Yindjibarndi Renewable Energy Hub

Baru Project

Noise Impact Assessment

S8467C1

June 2025

sonus.

Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000
Phone: +61 (8) 8231 2100
Email: info@sonus.com.au
www.sonus.com.au

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Document Reference	: S8467C1
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Author	: Simon Moore, MAAS

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1 INTRODUCTION

A noise impact assessment has been made of the Baru project area, as part of the proposed Yindjibarndi Renewable Energy Hub (the **Project**).

The Project is to be located approximately 60km south-east of Karratha. The Baru project area will comprise wind farm, solar farm, substation, and battery energy storage system (**BESS**) components.

The noise assessment considers the following:

- 60 Wind Turbine Generators (**WTGs**) at the locations shown in Appendix A.
- Operation of a substation up to 1.5 GW in capacity, located as shown in Appendix A.
- Operation of a BESS up to 400 MWh in capacity, located as shown in Appendix A.
- Operation of a solar farm up to 250MW in capacity, at one of the locations shown in Appendix A.
- Traffic noise relating to the construction of the Project, noting that traffic volumes during operation will be lower than during construction. Other noise sources related to construction are not considered.
- The nearest noise sensitive receptor being the Township of Ngurrawaana (the **Ngurrawaana Township**) as shown in Appendix A.
- Noise level data for the selected WTG, the Vestas *V172-7.2MW* with serrated trailing edges, in the *PO7200* operating mode, with a hub height of up to 160m and a tip height of up to 246m.
- The WTG being free of any excessive levels of tonality, or any other special audible characteristics, when assessed at the noise sensitive receptors.
- Background noise testing conducted between 26 March 2025 and 7 May 2025. It is noted that the existing generator serving the Ngurrawaana Township significantly contributes to the noise levels experienced by dwellings. If the generator is to be removed, background noise monitoring should be re-conducted (without the generator operating) to establish appropriate background noise levels for the Ngurrawaana Township.

The project layout is shown in Appendix A.

It is noted that the hub height for the WTGs has not yet been finalised and has therefore been conservatively assessed at a height of 160m. It has been assumed that, where compliance can be shown for a hub height of 160m, all lesser hub heights would also comply.

2 REGULATIONS AND GUIDELINES

The Western Australian EPA's *Environmental Protection (Noise) Regulations 1997,* dated November 2003 (the **Regulations**), has formed the basis of the assessment for the noise resulting from the Project.

The noise produced by wind turbines is both unique and complex and requires careful consideration when assessing any noise impacts. The Regulations form an overarching framework for the assessment of a wide range of noise producing activities, without providing specific assessment approaches for particular noise sources. The Western Australian Planning Commission (**WAPC**) recognises this in their document *Position Statement: Renewable energy facilities March 2020* (the **Position Statement**), which aims to promote the consistent consideration and assessment of renewable facilities.

The Position Statement requires the noise from wind turbines to achieve the requirements of the Regulations, but also makes reference to the South Australian Environmental Protection Authority's document *Wind Farms Environmental Noise Guidelines (2009)* for assessment purposes. The latest version of this document is the *Wind farms environmental noise guidelines,* as updated in November 2021 (the **SA Guidelines**). Despite referencing the assessment methodology of the SA Guidelines, this method is not easily reconcilable with the method presented in the Regulations.

It is understood that the Department of Water and Environmental Regulation (**DWER**) has previously provided advice regarding reconciling the Regulations and the SA Guidelines for other similar projects. They note that further WA government guidance specific to wind turbine assessments is under development, however in the interim, an appropriate approach is to adopt the SA Guidelines in conjunction with the Regulations and background noise monitoring. In summary, this approach involves:

- For non-associated receivers, adopting a base limit of 35 dB(A) to reflect the night period assigned levels from the Regulations.
- For associated receivers, adopting a base limit of 45 dB(A).
- Noting the steady state nature of the wind turbine noise source, using the L_{eq} metric for assessment consistent with the SA Guidelines in lieu of the L_{10} metric from the Regulations.
- All-time noise limits applicable for both day and night period, consistent with the SA Guidelines.
- Use of the L_{90} measurement metric detailed in the SA Guidelines for assessing compliance with the assigned levels.

