3	21.3
21	12.1	12.2	14.0	16.7	19.5	21.6	22.3	22.3	22.3	22.3	22.3	22.3
22	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
23	12.3	12.4	14.2	16.9	19.7	21.8	22.5	22.5	22.5	22.5	22.5	22.5
24	13.2	13.3	15.1	17.8	20.6	22.7	23.4	23.4	23.4	23.4	23.4	23.4
25	11.3	11.4	13.2	15.9	18.7	20.8	21.5	21.5	21.5	21.5	21.5	21.5
26	22.2	22.3	24.1	26.8	29.6	31.7	32.4	32.4	32.4	32.4	32.4	32.4
27	21.9	22.0	23.8	26.5	29.3	31.4	32.1	32.1	32.1	32.1	32.1	32.1
28	20.4	20.5	22.3	25.0	27.8	29.9	30.6	30.6	30.6	30.6	30.6	30.6
29	19.2	19.3	21.1	23.8	26.6	28.7	29.4	29.4	29.4	29.4	29.4	29.4
30	14.3	14.4	16.2	18.9	21.7	23.8	24.5	24.5	24.5	24.5	24.5	24.5
31	18.5	18.6	20.4	23.1	25.9	28.0	28.7	28.7	28.7	28.7	28.7	28.7

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
32	16.0	16.1	17.9	20.6	23.4	25.5	26.2	26.2	26.2	26.2	26.2	26.2
33	15.2	15.3	17.1	19.8	22.6	24.7	25.4	25.4	25.4	25.4	25.4	25.4
34	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
35	20.2	20.3	22.1	24.8	27.6	29.7	30.4	30.4	30.4	30.4	30.4	30.4
36	18.2	18.3	20.1	22.8	25.6	27.7	28.4	28.4	28.4	28.4	28.4	28.4
37	20.2	20.3	22.1	24.8	27.6	29.7	30.4	30.4	30.4	30.4	30.4	30.4
38	18.6	18.7	20.5	23.2	26.0	28.1	28.8	28.8	28.8	28.8	28.8	28.8
39	19.1	19.2	21.0	23.7	26.5	28.6	29.3	29.3	29.3	29.3	29.3	29.3
40	17.9	18.0	19.8	22.5	25.3	27.4	28.1	28.1	28.1	28.1	28.1	28.1
41	17.8	17.9	19.7	22.4	25.2	27.3	28.0	28.0	28.0	28.0	28.0	28.0
42	17.5	17.6	19.4	22.1	24.9	27.0	27.7	27.7	27.7	27.7	27.7	27.7
43	16.1	16.2	18.0	20.7	23.5	25.6	26.3	26.3	26.3	26.3	26.3	26.3
44	18.1	18.2	20.0	22.7	25.5	27.6	28.3	28.3	28.3	28.3	28.3	28.3
45	15.7	15.8	17.6	20.3	23.1	25.2	25.9	25.9	25.9	25.9	25.9	25.9
46	15.2	15.3	17.1	19.8	22.6	24.7	25.4	25.4	25.4	25.4	25.4	25.4
47	15.4	15.5	17.3	20.0	22.8	24.9	25.6	25.6	25.6	25.6	25.6	25.6
48	18.2	18.3	20.1	22.8	25.6	27.7	28.4	28.4	28.4	28.4	28.4	28.4
49	18.5	18.6	20.4	23.1	25.9	28.0	28.7	28.7	28.7	28.7	28.7	28.7
50	19.2	19.3	21.1	23.8	26.6	28.7	29.4	29.4	29.4	29.4	29.4	29.4
51	17.0	17.1	18.9	21.6	24.4	26.5	27.2	27.2	27.2	27.2	27.2	27.2
52	17.4	17.5	19.3	22.0	24.8	26.9	27.6	27.6	27.6	27.6	27.6	27.6
53	15.1	15.2	17.0	19.7	22.5	24.6	25.3	25.3	25.3	25.3	25.3	25.3
54	16.2	16.3	18.1	20.8	23.6	25.7	26.4	26.4	26.4	26.4	26.4	26.4
55	16.1	16.2	18.0	20.7	23.5	25.6	26.3	26.3	26.3	26.3	26.3	26.3
56	19.4	19.5	21.3	24.0	26.8	28.9	29.6	29.6	29.6	29.6	29.6	29.6
57	20.7	20.8	22.6	25.3	28.1	30.2	30.9	30.9	30.9	30.9	30.9	30.9
58	20.2	20.3	22.1	24.8	27.6	29.7	30.4	30.4	30.4	30.4	30.4	30.4
59	22.9	23.0	24.8	27.5	30.3	32.4	33.1	33.1	33.1	33.1	33.1	33.1
60	22.7	22.8	24.6	27.3	30.1	32.2	32.9	32.9	32.9	32.9	32.9	32.9
62	21.7	21.8	23.6	26.3	29.1	31.2	31.9	31.9	31.9	31.9	31.9	31.9
63	21.4	21.5	23.3	26.0	28.8	30.9	31.6	31.6	31.6	31.6	31.6	31.6
64	20.4	20.5	22.3	25.0	27.8	29.9	30.6	30.6	30.6	30.6	30.6	30.6

