

Willatook Wind Farm

Noise Assessment

S3522C39

June 2026

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1 INTRODUCTION

1.1 PROJECT DESCRIPTION

Willatook Wind Farm Pty Ltd (the **Proponent**) is developing the proposed Willatook Wind Farm (the **Project**) in Moyne Shire, Victoria. The Project will harness strong and reliable winds to generate renewable energy through the construction and operation of up to 52 wind turbines generators and would operate for a period of at least 25 years following a two-year construction period.

The Project is located approximately 22 kilometres to the north of Port Fairy and 32 kilometres to the northwest of Warrnambool and is situated to the south of the Woolsthorpe–Heywood Road. The Project is located within an area of private and public land that is largely used for agriculture, predominantly sheep and cattle grazing.

Electricity produced from wind turbines would be fed through underground cables to the on-site substation, where it will be exported to the NEM via the Tarrone Terminal Station and the existing Moorabool to Heywood 500 kilovolt (kV) transmission line.

Other project infrastructure would include:

- an on-site quarry for basalt rock that will be used to provide crushed rock during construction
- a battery energy storage system (**BESS**) located immediately to the west of the substation
- an operations and maintenance (**O&M**) facility consisting of site offices and amenities.

The Willatook Wind Farm Project in south-west Victoria has progressed through a comprehensive environmental assessment under the *Environment Effects Act 1978* (Vic), with the associated Environment Effects Statement (EES). Following public exhibition (in July-August 2022) and an Independent Panel Hearing/Inquiry (in Oct-Nov 2022), the Minister for Planning issued their Assessment of the EES (in July 2023). The Project was recommended for approval provided there were key modifications to the project relating to turbine free areas around habitat for the Brolga and Southern Bent-wing Bat.

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Since the conclusion of the EES process, the Victorian Government developed a new biodiversity policy specifically relating to onshore wind energy publishing the *Handbook for the Development of Renewable Energy in Victoria – Guidance to Avoid, Minimise, Mitigate and Compensate for Impacts on Threatened Bird and Bat Species* (DEECA 2025). In response, the Project proponent has refined the wind farm layout and reduced the overall project scale to align with the Minister’s recommendations, and applying the new Handbook. This removed seven proposed wind turbine generators and shifted a further nine proposed wind turbines. There were also changes to the proposed track, cable and quarry designs.

The project is now at the stage of submitting a revised Planning Permit Application incorporating the updated layout and supporting assessments.

1.2 ENVIRONMENTAL NOISE ASSESSMENT BACKGROUND

This environmental noise assessment considers the following aspects of the proposed project:

- Operation of the Wind Turbine Generators (**WTGs**)
- The cumulative noise of other wind farms in the vicinity, such as Macarthur, Ryan Corner, Hawkesdale and Woolsthorpe Wind Farms.
- The operation of site substations, the 200MW/400MWh Battery Energy Storage System (**BESS**) and ancillary activity; and,
- The construction noise and vibration associated with the development of the wind farm and onsite quarry.

The report details the relevant criteria for the assessment of each of the above aspects and provides the predicted noise levels from the current design (v120).

The assessment has been based on a representative turbine selection, being the Vestas V172 WTG (7.2MW) with a hub height of 166m. The representative turbine selection would result in a tip height of 254m. The assessment of noise from the representative turbine example demonstrates that a contemporary turbine can achieve the operational noise criteria. Should approval be granted, the predictions of noise from the turbines will be updated for the final layout and turbine selection, prior to construction.

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The Project also proposes other ancillary infrastructure, including a substation, BESS facility and an on-site quarry. These aspects of the project will include noise generating equipment, such as transformers, inverters, cooling management systems and large mobile plant (crushers, dozers and trucks) at the quarry.

The assessment has been based on the following:

- The location and status of dwellings in the vicinity, as summarised in Appendix . It is noted that for the purpose of this assessment, only those receivers with a predicted noise level greater than or equal to 30 dB(A) have been included in the report. The 30 dB(A) contour can be seen in Appendix . Although receivers outside this contour are shown, the results have not been presented in this assessment. The location of the WTGs in relation to the receivers is shown in Figure 1. It is noted that the assessment includes a number of dilapidated and uninhabited dwellings. Although included for completeness, these receivers are not considered to be noise sensitive. The dilapidated dwellings occur on both associated and non-associated properties.
- The locations of the WTGs, substation, BESS facility and quarry as summarised in Appendix B.

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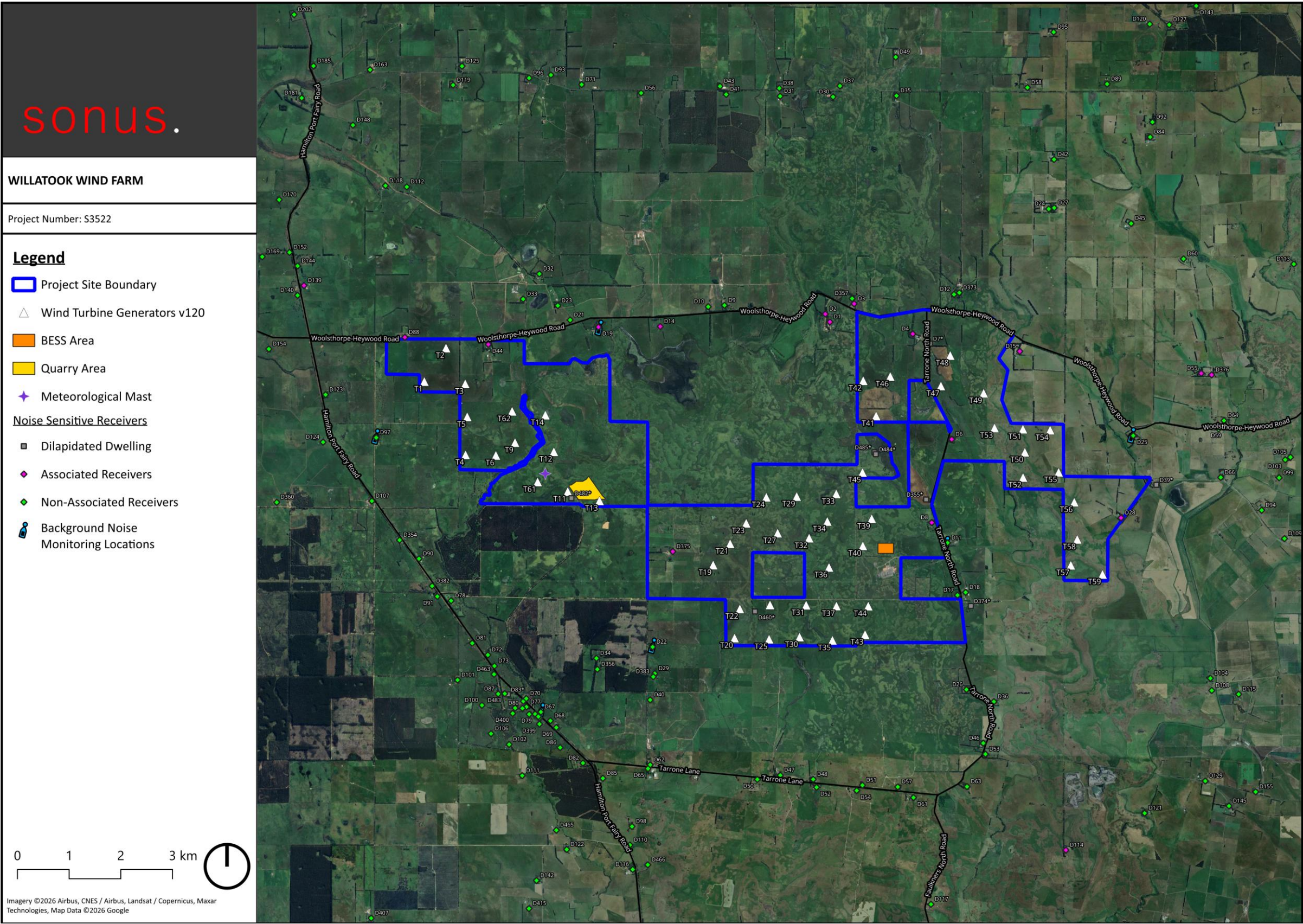


Figure 1: Surrounding Area

2 LEGISLATIVE AND POLICY CONTEXT

2.1 WILLATOOK WIND FARM MINISTER'S ASSESSMENT UNDER ENVIRONMENT EFFECTS ACT 1978

The Willatook Wind Farm Minister's Assessment Under Environment Effects Act 1978 July 2023 (the **Minister's Assessment**) considered the environmental effects statement (**EES**) from Wind Prospect Pty Ltd for the Willatook Wind Farm Project. An inquiry and panel (**IAP**) provided a report and recommendations to the Minister who then assessed the EES and IAP Recommendations. The Minister's Assessment supported the IAP's recommendations for modifying the project and strengthening Wind Prospect's proposed avoidance and management measures, to reduce the project's potential environmental effects to an acceptable level.

Within the Minister's Assessment was a review of noise and vibration, including an assessment context, discussion on the assessment and the Ministers assessment and recommendations. The relevant sections of the Minister's Assessment have been provided in Appendix C.

Key information from the Minister's Assessment that has been adopted are:

- Noise emissions from the temporary quarry and concrete batching plants have been assessed against the Noise Protocol.
- Background noise monitoring has been undertaken to provide a contemporary background noise dataset, in order to allow for the background plus 5 dB noise limits to be determined.
- The high amenity noise area has been applied to the Township Zone of Orford.

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2.2 CONSTRUCTION NOISE

2.2.1 EPA Publication 1834.2 Civil construction, building and demolition guide

EPA Publication 1834.2 *Civil construction, building and demolition guide* (September 2025) (Publication 1834.2) provides guidance to support the civil construction, building and demolition industries to eliminate or reduce the risk of harm to human health and the environment through good environmental practice.

Normal Working Hours

Publication 1834.2 requires that noise and vibration from a project be minimised at all times, but there is no objective criteria which must be achieved during normal working hours. Normal working hours are defined under Publication 1834.2 as 7am to 6pm weekdays and 7am to 1pm Saturdays for major infrastructure projects as well as commercial and industrial construction and demolition sites.

Although there are no objective criteria provided by Publication 1834.2 for construction noise during normal working hours, an emphasis is made on application of good working practices and community consultation to minimise any impacts at nearby residences, as required by the general environmental duty.

Outside of Normal Working Hours

Construction activities may also occur outside of normal working hours, subject to the specific requirements that are provided by Publication 1834.2 for construction noise that is “Outside normal working hours”.

For major infrastructure projects, such as power facilities, the “outside normal working hours” are defined as follows:

- Monday to Friday, 6 pm – 10 pm;
- Saturday, 1 pm – 10 pm; and,
- Sundays and public holidays, 7 am – 10 pm.

The following types of work may occur at these times, subject to specific requirements:

Low-noise impact works – inherently quiet or unobtrusive, for example, manual painting, internal fitouts, and cabling. Low-noise works do not have intrusive characteristics such as impulsive noise or tonal movement alarms. The relevant authority must be contacted, and any necessary approvals sought.

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Managed-impact works – works where the noise emissions are managed through actions specified in a noise and vibration management plan (may be part of a broader environmental management plan), to minimise impacts on sensitive receivers. Managed-impact works do not have intrusive characteristics such as impulsive noise or tonal movement alarms. You must contact the relevant authority and seek any necessary approvals. A noise and vibration management plan may need to be prepared or reviewed by a suitably qualified acoustic consultant or practitioner.

Unavoidable works – works which pose an unacceptable risk to life or property or a major traffic hazard and can be justified. Includes an activity which has commenced but cannot be stopped. You will need to demonstrate that planned unavoidable works cannot be reasonably moved to normal work hours. This requires additional consideration of potential noise and vibration generating activities and controls to minimise noise and vibration. These can be recorded within the noise and vibration management plan (may be part of a broader environmental management plan). You must contact the relevant authority and seek any necessary approvals for unavoidable works. You should notify affected sensitive receivers of the intended work, its duration and times of occurrence. A noise and vibration management plan may need to be prepared or reviewed by a suitably qualified acoustic consultant or practitioner to address unavoidable works

Any justified low-noise impact works or managed-impact works are required to achieve the following:

- Noise level from non-residential construction conducted between Monday to Friday, 6 pm to 10 pm, Saturday, 1 pm to 10 pm, or Sundays and public holidays, 7 am to 10 pm at any residential premises not to exceed background noise by:
 - 10 dB(A) or more for up to 18 months after project commencement
 - 5 dB(A) or more after 18 months
- Noise inaudible (see definition below) within a habitable room of any residential premises between 10pm and 7am.

For reference, Publication 1842.2 states the following relating to Inaudibility:

Inaudibility is the quality of not being perceptible by ear (i.e., cannot be heard) and cannot be measured in decibels (dB). The requirement for inaudibility relates primarily to adequate scheduling of works.

...

Inaudibility is not meant to be a measurable criterion in dB. It does not only relate to the intensity of the noise, but also to its frequency spectrum, its character and it varies with time.

To predict construction noise, a reference level set at the background noise level (L_{A90} representative of the background at the time of impact) +0 dB could be used as a suitable reference level to assess the risk of audible noise occurring. Where this approach is used, apply adjustments to consider the potential character of the noise that increases its impacts (e.g., tonality, impulsiveness)

To inform the assessment and provide an indication of risk to residences, consideration has been given to the background noise levels. The background noise level will vary for different locations and at different times of the evening and night periods. For the purposes of the impact assessment, a background noise level of 30 dB(A) has been assumed, which is often considered to be the lowest applicable background noise level under other noise policies and standards. This results in a reference level of 40 dB(A) for low-noise impact works or managed impact works on any weekend or evening that do not exceed a duration of 18 months at a particular dwelling¹.

The level at which a noise source is inaudible during the night period (10pm to 7am) will also vary significantly depending on the conditions at the time. While Publication 1842.2 notes that “*inaudibility is not meant to be a measurable criterion in dB*”, for the purposes of this assessment it is necessary to define a noise level. As such, “inaudibility” has been defined as 30 dB(A) outside a dwelling (as noted above, this is often considered to be the lowest applicable background noise level under other noise policies and standards), which would result in noise levels inside dwellings of approximately 15 dB(A) with the windows open. It is noted that a noise level of 15 dB(A) inside a dwelling is a very low noise level and would be very difficult to measure, as it would be at or below the noise floor of most Type 1 sound level meters. A monitoring regime may be used at the commencement of construction under a range of weather conditions to ensure that any activity during the night period will be inaudible at residences and confirm the outcomes of predictions in this assessment.

Minimising Noise and Vibration

Publication 1834.2 also provides guidance on the measures which can assist in minimising and reducing the risk of harm to human health and the environment, thereby satisfying the General Environmental Duty relating to noise.

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¹ It is noted that any single dwelling is unlikely to experience construction noise for more than 18 months, given the nature of wind farm construction activities, which move from one turbine site or cluster to the next. Work in each area would not extend past 18 months. One exception to this may be concrete batching plants which are at fixed locations although these will not operate for the full construction period and would likely operate for less than 18 months.

2.3 QUARRY, CONCRETE BATCHING AND UTILITIES NOISE

2.3.1 Planning Scheme

The proposed location of the quarry, concrete batching plants and utilities (i.e. BESS, substations etc) are within Moyne Shire. The Moyne Shire Planning Scheme (the **Planning Scheme**) has been reviewed and particular regard has been given to the following relevant provisions:

Victoria Planning Provisions Planning Scheme

Clause 13.05-1S Noise management

Objective

To assist the management of noise effects on sensitive land uses.

Strategy

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

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

Policy guidelines

Consider as relevant:

- *The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017.*

Policy documents

Consider as relevant:

- *Environment Protection Regulations under the Environment Protection Act 2017*
- *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826, Environment Protection Authority, May 2021)*
- *Environment Reference Standard (Gazette No. S 245, 26 May 2021)*

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2.3.2 Noise Protocol

Clause 13.05-15 of the Planning Scheme references the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (the **Noise Protocol**). The Noise Protocol is also referenced by the *Environment Protection Regulations 2021* (the **Regulations**). The Noise Protocol provides guidance in determining noise limits for new and existing commercial, industrial and trade premises in Victoria, including earth resources such as quarries.

Section 2 of the Noise Protocol provides noise limits for activities in a rural area.

Section 2.1 (18) states that *For each period, the noise limit is the greater of the distance-adjusted level and base noise level in Regulation 118(2)(b), unless a background level assessment has been conducted in accordance with clauses 21 to 23.*

Section 2.6 of the Protocol provides the noise limits for utilities, Section 2.7 relates specifically to the noise from earth resources (e.g. quarries) and Annex B provides the zone levels for all other noise sources, which would include the proposed concrete batching plants.

For all noise sources, the “distance adjusted level” is determined based on the closest dwellings being within the Farming Zone and compared against the *base noise level in Regulation 118(2)(b)*. Table 1 summarises these levels and provides the resulting criteria for assessment of the proposed quarry, concrete batching plants and utilities.

Table 1: Noise Criteria

	<i>Base Noise Level (Regulation 118(2)(b))</i>	<i>Distance Adjusted Level (Quarry and Concrete Batching)</i>	<i>Distance Adjusted Level (Utilities)</i>	<i>Resulting Criterion (Quarry and Concrete Batching)</i>	<i>Resulting Criterion (Utilities)</i>
Day Period 7am to 6pm	45 dB(A)	46 dB(A)	45 dB(A)	46 dB(A)	45 dB(A)
Evening Period 6pm to 10pm Monday to Saturday and 7am to 10pm Sunday	37 dB(A)	41 dB(A)	39 dB(A)	41 dB(A)	39 dB(A)
Night Period 10pm to 7am	32 dB(A)	36 dB(A)	34 dB(A)	36 dB(A)	34 dB(A)

Based on the above, the most onerous (i.e. lowest) criterion under the Noise Protocol is 36 dB(A) (L_{eq})² from operation of the quarry, and 34 dB(A) (L_{eq})⁵ from operation of the utilities (i.e. BESS and substations) during the night time period. As the concrete batching is understood to not occur during the night, the most onerous criterion for the assessment is 41 dB(A) during the evening hours.

2.3.3 Noise Character Adjustments

The Protocol, in Clauses 79 to 88 provides methods to adjust the predicted noise level where the noise is short in duration, tonal, impulsive or intermittent.

Duration adjustment (Clauses 79 – 81)

In accordance with the Protocol, if noise emissions from the commercial, industrial or trade premises investigated do not occur over the whole continuous 30-minute period, the duration adjustment applies.

The adjustment is based upon the ratio of the total time for which the source is operating over the measurement period, using the following equation:

$$A_{dur} = 10 \log_{10} (\text{total time source operating} / \text{measurement period}) \text{ dB}$$

Tonality adjustment (Clauses 82 – 84)

In accordance with the Protocol, a tonal adjustment is made based upon observations. Where a tonal character is just detectable, an adjustment of +2dB is applied. Where the tonal character is prominent, an adjustment of +5 dB is applied.

An objective method of determining the tonal character is also provided in Annex C of the Protocol. This assessment uses the objective method, but also considers the potential masking effect of background noise where potential tones are low in level.

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Impulse Adjustment (Clauses 85 - 86)

As with tonality, if an impulsive characteristic is just detectable, an adjustment of +2 dB is applied, however if the characteristic is prominent, a +5 dB adjustment is applied.

² This criterion corresponds to the recommended night-time (10pm to 7am) noise level for a noise source which can operate over a 24 hour period.

Intermittency Adjustment (Clauses 87 – 88)

An adjustment for intermittency applies where the noise both:

- (a) Increases in level rapidly by at least 5 dB on at least 2 occasions during a 30 minute period; and
- (b) Maintains the higher level for at least a one minute duration

2.3.4 Low Frequency Noise

Under the Regulations, the low frequency character of a noise source is a factor to be considered when determining if noise is unreasonable under the Environment Protection Act 2017, and should be considered in addition to the objectives under the Noise Protocol. *Noise Guidelines: Assessing low frequency noise* (Publication 1996, June 2021) provides a method to determine the risk of unreasonable low frequency noise.

For measurements outside a dwelling, Publication 1996 provides the limits for each one-third octave band centre frequency shown in Table 2.

Table 2: Low frequency noise limits outside a dwelling

	One-third Octave Band Centre Frequency (Hz)												
	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Noise limit (L_{eq}) (dB)	92	89	86	77	69	61	54	50	50	48	48	46	44

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2.3.5 General Environmental Duty

Part 3.2 of the Act introduces a general environmental duty, which states the following:

25 General environmental duty

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

Pollution is defined within the Act as follows:

pollution includes any emission, discharge, deposit, disturbance or escape of –

- (a) a solid, liquid or gas, or a combination of a solid, liquid or gas, including but not limited to smoke, dust, fumes or odour; or*
- (b) noise; or*
- (c) heat; or*
- (d) a thing prescribed for the purposes of this definition*

But does not include a thing prescribed not to be pollution for the purposes of this definition;

As noise is included within the definition of pollution, the Project has a general environmental duty to, so far as reasonably practicable, minimise risks of harm to human health or the environment from the noise associated with its operation.

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2.4 WIND TURBINE NOISE

2.4.1 Planning Scheme

The Wind Farm is in the Moyne Shire. The Moyne Shire Planning Scheme (the **Planning Scheme**) includes the following provisions in Clause 52.32 Wind Energy Facility. Each of the points has been labelled to be addressed individually.

- *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 in accordance with New Zealand Standard NZS6808:2010, Acoustics - Wind Farm Noise. (Section 2.4.2)*
 - *Provides an assessment of whether the proposed wind energy facility will comply with the noise limit for that facility under Division 5 Part 5.3 of the Environment Protection Regulations 2021. (Section 2.4.3)*
 - *Where the proposed wind energy facility will be the subject of a wind turbine noise agreement under Division 5 of Part 5.3 of 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. (Section 2.4.4)*
 - *Is prepared on the basis that the relevant noise standard under Division 5 of Part 5.3 of the Environment Protection Regulations 2021 will be 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. (Section 2.4.5 and Section 2.4.6)*

And

Before deciding on an application, in addition to the decision guidelines of Clause 65, the responsible authority must consider, as appropriate:

- *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria (Department of Environment, Land, Water and Planning, November 2021). (Section 2.1.7)*

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2.4.2 Assessment Requirements

In accordance with Section 8.1 of *New Zealand Standard NZS6808:2010, Acoustics - Wind Farm Noise (the Standard)*, any report of wind farm sound level predictions in accordance with the Standard shall provide the following:

- (a) *A map showing the topography (contour lines) in the vicinity of the wind farm, the position of the wind turbines, and noise sensitive locations;*
- (b) *Noise sensitive locations for which wind farm sound levels are calculated;*
- (c) *Wind turbine sound power levels;*
- (d) *The make and model of the wind turbines;*
- (e) *The hub-height of the wind turbines;*
- (f) *Distance of noise sensitive locations from the wind turbines;*
- (g) *Calculation procedure used*
- (h) *Meteorological conditions assumed;*
- (i) *Air absorption parameter used;*
- (j) *Ground attenuation parameter used;*
- (k) *Topography/screening assumed; and*
- (l) *Predicted far-field wind farm sound levels.*

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In addition, Section 8.2 of the Standard states that any report with background sound level measurements and assessment in accordance with the Standard shall provide the following:

- (a) *Description of the sound monitoring equipment including ancillary equipment;*
- (b) *The location of sound monitoring positions;*
- (c) *Description of the anemometry equipment including the height AGL of the anemometer;*
- (d) *Position of wind speed measurements*
- (e) *Time and duration of the monitoring period;*
- (f) *Averaging period for both sound and wind speed measurements*
- (g) *Atmospheric conditions: the wind speed and direction and the wind farm position and rainfall shall be recorded;*
- (h) *Number of data pair measured (wind speed in m/s, background sound in L90);*
- (i) *description of regression analysis; and*
- (j) *graphical plots showing the data scatter and the regression curves*

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2.4.3 Noise Limits

The noise limits for a wind energy facility are set within Division 5 of Part 5.3 of the *Environment Protection Regulations 2021* (the **Regulations**). Clause 131BA states the following:

- (1) Subject to subregulations (2) and (3), the noise limit for a wind energy facility must be determined in accordance with the relevant noise standard for that facility.*
- (2) If a wind energy facility is the subject of a wind turbine noise agreement, the noise limit for that facility in relation to noise emissions to the premises of the relevant landowner is—*
 - (a) if the agreement is made before 1 November 2021, the noise limit specified in the agreement; or*
 - (b) if the agreement is made on or after 1 November 2021, the noise limit that is the greater of—*
 - (i) 45 dB(A); or*
 - (ii) the background sound level plus 5 dB.*
- (3) The noise limit for a 1998 NZS wind energy facility may be determined in accordance with the procedures set out in NZS 6808:2010 that relate to extraneous noise.*

2.4.4 Agreements

Agreements have been made with a number of noise sensitive receivers in the vicinity of the Wind Farm. In accordance with 131BA of the Regulations, as the agreements were made before 1 November 2021, the noise limit is set out in the relevant agreement. The Proponent has advised that the agreements at each noise sensitive receiver are the greater of the following:

- The noise level identified in Table 3, or
- The background noise level + 5 dB(A)

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Table 3: Minimum Noise Limits

Location	Minimum Noise Limit in Agreement
D1	41 dB(A)
D2	41 dB(A)
D3	41 dB(A)
D4	42 dB(A)
D6	45 dB(A)
D8	42 dB(A)
D14	41 dB(A)
D15	45 dB(A)
D19	41 dB(A)
D28	45 dB(A)
D44	45 dB(A)
D55	41 dB(A)
D88	45 dB(A)
D375	45 dB(A)
D376	41 dB(A)

The agreed upon noise limits are discussed further in Section 3.3.4.

2.4.5 Relevant Standard

The relevant noise standard for the Wind Farm is established by Clause 131B of the Regulations. Based upon the Table within Clause 131B, the relevant noise standard for the Wind Farm is New Zealand Standard NZS6808:2010, Acoustics - Wind Farm Noise.

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2.4.6 High Amenity Areas

In accordance with Section 5.3 of the Standard, 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. A high amenity noise limit requires wind farm sound levels ($L_{A90(10 \text{ min})}$) during the evening and night time to not exceed background sound level by more than 5 dB or a level of 35 dB $L_{A90(10 \text{ min})}$ for wind speeds up to 6m/s.

Areas where a plan promotes a higher degree of protection of amenity are classified as High Amenity Areas (HAA). Once an area is identified as a HAA, the following is provided within the Standard Section 5.3.1:

The following steps provide guidance on whether a high amenity noise limit may be justified:

- (a) *There is no need to consider noise sensitive locations outside the 35 dB $L_{A90(10 \text{ min})}$ wind farm sound level contour*
- (b) *Using predicted wind farm sound levels and measured background sound levels relating to any particular noise sensitive location under investigation, calculate for each 10-minute time interval in the evening or night-time prescribed time frames the arithmetic difference between the estimated post-installation sound level and the background sound level. The post-installation sound level should be estimated by an energy addition of the background sound level and predicted wind farm sound level. The background and wind farm sound levels should be for a range of wind conditions representative of long-term wind sampling at the wind farm;*
- (c) *The differences calculated in (b) for all 10-minute time intervals in the prescribed time frame should be arithmetically averaged (there should typically be in excess of 540 data points at night...);*
- (d) *If the average difference in evening or night-time prescribed time frame is less than 8 dB then a high amenity noise limit is unlikely to be justified.*
- (e) *If the average difference in an evening or night-time prescribed time frame is greater than 8 dB then a high amenity noise limit is likely to be justified.*

Wind Energy Facility Turbine Noise Technical Guideline Publication 3011 (the **Technical Guideline**) specifies that the HAA noise limit:

- Should apply to a dwelling located in the following zones predominately intended for residential development: Low Density Residential Zone (LDRZ), Township Zone (TZ), Rural Living Zone (RLZ), and Green Wedge A Zone (GWAZ)
- Should not apply to dwellings in the Farming Zone (FZ)

- Should not be applied in any location where background sound levels are already affected by other specific sources such as road traffic noise (based on 5.3.1 of the 2010 Standard)
- Only applies for WEF wind speeds up to and including 6 m/s during evening and night-times.
- Is applicable only when there is no agreement made in accordance with regulation 131A.