In recognition of the above, the assessment of noise from the wind turbines has been conducted in accordance with the SA Guidelines, incorporating the WA specific changes recommended above. The noise from other sources, such as the substation, BESS, and solar farm, have been assessed in accordance with the Regulations.

It is noted that the noise emissions from the propulsion and braking systems of motor vehicles operating on a road is excluded from the Regulations. While the noise from construction activities is considered under the Regulations, the Regulations do not consider traffic associated with construction in the definition of construction works. In addition, the Regulations do not apply for construction works between 7:00am and 7:00pm. A different method is therefore required for the assessment of traffic noise associated with construction.

The WAPC document *State Planning Policy 5.4 – Road and Rail Noise* (**SPP 5.4**), dated September 2019, provides an assessment framework for the noise associated with traffic on new roads near to sensitive receivers. The requirement for a noise assessment depends on the distance a sensitive receiver is from the road. The distances within which an assessment is required (the trigger distances) provided in SPP 5.4 are as follows:

- For roads with 500 or more heavy vehicles per day and/or 50,000 per day traffic volumes, an assessment is required for sensitive receivers within 300m.
- For roads with 100 or more heavy vehicles per day and/or 23,000 per day traffic volumes, an assessment is required for sensitive receivers within 200m.

As traffic counts are not currently available for the Project, it has been assumed that there will be at least 100 heavy vehicles using the roads during construction per day. The smallest distance between a sensitive receiver and the road used for construction traffic is approximately 5.8km. This is much greater than the relevant trigger distance and therefore SPP 5.4 does not apply. Notwithstanding, an assessment of traffic noise associated with construction has still been conducted. It is considered that the NSW Road Noise Policy, dated March 2011 (the **RNP**) is the most appropriate framework for this assessment. It is noted that the criteria presented in the RNP are comparable to those in SPP 5.4, albeit with a shorter assessment period (therefore providing a more conservative assessment).

3 BACKGROUND NOISE MONITORING

3.1 Monitoring Procedure

The background noise levels were measured at the Ngurrawaana Township in the vicinity of the Project (see Appendix A) between 26 March 2025 and 7 May 2025. The background noise monitoring was conducted in accordance with the SA Guidelines as well as *Part 3 – Noise measurement* of the Regulations.

The noise monitoring equipment was located such that the measured background noise levels are representative of the background noise environment experienced at dwellings of the Ngurrawaana Township. Details of the monitoring location and equipment are shown in Table 1.

Table 1: Background Noise Monitoring Locations

Receptor	Noise Logger Model	Serial Number	Coordinates (GDA2020 / MGA Zone 50)		Monitoring Period
			Easting	Northing	
Ngurrawaana Township	*Rion NL-42A*	01224052	498460	7632201	26/3/25 – 7/5/25

3.2 Equipment

The background noise levels were measured using a Rion *NL-42A* (Type 2) sound level meter, which has a noise floor less than 20 dB(A). The sound level meter was field calibrated at the beginning and end of the measurement period with a Rion *NC-75* Calibrator (serial number 34913547) with no significant drift observed. Calibration certificates for the equipment used can be seen in Appendix B. The microphone was fitted with a weatherproof windshield, with the microphone positioned approximately 1.5 m above ground level.

Local rainfall and wind speed at approximately the microphone height were logged at a nearby location. The rainfall and wind speed data were collected to determine the periods when weather on the microphone may have influenced the measured background noise levels.

3.3 Data Collection

The background noise level ($L_{A90,10}$) was measured continuously in 10-minute intervals at the monitoring location over the monitoring period.

During the background noise monitoring regime, hub height wind speeds were measured at the site. The hub height wind speed was measured in 10-minute intervals concurrently with the background noise. Table 2 provides details of the wind mast used to measure the wind speed, as well as the measured values used to perform the analysis.

Table 2: Wind Mast Details

Mast ID	Datalogger Channels	Coordinates (GDA2020 / MGA Zone 50)	
		Easting	Northing
M1	*v2_CAL_Avg* *dir1_CAL_avg*	489363	7640429

The SA Guidelines specify that the background noise should be correlated with wind speeds at the WTG hub height. Wind speeds at a height of 160m have been used for the assessment.