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
65	20.5	20.6	22.4	25.1	27.9	30.0	30.7	30.7	30.7	30.7	30.7	30.7
66	17.9	18.0	19.8	22.5	25.3	27.4	28.1	28.1	28.1	28.1	28.1	28.1
67	17.8	17.9	19.7	22.4	25.2	27.3	28.0	28.0	28.0	28.0	28.0	28.0
68	19.0	19.1	20.9	23.6	26.4	28.5	29.2	29.2	29.2	29.2	29.2	29.2
69	17.7	17.8	19.6	22.3	25.1	27.2	27.9	27.9	27.9	27.9	27.9	27.9
70	13.3	13.4	15.2	17.9	20.7	22.8	23.5	23.5	23.5	23.5	23.5	23.5
71	13.8	13.9	15.7	18.4	21.2	23.3	24.0	24.0	24.0	24.0	24.0	24.0
72	17.6	17.7	19.5	22.2	25.0	27.1	27.8	27.8	27.8	27.8	27.8	27.8
73	22.1	22.2	24.0	26.7	29.5	31.6	32.3	32.3	32.3	32.3	32.3	32.3
74	22.4	22.5	24.3	27.0	29.8	31.9	32.6	32.6	32.6	32.6	32.6	32.6
75	20.8	20.9	22.7	25.4	28.2	30.3	31.0	31.0	31.0	31.0	31.0	31.0
76	21.7	21.8	23.6	26.3	29.1	31.2	31.9	31.9	31.9	31.9	31.9	31.9
77	21.0	21.1	22.9	25.6	28.4	30.5	31.2	31.2	31.2	31.2	31.2	31.2
78	21.0	21.1	22.9	25.6	28.4	30.5	31.2	31.2	31.2	31.2	31.2	31.2
83	22.5	22.6	24.4	27.1	29.9	32.0	32.7	32.7	32.7	32.7	32.7	32.7
84	14.2	14.3	16.1	18.8	21.6	23.7	24.4	24.4	24.4	24.4	24.4	24.4
85	15.0	15.1	16.9	19.6	22.4	24.5	25.2	25.2	25.2	25.2	25.2	25.2
86	14.4	14.5	16.3	19.0	21.8	23.9	24.6	24.6	24.6	24.6	24.6	24.6
87	15.1	15.2	17.0	19.7	22.5	24.6	25.3	25.3	25.3	25.3	25.3	25.3
88	15.7	15.8	17.6	20.3	23.1	25.2	25.9	25.9	25.9	25.9	25.9	25.9
89	16.0	16.1	17.9	20.6	23.4	25.5	26.2	26.2	26.2	26.2	26.2	26.2
90	15.0	15.1	16.9	19.6	22.4	24.5	25.2	25.2	25.2	25.2	25.2	25.2
91	16.3	16.4	18.2	20.9	23.7	25.8	26.5	26.5	26.5	26.5	26.5	26.5
92	16.3	16.4	18.2	20.9	23.7	25.8	26.5	26.5	26.5	26.5	26.5	26.5
93	16.5	16.6	18.4	21.1	23.9	26.0	26.7	26.7	26.7	26.7	26.7	26.7
94	18.7	18.8	20.6	23.3	26.1	28.2	28.9	28.9	28.9	28.9	28.9	28.9
95	19.2	19.3	21.1	23.8	26.6	28.7	29.4	29.4	29.4	29.4	29.4	29.4
96	20.5	20.6	22.4	25.1	27.9	30.0	30.7	30.7	30.7	30.7	30.7	30.7
97	19.2	19.3	21.1	23.8	26.6	28.7	29.4	29.4	29.4	29.4	29.4	29.4
99	22.6	22.7	24.5	27.2	30.0	32.1	32.8	32.8	32.8	32.8	32.8	32.8
100	23.3	23.4	25.2	27.9	30.7	32.8	33.5	33.5	33.5	33.5	33.5	33.5
101	23.4	23.5	25.3	28.0	30.8	32.9	33.6	33.6	33.6	33.6	33.6	33.6