In contrast to the Standard, the Technical Guideline appears to adopt a conservative approach by specifying where the high amenity noise limit applies without following the specific procedure that is outlined in the Standard once a HAA is identified.

The 35 dB(A) contour (based on the hub-height wind speed at rated power) and HAAs are shown in Figure 2. Despite not being located within the 35 dB $L_{A90(10 \text{ min})}$ contour as required by the Standard, the conservative approach provided by the Technical Guideline has been adopted to apply the high amenity noise limit to the nearby Township Zone in Orford.

2.4.7 Planning Guidelines for Development of Wind Energy Facilities

The *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria* (Department of Environment, Land, Water and Planning, November 2021) referred to in the Planning Scheme have been replaced by the Planning Guidelines for the Development of Wind Energy Facilities (Department of Transport and Planning, September 2023) (the **Planning Guidelines**). This assessment has therefore referred to the more contemporary Planning Guidelines.

Section 5.1.2 of the Planning Guidelines reiterates the noise limits must comply with the Standard, as well as repeating the definition of a noise sensitive location from the Standard.

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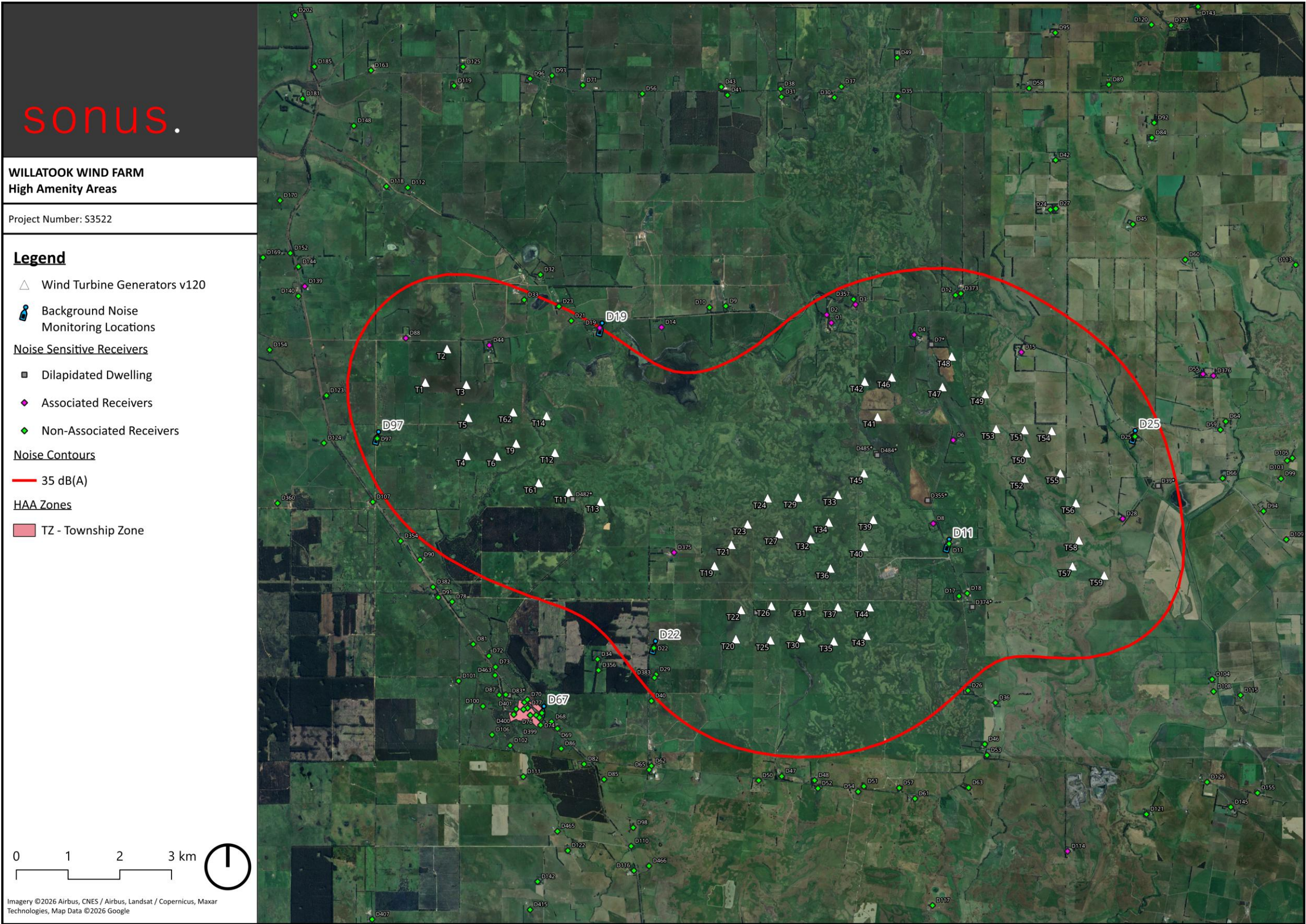


Figure 2: High Amenity Areas - 35 dB(A) Contour

3 BACKGROUND NOISE MONITORING

3.1 LOGGING EQUIPMENT

The A-weighted noise levels (L_{A90}) were measured continuously in 10-minute intervals at six locations, which resulted in six weeks of data at each location. Table 4 shows the locations at which the noise monitoring equipment was placed. At all monitoring locations, the noise logger was installed on the wind farm side of the dwelling.

Table 4: Residential Monitoring Details

Monitoring Location	Approximate Distance to Nearest Dwelling	Coordinates (GDA2020 / MGA zone 54)		Serial Number	Monitoring Period
		Easting	Northing		
D11	20m	604586	5774229	00331169 (NL-52A)	3/7/2025 – 14/8/2025
D19	16m	597882	5778407	598175 (NL-52)	3/7/2025 – 14/8/2025
D22	13m	598992	5772262	00331170 (NL-52A)	3/7/2025 – 14/8/2025
D25	13m	608181	5776330	00331171 (NL-52A)	3/7/2025 – 14/8/2025
D67	16m	596757	5771005	01224051 (NL-42A)	17/9/2025 – 29/10/2025
D97	14m	593561	5776306	00331168 (NL-52A)	3/7/2025 – 14/8/2025

At each of the monitoring locations NL-42A (Class 2), NL-52 (Class 1) or NL-52A (Class 1), NATA calibrated sound level meters were deployed. The serial numbers of the sound level meters are provided in Table 4 and the calibration certificates are provided in Appendix D. An example of an on-site setup can be seen in Figure 3.

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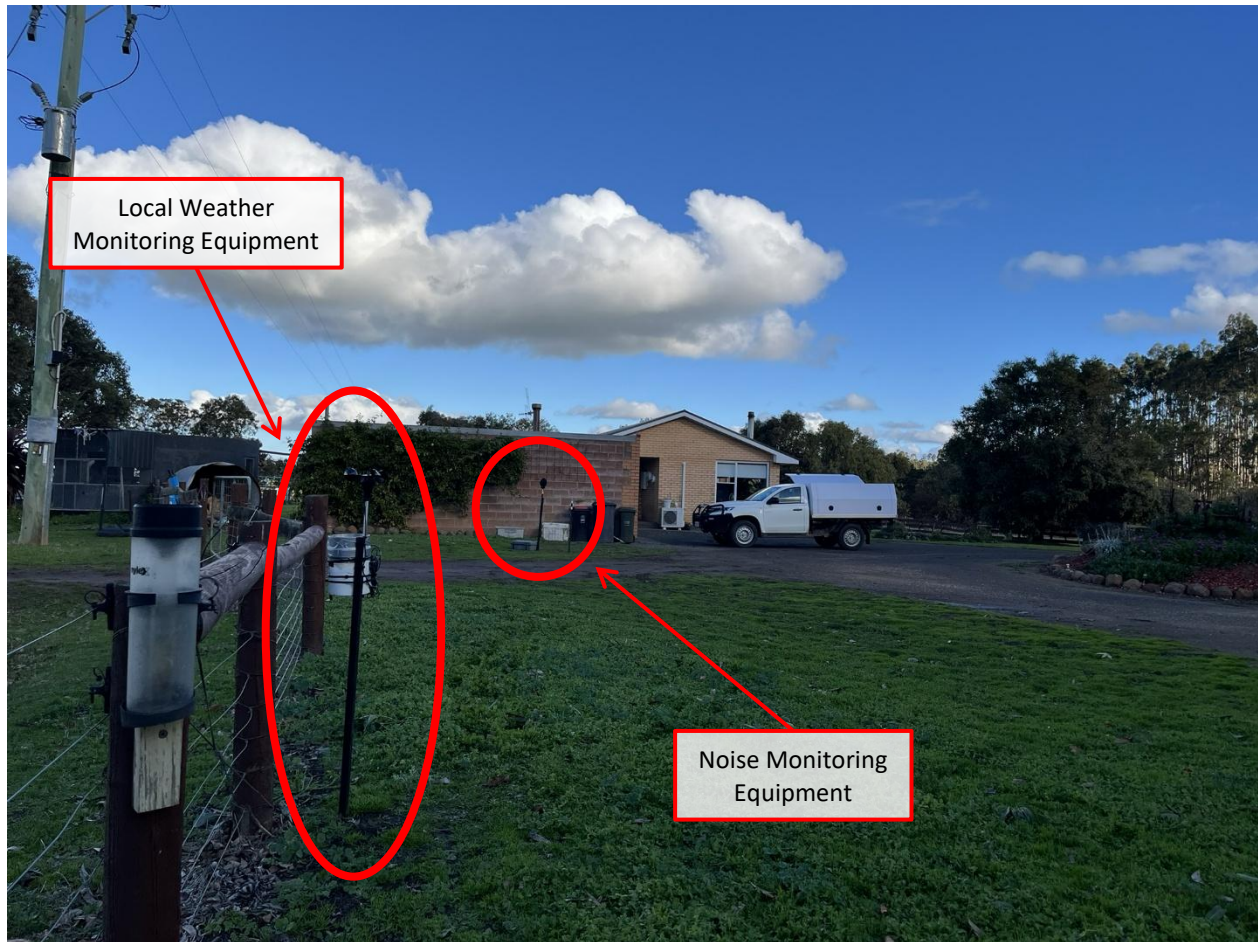


Figure 3: Typical On-Site Noise Monitoring Setup

The sound level meters were calibrated before and after the background noise monitoring regime with a Class 1 Rion NC-74 calibrator (with serial number 35094478) and the microphones were fitted with a wind shield with a diameter of at least 90 mm to minimise wind noise on the microphone (consistent with the minimum requirements of Technical Guideline). Each sound level meter was placed greater than 3.5m from the nearest reflective surface.

Photographs of the noise logging equipment at each residential logging location, alongside diagrams showing the monitoring locations relative to the dwelling and nearest WTGs, are provided in Appendix D. It is noted that two loggers were placed at D67 as a redundancy (in case of failure). While the measurements of each logger were similar, the slightly lower of the two measurements have been used for the background noise levels.

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3.2 LOCAL WEATHER

In addition to the noise logging, local wind speed logging was conducted at three locations (D22, D25 and D67) using Rainwise wind data loggers and Rainwise rain loggers. The rainfall data and the measured wind speed at the microphone height were used to identify periods when data might have been adversely affected by weather. For locations where the local weather logging equipment was not deployed, data from the closest weather logger has been used in the analysis.

3.3 WTG BACKGROUND NOISE MONITORING

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3.3.1 Hub Height Wind Speed Data

During the noise monitoring regime, wind speed and direction were monitored at a local meteorological mast at the Wind Farm. The met mast is equipped with First Class anemometry at four measurement heights: 60m, 80m, 100m, and 120m. At each height, anemometers are dual mounted on opposite booms to account for mast shadowing effects, ensuring valid wind speed data is available across all wind directions. Wind direction is measured using vanes at 77.5m, 97.5m, and 116m. Temperature and humidity sensors are installed at 115.5m and 2m, with a pressure sensor at 2m, allowing for air density calculations and atmospheric correction throughout the measurement campaign. The mast also undergoes biannual wind system maintenance to ensure a high level of measurement accuracy.

Wind Prospect have provided the following details on how the hub height wind speeds were provided:

The wind shear profile was derived from wind speed measurements across the four anemometer heights (60m, 80m, 100m and 120m) on the met mast. The resulting shear profile was then extrapolated to estimate wind speed at hub height (166m) using wind analysis software WindPRO. A long-term shear profile was applied to account for seasonal variability not fully captured in the short term data set during background noise monitoring.

The location of the meteorological mast is shown in Table 5.

Table 5: Meteorological Mast Location

Coordinates (GDA2020 / MGA zone 54)	
Easting	Northing
596831	5775586

Figure 4, Figure 5 and Figure 6 present wind roses for the long-term corrected dataset and the two background noise monitoring periods (3 July – 14 August 2025 and 17 September – 29 October 2025) all at 166m. Figure 4 clearly shows the prevailing wind direction from the NW–WNW, with a secondary southerly component. Both noise monitoring periods broadly capture the dominant NW–WNW prevailing direction, providing reasonable directional representation for the purposes of background noise assessment.

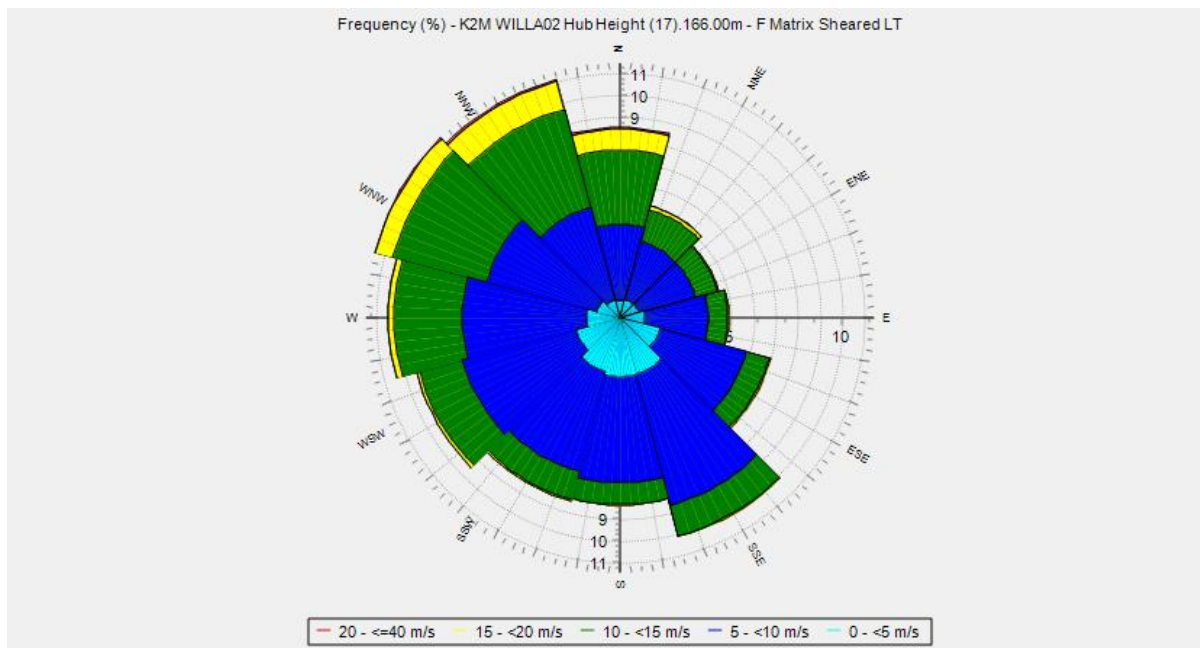


Figure 4: Long Term Wind Rose

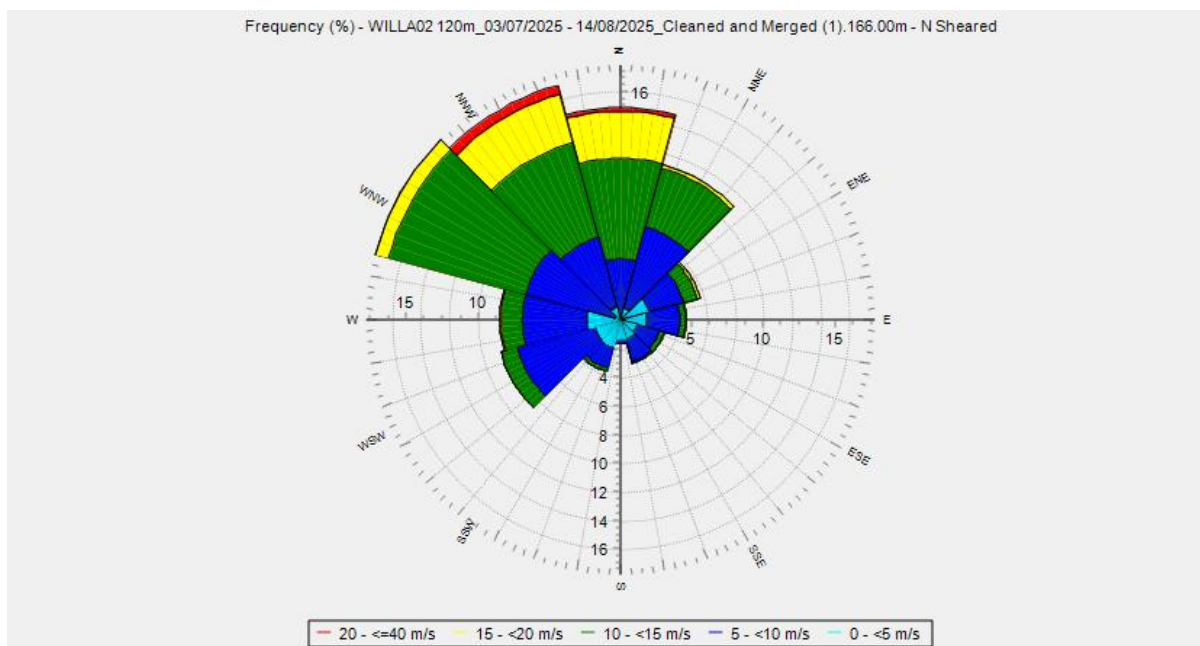


Figure 5: 2025 Background noise period 1 - 03/07/2025 - 14/08/2025

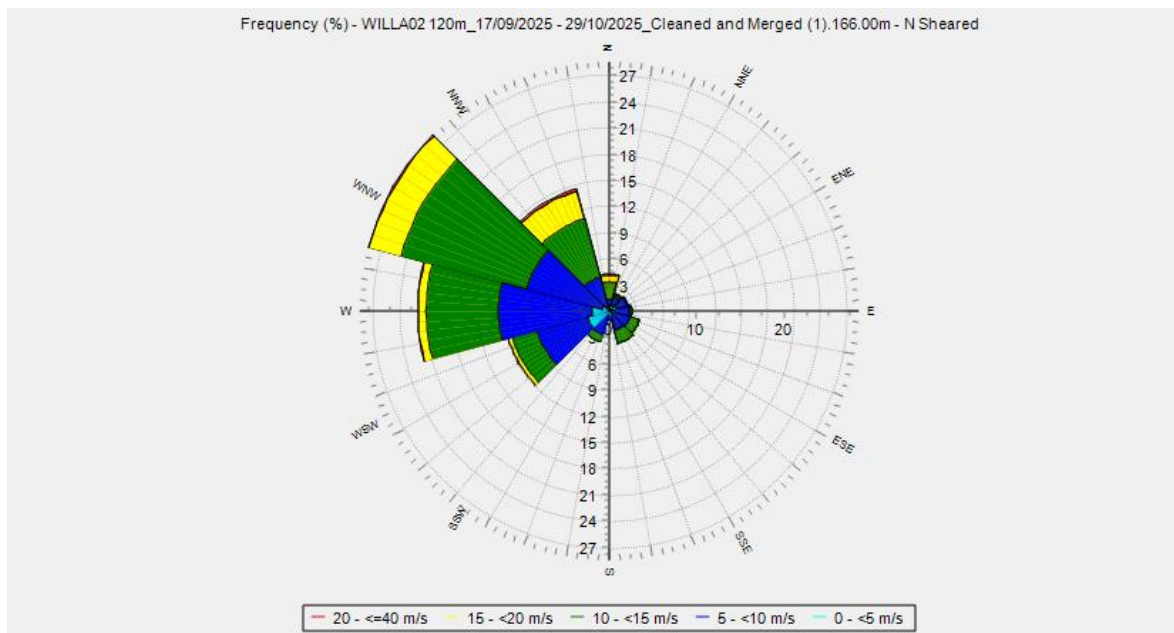


Figure 6: 2025 Background noise period 2 - 17/09/2025 - 29/10/2025

Neither monitoring period completely replicates the long-term directional distribution, which is expected given the short duration (~6 weeks each). The underrepresentation of the southerly sector in both noise monitoring periods is worth noting, however this is not considered to have materially affected the background noise monitoring results. Despite this, both periods sampled conditions within the range predicted by the long-term dataset and captured the dominant wind direction.

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3.3.2 Data Analysis

Extraneous Noise

In accordance with Section 7.2.4 of the Standard, extraneous noise caused by events including precipitation, insects and fauna should be removed from the data set. Analysis conducted on the one-third octave bands found a lot of high frequency noise during the night, likely due to insects or fauna, particularly in the 2 kHz, 2.5 kHz and 3.15 kHz one-third octave bands.

The Technical Guideline provides a method of identifying 10 minute periods where the level is dominated by a single one-third octave band, which has been adopted to identify the periods where insects or fauna are dominant. The method is defined as:

- Where the highest A-weighted one-third octave band noise level is within 5 dB of the overall broadband A-weighted noise level, and
- The noise level of the one-third octave band is greater than 20 dB L_{A90} .

Rather than excluding the data from the analysis, the noise in the 2 kHz one-third octave band and above have been mathematically removed from the L_{A90} for the identified periods. This method conservatively reduces the background noise level, while increasing the number of 10 minute data pairs available for regression analysis.

In addition, data affected by rain, hail or wind (based on the ground level wind speed) has been excluded. Data has been considered adversely affected where the ground level wind speed is greater than 5 m/s for more than 90% of the relevant 10-minute period, or where precipitation occurs within the relevant 10-minute period or either of the preceding or following 10-minute periods. This approach is generally consistent with the Technical Guideline.

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Regression Analysis

The measured 10 minute background noise levels have been plotted against the corresponding 10 minute hub height wind speeds with hub height wind speeds between cut-in (3 m/s) and the windspeed of rated power for the WTGs (13 m/s). In accordance with Section 7.4.1 of the Standard, where there are markedly different groups within the scatter plots, then separate plots may be required for different conditions. A review of the plots found that noise was typically higher during the day (7:00am to 10:00pm) than the night (10:00pm to 7:00am). Therefore, the measured noise levels have been split into day and night correlations. The number of data pairs analysed is shown in Table 6, with the correlations shown in Appendix F.

Table 6: Data Points

Receiver	Collected Points	Filtered (Removed) Points			Resultant Points Day Period	Resultant Points Night Period
		Cut-in/Cut-out	Local Wind	Local Rain		
D11	6000	1506	12	760	2586	1323
D19	6000	1499	19	769	2584	1323
D22	6000	1494	19	771	2584	1323
D25	6000	1506	12	756	2590	1323
D67	6000	1348	22	438	2713	1656
D97	6000	1503	19	765	2584	1323

The corresponding background noise levels at each wind speed at 166m hub height for the measurement locations are shown in Table 7.

Table 7: Correlated Background Noise Levels

Location	Time of Day	Background Noise Level, dB(A), for each Hub Height (166m) Wind Speed, m/s										
		3	4	5	6	7	8	9	10	11	12	13
D11	Day	25	27	28	30	31	33	34	35	37	38	39
	Night	25	24	24	24	25	27	28	30	32	33	34
D19	Day	26	29	31	32	33	33	33	34	34	35	36
	Night	20	21	23	23	24	24	25	26	28	30	33
D22	Day	27	28	30	31	32	34	35	36	37	38	39
	Night	22	23	23	24	25	26	27	28	30	32	34
D25	Day	24	27	29	31	32	34	35	36	37	38	39
	Night	24	23	23	23	24	26	28	30	32	34	35
D67	Day	30	31	32	33	33	34	35	36	37	39	41
	Night	28	27	27	27	28	29	29	31	32	33	34
D97	Day	26	28	30	31	32	32	33	34	35	35	37
	Night	22	22	22	23	23	24	25	27	28	31	33

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3.3.3 *Representative Locations*

As background noise could not be measured at all locations, the Standard allows for locations where measurements were not conducted to be represented by a location where the sound generating features are similar in proximity and character. To select a representative location, consideration was given to the following:

- Proximity to other noise sources uncorrelated to wind, such as roads
- Proximity to natural noise sources correlated to wind, such as trees
- Proximity to the representative location
- Topography
- Level of noise measured

The representative locations are show on Figure 7.

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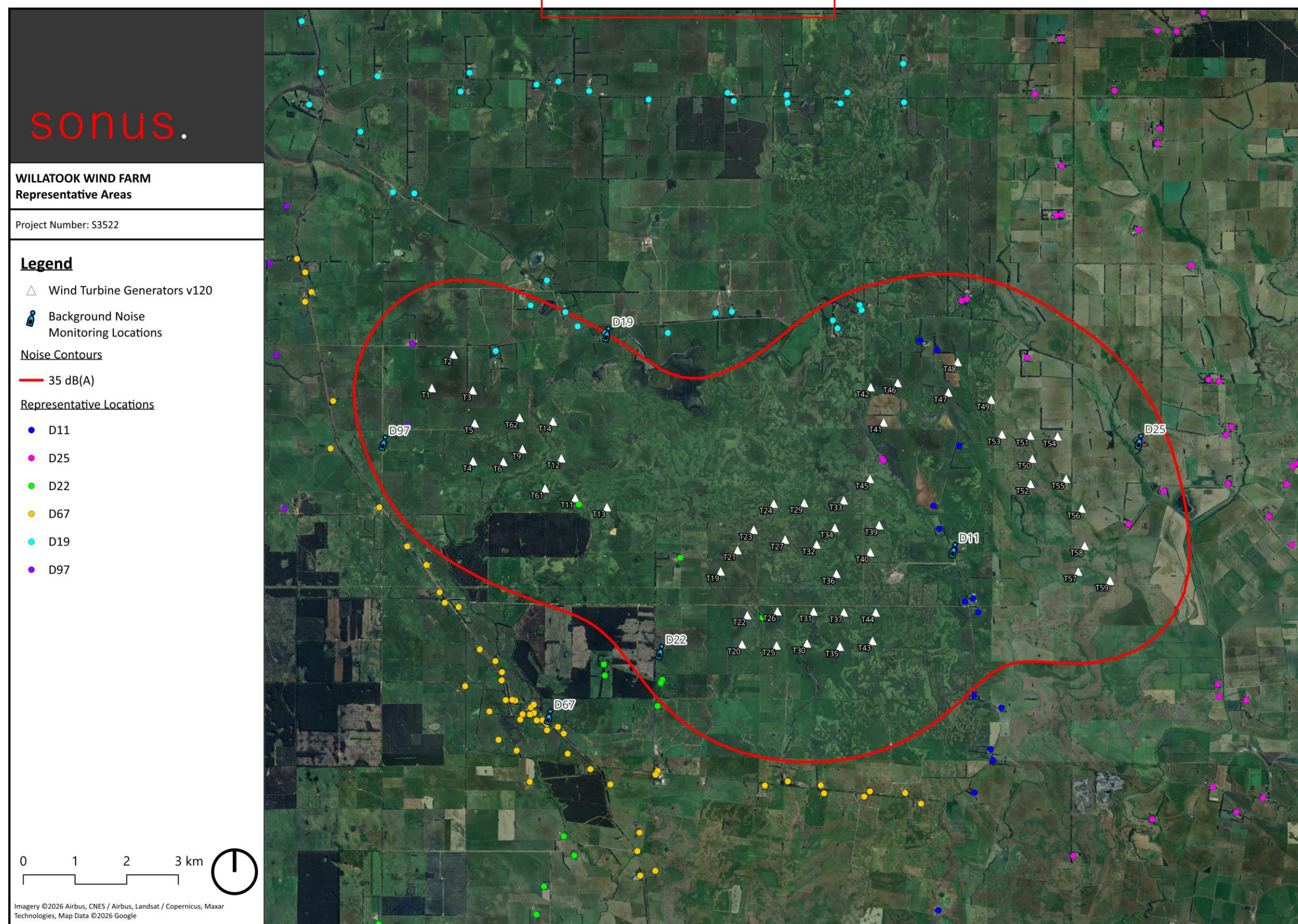


Figure 7: Representative Locations

3.3.4 Noise limits

The Minister's Assessment required the noise limits to be set to 40 dB(A) for all wind speeds based upon the background noise measurements being insufficient to inform any other noise limit due to the period of time between the measurements being conducted, and the time of submission. For this assessment, updated background noise monitoring has been conducted, allowing for the background noise level to be considered in any noise limits that are derived for the Project.