3.4 Monitoring Results

Prior to the correlation and analysis, the following noise data were removed:

- Data points corresponding to any periods of measured rainfall (including the 10-minute periods before and after the recorded period) and/or where the measured wind speed exceeded 5 m/s at the microphone height for more than 90% of the measurement period.
- Data points corresponding to wind speeds below the cut-in wind speed (3 m/s) and above the wind speed of rated power (13 m/s).
- Data points associated with the setup and/or collection of the equipment.

Table 3 summarises the number of data points at the monitoring location before and after the removal of data points.

Table 3: Total Collected Data Points

Receptor	Data points	Data points after filtering	Downwind points	Downwind points after filtering
Ngurrawaana Township	6000	5087	1613	1396

The resultant background noise data for the monitoring location were correlated with the wind speed data measured at the wind mast. The correlated noise data were then split into wind speed bins as required by the SA Guidelines. Each wind speed bin is 1m/s wide and is centred on the integer wind speeds between the cut-in wind speed and the wind speed of rated power. The arithmetic average noise level for each wind speed bin was then determined to give the background noise level at each integer wind speed. The correlation graph can be seen in Appendix C.

Based on the bin analysis, the background noise level ($L_{A90,10}$) corresponding to the integer wind speeds of 3m/s (cut-in wind speed) to 13m/s (approximate wind speed of rated power) are provided in Table 4.

Table 4: Background noise levels [dB(A)]

Receptor	Background Noise Level for Hub Height (160m) Wind Speed Bins [dB(A)]										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
Ngurrawaana Township	40	40	40	41	41	41	42	42	42	42	41

The noise monitoring showed that background noise levels were substantially higher than typical for remote locations (such as the Ngurrawaana Township). Upon review, it was found that the diesel generator that serves the township (located to the north of the township) was running throughout noise monitoring period, and significantly contributed to the measured noise levels. The assessment has assumed that the generator will continue to run at all times (including during the operation of the Project). If the generator is to be removed, background noise monitoring should be re-conducted (without the generator operating) to establish appropriate background noise levels (and subsequent criteria) for the Ngurrawaana Township in the absence of this generator.

4 CRITERIA

4.1 Operation of WTGs

As discussed in Section 2, the most contemporary edition of the South Australian *EPA's Wind farms environmental noise guidelines 2009*, as updated in November 2021, has been applied for the demonstration of compliance.

It is understood that the Ngurrawaana Township is associated with the Project and would typically be compared to less onerous criteria. The SA Guidelines however typically only consider sensitive receivers to be associated where they are located within the project boundary. Therefore, the Ngurrawaana Township has been compared against the more onerous criteria for non-associated residences, taking into account the relevant WA adjustments.

As the background noise measurements were impacted by a noise source that may not always be present, determining criteria based on these levels may not be appropriate. Notwithstanding, criteria determined based on the background noise measurements can be seen in Table 5.

Table 5: Noise criteria [dB(A)]

Receptor	Noise Criteria for Hub Height (160m) Wind Speed Bins [dB(A)]										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
Ngurrawaana Township	45	45	45	46	46	46	47	47	47	47	46

The assessment has therefore been compared against a baseline average noise level ($L_{Aeq,10min}$) criterion of 35 dB(A) for all integer wind speeds from the cut-in wind speed to the wind speed of rated power.

The adopted baseline criterion is similar to the L_{A10} assigned level of 35 dB(A) provided by the Regulations, for a noise sensitive premises in a highly sensitive area that is subject to noise at any time of the day.

4.2 Operation of Other Infrastructure

The criteria for the operational noise from other infrastructure, including the substation, BESS, and solar farm, are given by the Regulations. Table 6 gives a summary of the criteria.

Table 6: Summary of Criteria from the Regulations

Type of premises receiving noise	Time of day	Assigned level		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to: 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

The Regulations also note that noise emitted from a premises when received at other premises must not significantly contribute to a level of noise that exceeds the assigned level. A noise emission is taken to significantly contribute to a level of noise if the noise emission exceeds a level that is 5 dB below the assigned level.