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
102	20.2	20.3	22.1	24.8	27.6	29.7	30.4	30.4	30.4	30.4	30.4	30.4
103	22.3	22.4	24.2	26.9	29.7	31.8	32.5	32.5	32.5	32.5	32.5	32.5
104	20.7	20.8	22.6	25.3	28.1	30.2	30.9	30.9	30.9	30.9	30.9	30.9
105	22.5	22.6	24.4	27.1	29.9	32.0	32.7	32.7	32.7	32.7	32.7	32.7
106	17.3	17.4	19.2	21.9	24.7	26.8	27.5	27.5	27.5	27.5	27.5	27.5
107	20.5	20.6	22.4	25.1	27.9	30.0	30.7	30.7	30.7	30.7	30.7	30.7
108	18.1	18.2	20.0	22.7	25.5	27.6	28.3	28.3	28.3	28.3	28.3	28.3
109	18.0	18.1	19.9	22.6	25.4	27.5	28.2	28.2	28.2	28.2	28.2	28.2
110	15.1	15.2	17.0	19.7	22.5	24.6	25.3	25.3	25.3	25.3	25.3	25.3
111	15.0	15.1	16.9	19.6	22.4	24.5	25.2	25.2	25.2	25.2	25.2	25.2
112	14.5	14.6	16.4	19.1	21.9	24.0	24.7	24.7	24.7	24.7	24.7	24.7
113	14.7	14.8	16.6	19.3	22.1	24.2	24.9	24.9	24.9	24.9	24.9	24.9
114	14.4	14.5	16.3	19.0	21.8	23.9	24.6	24.6	24.6	24.6	24.6	24.6
115	12.7	12.8	14.6	17.3	20.1	22.2	22.9	22.9	22.9	22.9	22.9	22.9
116	11.4	11.5	13.3	16.0	18.8	20.9	21.6	21.6	21.6	21.6	21.6	21.6
117	11.5	11.6	13.4	16.1	18.9	21.0	21.7	21.7	21.7	21.7	21.7	21.7
118	11.4	11.5	13.3	16.0	18.8	20.9	21.6	21.6	21.6	21.6	21.6	21.6
119	12.2	12.3	14.1	16.8	19.6	21.7	22.4	22.4	22.4	22.4	22.4	22.4
120	12.9	13.0	14.8	17.5	20.3	22.4	23.1	23.1	23.1	23.1	23.1	23.1
121	13.3	13.4	15.2	17.9	20.7	22.8	23.5	23.5	23.5	23.5	23.5	23.5
122	14.4	14.5	16.3	19.0	21.8	23.9	24.6	24.6	24.6	24.6	24.6	24.6
123	14.2	14.3	16.1	18.8	21.6	23.7	24.4	24.4	24.4	24.4	24.4	24.4
124	13.6	13.7	15.5	18.2	21.0	23.1	23.8	23.8	23.8	23.8	23.8	23.8
125	12.8	12.9	14.7	17.4	20.2	22.3	23.0	23.0	23.0	23.0	23.0	23.0
126	14.6	14.7	16.5	19.2	22.0	24.1	24.8	24.8	24.8	24.8	24.8	24.8
127	14.7	14.8	16.6	19.3	22.1	24.2	24.9	24.9	24.9	24.9	24.9	24.9
128	13.4	13.5	15.3	18.0	20.8	22.9	23.6	23.6	23.6	23.6	23.6	23.6
129	13.3	13.4	15.2	17.9	20.7	22.8	23.5	23.5	23.5	23.5	23.5	23.5
130	14.7	14.8	16.6	19.3	22.1	24.2	24.9	24.9	24.9	24.9	24.9	24.9
131	12.5	12.6	14.4	17.1	19.9	22.0	22.7	22.7	22.7	22.7	22.7	22.7
132	12.7	12.8	14.6	17.3	20.1	22.2	22.9	22.9	22.9	22.9	22.9	22.9
133	12.9	13.0	14.8	17.5	20.3	22.4	23.1	23.1	23.1	23.1	23.1	23.1