In accordance with the Regulations, the noise limits are to be established based upon the Relevant Standard, which is the Standard. In accordance with the Standard, the noise limits for the assessment (other than receivers with agreements or within a HAA) are the greater of:

- 40 dB(A) or
- The background noise level + 5 dB(A)

For the receivers within the HAA, the noise limits for the assessment are the greater of:

- 35 dB(A) or
- The background noise level + 5 dB(A)

For the receivers with an agreement, the noise limits for the assessment are the greater of:

- The agreed upon noise level or
- The background noise level + 5 dB(A)

The noise limits for each noise sensitive receiver are shown in Appendix G for all locations where the predicted noise level is greater than 30 dB(A).

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3.4 BESS BACKGROUND NOISE MONITORING

3.4.1 Monitoring Results

The background noise and existing noise environment was measured at D11, which is the closest noise sensitive receiver to the proposed site. The background noise levels at D11 were influenced by insect noise, particularly during the night. As this noise may not be present for the full year, background noise levels have been determined by mathematically removing the frequencies at which the insect noise occurred. The method is described in Section 3.3.2.

The background noise levels measured at D11, are shown in Table 8.

Table 8: Background Noise Level dB(A) – BG1

Time	Background Noise Level
Day	32 dB(A)
Evening (Monday – Saturday)	27 dB(A)
Evening (Sunday)	33 dB(A)
Night	28 dB(A)

3.4.2 Noise Limits

Based upon the measured existing noise environment, noise limits have been established in accordance with the Protocol for each noise sensitive receiver. These are shown in Table 9.

Table 9: Noise Limits (dB(A))

Time	Background Noise Level	Adjusted Background Noise Level	Base Distance-adjusted noise level	Noise Limit
Day	32 dB(A)	40 dB(A)	45 dB(A)	45 dB(A)
Evening (Monday – Saturday)	27 dB(A)	32 dB(A)	39 dB(A)	39 dB(A)
Evening (Sunday)	33 dB(A)	38 dB(A)	39 dB(A)	39 dB(A)
Night	28 dB(A)	33 dB(A)	34 dB(A)	34 dB(A)

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4 ASSESSMENT

4.1 NOISE SOURCES

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4.1.1 Construction

The equipment and activities on site will vary throughout the project, depending on various stages of construction, required processes and specific equipment used. The noise levels from typical construction activities, which generally occur at wind turbine sites and at a substation/BESS site have been predicted. The Predicted noise levels from construction activity have been presented as a typical worst case (highest noise level) scenario for the various stages of construction and provide an indication of the noise level which can be expected at residences in the vicinity of turbine locations. These predictions should be used and refined for specific action plans for any night works, which should also take into account the likely background noise levels at specific locations and times of year.

Predictions have been made for the typical construction activities which will occur at each of the turbine sites, BESS and Substation sites. The noise level from these activities has previously been measured at a number of other wind farms with the following sound power levels determined for each activity and used as the basis for the predictions.

Table 10: Construction Noise Sources

Phase	Equipment Details	Maximum Overall Sound Power Level, dB(A)
Road & Hardstand Earthworks	Dozer Scraper Excavator Compactor Grader Roller Dump Truck Water Truck	122
Concrete Pouring	Concrete Pump Concrete truck x 3 Generator	111
Prepare foundation	Clean stud threads with angle grinder/wire wheel Remove nuts from studs with electric impact driver & generator Remove template flanges Clean foundation with motorised pressure washer Lights (for night time operation)	107

Phase	Equipment Details	Maximum Overall Sound Power Level, dB(A)
Prepare Base Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	110
Install Base Tower	Lift tower into place with crane Install foundation nuts with electric impact driver & motorised 240V generator (inside & outside tower @ ground level) Lights (for night time operation)	110
Prepare Mid Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	110
Install Mid Tower	Lift tower into place with crane Install Base / Mid nuts with electric impact driver & generator (inside tower) Lights (for night time operation)	110
Prepare Top Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	110
Install Top Tower	Lift tower into place with crane Install Base / Mid nuts with electric impact driver & generator (inside tower) Lights (for night time operation)	110
Prepare Nacelle	Complete assembly with hand tools Clean outside of nacelle with motorised pressure washer Lift nacelle with crane Clean underside of nacelle with motorised pressure washer Lights (for night time operation) ALE Self Propelled Trailer	111
Install Nacelle	Lift nacelle into place with crane Install nacelle / tower bolts & nuts with electric impact driver & generator (inside nacelle / tower) Lights (for night time operation)	108
Prepare Hub	Complete assembly with hand tools Clean outside of hub with motorised pressure washer Lift hub with crane Clean underside of hub with motorised pressure washer Lights (for night time operation) ALE Self Propelled Trailer	112
Install Hub	Lift hub into place with crane Install hub / nacelle bolts with electric impact driver & generator (inside nacelle / tower) Lights (for night time operation)	107

Phase	Equipment Details	Maximum Overall Sound Power Level, dB(A)
Prepare 3 No. Blades	Remove transport frames with electric impact driver & motorised 240V generator (on hardstand) Install blade studs with electric impact driver & generator Lift blade with crane Clean blade with motorised pressure washer Lights (for night time operation)	111
Install 3 No. Blades	Lift blades into place with crane Install blade / hub nuts with electric impact driver generator (inside hub) Lights (for night time operation)	109
Install HV & LV cabling and Install Lift	- Lift cables into place with electric winch & motorised generator – fasten with hand tools (inside tower) - Lights	104
Substation/BESS site fencing, lifting components and installation of electrical	- Lift components with crane - Use of hand tools such as an angle grinder or impact driver	107
Movement of Equipment	ALE Self Propelled Trailer	108

4.1.2 Quarry and Concrete Batching Sites

The proposed quarry will provide aggregate and will include the following noise sources:

- Excavators for topsoil and overburden stripping
- blasting of basalt rock
- Generator and pumps
- Front end loader or excavator
- Primary and secondary crushers, aggregate screens and blenders
- bulldozers
- Delivery trucks

The concrete batching plants will consist of the following noise sources:

- Front end loader
- Concrete trucks

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With the exception of any blasting activity, the assessment has considered noise from the equipment described above, operating continuously within the quarry location, and three concrete batching locations shown in Appendix B. Noise and vibration from blasting has been considered in a separate Blast Impact Assessment for the quarry.

The sound power levels from each of the other noise generating activities/equipment above have previously been measured at similar facilities. The overall sound power level has been provided in Table 11.

Table 11: Sound power level data

Equipment	Sound Power Level (dB(A))
Generator & Pump	96
Front End Loader or Excavator	110
Primary and secondary Crusher	113
Bulldozer	113
Delivery Truck	96
Concrete Truck	101

4.1.3 WTG

The candidate WTG for the Wind Farm is the Vestas V172 7.2MW with blades with serrated trailing edges, with a hub height of 166m. The sound power levels at each integer wind speed are shown in Table 12, as supplied by Vestas. It is understood that Vestas conduct turbine noise measurements in accordance with IEC 61400-11 Ed.3.

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Table 12:WTG Sound Power Levels

Frequency [Hz]	Sound Power Levels [dB(A)] per Hub Height Wind Speed [m/s]										
	3	4	5	6	7	8	9	10	11	12	13
10	32.1	31.9	33.7	36.2	45.1	45.9	47.2	48.8	48.8	48.8	48.8
12.5	37	37.5	39.2	41.4	49.7	50.6	51.8	53.4	53.4	53.4	53.4
16	41.9	43	44.6	46.6	54.2	55.2	56.4	58.1	58.1	58.1	58.1
20	46.7	48.6	50	51.7	58.7	59.9	61	62.7	62.7	62.7	62.7
25	51.9	54.9	56.1	56.9	63.9	65.4	66.4	67.9	67.9	67.9	67.9
31.5	56.7	60.5	61.6	62.1	68.5	70	71	72.6	72.6	72.6	72.6
40	61.3	65	66.1	67.3	71.9	73.4	74.6	76.4	76.4	76.4	76.4
50	78.3	78.9	79.3	80.6	81.4	82.3	78.7	81	81	81	81
63	84	84.5	84.9	86.2	86.7	87.5	82.3	84.9	84.9	84.9	84.9
80	85	85.5	85.9	87.1	87.9	88.8	84.8	87.2	87.2	87.2	87.2
100	86.1	86.5	87	88	89.3	90.3	87.7	89.7	89.7	89.7	89.7
125	87.1	87.5	88	88.9	90.6	91.8	90.3	92	92	92	92
160	85.8	86.3	86.7	87.7	89.9	91.4	91.8	93.6	93.6	93.6	93.6
200	85.4	85.9	85.8	87.2	89.6	91.8	93.9	95.7	95.7	95.7	95.7
250	86.4	86.4	85.6	87.3	89.9	92.7	95.4	97.2	97.2	97.2	97.2
315	85.6	85.4	84.2	86.3	89.2	92.3	95.2	96.9	96.9	96.9	96.9
400	85	84.5	83.2	85.4	88.3	91.5	94.1	95.8	95.8	95.8	95.8
500	85.1	84.5	83	85.3	88.2	91.5	93.8	95.4	95.4	95.4	95.4
630	85.1	84.5	83.6	86	89	92.3	94.6	95.6	95.6	95.6	95.6
800	85.2	84.8	84.8	87.4	90.5	93.7	96	96.2	96.2	96.2	96.2
1000	85.2	84.9	85.4	88.1	91.3	94.5	96.8	96.4	96.4	96.4	96.4
1250	84.6	84.3	85	87.7	90.9	94.3	96.8	96	96	96	96
1600	84.1	84.1	84.9	87.3	90.5	94.3	97	95.5	95.5	95.5	95.5
2000	83.4	83.5	84.6	86.8	90.2	94.1	96.9	95.2	95.2	95.2	95.2
2500	81.2	80.9	82	84.3	88.5	92.1	95	94.6	94.6	94.6	94.6
3150	78.5	77.6	78.6	81.2	86.8	89.8	92.8	94.8	94.8	94.8	94.8
4000	76.3	75	76.1	78.7	85.1	87.8	90.9	94.3	94.3	94.3	94.3
5000	72.5	70.7	71.8	73.9	80.4	83.6	86.5	90	90	90	90
6300	68	65.4	66.4	67.5	73.9	78.1	80.5	83.7	83.7	83.7	83.7
8000	64.3	61.1	62.1	62.6	69.2	73.9	76.1	79.4	79.4	79.4	79.4
10000	60.6	56.8	57.9	57.8	64.5	69.7	71.6	75.2	75.2	75.2	75.2
Total	97.6	97.6	97.7	99.5	102.2	105.0	107.1	107.8	107.8	107.8	107.8

4.1.4 BESS

Sound power levels used for the battery and inverter units were as per manufacturer’s data, while the transformers were based on the ‘reduced’ level derived from the Australian/New Zealand Standard AS/NZS60076.10:2009 Power Transformers Part 10: Determination of sound levels (IEC 60076-10, Ed.1 (2001) MOD) (AS/NZS60076), as required by the Minister’s Assessment.

The sound power of equipment used for the assessment can be seen in Table 13. It is noted that these noise levels can be achieved in all seasons.

Table 13: Operating Scenario Noise Data

	Number of units	SWL per unit
Battery	105	80 dB(A)
Inverter	70	85 dB(A)
Site Transformer	1	90 dB(A)

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4.2 ASSESSMENT METHODOLOGY

4.2.1 Construction Noise

The noise from the construction of the Project has been predicted using the *ISO 9613-2:2024 Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors (ISO 9613)* noise propagation model, as implemented in the SoundPLANnoise software (version 9.1). The ISO 9613 noise propagation model is widely accepted as an appropriate model for ground-based sources and takes into account relevant influences, including:

- Sound power levels of each individual noise source
- The location of noise sources
- Separation distances between the noise sources and the sensitive receivers
- The influence of barriers
- The influence of the ground
- Directivity of the noise source
- Atmospheric absorption

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The ISO 9613 model is known as a downwind noise model and is based on the meteorological conditions that are favourable to noise propagation and the assumption that the receiver is downwind from the noise source.

The following inputs have been used in the model:

- Ground factor of 0.7
- Temperature of 10°C³
- Relative humidity of 70%

The air absorption coefficients corresponding to the conditions above are as follows:

Temperature °C	Humidity %	Atmospheric Attenuation Coefficient α dB/km							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
10	70	-0.1	-0.4	-1.0	-1.9	-3.7	-9.7	-32.8	-117.0

³ 10°C has been chosen as a conservative assumption as it results in a higher level of sound propagation and therefore higher noise levels at residences. However, at this temperature, the fan speeds are likely to be lower than the assumed 100% operating speed.

All dwellings which are not owned by stakeholders of the wind farm are separated by 1,200m or more from the closest proposed wind turbine location (with D12 and D373 being the closest).

Based on the setback distances, predictions have been made for 1,200m from activity at a turbine site and 890m from the substation/BESS facility to provide indicative levels which can be expected at residences. In addition, the estimated setback distance required in order to achieve the “outside normal working hours” and “night time” reference levels of 40 dB(A) and 30 dB(A) respectively have been provided. The predictions and the distances may be used during the detailed design when determining if a work process fits into the definition of “low-impact” or “managed-impact” under Publication 1834.2.

It is noted that in reality, noise levels will likely be less than those predicted as a result of topography and barriers at the construction site. Noise levels will also reduce with greater distance, such as at residences further away from the wind farm.

4.2.2 Quarry, Concrete Batching and Utilities Noise

The noise from operation of the quarry and concrete batching plants, and BESS and substations, has been modelled using the ISO 9613 propagation model within the *SoundPLANnoise* software (version 9.1), as described in Section 4.2.1.

4.2.3 Wind Turbine Noise

The methods of predictions should be based upon Section 6 of the Standard. In accordance with Section 6.1.2 of the Standard, predictions of wind farm sound levels should take into account:

- (a) Sound power levels and positions of wind turbines, see Section 4.1 for details
- (b) Directivity of propagation
- (c) Meteorological conditions
- (d) Attenuation due to geometric spreading
- (e) Attenuation due to atmospheric absorption
- (f) Ground attenuation
- (g) Miscellaneous attenuation, for example, through foliage and buildings;
- (h) Barrier and terrain screening

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The Standard states that there is no standardised sound propagation calculation method, but provides an example of using the noise propagation model within ISO 9613-2. The edition of ISO 9613-2 has not been provided, and therefore has been assumed as the latest edition which is ISO 9613-2 Second Edition 2024-01 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors (ISO 9613-2)*. It is noted that the Technical Guideline specifies that ISO 9613-2 – 1996 should be used unless appropriate and adequate justification is provided. The justification for the use of the latest edition (2024) rather than the 1996 edition is the “Latest Revisions” section of the Standard, which states that “The users of this Standard should ensure that their copies of the above-mentioned reference documents are the latest revisions”.

A noise model of the site has been developed using the *ISO 9613-2* prediction method as implemented by SoundPLANnoise software (version 9.1) to predict the noise level resulting at the surrounding residences. The model considers the noise level generated by each noise source, the shielding effects provided by barriers and topography, and meteorological conditions that are conducive to noise propagation.

In accordance with ISO 9613-2, shielding effects from barriers and topography have been calculated at hub height and are also limited to 3 dB(A). ISO 9613-2 also specifies the ground effect should be no more than 0.5. A ground effect of 0.5 has been applied within the noise model. The topography of the area, which is based on publicly available data with a 10m resolution, can be seen relative to the noise sensitive receivers and WTGs in Figure 8.

Meteorological conditions are not specifically defined with the propagation of noise from a wind turbine within ISO 9613-2. Meteorological conditions which are conducive to the propagation of noise have been applied, in accordance with the Technical Guideline. These include:

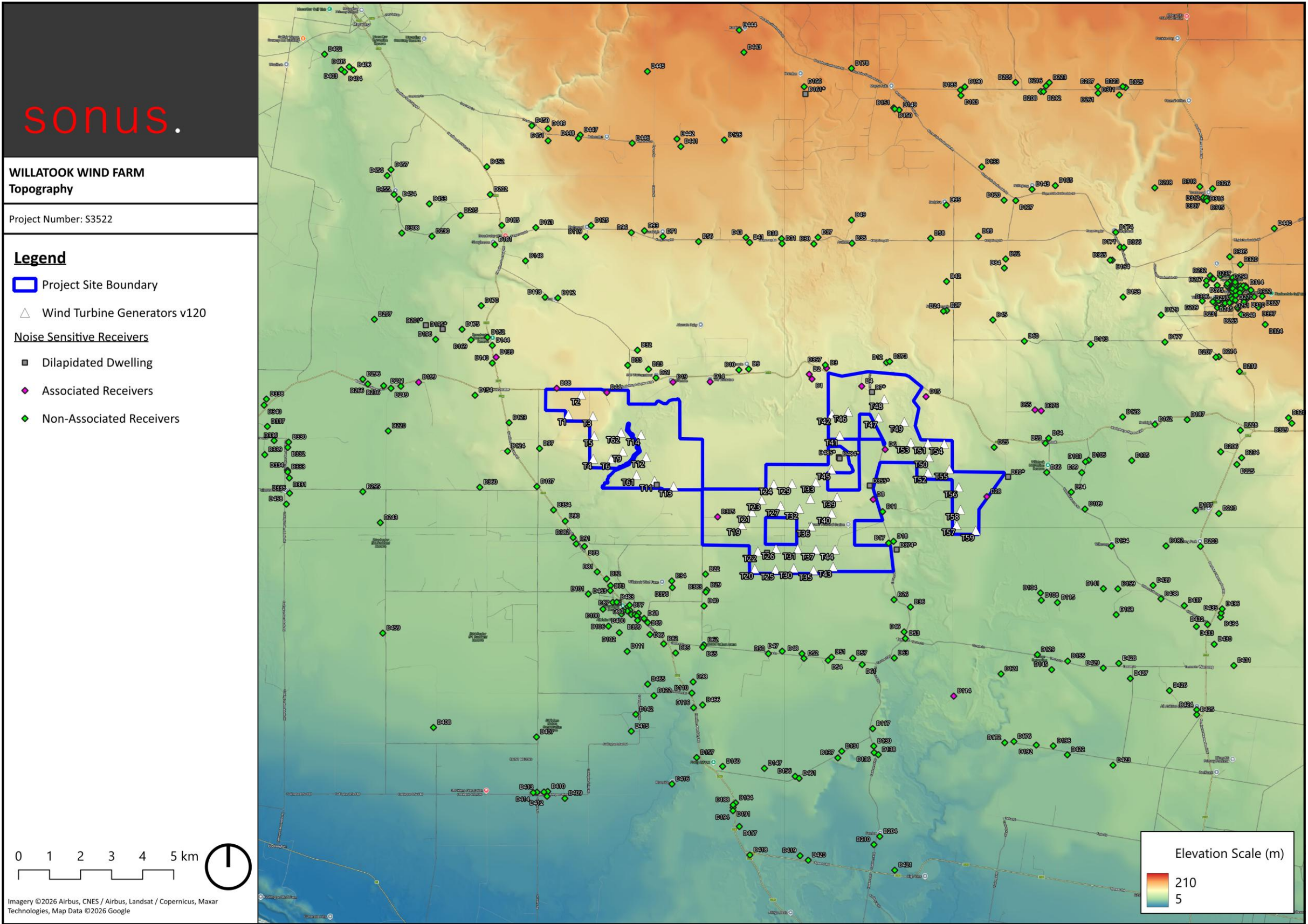
- Humidity 70%
- Air pressure 1013.3 mbar
- Temperature 10 °C

As per the Technical Guideline, the receiver height has also been set at 4m.

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4.3 PREDICTED NOISE LEVELS

4.3.1 Construction Noise

Road and Hardstand Excavation

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The following table provides the distance to achieve the 40 dB(A) and 30 dB(A) reference levels.

Table 14: Substation/BESS Construction Noise Predictions

Phase	Equipment Details	Distance to achieve 40 dB(A)	Distance to achieve 30 dB(A)
Road and Hardstand Excavation	Dozer Scraper Excavator Compactor Grader Roller Dump Truck Water Truck	1700m	3300m

WTG Construction

Table 15 provides the predicted noise levels from turbine construction at a setback distance equivalent to the closest residences (approximately 1,200m from a turbine site) and the distance to achieve the 40 dB(A) and 30 dB(A) reference levels.

Table 15: WTG Construction Noise Predictions

Phase	Equipment Details	Noise Level at 1200m, dB(A)	Distance to achieve 40 dB(A)	Distance to achieve 30 dB(A)
Concrete Pouring	Concrete Pump Concrete truck x 3 Generator	34	650m	1500m
Prepare foundation	Clean stud threads with angle grinder/wire wheel Remove nuts from studs with electric impact driver & generator Remove template flanges Clean foundation with motorised pressure washer Lights (for night time operation)	30	550m	1200m
Prepare Base Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	33	700m	1500m

Phase	Equipment Details	Noise Level at 1200m, dB(A)	Distance to achieve 40 dB(A)	Distance to achieve 30 dB(A)
Install Base Tower	Lift tower into place with crane Install foundation nuts with electric impact driver & motorised 240V generator (inside & outside tower @ ground level) Lights (for night time operation)	33	700m	1500m
Prepare Mid Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	33	700m	1500m
Install Mid Tower	Lift tower into place with crane Install Base / Mid nuts with electric impact driver & generator (inside tower) Lights (for night time operation)	33	700m	1500m
Prepare Top Tower	Clean inside & outside of tower with motorised pressure washer Lift tower with crane Clean underside of tower with motorised pressure washer Lights (for night time operation)	33	700m	1500m
Install Top Tower	Lift tower into place with crane Install Base / Mid nuts with electric impact driver & generator (inside tower) Lights (for night time operation)	33	700m	1500m
Prepare Nacelle	Complete assembly with hand tools Clean outside of nacelle with motorised pressure washer Lift nacelle with crane Clean underside of nacelle with motorised pressure washer Lights (for night time operation) ALE Self Propelled Trailer	34	750m	1500m
Install Nacelle	Lift nacelle into place with crane Install nacelle / tower bolts & nuts with electric impact driver & generator (inside nacelle / tower) Lights (for night time operation)	31	600m	1300m
Prepare Hub	Complete assembly with hand tools Clean outside of hub with motorised pressure washer Lift hub with crane Clean underside of hub with motorised pressure washer Lights (for night time operation) ALE Self Propelled Trailer	35	800m	1700m

Phase	Equipment Details	Noise Level at 1200m, dB(A)	Distance to achieve 40 dB(A)	Distance to achieve 30 dB(A)
Install Hub	Lift hub into place with crane Install hub / nacelle bolts with electric impact driver & generator (inside nacelle / tower) Lights (for night time operation)	30	550m	1200m
Prepare 3 No. Blades	Remove transport frames with electric impact driver & motorised 240V generator (on hardstand) Install blade studs with electric impact driver & generator Lift blade with crane Clean blade with motorised pressure washer Lights (for night time operation)	34	750m	1500m
Install 3 No. Blades	Lift blades into place with crane Install blade / hub nuts with electric impact driver generator (inside hub) Lights (for night time operation)	32	600m	1400m
Install HV & LV cabling and Install Lift	Lift cables into place with electric winch & motorised generator – fasten with hand tools (inside tower) Lights	27	400m	950m
Movement of Equipment	ALE Self Propelled Trailer	30	600m	1200m

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Substation/BESS Construction

The following table provides the predicted noise levels from construction activity at the substation/BESS site at a setback distance equivalent to the closest residences (approximately 890m from the substation/BESS site) and the distance to achieve the 40 dB(A) and 30 dB(A) reference levels.

Table 16: Substation/BESS Construction Noise Predictions

Phase	Equipment Details	Noise Level at 890m, dB(A)	Distance to achieve 40 dB(A)	Distance to achieve 30 dB(A)
Concrete Pouring	Concrete Pump Concrete truck x 3 Generator	37	650m	1500m
Substation/BESS site fencing, lifting components and installation of electrical	Lift components with crane Use of hand tools such as an angle grinder or impact driver	33	550m	1200m
Movement of Equipment	ALE Self Propelled Trailer	34	600m	1200m

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Construction Hours

As noted in Section 2.2, there are no objective criteria for work which occurs during the standard operating hours. Therefore, the noise levels from the above activities will comply with the requirements of Publication 1834.2 where reasonable and practical noise reduction measures are implemented in accordance with the following sections.

In addition, the noise levels indicate that all of these activities could be undertaken where justified to be low noise impact or managed impact works between the hours of 6pm and 10pm on Monday to Friday and from 1pm to 10pm on Saturdays. That is, the noise level is predicted to be less than 40 dB(A) and therefore could be undertaken where it is demonstrated the background noise level is at least 30 dB(A). The measurement procedure in this assessment can be used to demonstrate that the noise level from construction does not exceed the background noise level by more than 10 dB(A).

Should there be a need to undertake works during the night period (10pm to 7am any day) and the works can be justified, the minimum separation distances provided in the tables to achieve the reference noise level of 30 dB(A) should be considered where possible. It is noted that if any noise characteristics (such as tonality or impulsiveness) are present, the distances may need to be increased to achieve inaudibility. It is recommended that the measurement procedure in this assessment be used to measure the noise level from these activities, the background noise level and conduct observations at various setback distances to ensure that the noise from construction is inaudible at residences. Unless strong justification can be provided for unavoidable works, the work should only proceed in locations where the noise level will be inaudible at residences.

Strong justification for works to proceed at higher noise levels could be made for activities such as lifting of turbine components (which requires low wind speed conditions and uninterrupted construction). The timing and need for these activities will not be confirmed until the construction contractor is known and has scheduled the construction of the wind farm. An application to undertake these works will be made when/if there is a need to work outside of the Normal Working Hours.

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General Environmental Duty

The General Environmental Duty requires that

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

To provide an indication of the risk of harm to human health, reference is made to the *World Health Organisation Guidelines for Community Noise* (the **WHO Guidelines**). The WHO Guidelines provide the following recommendations to avoid critical health effects:

Specific environment	Critical health effect	Guideline value
Outdoor living area	Serious annoyance, daytime and evening	55 dB(A)
	Moderate annoyance, daytime and evening	50 dB(A)
Outside Bedrooms	Sleep disturbance, windows open	45 dB(A)

The predicted construction noise levels are well below the WHO Guideline recommended levels (at stakeholder and non-stakeholder residences) and therefore the risk of harm to human health from temporary construction noise is very low. Notwithstanding, consideration has been given to measures to further reduce noise levels in the following section.

For construction activities at wind farms, ground vibration is unlikely to be detectable to humans at distances greater than approximately 100m. Given the expected separation distances, the risk of harm to human health from vibration associated with construction is therefore not significant.