The influencing factors provide additions to the assigned levels based upon the noise environment surrounding the noise sensitive premises. Achieving the assigned level without influencing factors shows compliance with the Regulations. Given the potential for 24-hour operation of the substation and BESS, it is the criteria for the night period that are deemed most relevant. Based on this, conservatively not considering any influencing factors, and ensuring there is no significant contribution to the overall noise levels, the ancillary infrastructure must achieve a L_{A10} of 30 dB(A), a L_{A1} of 40 dB(A), and a L_{Amax} of 50 dB(A) during the night period.

The Regulations also provide guidance on intrusive or dominant noise characteristics, such as impulsiveness, modulation and tonality, which are defined in Table 7.

Table 7: Intrusive or Dominant Noise Characteristics

Characteristic	Definition
Impulsiveness	A variation in the emission of noise where the difference between $L_{A\ peak}$ and $L_{A\ Slow\ max}$ is more than 15 dB when determined for a single representative event
Modulation	A variation in the emission of noise that is: (a) more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and (b) present for at least 10% of the representative assessment period; and (c) regular, cyclic and audible;
Tonality	Noise emission of tonal characteristics where the difference between — (a) the A-weighted sound pressure level in any one-third octave band; and (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands, is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels

Where these noise characteristics are present, the adjustments shown in Table 8 should be applied, up to a maximum of + 15 dB.

Table 8: Noise Characteristic Adjustments

Where tonality is present	Where modulation is present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB

4.3 Construction Related Traffic Noise

Noise relating to road traffic due to construction of the Project has been assessed against the RNP. The RNP aims to identify the strategies that address the issue of road traffic noise from:

- Existing roads
- New road projects
- Road redevelopment projects
- New traffic-generating developments

The Project can be defined as a new traffic-generating development. The RNP defines the criteria to be used in assessing the impact of such noise. The assessment criteria are defined by road categories, the type of project or land use and the time of day under which the noise is created. Table 9 shows the assessment criteria for road traffic noise within residential land uses. The criteria applicable to the assessment has been made **BOLD**.

Table 9: Road traffic noise assessment criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway / arterial / sub-arterial roads	• Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	• Existing residences affected by noise from redevelopment of existing redevelopment of existing freeway/arterial/sub-arterial roads • Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial road generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
Local Roads	• **Existing residences affected by noise from new local road corridors** • Existing residences affected by noise from redevelopment of existing local roads • Existing residences affected by additional traffic on existing local roads generated by land use developments	**$L_{Aeq,\ (1\ hour)}$ 55 (external)**	**$L_{Aeq,\ (1\ hour)}$ 50 (external)**

5 METHODOLOGY

5.1 Operation of WTGs

The predictions of environmental noise from the WTGs have been based on the noise propagation model described by *ISO 9613-2:1996 "Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation"* (**ISO 9613-2**)[1] and the *SoundPLANnoise* noise modelling software. ISO 9613-2 is one of the recommended models under the SA Guidelines for the prediction of wind turbine noise. The noise propagation model considers the following:

- sound power levels and noise source locations
- separation distances between noise sources and residences
- topography of the area
- influence of the ground and air absorption
- meteorological conditions

ISO 9613-2 provides a methodology for predicting noise levels at sensitive land uses under meteorological conditions favourable to noise propagation. Specifically, the ISO 9613-2 model predicts noise based on the assumption of downwind noise propagation (resulting in higher noise levels) from all WTGs to all noise sensitive receptors simultaneously, therefore representing a conservative approach.

[1] It is noted that an updated revision of ISO 9613-2 was released in 2024. This version of the standard has not been adopted for this assessment, as it is understood that the conditions and assumptions considered by the IOA Guide have not yet been validated for the 2024 version of the standard. Assessment of the noise using ISO 9613-2:2024 could be considered separately (if required) in addition to the approved methodology of the IOA Guide and ISO 9613-2:1996.

Inputs to the noise prediction model are in accordance with the Institute of Acoustics *"A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise"* (May 2013) (the **IOA Guide**), which includes the following requirements:

- 10°C air temperature
- 70% relative humidity
- intermediate ground absorption
- barrier attenuation of no greater than 2 dB(A)
- noise sensitive receptor point located 4m above ground level (required by the IOA Guide, despite receptor points being at a lower level than this)
- application of a 3 dB(A) correction where a "concave" ground profile exists as defined by the IOA Guide

These inputs are in accordance with the SA Guidelines, which specifically references the IOA Guide for suitable noise model inputs.