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
134	12.9	13.0	14.8	17.5	20.3	22.4	23.1	23.1	23.1	23.1	23.1	23.1
135	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
136	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
137	11.3	11.4	13.2	15.9	18.7	20.8	21.5	21.5	21.5	21.5	21.5	21.5
138	11.2	11.3	13.1	15.8	18.6	20.7	21.4	21.4	21.4	21.4	21.4	21.4
139	10.8	10.9	12.7	15.4	18.2	20.3	21.0	21.0	21.0	21.0	21.0	21.0
140	9.7	9.8	11.6	14.3	17.1	19.2	19.9	19.9	19.9	19.9	19.9	19.9
141	12.6	12.7	14.5	17.2	20.0	22.1	22.8	22.8	22.8	22.8	22.8	22.8
142	14.3	14.4	16.2	18.9	21.7	23.8	24.5	24.5	24.5	24.5	24.5	24.5
143	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
144	16.2	16.3	18.1	20.8	23.6	25.7	26.4	26.4	26.4	26.4	26.4	26.4
145	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
146	15.9	16.0	17.8	20.5	23.3	25.4	26.1	26.1	26.1	26.1	26.1	26.1
147	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
148	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
149	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
150	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
151	11.2	11.3	13.1	15.8	18.6	20.7	21.4	21.4	21.4	21.4	21.4	21.4
152	11.1	11.2	13.0	15.7	18.5	20.6	21.3	21.3	21.3	21.3	21.3	21.3
153	10.8	10.9	12.7	15.4	18.2	20.3	21.0	21.0	21.0	21.0	21.0	21.0
154	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
155	12.4	12.5	14.3	17.0	19.8	21.9	22.6	22.6	22.6	22.6	22.6	22.6
158	12.8	12.9	14.7	17.4	20.2	22.3	23.0	23.0	23.0	23.0	23.0	23.0
159	12.7	12.8	14.6	17.3	20.1	22.2	22.9	22.9	22.9	22.9	22.9	22.9
163	10.6	10.7	12.5	15.2	18.0	20.1	20.8	20.8	20.8	20.8	20.8	20.8
169	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
170	11.3	11.4	13.2	15.9	18.7	20.8	21.5	21.5	21.5	21.5	21.5	21.5
171	12.6	12.7	14.5	17.2	20.0	22.1	22.8	22.8	22.8	22.8	22.8	22.8
172	10.5	10.6	12.4	15.1	17.9	20.0	20.7	20.7	20.7	20.7	20.7	20.7
173	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
174	11.7	11.8	13.6	16.3	19.1	21.2	21.9	21.9	21.9	21.9	21.9	21.9
176	25.7	25.8	27.6	30.3	33.1	35.2	35.9	35.9	35.9	35.9	35.9	35.9