Minimising Noise and Vibration

A guide on minimising noise and vibration, as well as a complaints response procedure are provided in Appendix I.

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4.3.2 Quarry and Concrete Batching Noise

Quarry

Predictions for the proposed quarry indicate that the noise criteria under the Noise Protocol will easily be achieved at all non-stakeholder dwellings without any specific acoustic treatment. The noise level from the proposed activities is predicted to be 26 dB(A) at the closest non-stakeholder dwelling (D34) and 32 dB(A) at the closest stakeholder dwelling (D375), thereby achieving the night time criterion of 36 dB(A), determined under the Noise Protocol. The assessment will therefore allow for the final operating hours to be determined by the contractor.

The low frequency noise levels at the closest dwellings to the quarry have been predicted. The predictions have been made based on previous measurements of the low frequency spectrum for quarry equipment such as dozers and large trucks. The noise levels in each one third octave band from 10Hz up to 160Hz have been compared against the outdoor levels in Publication 1996.

Based on the predictions, the one-third octave band noise levels up to 160 Hz are below the outdoor threshold levels at all associated and non-associated residences. Predicted noise levels are less than 40 dB in each one third octave band, easily achieving the requirements under Publication 1996.

Consideration has been given to the cumulative noise from the quarry and any other future potential noise sources. Given the low predicted noise levels, there is scope for other noise sources to contribute to the noise at residences without exceeding the criteria of the Protocol.

Notwithstanding the low predicted noise levels, it is recommended that noise management be part of the overall environmental management plan, to assist in fulfilling the requirements of the *General Environmental Duty under the Environment Protection Act*.

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Concrete Batching

Predictions for the proposed concrete batching plants indicate that the noise criteria under the Noise Protocol will be achieved at all non-stakeholder dwellings without any specific acoustic treatment. The noise level from the proposed activities is predicted to be less than 28 dB(A) at the closest non-stakeholder dwellings (D11 and D33) thereby achieving the evening time criterion of 41 dB(A), determined under the Noise Protocol⁴.

At the closest stakeholder dwellings (D6 and D44), the predicted noise level is 38 dB(A), which achieves the evening criterion under the Noise Protocol.

The assessment will therefore allow for the final operating hours to be determined by the contractor.

Consideration has been given to the cumulative noise from the concrete batching plants and any other future potential noise sources. The predictions include the noise from all batching plants operating simultaneously, and are at least 3 dB(A) below the criteria for evening operation. In order to not exceed the Protocol, any future industrial noise sources should not exceed a noise level of 41 dB(A) at the closest non-stakeholder dwelling (D11 and D33) and 38 dB(A) at the closest stakeholder dwelling (D6 and D44). These limits would only apply when the temporary concrete batching plants are in operation.

It is therefore recommended that noise management be part of the overall environmental management plan for the concrete batching plants, to assist in fulfilling the requirements of the *General Environmental Duty under the Environment Protection Act*.

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⁴ The concrete batching is understood to not occur during the night hours, as discussed in Section 2.3.

4.3.3 WTG Noise

Predicted Noise Levels

The highest predicted noise level (i.e. wind speed at which each WTG generates the maximum noise level) at noise sensitive receivers is shown in Table 17.

Table 17: Highest Predicted Noise Levels

Receiver Type	Highest Predicted Noise Level	Location of Highest Predicted Noise Level	Lowest Relevant Noise Limit
Non-Associated Receiver (other than HAA Receiver)	40 dB(A)	D11	40 dB(A)
Non-Associated Receiver (HAA Receiver)	31 dB(A)	D67	35 dB(A)
Associated Receiver	43 dB(A)	D6	45 dB(A)

The predicted noise levels achieve both the day and night noise limits for all winds speeds. The predictions at all wind speeds for noise sensitive receivers with a highest predicted noise level greater than 30 dB(A) are shown in Appendix H. The noise contours for the highest predicted noise levels are shown in Figure 9.

Despite Table 17 demonstrating compliance with the relevant noise limits, if required mitigation measures to manage any operational noise risks could include:

- Curtailment of WTGs under certain wind conditions
- Proprietary noise reduction options (manufacturer specific)
- Ongoing maintenance.

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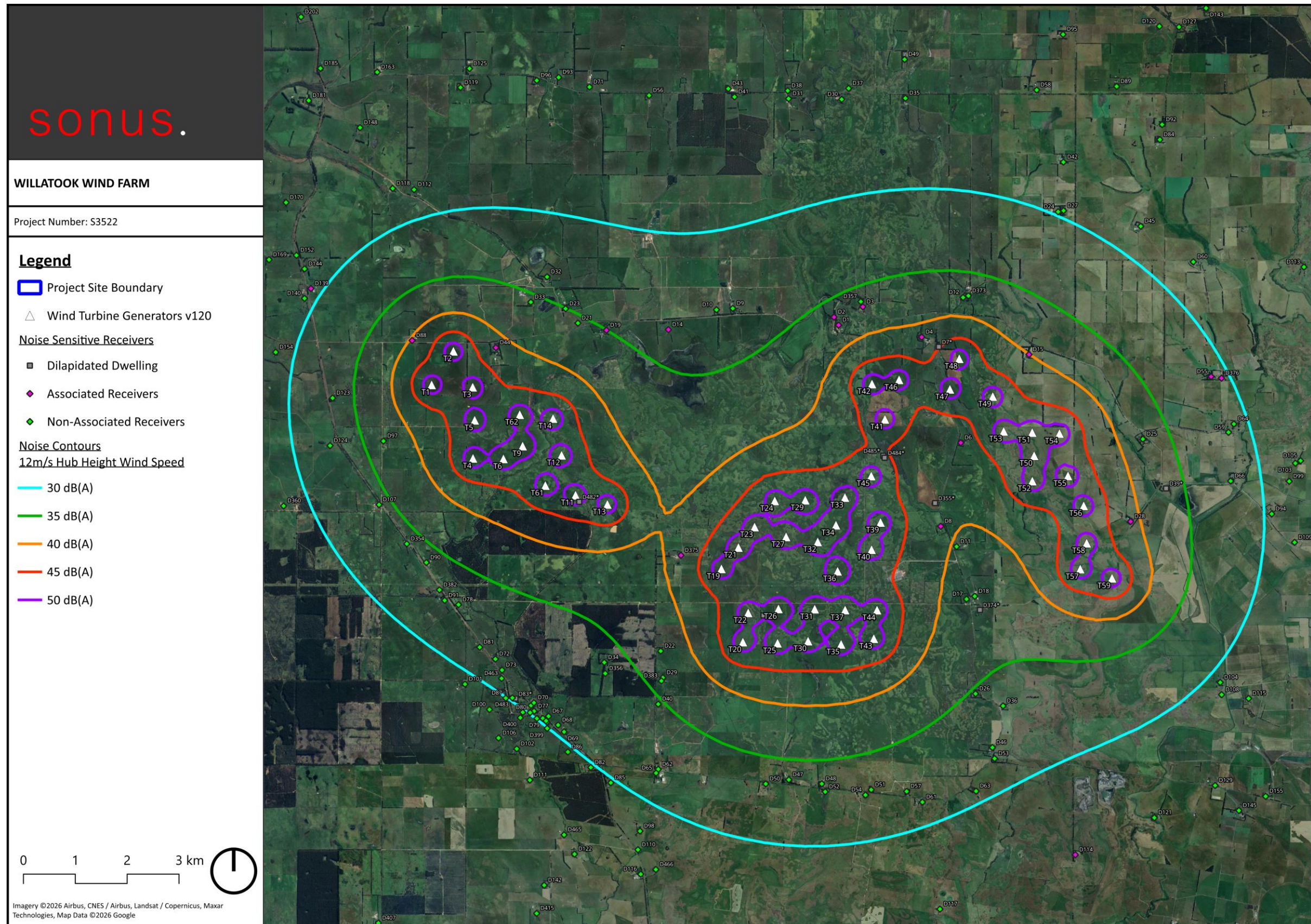


Figure 9: WTG Noise Contours

Special Audible Characteristics

In accordance with the Standard, a wind farm should be designed so that the sound at a noise sensitive receiver does not have special audible characteristics (tonality, impulsiveness and amplitude modulation). Special audible characteristics cannot always be predicted and therefore consideration should be given to special audible characteristics when comparing the measured level to noise limits.

Where a special audible characteristic exists, a penalty of up to 6 dB shall be added to the measured noise level at the noise sensitive location.

The Standard provides an objective “simplified test method” for determining if a sound includes tonality, which considers the one-third octave bands. This method has been applied to the one-third octave band sound power level data for the candidate turbine. The method indicates that a penalty would not apply.

The remaining test methods under the Standard apply to measurements of the noise at dwellings and therefore cannot be predicted. Based on the assessment, a penalty for special audible characteristics has not been applied to the predicted operational noise levels in this report.

Should the Project proceed, a compliance monitoring regime will be undertaken to determine the operational noise level from the wind farm at dwellings. The regime will include testing for the presence of any special audible characteristics. Should there be special audible characteristics identified, which result in the noise limits being exceeded, modifications will be required to achieve compliance. This could be achieved by removal of the special audible characteristic or operation of turbines in noise reduced modes under specific wind conditions.

4.3.4 BESS Noise

The highest predicted noise level from the BESS is 27 dB(A) at D8 (associated) and 26 dB(A) at D11 (non-associated). This achieves the noise limits during all time periods. Noise contours for the BESS are provided in Figure 10.

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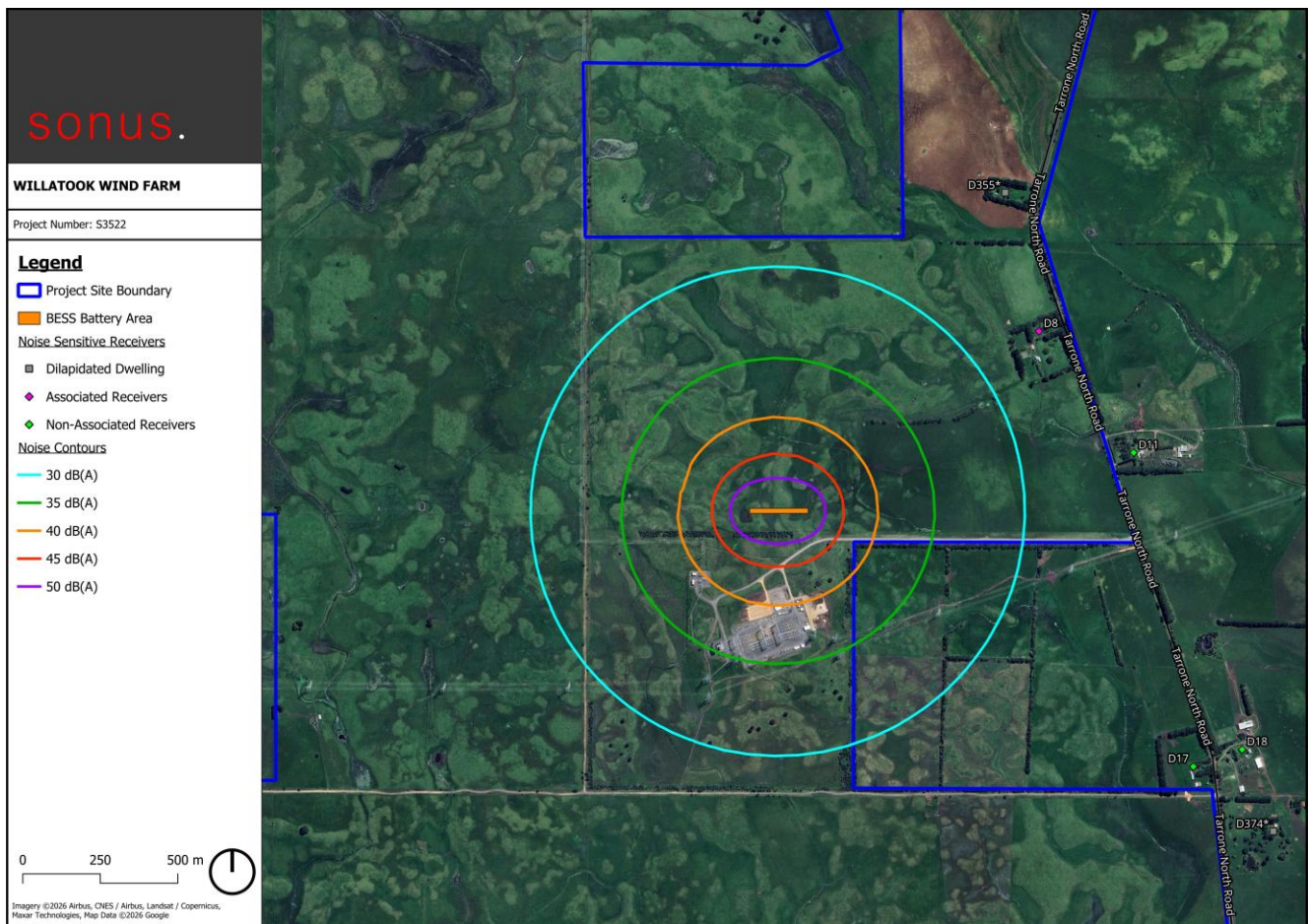


Figure 10: BESS Noise Contours

Noise Characteristics

Duration, Impulse and Intermittency adjustments

It is anticipated that under the worst case operational conditions, the units would operate continuously at their maximum designed capacity for the period. Therefore, no adjustment for duration, impulse or intermittency is applicable.

Tonality Adjustment

The objective tonality assessment methodology of the Protocol has been applied to the predicted noise levels. The assessment showed a 2 dB(A) adjustment is applicable, increasing the highest predicted noise level to 29 dB(A), which still achieves the noise limits during all time periods.

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Low Frequency Noise

The noise from the proposed BESS equipment is dominated by many small fans. These fans are not sources of significant low frequency noise but rather produce most noise in the mid-frequencies. Measurements of noise close to the components confirm that low frequency noise is not a significant component. Notwithstanding, the highest predicted noise levels at each receiver have been calculated and are summarised in Table 18.

Table 18: Predicted Low Frequency Noise (dB)

One-Third Octave (Hz)	25	31.5	40	50	63	80	100	125	160
D8	40	38	39	42	42	42	30	25	25
Criteria	69	61	54	50	50	48	48	46	44

BESS General Environmental Duty

The BESS has been designed with the reduction of noise as a primary consideration. This has included manufacturer's attenuation being incorporated into the design.

Other measures, such as noise barriers and site levels have been considered to reduce noise but have been found to be ineffective. To be effective, the barrier must be located close to the noise source or noise receiver and block line of sight between them.

The proposed layout results in noise levels which are no higher than 29 dB(A) during the night (accounting for a tonality adjustment). These levels are well below the recommendations of the World Health organisation to protect against health impacts of 40-45 dB(A) at night and 50-55 dB(A) during the day.

The approach to environmental noise has included a conservative assessment of criteria as well as the use of every practical measure to reduce noise. Based on this approach, it is considered that all reasonably practical methods of minimising noise pollution have been explored.

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4.4 CUMULATIVE WIND FARM NOISE

An assessment has been made of the cumulative noise resulting from the Project and surrounding wind farms. Publicly available noise contours have been reviewed for the Hawkesdale Wind Farm, Macarthur Wind Farm, Ryan Corner Wind Farm and Woolsthorpe Wind Farm. These contours have been compared to the 30 dB(A) noise contour from the Project, as shown in Figure 11.

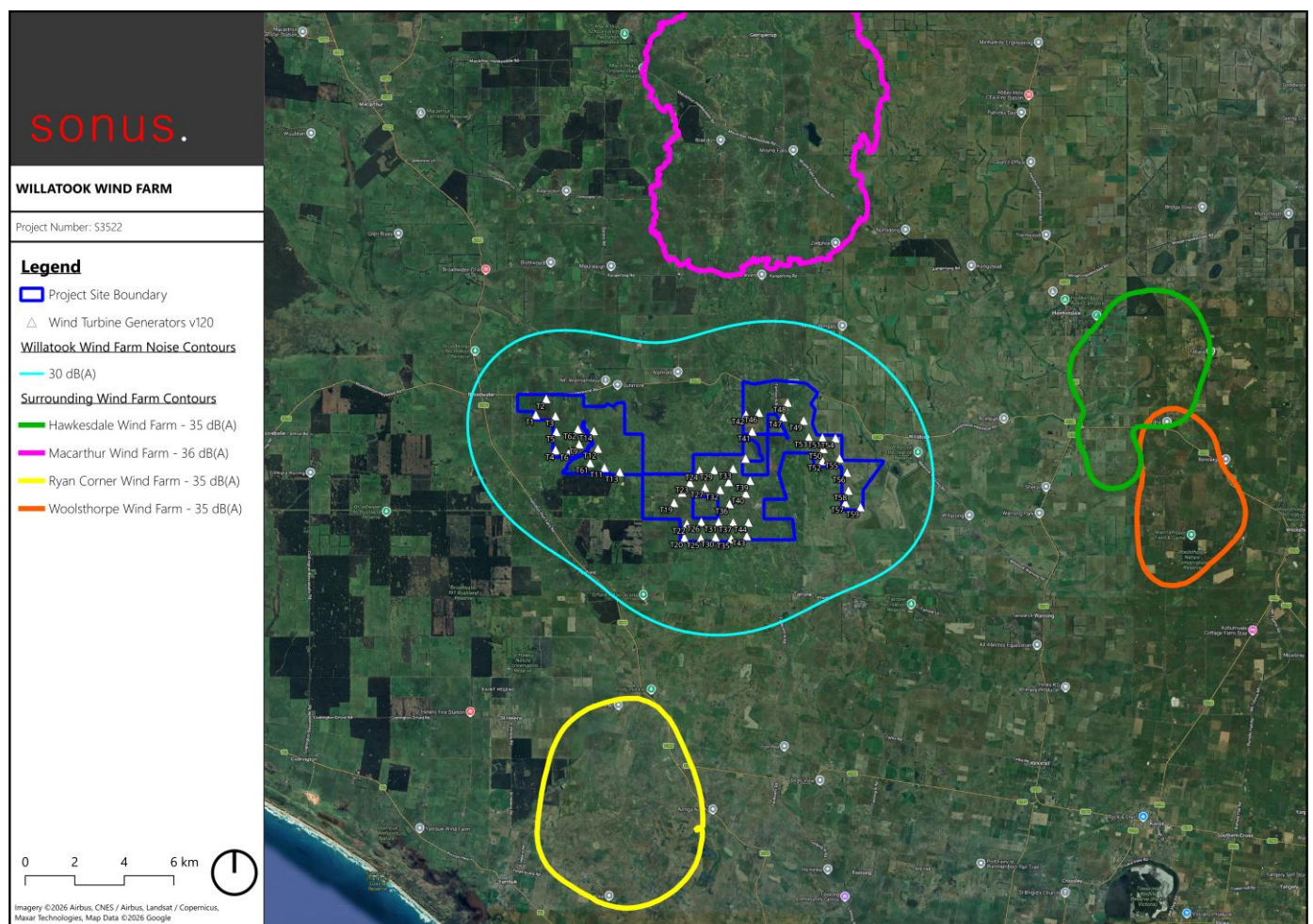


Figure 11: Cumulative Noise Contours

As shown in Figure 11, there is no overlap between the 30 dB(A) noise contour of the Project, and the surrounding wind farms 35 dB(A) or 36 dB(A) noise contours. Although it is not possible based on the contours presented in Figure 11, if a receiver were to receive a noise level of 30 dB(A) from the Project and up to 36 dB(A) from any surrounding wind farm, the total noise level would be 37 dB(A). As the minimum criterion for wind farm noise is 40 dB(A) (outside of any high amenity area), noise from the Project cannot therefore contribute to a non-compliance at any other site.

5 UNCERTAINTY

Within the assessment, various areas of uncertainty have been identified. The general approach with noise modelling is to take a conservative approach to marginally over-predict noise levels to account for any potential uncertainties in the process. For example, noise models unrealistically assume that the wind is blowing from all noise sources to all receivers at the same time, resulting in higher noise levels. Notwithstanding, each of the identified areas of uncertainty are discussed below.

5.1 REMOVAL OF EXTRANEOUS NOISE FROM BACKGROUND NOISE MONITORING RESULTS

In accordance with Section 7.2.4 of the Standard, extraneous noise caused by events including precipitation, insects and fauna has been removed from the data set as far as reasonably practical. The approach taken with respect to excluding noise from insects and fauna was to recalculate the background noise levels over a certain frequency range (and exclude high frequency noise which is a common characteristic of insect and fauna noise), which is described in detail within Section 3.3.2. The process of removing the high frequency noise from certain periods within the dataset will result in some uncertainty in relation to the background noise level. As the process always results in a lowering of the background noise levels in comparison to what was measured, the resultant criteria are also more onerous than would be derived without removing the high frequency noise.

5.2 SELECTION OF PREDICTION MODEL

Predictions of WTG noise have been undertaken using ISO 9613-2 Second Edition 2024-01 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors*. Discussion as to why this standard was selected can be found in Section 4.2.3.

The ISO technical committee (TC43) has since provided feedback that three issues have been identified in the formulae provided in the 2024 version of the standard, in particular the barrier/screening calculations (note that while these issues have been identified, the standard has not been withdrawn). Advice provided is that the standard is over-predicting noise levels:

After publication and implementation of ISO 9613-2:2024 in software applied for noise prediction, plant operators reported that during the trial recalculation of large existing projects, significantly higher sound pressure levels were obtained in some cases, which also deviated from the experience with measurements.

There is therefore some uncertainty in relation to the use of the latest edition of ISO 9613-2. Noise predictions for the WTG noise at 10m/s hub height wind speed have therefore also been completed using the previous 1996 version of ISO 9613-2 (also implementing the recommendations of the IOA for use of this standard to predict noise from wind turbines), to compare with the results of ISO 9613-2 Second Edition 2024-01. The results found that there are no changes to the predicted noise levels for all receivers greater than 30 dB(A).

5.3 SUPPLIED SOUND POWER LEVEL DATA

The Vestas specification states the following in relation to the sound power level data provided for their WTGs: *Turbine noise measurements are conducted following IEC 61400-11 Ed.3 across potentially multiple turbines and turbine sites to collect a representative set. The mean of these results are then computed to define the expected 3rd octave emission.*

Experience on previous projects has indicated that the use of the specified level, without any addition for uncertainty provides a reliable method of predicting noise from turbines. In these circumstances, no adjustment for uncertainty has been applied.

Through the commercial negotiation process with the preferred WTG supplier, it is anticipated that a guarantee will be obtained to reduce any remaining uncertainty.

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6 CONCLUSION

An environmental noise assessment has been made of the construction, operation and decommissioning of the Willatook Wind Farm.

The Project will involve up to 52 wind turbines, having a tip height of approximately 254m and ancillary infrastructure to serve the project.

The assessment has been made with reference to the following current noise policies and standards:

- *General Environmental Duty* under the *Environment Protection Act 2017*
- *Environment Protection Regulations 2021* which includes the *Environment Protection Amendment (Wind Turbine Noise) Regulations 2022*
- Construction activities in accordance with the *EPA Publication 1834.2 Civil construction, building and demolition guide*
- Wind turbine operational noise in accordance with the *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria and NZS 6808:2010 Acoustics – Wind Farm Noise for the turbines*
- Ancillary infrastructure, such as the quarry, concrete batching, BESS and substations, in accordance with the *EPA Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*
- *Willatook Wind Farm Minister's Assessment Under Environmental Effects Act 1978 July 2023*

Background noise monitoring has been conducted at six locations in the vicinity of the proposed wind farm to assist in determining compliance of the wind farm. The objective limits for the wind turbine operational noise have been determined in accordance with the publications described above.

Predictions have been made of the operational noise from Vestas V172 7.2MW turbines with blades with serrated trailing edges, having a hub height of 166m. The predictions have been conducted using the ISO9613 prediction model and indicate that the project criteria will be achieved at all non-stakeholder dwellings, and as such, the wind energy facility will comply with the noise limits set within Division 5 of Part 5.3 of the *Environment Protection Regulations 2021*.

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An assessment has been made of the potential cumulative noise level from the operation of the Willatook Wind Farm and other nearby existing and approved wind farms. Those considered include Macarthur, Ryan Corner, Hawkesdale and Woolsthorpe Wind Farms. The assessment concludes that the cumulative noise will achieve the criteria of the Standard.

Predictions have been made of the noise from ancillary infrastructure, including the proposed quarry and concrete batching plants, transformers at the site substation and the BESS facility. The predictions indicate that the noise from the substation and BESS facility will achieve the noise criteria for utilities. The noise from the quarry and concrete batching plants have also been predicted to achieve the noise criteria for other commercial, industrial and trade premises without any specific treatments of the facility. As such, the quarry, concrete batching and utilities noise will comply with the noise limits set by the *EPA Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*.

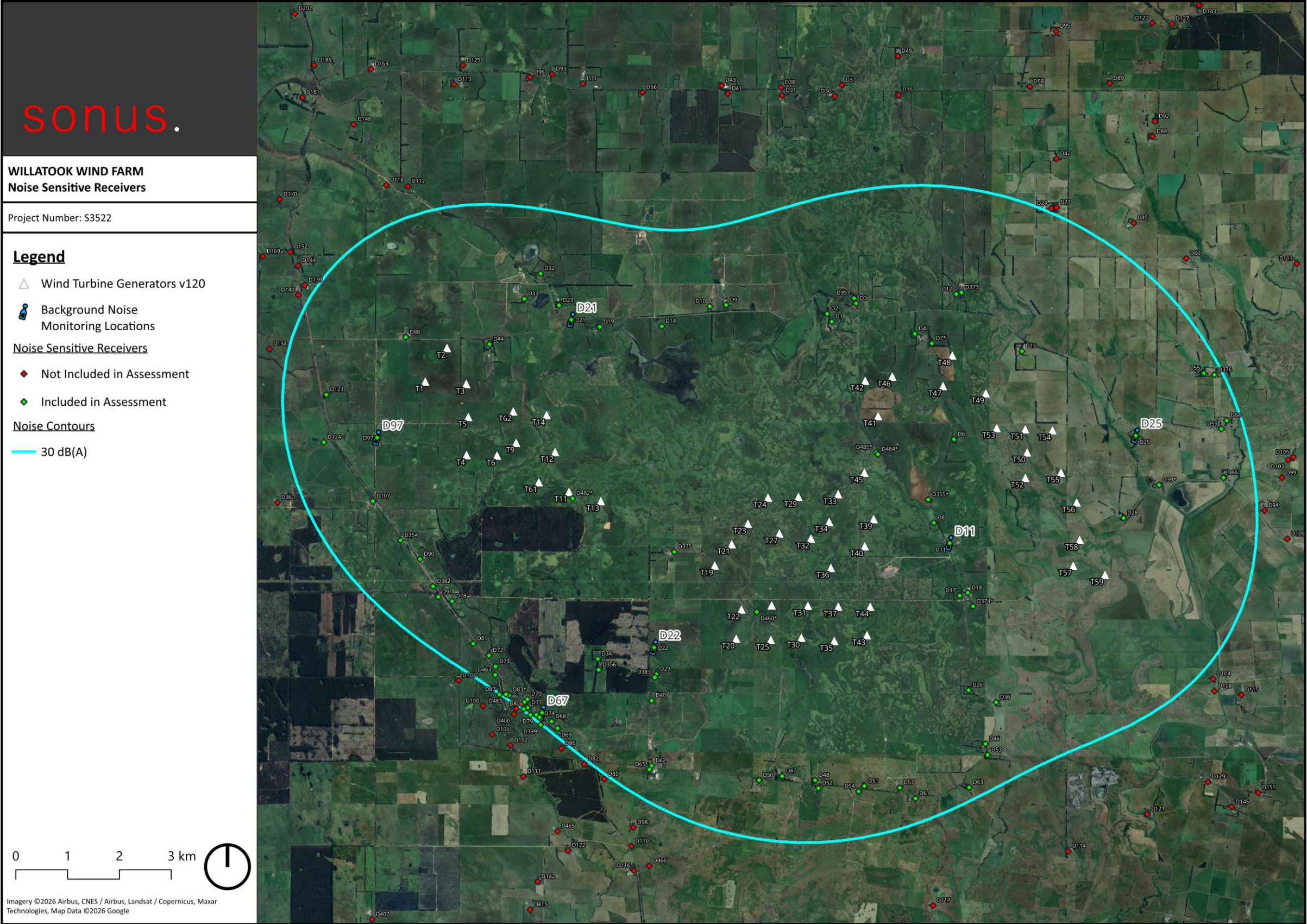
Construction noise has also been considered. The assessment indicates that all construction activities could be undertaken where justified to be low noise impact or managed impact works between the hours of 6pm and 10pm on Monday to Friday and from 1pm to 10pm on Saturdays. Minimum separation distances are provided for various construction activities to achieve the reference noise levels for works at night. The timing and need for evening and night time construction works will be confirmed once the construction contractor is known and has scheduled the construction of the wind farm. An application to undertake these works will be made when/if there is a need to work outside of the Normal Working Hours.

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APPENDIX A: NOISE SENSITIVE RECEIVERS



Location	Association Status	HAA	Coordinates (GDA2020 / MGA zone 54)		Closest WTG	Distance to Closest WTG (m)	Representative Background
			Easting	Northing			
D1	Associated	No	602338	5778517	T42	1300	D19
D2	Associated	No	602249	5778671	T42	1480	D19
D3	Associated	No	602806	5778870	T42	1500	D19
D4	Associated	No	603939	5778286	T48	840	D11
D6	Associated	No	604693	5776249	T53	860	D11
D7*	Associated	No	604270	5778099	T48	460	D11
D8	Associated	No	604307	5774639	T39	1160	D11
D14	Associated	No	599057	5778429	T14	2810	D19
D15	Associated	No	606009	5777950	T49	1070	D25
D19	Associated	No	597861	5778419	T14	1990	D19
D28	Associated	No	607967	5774731	T58	940	D25
D39*	Associated	No	608652	5775369	T56	1620	D25
D44	Associated	No	595730	5778083	T2	820	D19
D55	Associated	No	609519	5777525	T54	3120	D25
D88	Associated	No	594116	5778220	T2	820	D97
D355*	Associated	No	604198	5775087	T39	1120	D11
D374*	Associated	No	605063	5773027	T44	1980	D11
D375	Associated	No	599299	5774080	T19	820	D22
D376	Associated	No	609720	5777494	T54	3300	D25
D460*	Associated	No	600889	5772922	T22	300	D22
D482*	Associated	No	597337	5775111	T11	150	D22
D484*	Associated	No	603225	5775960	T45	440	D25
D485*	Associated	No	603199	5775999	T45	450	D25
D9	Non-associated	No	600298	5778839	T42	3050	D19
D10	Non-associated	No	599984	5778813	T42	3320	D19
D11	Non-associated	No	604612	5774248	T39	1540	D11
D12	Non-associated	No	604738	5779050	T48	1180	D25
D17	Non-associated	No	604805	5773236	T44	1740	D11

Location	Association Status	HAA	Coordinates (GDA2020 / MGA zone 54)		Closest WTG	Distance to Closest WTG (m)	Representative Background
			Easting	Northing			
D18	Non-associated	No	604962	5773291	T44	1900	D11
D21	Non-associated	No	597313	5778556	T14	1900	D19
D22	Non-associated	No	598908	5772235	T20	1590	D22
D23	Non-associated	No	597075	5778833	T14	2130	D19
D25	Non-associated	No	608204	5776320	T55	1610	D25
D26	Non-associated	No	604978	5771412	T43	2230	D11
D29	Non-associated	No	598950	5771721	T20	1690	D22
D32	Non-associated	No	596718	5779446	T2	2300	D19
D33	Non-associated	No	596404	5778960	T2	1770	D19
D34	Non-associated	No	597821	5772016	T20	2700	D22
D36	Non-associated	No	605508	5771178	T43	2810	D11
D40	Non-associated	No	598861	5771212	T20	2020	D22
D46	Non-associated	No	605303	5770376	T43	3100	D11
D47	Non-associated	No	601378	5769755	T25	2640	D67
D48	Non-associated	No	602014	5769677	T35	2710	D67
D50	Non-associated	No	600934	5769675	T25	2720	D67
D51	Non-associated	No	602966	5769562	T35	2860	D67
D52	Non-associated	No	602079	5769523	T35	2860	D67
D53	Non-associated	No	605345	5770163	T43	3280	D11
D54	Non-associated	No	602856	5769460	T35	2940	D67
D57	Non-associated	No	603650	5769530	T43	3010	D67
D59	Non-associated	No	609855	5776451	T56	3130	D25
D61	Non-associated	No	603954	5769324	T43	3290	D67
D62	Non-associated	No	598860	5769956	T20	2950	D67
D63	Non-associated	No	604989	5769535	T43	3540	D11
D64	Non-associated	No	609959	5776611	T56	3300	D25
D65	Associated	No	598819	5769883	T20	3030	D67
D66	Non-associated	No	609896	5775512	T56	2870	D25

Location	Association Status	HAA	Coordinates (GDA2020 / MGA zone 54)		Closest WTG	Distance to Closest WTG (m)	Representative Background
			Easting	Northing			
D67	Non-associated	Yes	596746	5770978	T20	4010	D67
D68	Non-associated	No	596931	5770809	T20	3910	D67
D69	Non-associated	No	597045	5770678	T20	3860	D67
D70	Non-associated	No	596464	5771238	T13	4080	D67
D72	Non-associated	No	595722	5772081	T61	3480	D67
D73	Non-associated	No	595850	5771868	T61	3650	D67
D74	Non-associated	Yes	596717	5770865	T20	4080	D67
D75	Non-associated	Yes	596409	5771187	T11	4140	D67
D76	Non-associated	Yes	596636	5770938	T20	4130	D67
D77	Non-associated	Yes	596467	5771076	T13	4230	D67
D78	Non-associated	No	595010	5773129	T4	2830	D67
D79	Non-associated	Yes	596521	5770935	T20	4240	D67
D80	Non-associated	Yes	596390	5771049	T13	4280	D67
D81	Non-associated	No	595419	5772309	T61	3360	D67
D83*	Non-associated	No	596107	5771319	T11	4090	D67
D87	Non-associated	No	595922	5771328	T11	4140	D67
D90	Non-associated	No	594390	5773941	T4	2200	D67
D91	Non-associated	No	594743	5773211	T4	2790	D67
D97	Non-associated	No	593563	5776282	T1	1430	D97
D107	Non-associated	No	593478	5775056	T4	2020	D67
D123	Non-associated	No	592583	5777111	T1	1930	D67
D124	Non-associated	No	592534	5776194	T1	2280	D67
D354	Non-associated	No	594014	5774302	T4	2080	D67
D356	Non-associated	No	597839	5771804	T20	2720	D22
D357	Non-associated	No	602767	5778969	T42	1600	D19
D373	Non-associated	No	604840	5779083	T48	1230	D25
D382	Non-associated	No	594643	5773413	T4	2620	D67
D383	Non-associated	No	598921	5771659	T20	1740	D22

Location	Association Status	HAA	Coordinates (GDA2020 / MGA zone 54)		Closest WTG	Distance to Closest WTG (m)	Representative Background
			Easting	Northing			
D399	Non-associated	Yes	596720	5770744	T20	4120	D67
D463	Non-associated	No	595841	5771707	T11	3810	D67
D464	Non-associated	Yes	596698	5770889	T20	4090	D67
D483	Non-associated	No	596049	5771332	T11	4090	D67

* Dilapidated dwellings

These locations have been included in the table, but it is understood will not be inhabited for the life of the wind farm and therefore are not part of the assessment.

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APPENDIX B: NOISE SOURCE LOCATIONS

APPENDIX B.1: WTG LOCATIONS

WTG	Coordinates (GDA2020 / MGA zone 54)	
	Easting	Northing
T1	594493	5777366
T2	594912	5778014
T3	595284	5777322
T4	595285	5775943
T5	595322	5776684
T6	595876	5775940
T9	596317	5776231
T11	597266	5775240
T12	596997	5776009
T13	597881	5775057
T14	596834	5776718
T19	600079	5773820
T20	600493	5772409
T21	600407	5774231
T22	600595	5772972
T23	600719	5774627
T24	601107	5775130
T25	601161	5772387
T26	601178	5773049
T27	601326	5774436
T29	601695	5775144
T30	601750	5772428
T31	601877	5773044
T32	601936	5774340
T33	602460	5775195
T34	602287	5774662
T35	602386	5772365
T36	602511	5773721
T37	602464	5773027

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WTG	Coordinates (GDA2020 / MGA zone 54)	
	Easting	Northing
T39	603146	5774714
T40	602974	5774190
T41	603231	5776701
T42	602982	5777383
T43	603017	5772475
T44	603079	5773025
T45	602967	5775610
T46	603504	5777464
T47	604484	5777280
T48	604664	5777870
T49	605311	5777141
T50	606108	5776000
T51	606071	5776447
T52	606073	5775512
T53	605521	5776470
T54	606597	5776429
T55	606752	5775541
T56	607125	5774999
T57	606997	5773816
T58	607121	5774315
T59	607610	5773640
T61	596684	5775426
T62	596093	5776969

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APPENDIX B.2: BESS LOCATION

Equipment	Coordinates (GDA2020 / MGA zone 54)	
	Easting	Northing
BESS Construction Area Centroid	603622	5774159

APPENDIX B.3: QUARRY LOCATION

Equipment	Coordinates (GDA2020 / MGA zone 54)	
	Easting	Northing
Quarry Area Centroid	597808	5775176

APPENDIX B.4: CONCRETE BATCHING LOCATIONS

Concrete Batching Locations	Coordinates (GDA2020 / MGA zone 54)	
	Easting	Northing
1	595007	5777731
2	605243	5776831
3	602744	5773957

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APPENDIX C: MINISTER'S ASSESSMENT

APPENDIX C.1: ASSESSMENT CONTEXT

Appendix C.1.1: Construction noise

The Minister's Assessment stated the following in relation to construction noise:

Construction noise needs to be managed in accordance with EPA Publication 1834 Civil construction, building and demolition guide (November 2020).

...

The temporary quarry and concrete plants proposed for the construction phase are classified as commercial, industrial and trade premises and noise must be managed in accordance with the Environment Protection Regulations 2021 (EP Regulations) and the Noise Protocol⁵. Assessments for the EES determined the most stringent applicable limit for quarry noise to be 36 dB(A)(L_{Aeq}), which equates to the night-time (10pm-7am) limit for a 24-hour operation.

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⁵ EPA Publication 1826.4 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues (EPA 2021), since updated to 1826.5

Appendix C.1.2: Construction Vibration

The Minister's Assessment stated the following in relation to construction vibration:

Sources of vibration during construction include earth moving equipment and quarry blasting. Vibration effects from quarry blasting must be managed in accordance with Earth Resources Regulation's (ERR) Ground vibration and airblast limits for mines and quarries. The vibration and airblast limits for blasting in the ERR guidelines are:

- *vibration – 5 mm/s (95% of blasts) and 10 mm/s (for all blasts); and*
- *airblast – 115 dBL (95% of blasts) and 120 dBL (for all blasts).*

Vibration limits for blasting effects on buildings were derived for the EES from the Australian Standard AS2187.2-2006 Explosives - Storage and Use - Use of Explosives.

It is noted that blasting noise and vibration from the quarry has not been considered within this noise assessment, as it has been addressed elsewhere.

Appendix C.1.3: Operational Noise

The Minister's Assessment stated the following in relation to operational noise:

In accordance with Regulation 131B of the EP Regulations, the relevant noise standard for the facility is NZS 6808:2010 Acoustics – Wind Farm Noise (NZ Standard). The relevant noise limit for the facility must be determined in accordance with the NZ Standard. In accordance with the NZ Standard, the level of sound from a wind farm, when heard outside a home, should not exceed the greater of either 40 dB $L_{A90(10min)}$ or the background sound level plus 5 dB at non-stakeholder dwellings. For stakeholder dwellings, the EP Regulations state that, for new wind energy facilities, the noise limit is the greater of either 45 dB(A) or the background sound level plus 5 dB.

Under section 5.3 of the NZ Standard, a high amenity noise limit of 35 dB $L_{A90(10min)}$ may be justified in special circumstances. The NZ Standard identifies circumstances where a more stringent "high amenity" noise limit may be justified to afford a greater degree of protection during the evening and night. The high amenity noise limit should be considered where a planning scheme promotes a higher degree of protection of amenity relating to the sound environment. The high amenity noise limit specified by the NZ Standard is 35 dB or background sound level plus 5 dB, whichever is greater.

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Section 5.3 of the NZ Standard outlines the approach to determining whether high amenity noise limits apply. The first step is to determine whether the area is a high amenity area. If it is determined to be a high amenity area, the second step, described in C5.3.1 of the Standard, outlines the approach to determine if a high amenity noise limit is justified for the area based on whether the area falls within the predicted 35 dB L_{A90} wind farm sound level contour and the night-time background noise level is about 8 dB lower than the predicted noise levels from the wind farm. As pointed out by the Wind Energy Facility Guidelines⁶, further guidance on the application of the high amenity noise limit can be found in the VCAT determination for the Cherry Tree Wind Farm⁷.

APPENDIX C.2: DISCUSSION

Appendix C.2.1: Construction noise

The IAP and the Minister found that the predicted construction noise impacts would be low at less than 40 dB(A) and that they can be managed to acceptable levels.

Appendix C.2.2: Construction noise and vibration – quarry

The Minister assessed that the noise impacts from blasting are likely to be acceptable with the implementation of their recommendations. The Minister's Assessment stated:

Should Wind Prospect proceed with the proposed on-site quarry, Wind Prospect should finalise its work plan for the quarry in accordance with direction from Earth Resources Regulation to ensure noise and vibration effects are appropriately managed and should demonstrate it has taken all practicable measures to reduce noise as far as practicable in line with the General Environmental Duty.

Appendix C.2.3: Operational Noise – Wind turbine noise

Appropriate Noise Limits

The IAP concluded the appropriate noise limits stem from the EP Regulations, which only reference the NZ Standard. The IAP also found that the EP Regulations, as amended in 2022 for wind turbine noise, take precedence over the Wind Energy Facility Guidelines.

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⁶ Development of Wind Energy Facilities in Victoria, policy and planning guidelines (DELWP 2021)

⁷ Cherry Tree Wind Farm v Mitchell Shire Council (2013).

The Minister supported the IAP's conclusion to apply a noise limit of 40 dB $L_{A90(10min)}$ at all wind speeds. However, they recommend this limit only be applied at non-stakeholder dwellings to differentiate it from the noise limits at stakeholder dwellings (45 dB(A) or background plus 5 dB as specified in the EP Regulations).

The IAP found that the Township Zone of Orford should be defined as high amenity for the purpose of the standard and the calculations for a high amenity limit should be undertaken according to the standard, which the Minister agreed with, noting that the requirement is also consistent with the mandatory noise assessment requirement of Clause 52.32 of the Moyne Planning Scheme, which requires that the pre-construction (predictive) noise assessment report includes an assessment of whether a high amenity noise limit is applicable under section 5.3 of the NZ Standard.

Background noise monitoring

The IAP concluded that the data measurements of background noise, being over ten years old, should be updated before construction and that additional data be provided with any future noise measurements to address deficiencies in the background data for the EES.

The IAP found that there is insufficient information in the background monitoring data to establish seasonal or diurnal variation in the background noise levels, including an absence of separate night-time background noise measurement. To these findings, the IAP recommended changes to the background noise measurement reporting requirements in the planning permit conditions, including a requirement for time series noise plot data to capture background noise variability across day and night. The Minister supported the recommendations of the IAP to provide more prescriptive detail on the requirements for future background noise monitoring to ensure the requirements align with the suggestions made in the audit report exhibited with the EES.

The use of the 2010 background monitoring data to inform noise limits was also examined by the IAP, which found that, the measurement of older background noise levels to determine noise criteria is of lesser importance. Wind Prospect previously committed to adopting the more conservative noise criterion of 40 dB $L_{A90(10min)}$ rather than using background measurements to inform noise limits, which negated the issue. The Minister was satisfied that further monitoring required for the predictive noise assessment can inform both the pre-construction noise assessment and post-construction compliance assessments.

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Noise modelling

The IAP was satisfied with the modelling and the modelled noise levels. The Minister agreed with the IAP's finding and its rationale, including that noise modelling will need to be undertaken again when the final wind turbine has been chosen, and that the pre-construction noise assessment report needs to demonstrate compliance with the EP Regulations before development commences.

Special Audible characteristics

The IAP found that turbine models with inherent SACs should not be considered for the project and that SACs are a significant issue and should be considered in the modelling of turbine noise levels during the pre-construction assessment. The IAP recommended changes to the planning permit conditions to require noise level penalties for the presence of SACs.

The Minister disagreed, stating their assessment was that the appropriate time to consider SACs is during commissioning and operational compliance testing in accordance with the NZ Standard, not at the approval stage.

Appendix C.2.4: Cumulative noise impacts

The IAP found that the cumulative noise impacts of the project and the operating Macarthur wind farm to the north can acceptably comply with noise limits. The Minister acknowledged the concerns of Moyne Shire Council about potential cumulative noise impacts from multiple wind energy facilities, but was satisfied that in this case the cumulative noise impacts can be acceptably managed.

Appendix C.2.5: Operational noise – substation and battery energy storage system

The IAP found that there are opportunities to further reduce noise during detailed design of the facilities, including through final equipment selection (e.g., transformers and fans) and noise mitigation (e.g., barriers) as required. The Minister agreed with the IAP's assessment that there are opportunities to further reduce noise emissions from the facilities during detailed design and agreed that the priority should be to reduce noise at the source through the selection of quieter equipment and recommended changes to EMM NV13 to broaden its scope to require consideration of all available options to reduce noise at the source (i.e. not just from the transformer as proposed by NV13).

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The IAP found that noise impacts from the substation and battery energy facility can be acceptably managed. During detailed design noise would be remodelled and, should the results show noise is still above the noise limits, noise barriers would need to be adopted in accordance with EMM NV14. On this basis, the Minister recommended amendments to EMM NV14 to capture the EPA's suggested changes to remove Wind Prospect's reference to the requirements of the Environmental Assessment Report exhibited with the EES and refer to the requirements of the EP Regulations. Subject to these amendments, the Minister supported the IAP's findings that noise impacts from the substation and battery energy facility can be acceptably managed.

APPENDIX C.3: ASSESSMENT

In accordance with the IAP's findings, it was the Minister's assessment that the areas zoned Township Zone within and surrounding Orford, should be considered a high amenity area for the purposes of applying the NZ Standard and Wind Prospect should assess whether a high amenity limit should apply to this area.

The Minister supported the recommendation of the IAP for a 40 dB noise limit at non-stakeholder dwellings consistent with what Wind Prospect volunteered.

The Minister supported the recommendation of the IAP that a pre-construction noise assessment will need to be prepared in accordance with clause 52.32 of the Moyne Planning Scheme, including requirements to:

- acknowledge that the area in and around Orford that is zoned Township Zone is a high amenity area for the purposes of the NZ Standard;
- assess whether a high amenity limit should apply to this area in accordance with clause 5.3.1 of the NZ Standard; and
- conduct background noise monitoring, analysed by 24-hour and night-time (10pm to 7am) periods.

The Minister recommended the following amendments to the proposed EMMs and permit conditions:

- amend NV05 noise requirements for the temporary concrete batching plants to reflect requirements of the EP Act regarding the general environmental duty, consideration of cumulative noise when calculating compliance with noise limits and not emitting unreasonable noise, as defined by the Act;
- amend NV06 to include IAP's recommendation for an impact assessment of audible blasting noise, to include community notifications of planned blasting and to include EPA's proposed amendments limiting blasting to normal working hours;

- amend NV08 to include an explicit requirement for consideration of the Orford Township Zone as a high amenity area;
- amend NV08 to include more prescriptive detail on the requirements for future background noise monitoring to ensure the requirements align with the recommendations made in the verification report exhibited as Appendix E2 to the EES, including the need for time series noise plots for the 24-hour period;
- amend NV09 to include an explicit requirement for the post-construction assessment to consider SACs, although I do not support the IAP's recommendation for a planning permit condition to require noise penalties for SACs as this is a compliance monitoring issue that is already required by the NZ Standard and implemented through the EP Regulations;
- amend NV10, NV11 and NV12 to refer to the requirements of the EP Regulations rather than the Environment Protection Amendment (Interim) Regulations 2021;
- delete the proposed planning permit conditions requiring time series data for compliance measurements and the percentage of time that the noise limit is exceeded at night and insert those requirements into EMM NV11 to be captured in the noise management plan for EPA;
- revise NV13 to broaden the requirements to considering all options for reducing noise at the source, not just from the transformer; and
- revise NV14 to reference the requirements of the EP Regulations, not the requirements included in the EES documentation.

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APPENDIX D: CALIBRATION CERTIFICATES

**CERTIFICATE OF
CALIBRATION**

CERTIFICATE No: **SLM54242**

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-52A	Serial No:	00331169
Mic. Model:	Rion UC-52	Serial No:	23072
Pre-Amp. Model:	Rion NH-25	Serial No:	22644

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1007	hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	23	$^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	13/06/2025
Relative Humidity	42	% $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3.

CHECKED BY: L. Gail AUTHORISED H. Soe
SIGNATURE:

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.
The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

Acu-Vib Electronics
ACOUSTICS AND VIBRATIONS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Avenue, Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

Page 1 of 2 Calibration Certificate
AVCERT10.12 Rev.3.0 10/03/2025

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Measurements

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM54233

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-52	Serial No:	00598175
Mic. Model:	Rion UC-59	Serial No:	15519
Pre-Amp. Model:	Rion NH-25	Serial No:	98387

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1009 hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	22 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	13/06/2025
Relative Humidity	40 % $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3

CHECKED BY: *L. Gail*

AUTHORISED *H. Soe*
SIGNATURE:

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Page 1 of 2 Calibration Certificate
AVCERT10.2 Rev.3.0 10/03/2025

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM54223

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-52A	Serial No:	00331170
Mic. Model:	Rion UC-59	Serial No:	23074
Pre-Amp. Model:	Rion NH-25	Serial No:	22645

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1005 hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	12/06/2025
Relative Humidity	40 % $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3.

CHECKED BY: L. Gail

AUTHORISED H. Soe
SIGNATURE:

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CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM54226**

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-52A	Serial No:	00331171
Mic. Model:	Rion UC-59	Serial No:	23075
Pre-Amp. Model:	Rion NH-25	Serial No:	22646

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1009 hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	22 °C $\pm 1^\circ$ C	Date of Calibration :	13/06/2025
Relative Humidity	37 % $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3

CHECKED BY: **L. Gail**

AUTHORISED **H. Soe**
SIGNATURE:

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM54224**

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-42A	Serial No:	01224051
Mic. Model:	Rion UC-52	Serial No:	200732
Pre-Amp. Model:	Rion NH-24	Serial No:	27270

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 2. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1005 hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	13/06/2025
Relative Humidity	40 % $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3

CHECKED BY: L. Gail

AUTHORISED SIGNATURE: H. Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
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CERTIFICATE OF CALIBRATION

CERTIFICATE No: **SLM54239**

EQUIPMENT TESTED: Sound Level Meter

Make & Model:	Rion NL-52A	Serial No:	00331168
Mic. Model:	Rion UC-59	Serial No:	23071
Pre-Amp. Model:	Rion NH-25	Serial No:	22643

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1007 hPa ± 1 hPa	Date of Receipt :	04/06/2025
Temperature	23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$	Date of Calibration :	13/06/2025
Relative Humidity	41 % $\pm 5\%$	Date of Issue :	16/06/2025

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3

CHECKED BY: **L. Gail**

AUTHORISED **H. Soe**
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CERTIFICATE OF CALIBRATION

CERTIFICATE No: **C53563**

EQUIPMENT TESTED : Acoustic Calibrator

Make & Model: Rion NC-74

Serial No: 35094478

Class: 1

Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000

Tests Performed: Measured Output Pressure level, Frequency & Distortion
See Details and Class Tolerance overleaf.