Receiver	Hub-height wind speed, m/s											
	4	5	6	7	8	9	10	11	12	13	14	15
179	11.0	11.1	12.9	15.6	18.4	20.5	21.2	21.2	21.2	21.2	21.2	21.2
180	11.2	11.3	13.1	15.8	18.6	20.7	21.4	21.4	21.4	21.4	21.4	21.4
183	14.0	14.1	15.9	18.6	21.4	23.5	24.2	24.2	24.2	24.2	24.2	24.2
184	15.1	15.2	17.0	19.7	22.5	24.6	25.3	25.3	25.3	25.3	25.3	25.3
186	11.5	11.6	13.4	16.1	18.9	21.0	21.7	21.7	21.7	21.7	21.7	21.7
187	11.6	11.7	13.5	16.2	19.0	21.1	21.8	21.8	21.8	21.8	21.8	21.8
188	11.1	11.2	13.0	15.7	18.5	20.6	21.3	21.3	21.3	21.3	21.3	21.3
194	8.2	8.3	10.1	12.8	15.6	17.7	18.4	18.4	18.4	18.4	18.4	18.4
195	10.2	10.3	12.1	14.8	17.6	19.7	20.4	20.4	20.4	20.4	20.4	20.4
197	9.8	9.9	11.7	14.4	17.2	19.3	20.0	20.0	20.0	20.0	20.0	20.0
198	9.7	9.8	11.6	14.3	17.1	19.2	19.9	19.9	19.9	19.9	19.9	19.9
199	9.7	9.8	11.6	14.3	17.1	19.2	19.9	19.9	19.9	19.9	19.9	19.9
200	15.3	15.4	17.2	19.9	22.7	24.8	25.5	25.5	25.5	25.5	25.5	25.5
201	15.8	15.9	17.7	20.4	23.2	25.3	26.0	26.0	26.0	26.0	26.0	26.0
202	16.2	16.3	18.1	20.8	23.6	25.7	26.4	26.4	26.4	26.4	26.4	26.4
205	13.7	13.8	15.6	18.3	21.1	23.2	23.9	23.9	23.9	23.9	23.9	23.9
206	12.3	12.4	14.2	16.9	19.7	21.8	22.5	22.5	22.5	22.5	22.5	22.5
207	12.2	12.3	14.1	16.8	19.6	21.7	22.4	22.4	22.4	22.4	22.4	22.4
208	14.7	14.8	16.6	19.3	22.1	24.2	24.9	24.9	24.9	24.9	24.9	24.9
209	16.2	16.3	18.1	20.8	23.6	25.7	26.4	26.4	26.4	26.4	26.4	26.4
212	12.1	12.2	14.0	16.7	19.5	21.6	22.3	22.3	22.3	22.3	22.3	22.3
214	17.9	18.0	19.8	22.5	25.3	27.4	28.1	28.1	28.1	28.1	28.1	28.1
215	11.1	11.2	13.0	15.7	18.5	20.6	21.3	21.3	21.3	21.3	21.3	21.3
216	11.0	11.1	12.9	15.6	18.4	20.5	21.2	21.2	21.2	21.2	21.2	21.2
218	10.8	10.9	12.7	15.4	18.2	20.3	21.0	21.0	21.0	21.0	21.0	21.0
219	10.9	11.0	12.8	15.5	18.3	20.4	21.1	21.1	21.1	21.1	21.1	21.1
220	14.1	14.2	16.0	18.7	21.5	23.6	24.3	24.3	24.3	24.3	24.3	24.3
221	13.4	13.5	15.3	18.0	20.8	22.9	23.6	23.6	23.6	23.6	23.6	23.6
222	11.0	11.1	12.9	15.6	18.4	20.5	21.2	21.2	21.2	21.2	21.2	21.2
223	11.9	12.0	13.8	16.5	19.3	21.4	22.1	22.1	22.1	22.1	22.1	22.1
224	10.5	10.6	12.4	15.1	17.9	20.0	20.7	20.7	20.7	20.7	20.7	20.7
225	23.1	23.2	25.0	27.7	30.5	32.6	33.3	33.3	33.3	33.3	33.3	33.3

Receiver	Hub-height wind speed, m/s											
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Camping ground	12.9	13.0	14.8	17.5	20.3	22.4	23.1	23.1	23.1	23.1	23.1	23.1
Stakeholder receivers within the Project boundary												
61 (S)	23.8	23.9	25.7	28.4	31.2	33.3	34.0	34.0	34.0	34.0	34.0	34.0
79 (S)	27.2	27.3	29.1	31.8	34.6	36.7	37.4	37.4	37.4	37.4	37.4	37.4
80 (S)	26.5	26.6	28.4	31.1	33.9	36.0	36.7	36.7	36.7	36.7	36.7	36.7
81 (S)	24.7	24.8	26.6	29.3	32.1	34.2	34.9	34.9	34.9	34.9	34.9	34.9
82 (S)	23.5	23.6	25.4	28.1	30.9	33.0	33.7	33.7	33.7	33.7	33.7	33.7
98 (S)	25.8	25.9	27.7	30.4	33.2	35.3	36.0	36.0	36.0	36.0	36.0	36.0
177 (S)	24.6	24.7	26.5	29.2	32.0	34.1	34.8	34.8	34.8	34.8	34.8	34.8
178 (S)	28.0	28.1	29.9	32.6	35.4	37.5	38.2	38.2	38.2	38.2	38.2	38.2