Comments:

CONDITION OF TEST:

Ambient Pressure 1001 hPa ± 1 hPa
Temperature 23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$
Relative Humidity 62 % $\pm 5\%$

Date of Receipt : 16/04/2025
Date of Calibration : 28/04/2025
Date of Issue : 29/04/2025

Acu-Vib Test AVP02 (Calibrators)

Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY: *KB*

AUTHORISED
SIGNATURE:

Hein Soc

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APPENDIX E: LOGGING LOCATION PHOTOGRAPHS

APPENDIX E.1: D11 MONITORING PHOTOGRAPHS

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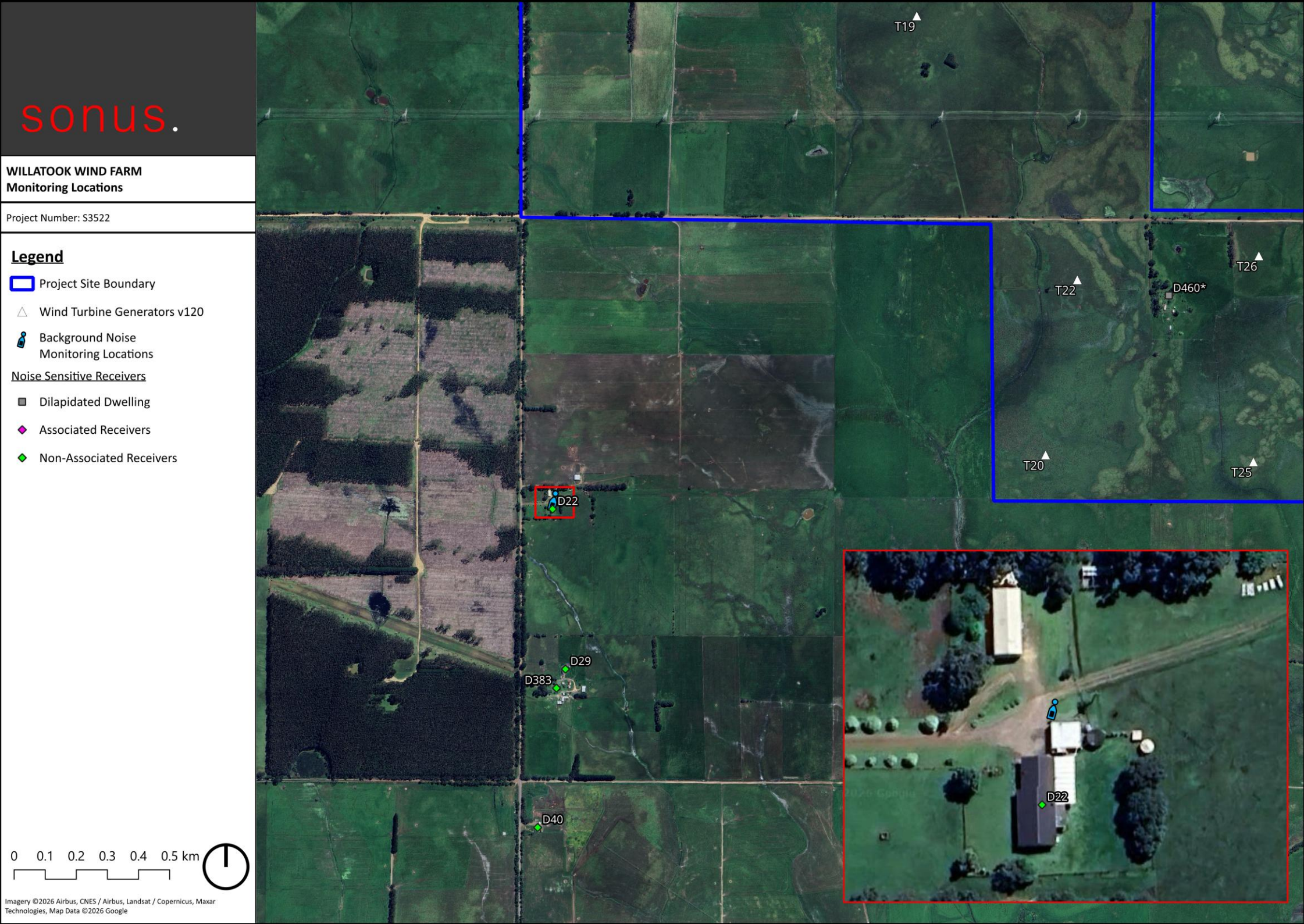


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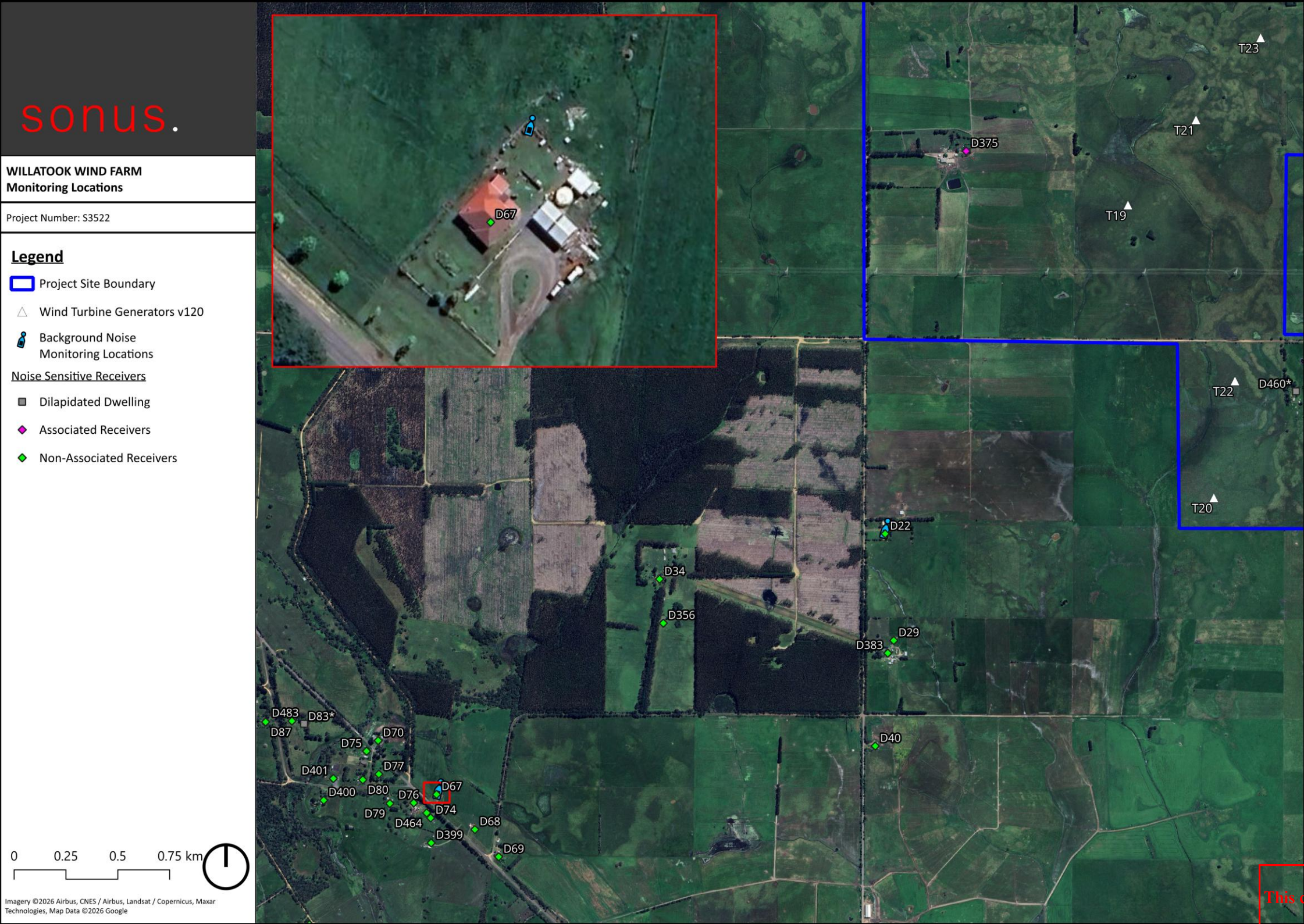


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APPENDIX E.5: D67 MONITORING PHOTOGRAPHS

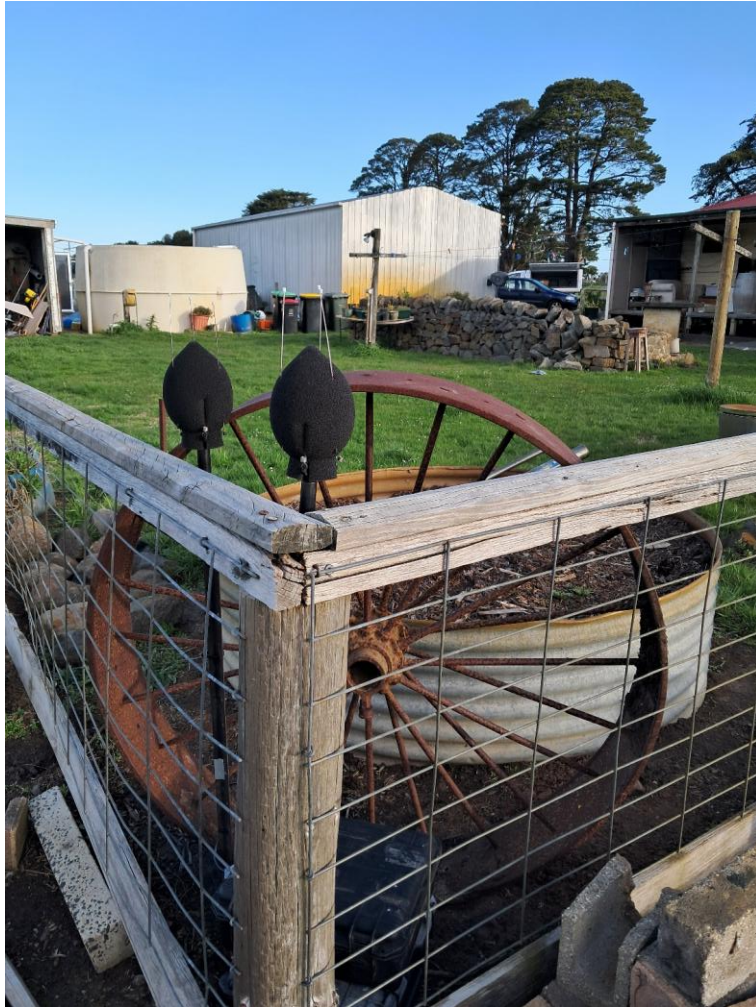


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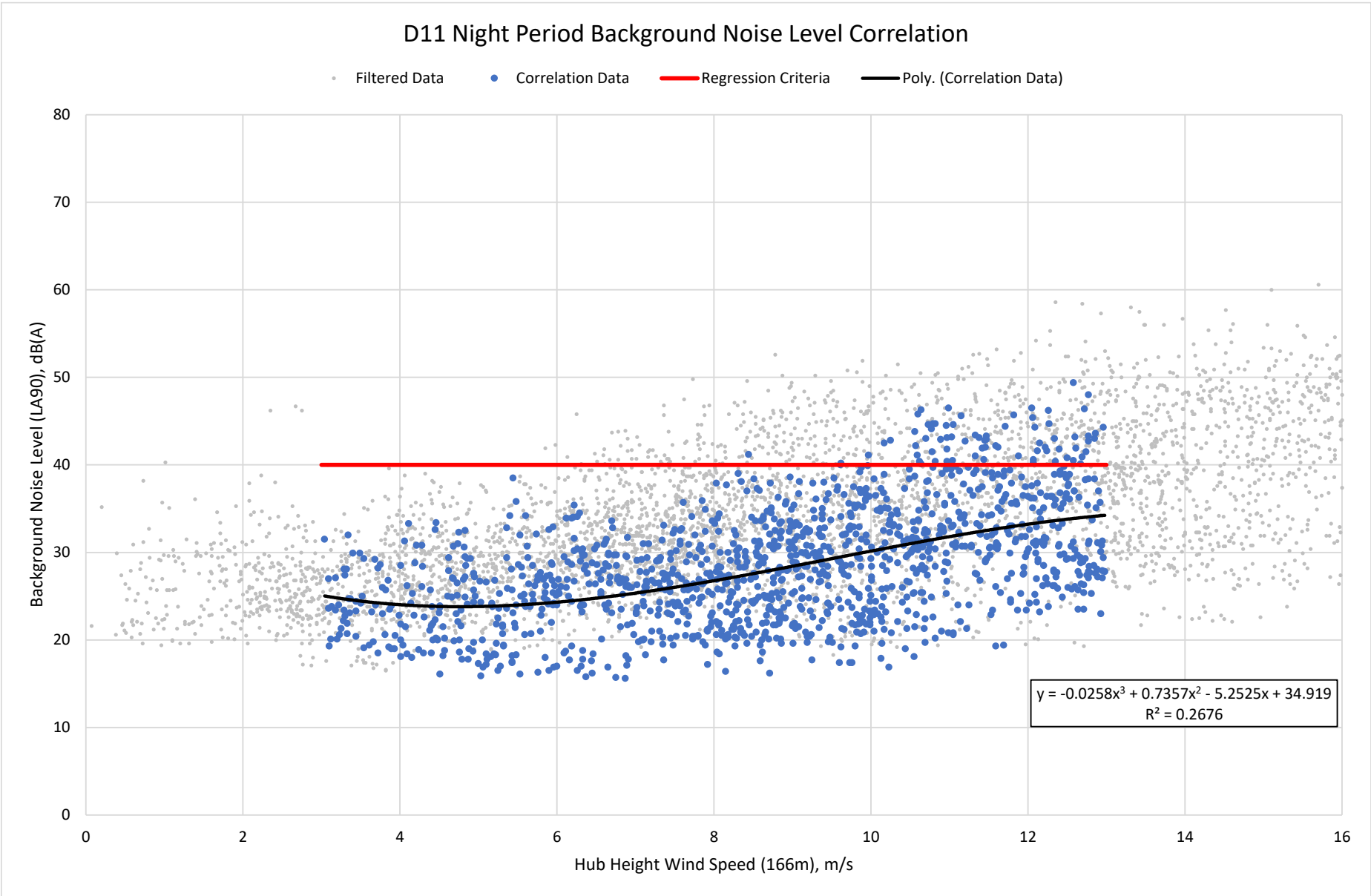
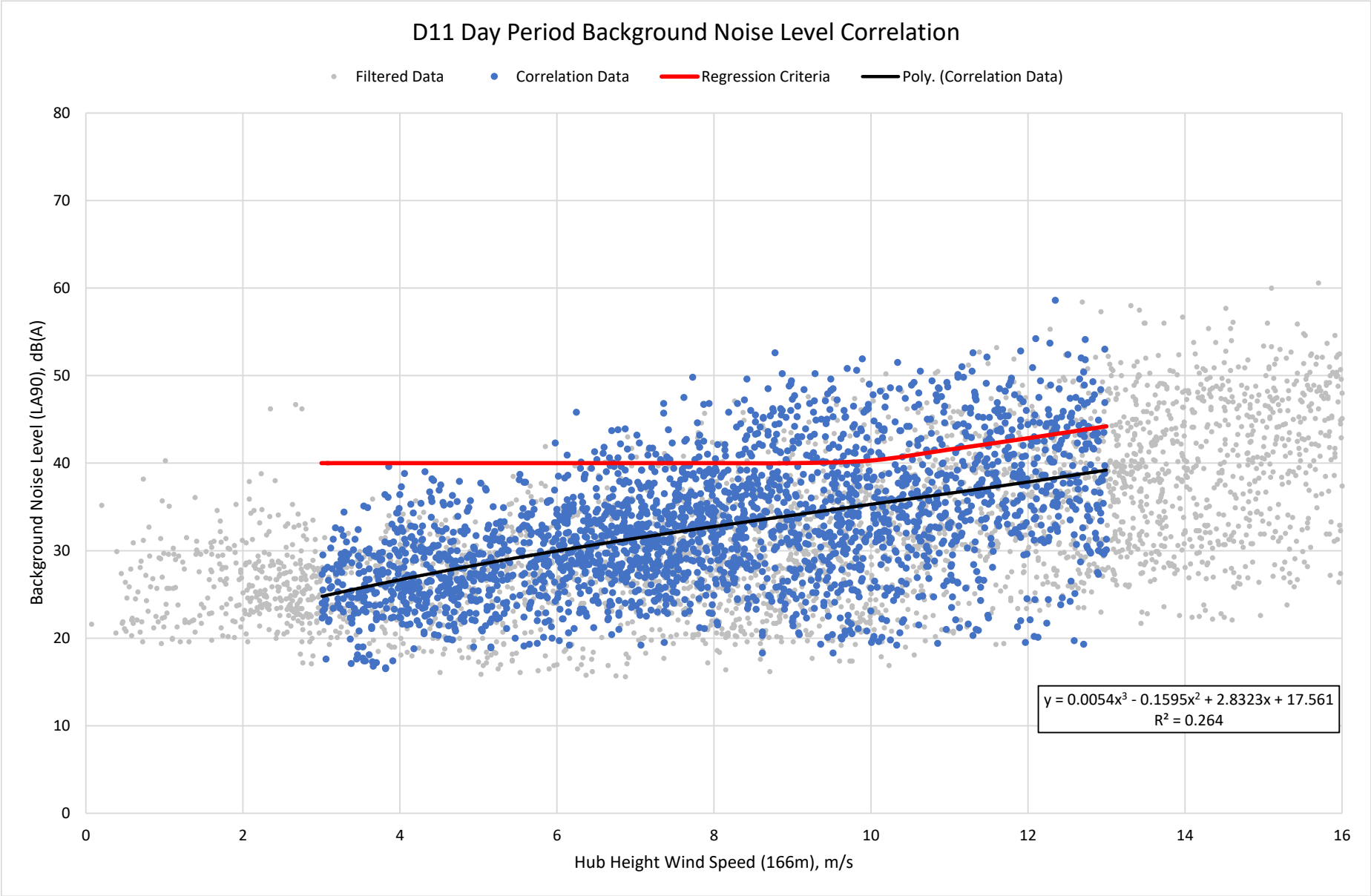


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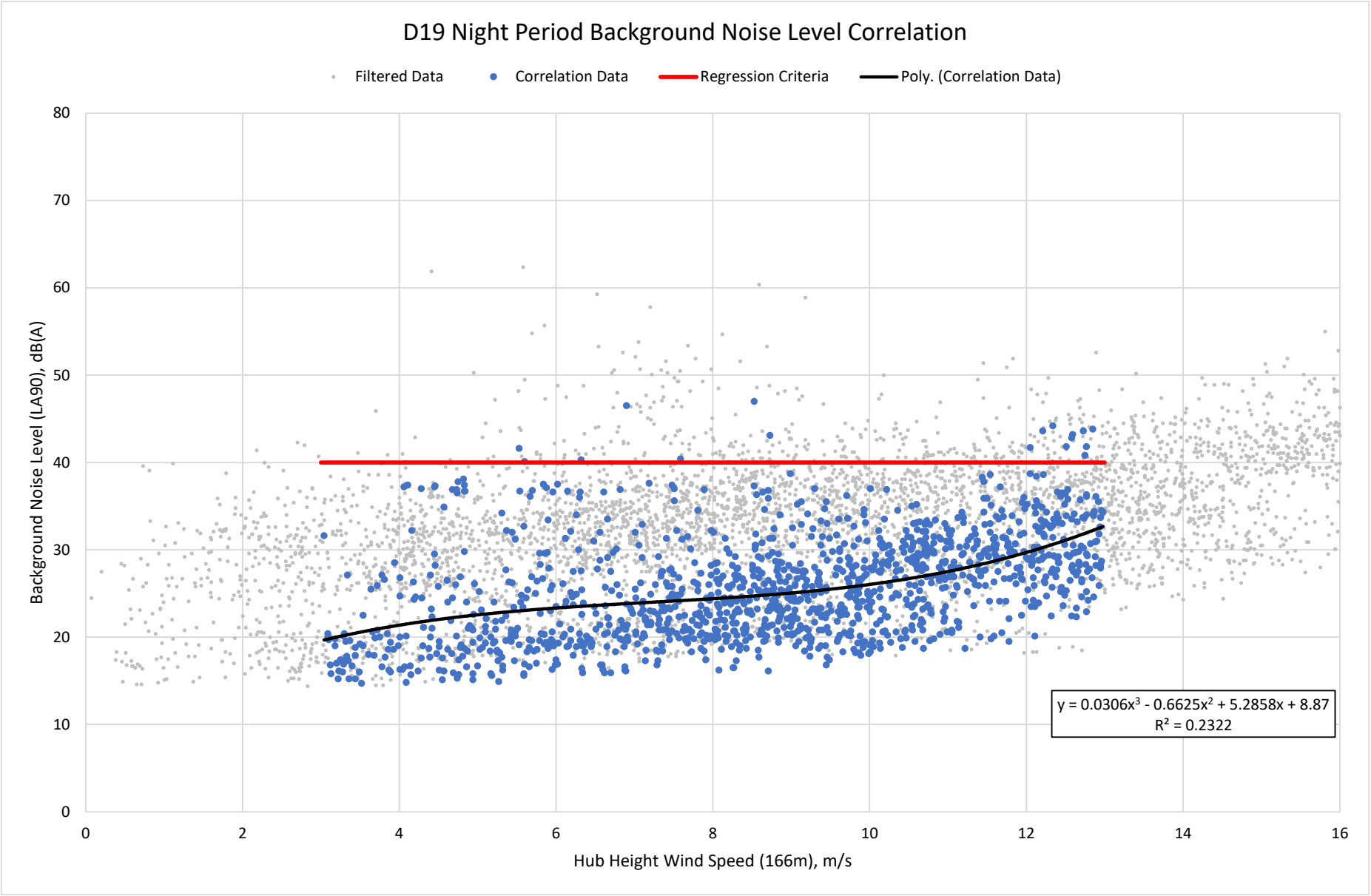
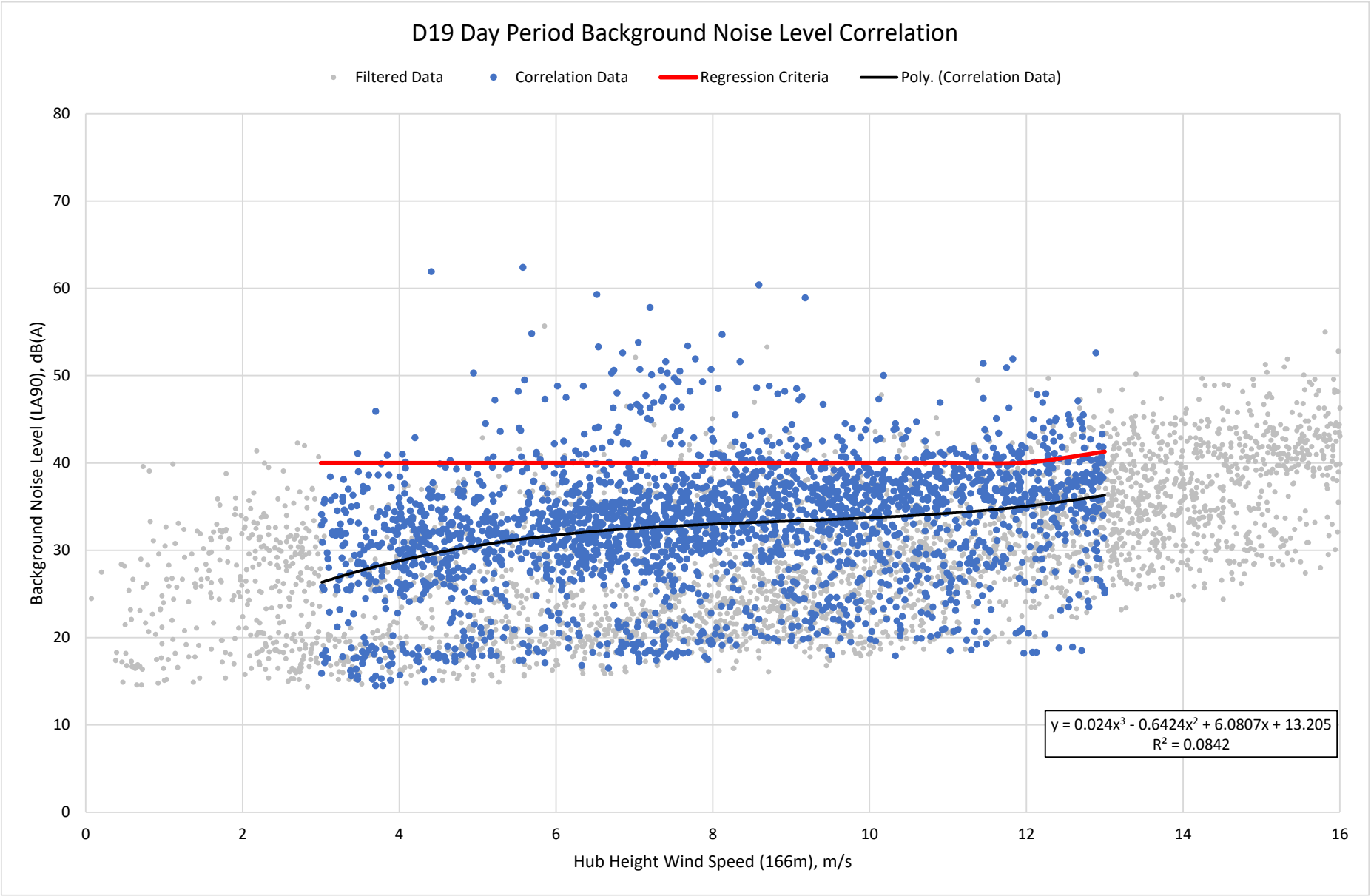
APPENDIX F: CORRELATION GRAPHS

APPENDIX F.1: D11 CORRELATIONS

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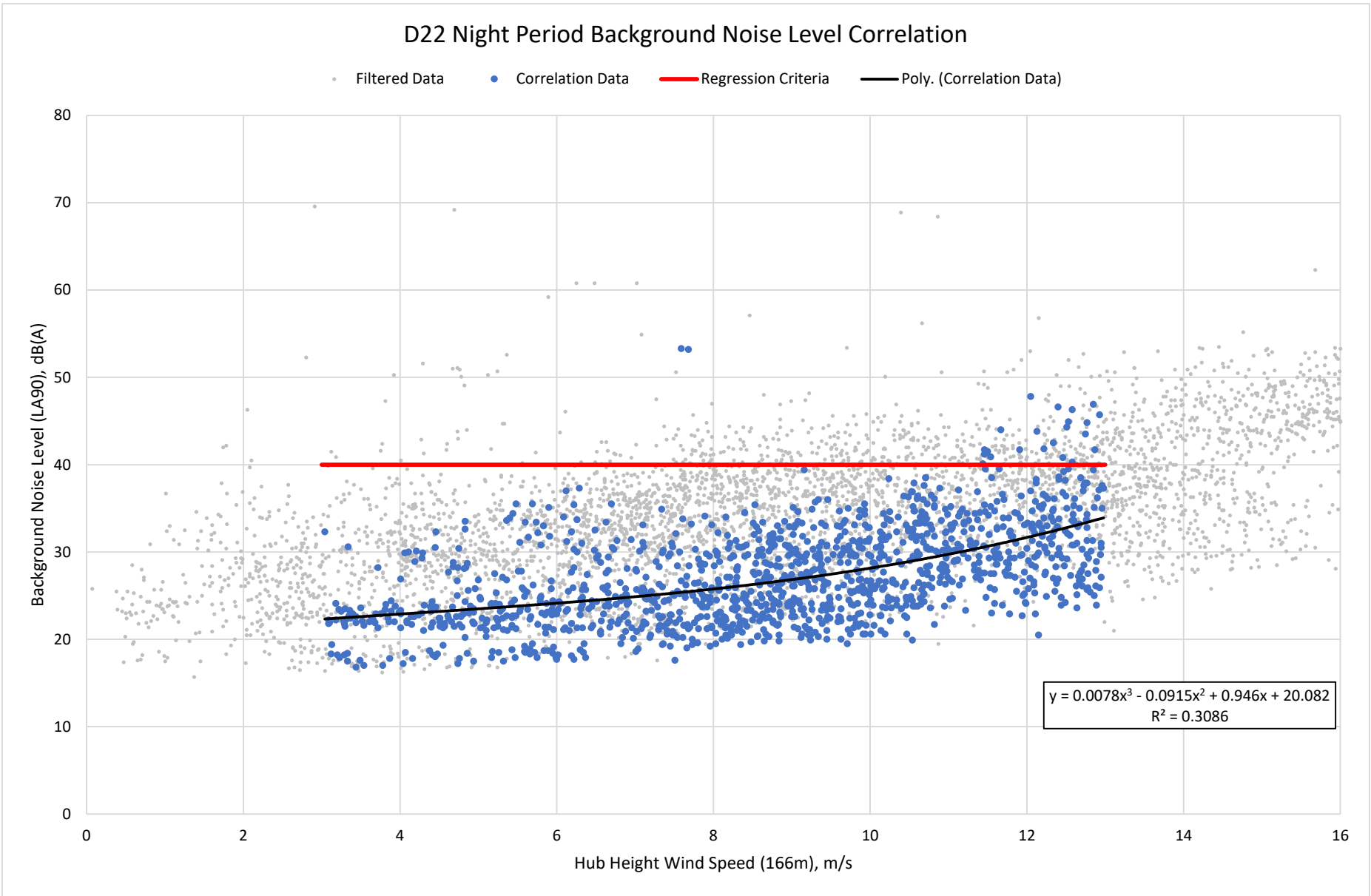
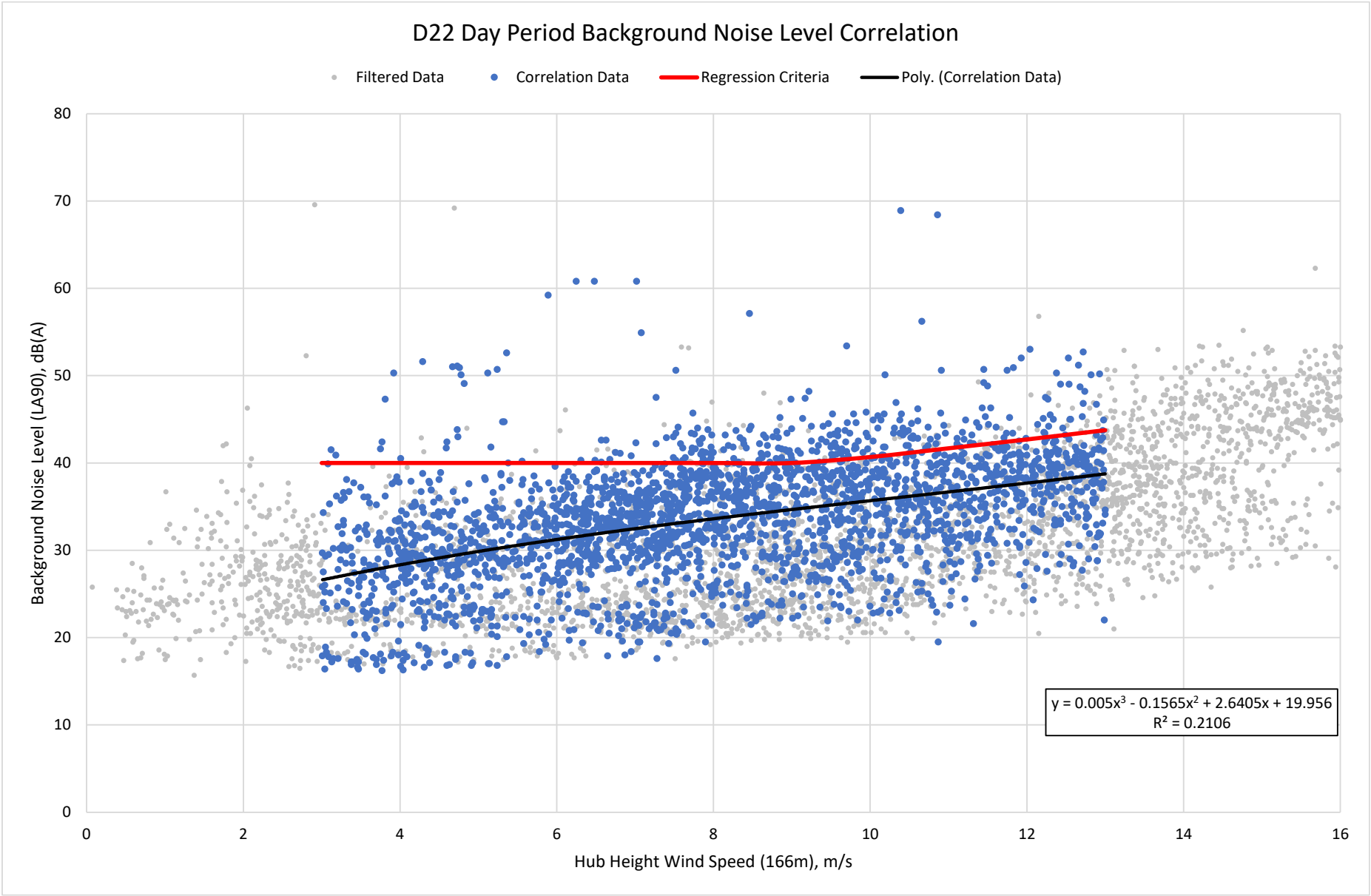


APPENDIX F.2: D19 CORRELATIONS

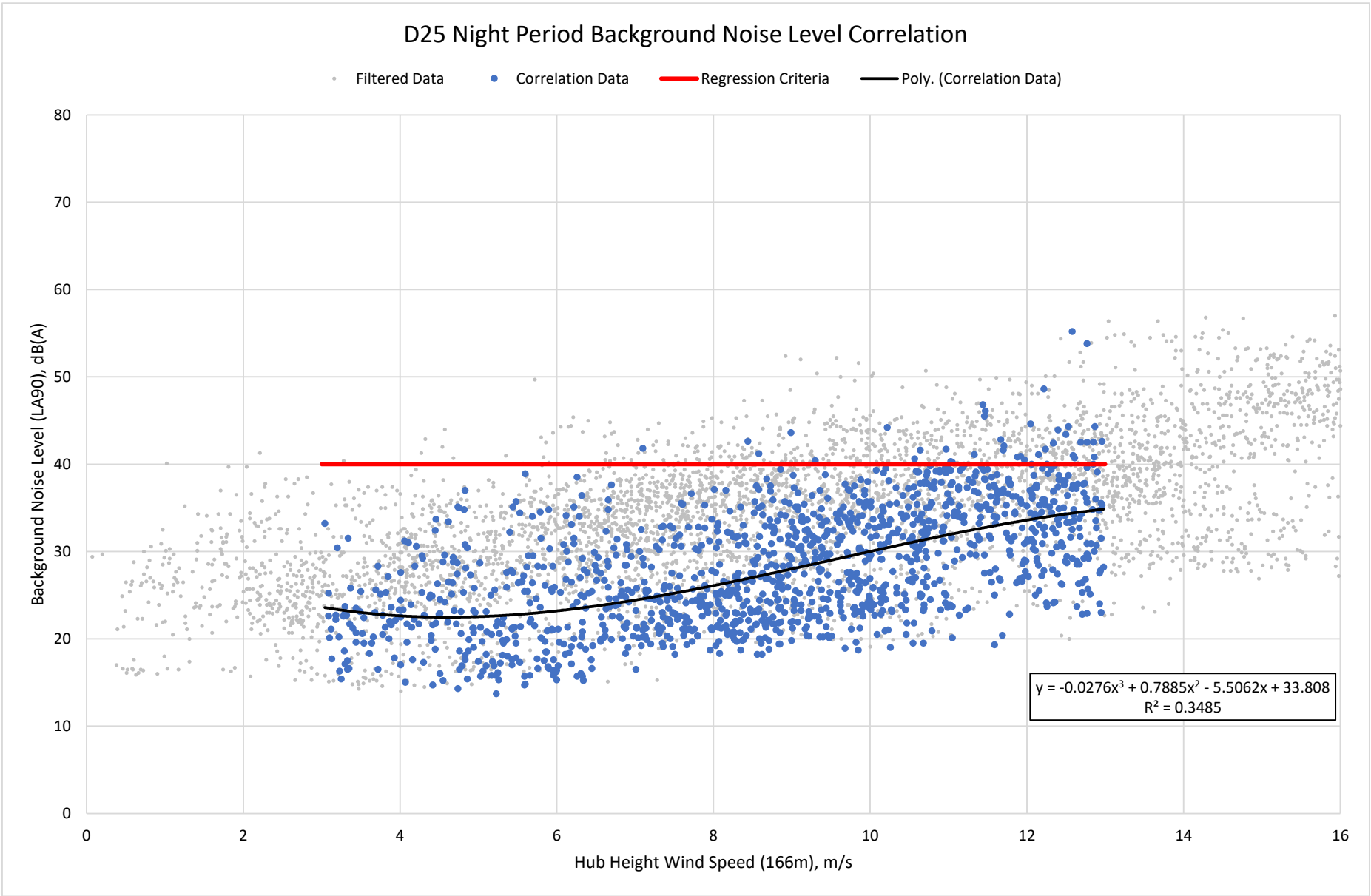
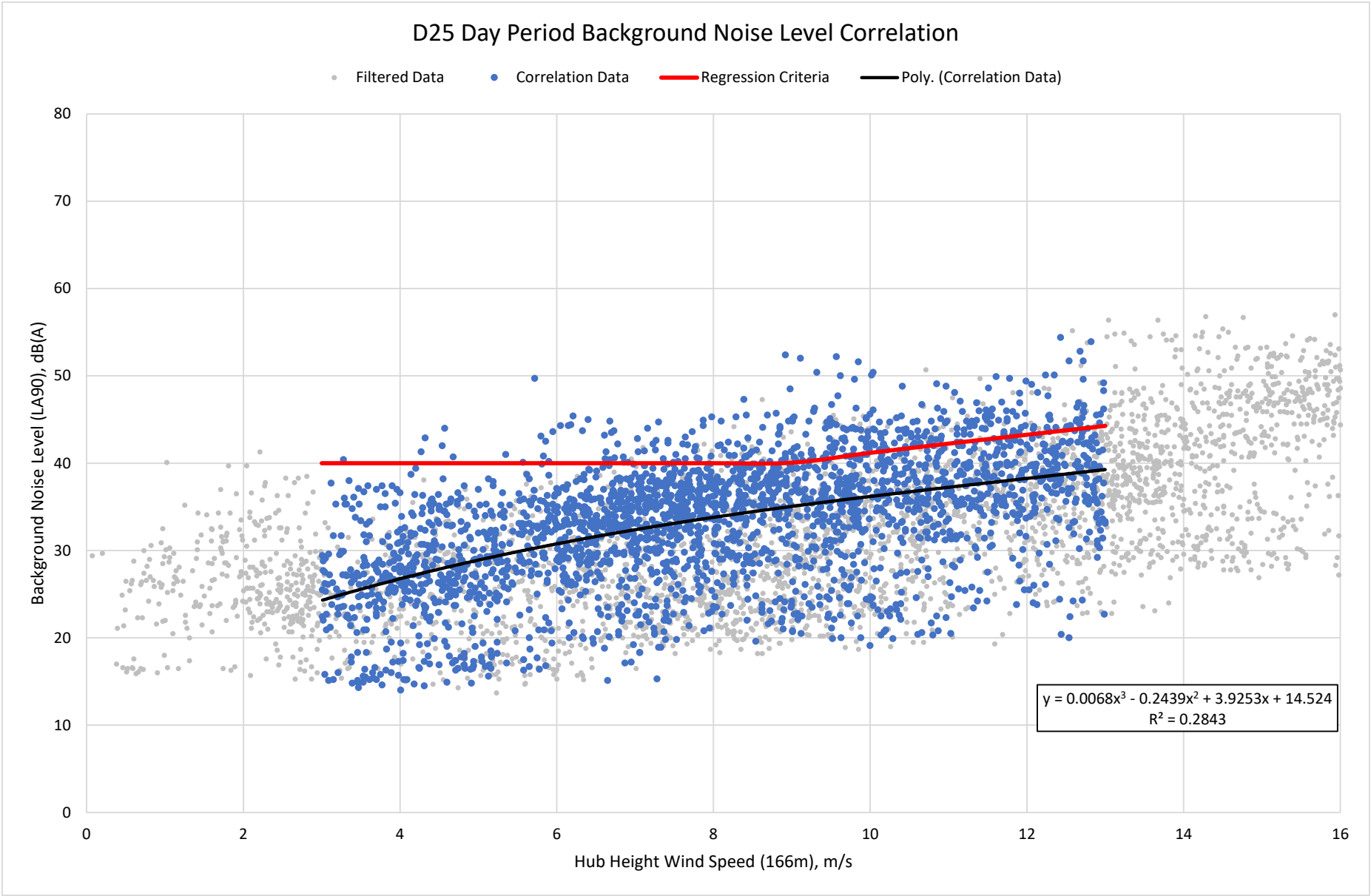


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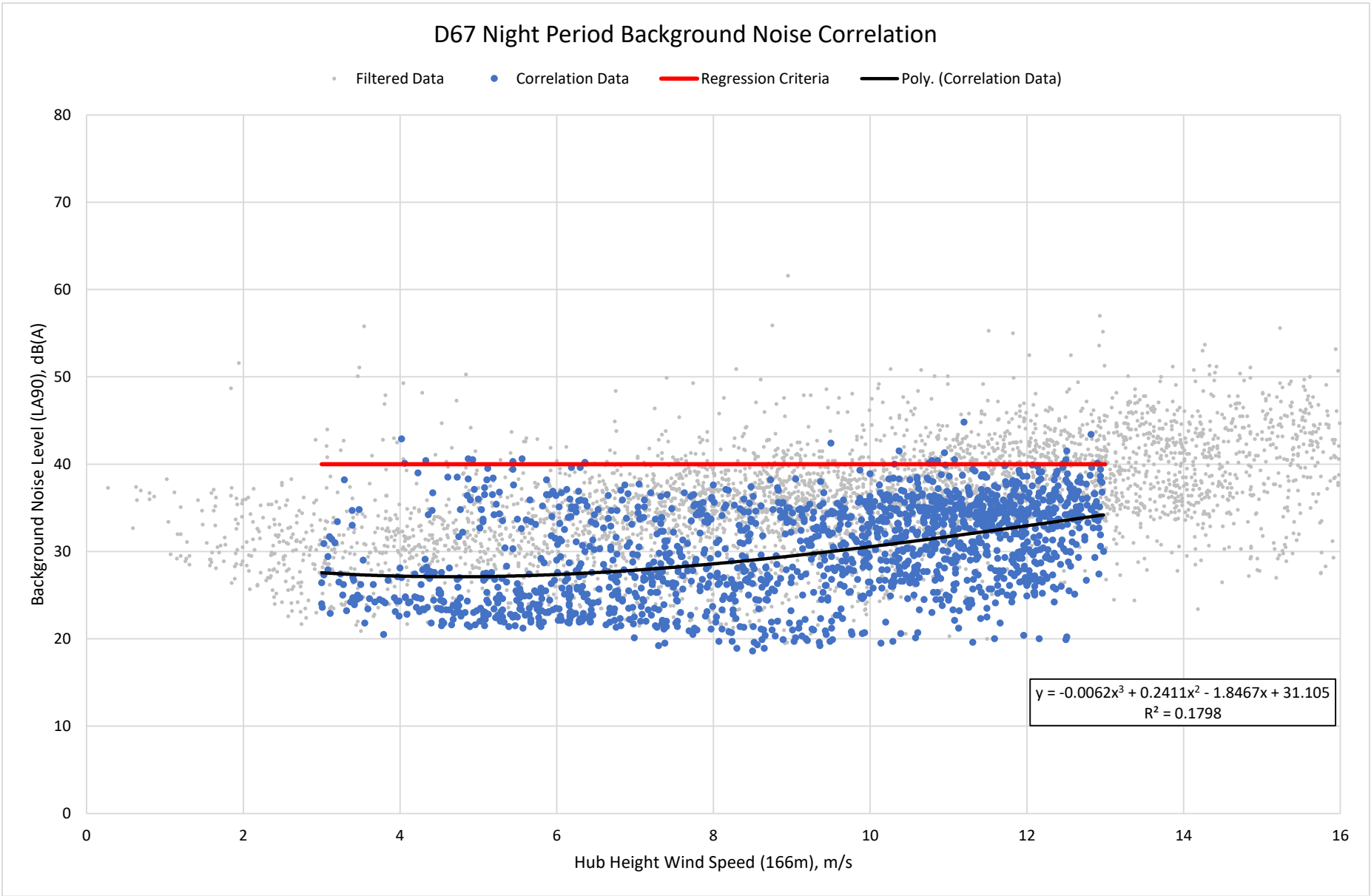
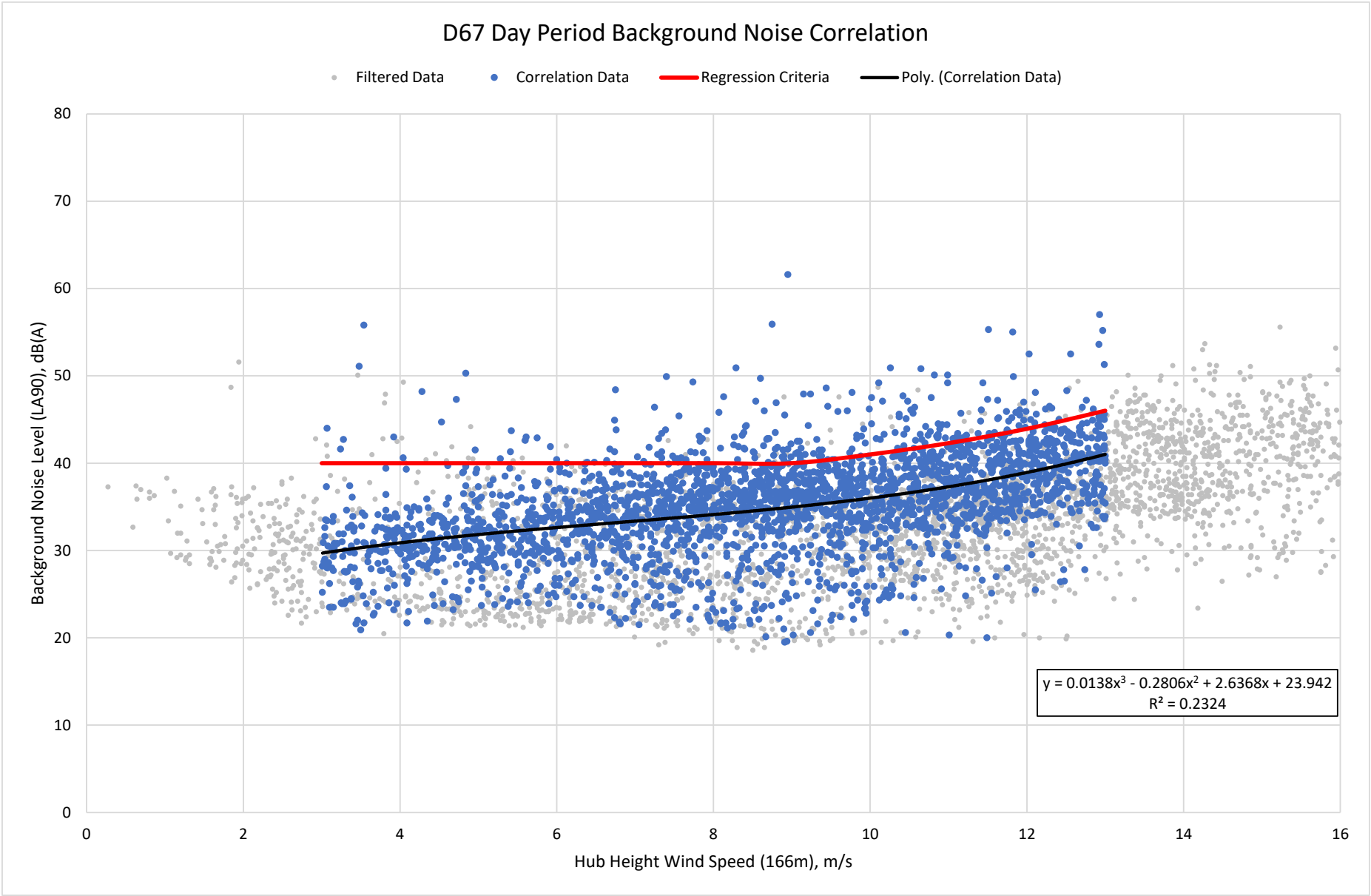
APPENDIX F.3: D22 CORRELATIONS



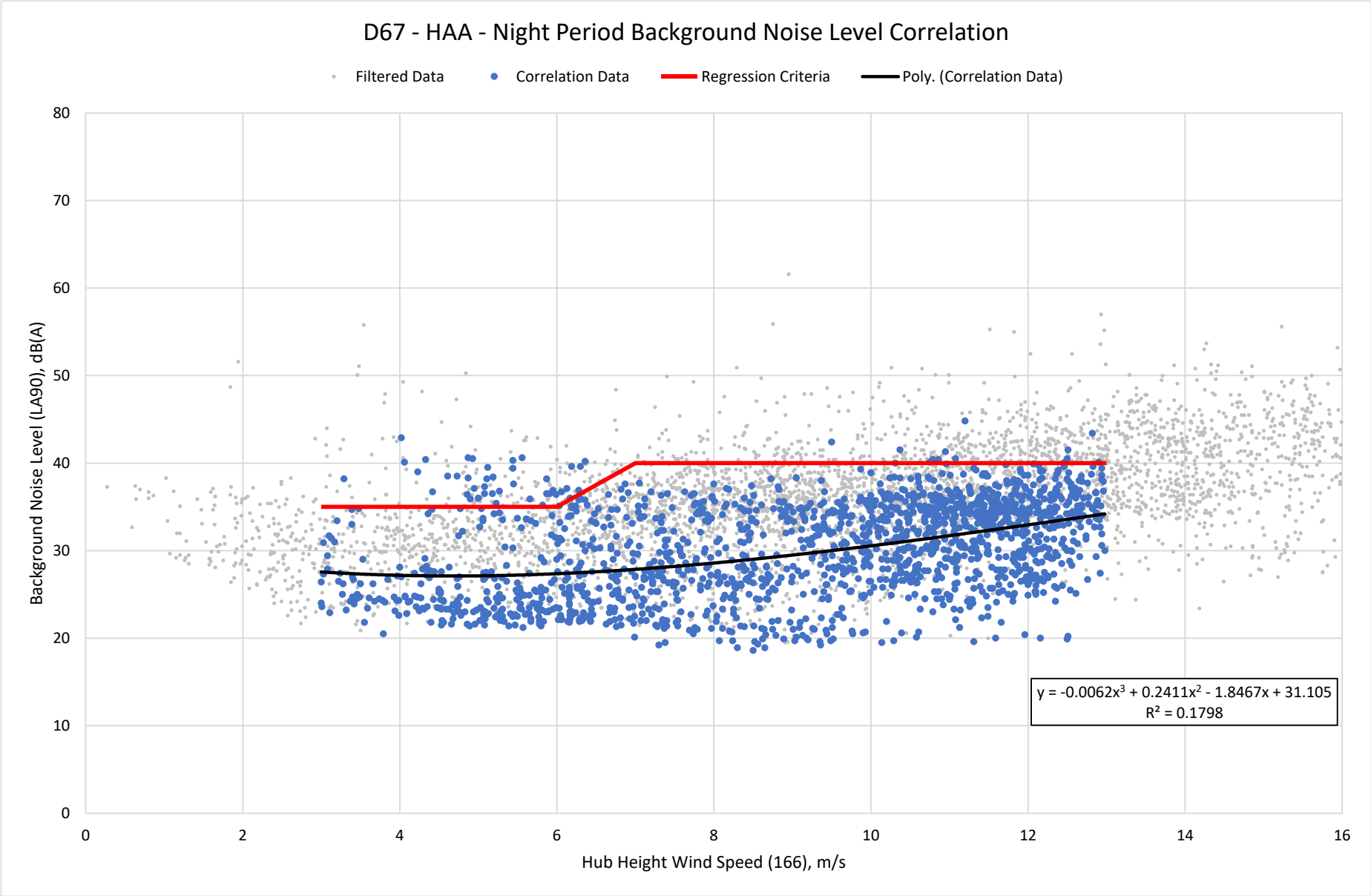
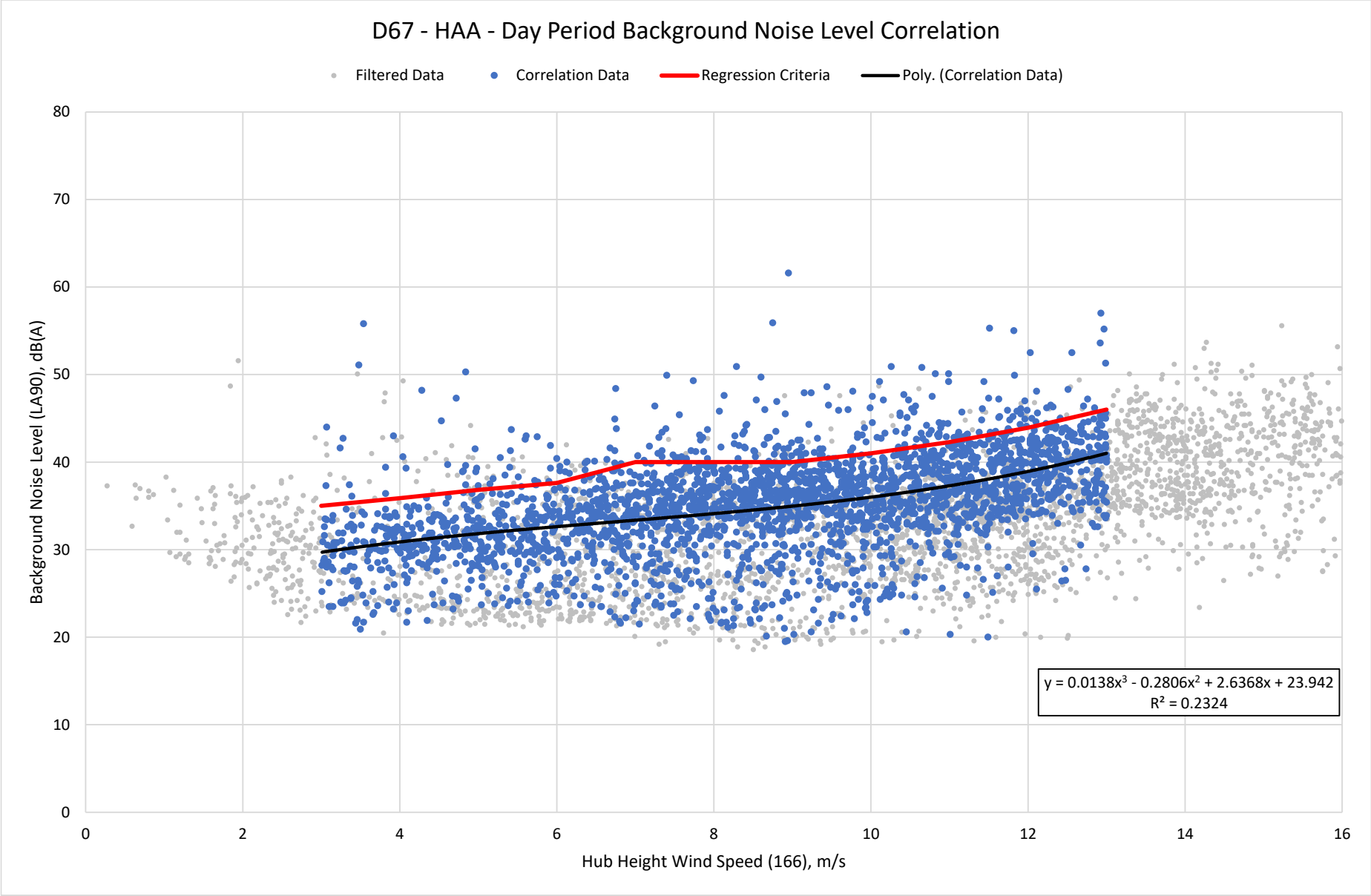
APPENDIX F.4: D25 CORRELATIONS