(S) Stakeholder receiver

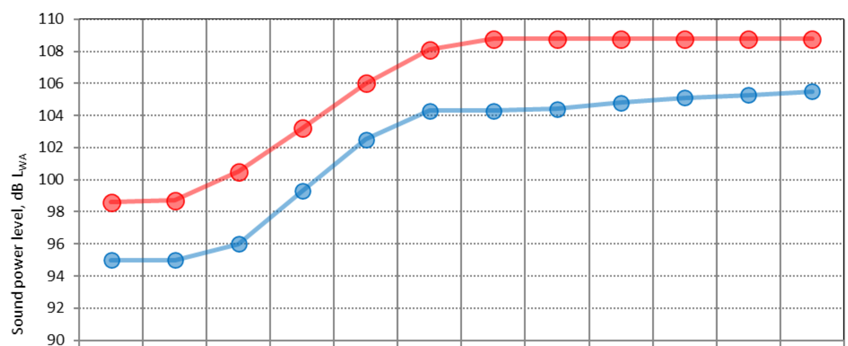
APPENDIX J NZS 6808 DOCUMENTATION

(a) Map of the site showing topography, wind turbines and residential properties: See Appendix F

(b) Noise sensitive locations: See Section 2.0 and Appendix C

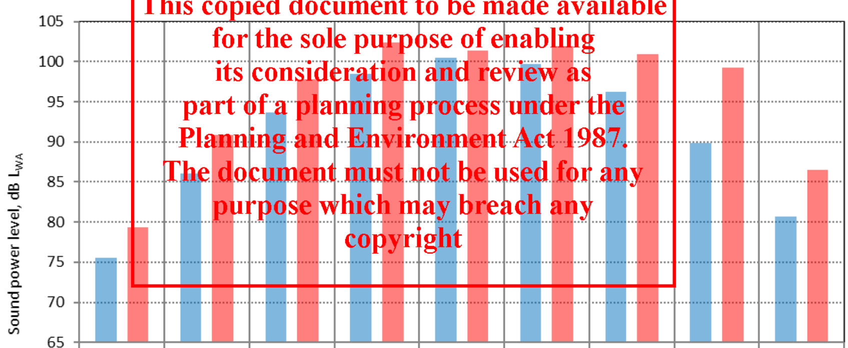
(c) Wind turbine sound power levels, L_{WA} dB (refer to Section 6.3.1)

Sound power levels (manufacturer specification +1 dB margin for uncertainty), dB L_{WA}



Hub height wind speed, m/s	4	5	6	7	8	9	10	11	12	13	14	15
V162-6.8MW	95.0	95.0	96.0	99.3	102.5	104.3	104.3	104.4	104.8	105.1	105.3	105.5
V172-7.2MW	98.6	98.7	100.5	103.2	106.0	108.1	108.8	108.8	108.8	108.8	108.8	108.8

Reference octave band spectra adjusted to the highest sound power level detailed above dB L_{WA}



Octave band centre frequency, Hz	31.5	63	125	250	500	1000	2000	4000	8000
V162-6.8MW	75.6	86.0	93.6	98.4	100.5	99.7	96.2	89.8	80.7
V172-7.2MW	79.3	90.8	97.8	102.4	101.4	102.0	100.9	99.3	86.5

(d) Wind turbine model: See Table 4 of Section 6.2

(e) Wind turbine hub height: See Table 4 of Section 6.2

(f) Distance of noise sensitive locations from the wind turbines: See Appendix C

(g) Calculation procedure used: ISO 9613-2:1996 prediction algorithm as implemented in SoundPLANnoise v9.0 (See Section 4.3 and Appendix H)

(h) Meteorological conditions assumed: See Table 1 of Section 4.3

(i) Air absorption parameters:

	Octave band mid frequency, Hz							
Description	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Atmospheric attenuation, dB/km	0.12	0.41	1.04	1.93	3.66	9.66	32.8	116.9

(j) Topography/screening: 10 m resolution elevation contours – See Appendix F

(k) Predicted far-field wind farm sound levels: See Section 6.4 and Appendix I.