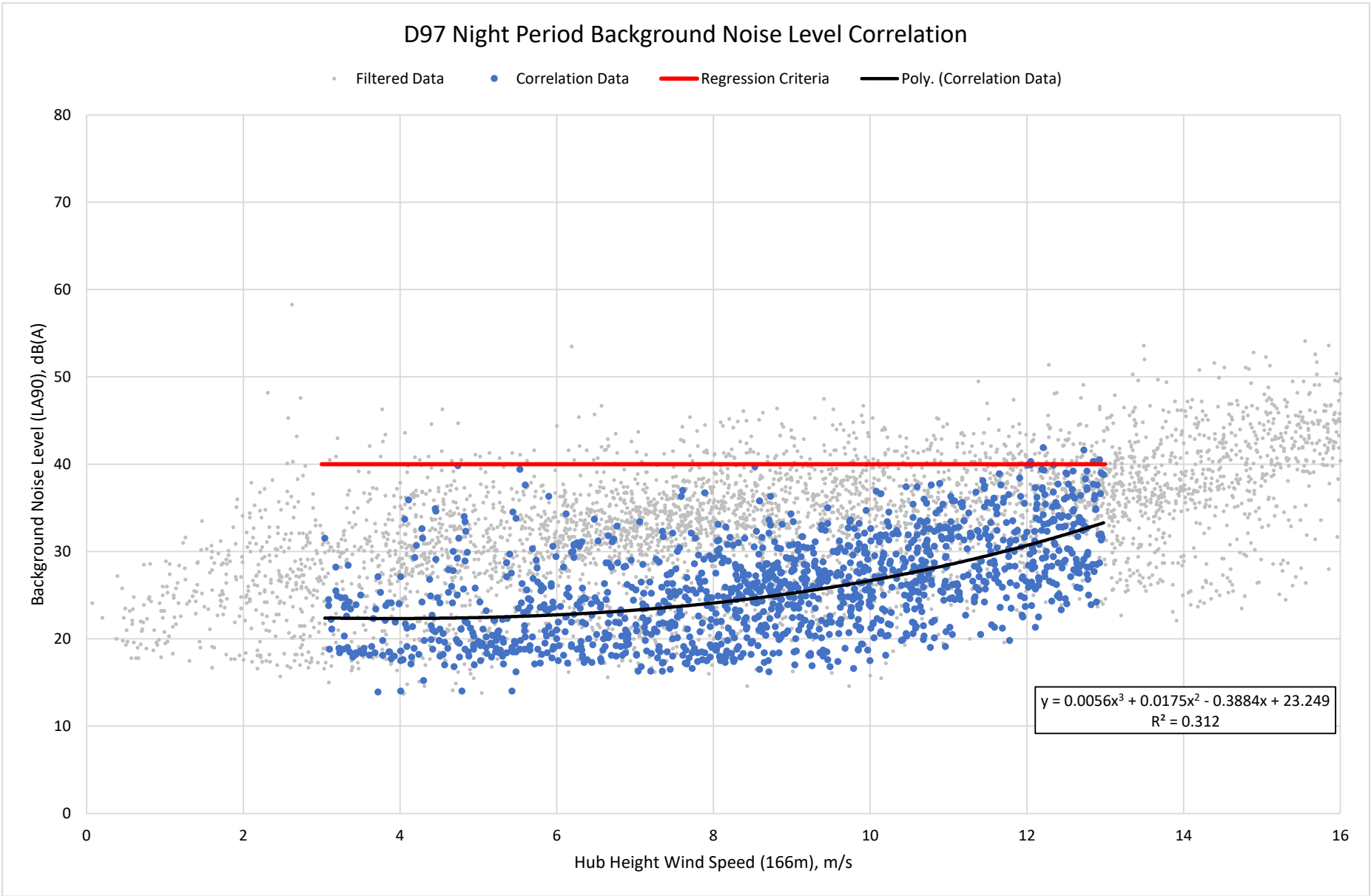
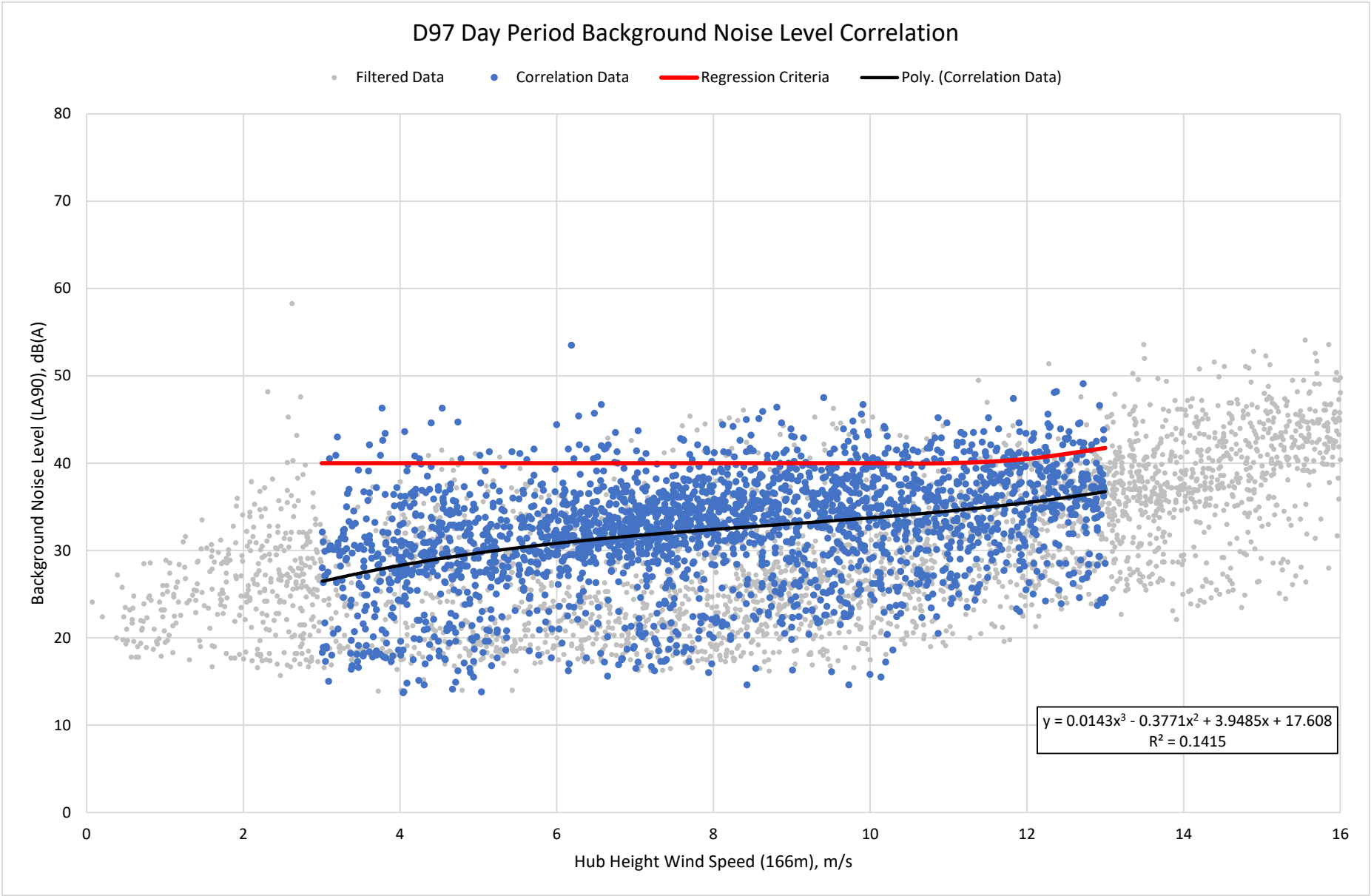
APPENDIX F.5: D67 CORRELATIONS



APPENDIX F.6: D67 – HAA CORRELATIONS



APPENDIX F.7: D97 CORRELATIONS



APPENDIX G: NOISE LIMITS

Table 19: Day Noise Limits

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D1	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D2	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D3	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D4	Associated	D11	No	42	42	42	42	42	42	42	42	42	43	44
D6	Associated	D11	No	45	45	45	45	45	45	45	45	45	45	45
D8	Associated	D11	No	42	42	42	42	42	42	42	42	42	43	44
D14	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D15	Associated	D25	No	45	45	45	45	45	45	45	45	45	45	45
D19	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D28	Associated	D25	No	45	45	45	45	45	45	45	45	45	45	45
D44	Associated	D19	No	45	45	45	45	45	45	45	45	45	45	45
D55	Associated	D25	No	41	41	41	41	41	41	41	41	42	43	44
D88	Associated	D97	No	45	45	45	45	45	45	45	45	45	45	45
D375	Associated	D22	No	45	45	45	45	45	45	45	45	45	45	45
D376	Associated	D25	No	41	41	41	41	41	41	41	41	42	43	44
D9	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D10	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D11	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D12	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D17	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D18	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D21	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D22	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D23	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D25	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D26	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D29	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D32	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D33	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D34	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D36	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D40	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D46	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D47	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D48	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D50	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D51	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D52	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D53	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D54	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D57	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D59	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D61	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D62	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D63	Non-associated	D11	No	40	40	40	40	40	40	40	40	42	43	44
D64	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D65	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D66	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D67	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D68	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D69	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D70	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D72	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D73	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D74	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D75	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D76	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D77	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D78	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D79	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D80	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D81	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D82	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D87	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D90	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D91	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D97	Non-associated	D97	No	40	40	40	40	40	40	40	40	40	40	42
D107	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D123	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D124	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D354	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D356	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D357	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	41
D373	Non-associated	D25	No	40	40	40	40	40	40	40	41	42	43	44
D382	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D383	Non-associated	D22	No	40	40	40	40	40	40	40	41	42	43	44
D399	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D401	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D463	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46
D464	Non-associated	D67	Yes	35	36	37	38	38	39	40	41	42	44	46
D483	Non-associated	D67	No	40	40	40	40	40	40	40	41	42	44	46

Table 20: Night Noise Limits

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D1	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D2	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D3	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D4	Associated	D11	No	42	42	42	42	42	42	42	42	42	42	42
D6	Associated	D11	No	45	45	45	45	45	45	45	45	45	45	45
D8	Associated	D11	No	42	42	42	42	42	42	42	42	42	42	42
D14	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D15	Associated	D25	No	45	45	45	45	45	45	45	45	45	45	45
D19	Associated	D19	No	41	41	41	41	41	41	41	41	41	41	41
D28	Associated	D25	No	45	45	45	45	45	45	45	45	45	45	45
D44	Associated	D19	No	45	45	45	45	45	45	45	45	45	45	45
D55	Associated	D25	No	41	41	41	41	41	41	41	41	41	41	41
D88	Associated	D97	No	45	45	45	45	45	45	45	45	45	45	45
D375	Associated	D22	No	45	45	45	45	45	45	45	45	45	45	45
D376	Associated	D25	No	41	41	41	41	41	41	41	41	41	41	41
D9	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D10	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D11	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D12	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D17	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D18	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D21	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D22	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40
D23	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D25	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D26	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D29	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D32	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D33	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D34	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40
D36	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D40	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40
D46	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D47	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D48	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D50	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D51	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D52	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D53	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D54	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D57	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D59	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D61	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D62	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D63	Non-associated	D11	No	40	40	40	40	40	40	40	40	40	40	40
D64	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D65	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D66	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D67	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D68	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D69	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D70	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D72	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D73	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D74	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40

Location	Association Status	Representative Logging Location	HAA	Noise Limit [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D75	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D76	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D77	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D78	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D79	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D80	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D81	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D82	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D87	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D90	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D91	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D97	Non-associated	D97	No	40	40	40	40	40	40	40	40	40	40	40
D107	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D123	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D124	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D354	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D356	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40
D357	Non-associated	D19	No	40	40	40	40	40	40	40	40	40	40	40
D373	Non-associated	D25	No	40	40	40	40	40	40	40	40	40	40	40
D382	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D383	Non-associated	D22	No	40	40	40	40	40	40	40	40	40	40	40
D399	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D401	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D463	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40
D464	Non-associated	D67	Yes	35	35	35	35	40	40	40	40	40	40	40
D483	Non-associated	D67	No	40	40	40	40	40	40	40	40	40	40	40

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APPENDIX H: PREDICTED NOISE LEVELS

Location	Association Status	Representative Logging Location	Minimum Criteria – dB(A)	Predicted Noise Level [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D1	Associated	D19	41	30	30	30	31	33	35	36	37	37	37	37
D2	Associated	D19	41	29	29	29	31	32	34	35	36	36	36	36
D3	Associated	D19	41	29	29	29	31	33	35	35	37	37	37	37
D4	Associated	D11	42	33	33	33	35	37	39	41	42	42	42	42
D6	Associated	D11	45	35	35	35	36	38	41	42	43	43	43	43
D8	Associated	D11	42	33	33	33	35	36	38	39	41	41	41	41
D14	Associated	D19	41	27	27	27	28	30	32	32	33	33	33	33
D15	Associated	D25	45	32	32	32	34	35	38	39	40	40	40	40
D19	Associated	D19	41	28	28	28	29	31	33	33	35	35	35	35
D28	Associated	D25	45	33	33	33	35	37	39	40	41	41	41	41
D44	Associated	D19	45	33	34	34	35	37	39	41	42	42	42	42
D55	Associated	D25	41	24	25	25	26	28	29	29	31	31	31	31
D88	Associated	D97	45	32	32	32	34	36	38	39	40	40	40	40
D375	Associated	D22	45	33	33	34	35	37	39	40	42	42	42	42
D376	Associated	D25	41	24	24	24	26	27	29	29	30	30	30	30
D9	Non-associated	D19	40	26	26	27	28	29	31	31	33	33	33	33
D10	Non-associated	D19	40	26	26	26	28	29	31	31	33	33	33	33
D11	Non-associated	D11	40	32	32	32	34	35	37	38	40	40	40	40
D12	Non-associated	D25	40	30	30	30	31	33	35	36	37	37	37	37
D17	Non-associated	D11	40	31	31	31	32	34	36	37	38	38	38	38
D18	Non-associated	D11	40	30	31	31	32	34	36	37	38	38	38	38
D21	Non-associated	D19	40	28	28	29	30	32	33	34	36	36	36	36
D22	Non-associated	D22	40	29	30	30	31	33	35	36	37	37	37	37
D23	Non-associated	D19	40	28	28	28	29	31	33	34	35	35	35	35
D24	Non-associated	D25	40	23	24	24	25	27	28	28	30	30	30	30
D25	Non-associated	D25	40	29	30	30	31	33	35	36	37	37	37	37

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Location	Association Status	Representative Logging Location	Minimum Criteria – dB(A)	Predicted Noise Level [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D26	Non-associated	D11	40	27	28	28	29	31	33	33	35	35	35	35
D27	Non-associated	D25	40	23	24	24	25	27	28	28	30	30	30	30
D29	Non-associated	D22	40	29	29	29	30	32	34	35	36	36	36	36
D32	Non-associated	D19	40	26	27	27	28	30	32	32	34	34	34	34
D33	Non-associated	D19	40	28	28	29	30	32	34	34	36	36	36	36
D34	Non-associated	D22	40	27	27	27	29	30	32	32	34	34	34	34
D36	Non-associated	D11	40	26	27	27	28	30	31	32	33	33	33	33
D40	Non-associated	D22	40	27	28	28	29	31	33	33	35	35	35	35
D46	Non-associated	D11	40	25	26	26	27	29	30	30	32	32	32	32
D47	Non-associated	D67	40	26	27	27	28	30	32	32	34	34	34	34
D48	Non-associated	D67	40	26	27	27	28	30	31	32	33	33	33	33
D50	Non-associated	D67	40	26	26	27	28	30	31	31	33	33	33	33
D51	Non-associated	D67	40	26	26	26	28	29	31	31	33	33	33	33
D52	Non-associated	D67	40	26	26	26	28	29	31	31	33	33	33	33
D53	Non-associated	D11	40	25	25	25	27	28	30	30	31	31	31	31
D54	Non-associated	D67	40	26	26	26	27	29	31	31	32	32	32	32
D57	Non-associated	D67	40	25	26	26	27	29	30	30	32	32	32	32
D59	Non-associated	D25	40	24	25	25	26	28	29	30	31	31	31	31
D61	Non-associated	D67	40	25	25	25	26	28	29	29	31	31	31	31
D62	Non-associated	D67	40	25	25	25	27	28	30	30	32	32	32	32
D63	Non-associated	D11	40	24	24	25	26	27	29	29	31	31	31	31
D64	Non-associated	D25	40	24	24	25	26	27	29	29	31	31	31	31
D65	Non-associated	D67	40	25	25	25	27	28	30	30	31	31	31	31
D66	Non-associated	D25	40	25	25	25	27	28	30	30	32	32	32	32
D67	Non-associated	D67	35	24	24	25	26	27	29	29	30	30	30	30
D68	Non-associated	D67	40	24	24	25	26	27	29	29	30	30	30	30
D69	Non-associated	D67	40	24	24	25	26	27	29	28	30	30	30	30
D70	Non-associated	D67	40	24	24	25	26	27	29	29	30	30	30	30

Location	Association Status	Representative Logging Location	Minimum Criteria – dB(A)	Predicted Noise Level [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D72	Non-associated	D67	40	25	25	25	26	28	29	29	31	31	31	31
D73	Non-associated	D67	40	24	25	25	26	28	29	29	31	31	31	31
D74	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D75	Non-associated	D67	35	24	24	25	26	27	29	29	30	30	30	30
D76	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D77	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D78	Non-associated	D67	40	26	26	26	27	29	31	31	33	33	33	33
D79	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D80	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D81	Non-associated	D67	40	25	25	25	26	28	30	29	31	31	31	31
D82	Non-associated	D67	40	24	24	24	25	27	28	28	30	30	30	30
D85	Non-associated	D67	40	24	24	24	25	27	28	28	30	30	30	30
D86	Non-associated	D67	40	24	24	24	25	27	28	28	30	30	30	30
D87	Non-associated	D67	40	24	24	24	26	27	28	28	30	30	30	30
D90	Non-associated	D67	40	26	27	27	28	30	32	32	34	34	34	34
D91	Non-associated	D67	40	25	26	26	27	29	30	31	32	32	32	32
D94	Non-associated	D25	40	23	24	24	25	26	28	28	30	30	30	30
D97	Non-associated	D97	40	29	29	29	31	32	35	35	37	37	37	37
D101	Non-associated	D67	40	23	24	24	25	27	28	28	30	30	30	30
D107	Non-associated	D67	40	27	27	27	28	30	32	32	34	34	34	34
D123	Non-associated	D67	40	26	26	26	27	29	31	32	33	33	33	33
D124	Non-associated	D67	40	25	25	26	27	29	30	31	32	32	32	32
D354	Non-associated	D67	40	26	27	27	28	30	32	32	34	34	34	34
D356	Non-associated	D22	40	26	27	27	28	30	32	32	33	33	33	33
D357	Non-associated	D19	40	29	29	29	30	32	34	35	36	36	36	36
D373	Non-associated	D25	40	29	30	30	31	33	35	36	37	37	37	37
D382	Non-associated	D67	40	26	26	26	27	29	31	31	33	33	33	33
D383	Non-associated	D22	40	28	29	29	30	32	34	34	36	36	36	36

Location	Association Status	Representative Logging Location	Minimum Criteria – dB(A)	Predicted Noise Level [dB(A)] for each hub height wind speed [m/s]										
				3	4	5	6	7	8	9	10	11	12	13
D399	Non-associated	D67	35	24	24	24	26	27	28	28	30	30	30	30
D400	Non-associated	D67	35	23	24	24	25	27	28	28	30	30	30	30
D401	Non-associated	D67	40	24	24	24	25	27	28	28	30	30	30	30
D463	Non-associated	D67	40	24	24	25	26	27	29	29	31	31	31	31
D464	Non-associated	D67	35	24	24	24	26	27	29	28	30	30	30	30
D483	Non-associated	D67	40	24	24	24	26	27	29	28	30	30	30	30

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APPENDIX I: MINIMISING NOISE AND VIBRATION

It is recommended that the following measures be incorporated into relevant work plans to ensure compliance with the requirements of Publication 1834.2 relating to minimising all noise and vibration.

APPENDIX I.1: COMMUNITY INFORMATION AND CONSULTATION

It is recommended that the following community consultation occur with nearby residents prior to construction activity being undertaken:

- Make contact with residents living within the “distance to achieve 30 dB(A)” column Section 4.3 of this Appendix in the early stages of planning. Maintain communication with these residents to inform them of the timing of construction activity in the vicinity of their homes, particularly where the activity is to occur out of normal hours.
- Engage with the community more generally, to keep them informed (via community meetings, the project website, letter box drops, individual contact etc) and provide the following information:
 - – dates and times (start and finish) when noise will be generated
 - – why the noise is necessary
 - – type of noise
 - – measures to minimise noise volume, for example, installation of noise barriers
 - – measures to minimise disturbance, for example, works scheduled to cease on certain days to provide residents with a break from the noise and discuss expected noise after implementation of management measures
 - – contact details for information (the contact person should have a level of knowledge and responsibility that will enable them to provide a real-time response to queries and complaints)
 - – what is happening now and what is happening next.
- Where unavoidable work is required outside of the normal working hours, provide notice at least one month prior to the works being undertaken
- Install and maintain a site information board at site access points with contact details, hours of operations, after hours emergency contact details, and regular information updates.
- Maintain a process for managing and responding to any complaints.

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APPENDIX I.2: SCHEDULING AND WORK PLANNING

- Schedule activities to minimise noise impacts with consideration given to:
 - where possible undertaking work during normal working hours
 - scheduling any particularly noisy work when neighbours/residents are not present, such as the middle of the day
 - scheduling noisy activities for less sensitive times, for example, delay rock-breaking tasks to the later morning or afternoon when close to residences.
- Organise deliveries and access to the site, in accordance with the following:
 - minimise deliveries to the site by using the on-site quarry where possible
 - maintain designated access routes to and from the site which minimises the impact on residences
 - plan vehicle movements to avoid manoeuvres and idling at locations nearest to nearby people.
 - plan transport and haulage routes to minimise the number of trucks/vehicles. For large numbers of truck movements, consider truck route and truck waiting protocols (e.g. engines on/off and restart requirements).
 - locate site vehicle access and waiting areas away from people who could be affected by noise.
 - restrict the areas where mobile plant can operate so that it is away from people who could be affected by noise.
 - combine loads to reduce noise and congestion on roads
 - use bus transport for workers to minimise the number of vehicle trips
 - maintain vehicles in good condition
 - use inductions and training to promote good driving behaviour, to prevent sudden acceleration and unjustified use of engine brakes
 - consult and inform potentially noise-affected residences regarding the designated access routes and ensure drivers are aware and use the nominated vehicle routes
 - provide onsite parking for staff and onsite truck waiting areas away from nearby residences
 - where practical, schedule deliveries within nominated hours only, being the least sensitive times of the day (middle of the day).
- Connect the site to the electricity grid as early as possible to minimise the use of diesel generators.
- Schedule the use of vibration-causing equipment such as jackhammers, demolition, earthmoving and ground-impacting operations to the least sensitive time of day, if ever within 100m of a residence.

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APPENDIX I.3: NOISE SOURCES

Reasonable and practical noise control measures should be implemented at the source of noise, including site plant and equipment. The following should be implemented to reduce the noise from site equipment:

- Use quieter equipment or methods as follows:
 - – buy or lease the quietest equipment/plant possible
 - – install noise reducing mufflers to any equipment which is not fitted with an OEM muffler
 - – reduce throttle use and turn engines off when not in use
 - – provide site based training to operators on best practices that minimise noise.
- Use battery powered equipment rather than equipment driven by a diesel generator.
- Use enclosed or “low-noise emitting” generators.
- Use broadband alarms on all site equipment as alternatives to tonal alarms.
- Maintain equipment by:
 - – inspecting daily prior to use and maintaining in good working order
 - – check machines with enclosures, such as generators, including doors and door seals to ensure that the door closes properly against seals
 - – maintain air lines on pneumatic equipment such that they do not leak and are fixed if identified.
- Maintain vehicles by:
 - – inspecting the working condition of exhausts and mufflers regularly, with particular attention to holes or leaks around joints
 - – secure loose parts and loads on trucks and utes that may rattle.
- Limit the noise caused by people onsite, including:
 - – not yelling and shouting onsite (it is noted that if people onsite need to shout to hear each other over the site ambient noise, it is possible the noise level may be putting their hearing at risk)
 - – minimise the use and volume of any electrical amplified sound-reproducing equipment, for example radios or public address systems.
- Implement substitute work methods such as:

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- – alternatives to rock-breaking work methods, including hydraulic splitters for rock and concrete, hydraulic jaw crushers, chemical rock and concrete splitting, and controlled blasting such as penetrating cone fractures. The suitability of alternative methods should be considered on a case by case basis during the detailed design of construction processes, including what other potential risks they involve to safety and the environment.
- – use alternative lower-impact equipment or methods e.g. substitute impact piling with bored piling.
- – alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electrical generators which are located away from residences.

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APPENDIX I.4: NOISE REDUCTION BETWEEN THE SOURCE AND RECEIVER

Consideration will be given to the following engineering measures, which can be used to reduce the noise impact at nearby residences:

- Plan to have as much distance as possible between plant, equipment and other noisy activities and nearby residences which may be affected by noise. Although the distance from a turbine site or the substation/BESS site to residences cannot be changed, the distance to other processes such as unloading areas, assembly areas, fabrication areas, etc. should be located as far away from residences as practical.
- Maximise shielding with consideration for:
 - – topography of the site (e.g. using earth mounds as barriers between works and residences)
 - – use of temporary buildings and material stockpiles between works and residences
 - – avoid placing noise-producing equipment in locations where reflected noise will increase noise exposure or reduce the effectiveness of mitigation measures, such as locating a temporary building behind noise generating works, in line with a residence. The building should ideally be between the works and the residence.
- Prioritise construction/placement of structures and site equipment that can contribute to shielding noise from the construction works.
- If any unforeseen noisy activity occurs close to residences, use acoustical walls or barrier, flexible noise barriers such as noise curtain or blankets, acoustic sheds or enclosures to obstruct the transmission path of sound.
- If an unreasonable impact is predicted to result, consider protecting noise sensitive receivers with other engineering measures (e.g. increasing window sound insulation by retrofitting acoustic glazing or suitable double glazing).

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APPENDIX I.5: ADDITIONAL MEASURES FOR WORK OUTSIDE NORMAL WORKING HOURS

Works occurring outside of the normal working hours are at more sensitive times of the day and therefore additional measures should be taken. The following additional measures are recommended when/if works occur outside of the Normal Working Hours:

- Scheduling:
 - Schedule any noisy unavoidable work when it is least likely to affect residents' sleep. This may include these works occurring into the evening or for a short period prior to 7:00am, but not in the early morning hours.
 - Schedule respite periods if unavoidable work is impacting residences and on-going. Consult with residents who may be most affected about restricting the number of nights per week and/or per calendar month when works are undertaken.
 - Stockpile fill materials from unavoidable work activities that occur outside normal hours and only load/unload trucks during the Normal Working Hours.
 - As part of the site training, ensure all workers are aware of those works which can and cannot be conducted outside normal working hours.
- Community information:
 - Manage the expectations of the community by explaining:
 - what will happen, with as much detail as possible
 - why unavoidable works are required outside normal working hours
 - the timing and nature of works that may affect them and details of any changes to the existing construction work schedules
 - the criteria for qualification for offsite mitigation such as respite offers, acoustic treatment or alternative accommodation.
- Offset the noise impact:
 - Provide respite offers or compensation that reflects the level of impact at the residences.
 - Offer alternative accommodation where there is sustained noise impact (such as ongoing sleep disturbance over many nights) or where residents may have underlying health conditions that could be adversely impacted. A residence affected by a particular concrete batching plant used for numerous concrete pours may be more susceptible to long term impacts than those near turbines where activity will only occur for a short period.

APPENDIX I.6: COMPLAINTS RESPONSE PROCEDURE

The following Complaints Response Procedure is recommended for the duration of the project construction. The procedure allows for complaints to be logged and for actions to be taken to minimise noise.

The aim of the complaints response process is to identify any feasible and reasonable measures that may further reduce impacts following a complaint, and to provide feedback to the community on the process within a reasonable timeframe. The complaints response process should include the following noise elements:

- Provide contact methods and details for dealing with any complaints. The contact should be appropriately trained in the construction noise assessment requirements and in community consultation, with the ability to action the complaint.
- Establish a complaints handling procedure that includes:
 - Assess whether the issue can be resolved easily and take immediate action if possible;
 - If not, ensure that the appropriate consultation has been undertaken for the activity;
 - Ensure that the on-site inspections with regard to the construction noise assessment have been carried out regularly for the activity;
 - Assesses the construction site and activities to determine whether there is any reason to believe the noise exposure at residences is higher than anticipated or if there are reasonable and practical noise reduction measures which should be taken;
 - Undertake monitoring of noise levels where this cannot be confirmed and the complaint relates to out of hours activity, with the aim of establishing if the exposure of receivers is higher than anticipated by the construction noise assessment;
 - Take remedial action with the assistance of an acoustic engineer if any of the above cannot be confirmed.

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APPENDIX I.7: MEASUREMENT PROCEDURE

The following measurement and inspection procedures have been developed for activity occurring outside of and during Normal Working Hours. The procedures can be used to ensure compliance with Publication 1834.2 and assist with the resolution of any complaints.

Given that construction noise levels are expected to be in the order of the existing ambient noise environment and therefore difficult to identify and measure at an unattended monitoring site, long term monitoring of construction activity will not be effective for this site. This measurement procedure therefore requires attended measurements to occur. It also enables measurements to be taken at an intermediate distance and extrapolated in circumstances where the construction noise levels are at or below the noise levels of the ambient environment.

The following is proposed:

- Noise measurements should be carried out whenever a new construction activity is occurring outside of normal working hours.
- The noise level should be measured and observed at the closest dwelling (or at a location representative of the closest dwelling) during the night under conditions which are conducive to noise propagation towards the measurement location. The measurements will include measuring the background noise level at the dwelling, or a representative location not affected by the construction noise, for comparison with the requirements under Publication 1834.2 (background level +10 dB(A));
- The noise level may be measured and observed at an intermediate location and extrapolated using a recognised noise model if the noise cannot be satisfactorily measured at the closest dwelling (or at a location representative of the closest dwelling).
- The observations should include identifying any potential characteristics of the noise which may make the construction activity more annoying or only audible at certain times.
- In the event that the measured noise level exceeds the relevant criteria in Publication 1834.2, any feasible and reasonable mitigation measures not already being taken must be implemented and the testing repeated to confirm compliance with the criteria.

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