5.2 Operation of the Other Infrastructure

To predict the noise from other infrastructure, a noise model of the Project has been created using the *SoundPLANnoise* noise modelling software to predict the resultant noise levels at the noise sensitive receptors. Environmental noise predictions have been made using the CONCAWE[2] noise propagation model within the *SoundPLANnoise* noise modelling software. The sound propagation model considers the following influences:

- Sound power levels and locations of noise sources (including height of sources).
- Separation distances between noise sources and receivers.
- Shielding provided by the ground topography.
- Influence of the ground and air absorption.
- Meteorological conditions.

[2] CONCAWE - The oil companies' international study group for conservation of clean air and water – Europe, 'The propagation of noise from petrochemical complexes to neighbouring communities', May 1981.

In addition, the following meteorological inputs have been used for the CONCAWE model in accordance with the recommendations contained in the DWER Draft Guideline *Assessment of environmental noise emissions (May 2021)*.

- Wind Speed: 3 m/s.
- Pasquill Stability Class: F.
- Temperature: 15°C.
- Relative Humidity: 50%.

6 ASSESSMENT

6.1 Operation of WTGs

The predicted noise level for the worst-case (highest noise level) wind speed, corresponding to hub height wind speeds of 10m/s and above, resulting from the assessment is less than 20 dB(A) at the Ngurrawaana Township. Noise contours are provided in Appendix D.

Based upon the assessment, the baseline average noise level ($L_{eq,10min}$) criterion of 35 dB(A) is easily achieved for the operation of the WTGs.

As the criteria are achieved at an indicative hub height of 160m, it can be assumed that the criteria would also be achieved at lower hub heights.

6.2 Operation of Other Infrastructure

The approximate capacity for the other infrastructure components is as follows:

- Substation: 1500MW.
- BESS: 400MWh.
- Solar farm: 250MW.

As the design for these elements of the Project is still ongoing, a number of assumptions have been made for the noise produced by each component, as shown below:

- The noise from the substation has been assumed to be generated by a single transformer of the stated capacity. The sound power level for this transformer has been determined in accordance with the *Australian Standard AS 60076.10:2023 Power transformers, Part 10: Determination of sound levels (IEC 60076-10:2016 (ED. 2.0) MOD)*. This resulted in a sound power level of 110 dB(A).
- The sound power level for the BESS has been assumed based on the stated capacity and other previous experience with similar facilities. A conservative overall sound power level of 130 dB(A) has been determined for this component.
- Based on the stated capacity of the solar farm, an overall sound power level of 113 dB(A) has been determined based on past experience. The worst-case (closest) potential solar farm location has been considered.

The noise from some electrical equipment, particularly transformers, batteries, and inverters, has the potential to exhibit tonality. In accordance with the Regulations, an adjustment of + 5 dB is required where intrusive or excessive tonality is present. As a conservative measure, this adjustment has been applied to the predicted noise levels.

The highest predicted noise level at the Ngurrawaana Township as a result of the operation of other infrastructure, including the substation, BESS, and solar farm, has been predicted to be less than 20 dB(A), with the inclusion of an adjustment for tonality. This will easily achieve the relevant criterion of 30 dB(A) at night at this location.

6.3 Construction Related Traffic Noise

Estimates for the traffic generated by the construction of the Project have been established based on similarly sized projects. The assessment of construction related traffic noise has been based on the following assumptions:

- The understanding that the nearest access road to the township will not be used during construction, and that the next nearest access road is located at a setback distance of approximately 5.8km from the Ngurrawaana Township.
- A peak hour traffic volume comprising 30 light vehicles and 33 heavy vehicles.
- A speed limit of 40kmh.

Based on the above, the peak hour average noise level ($L_{eq,1hr}$) predicted at the Ngurrawaana Township is less than 20 dB(A), thereby easily achieving both the day and night criteria of the RNP.

7 CONCLUSION

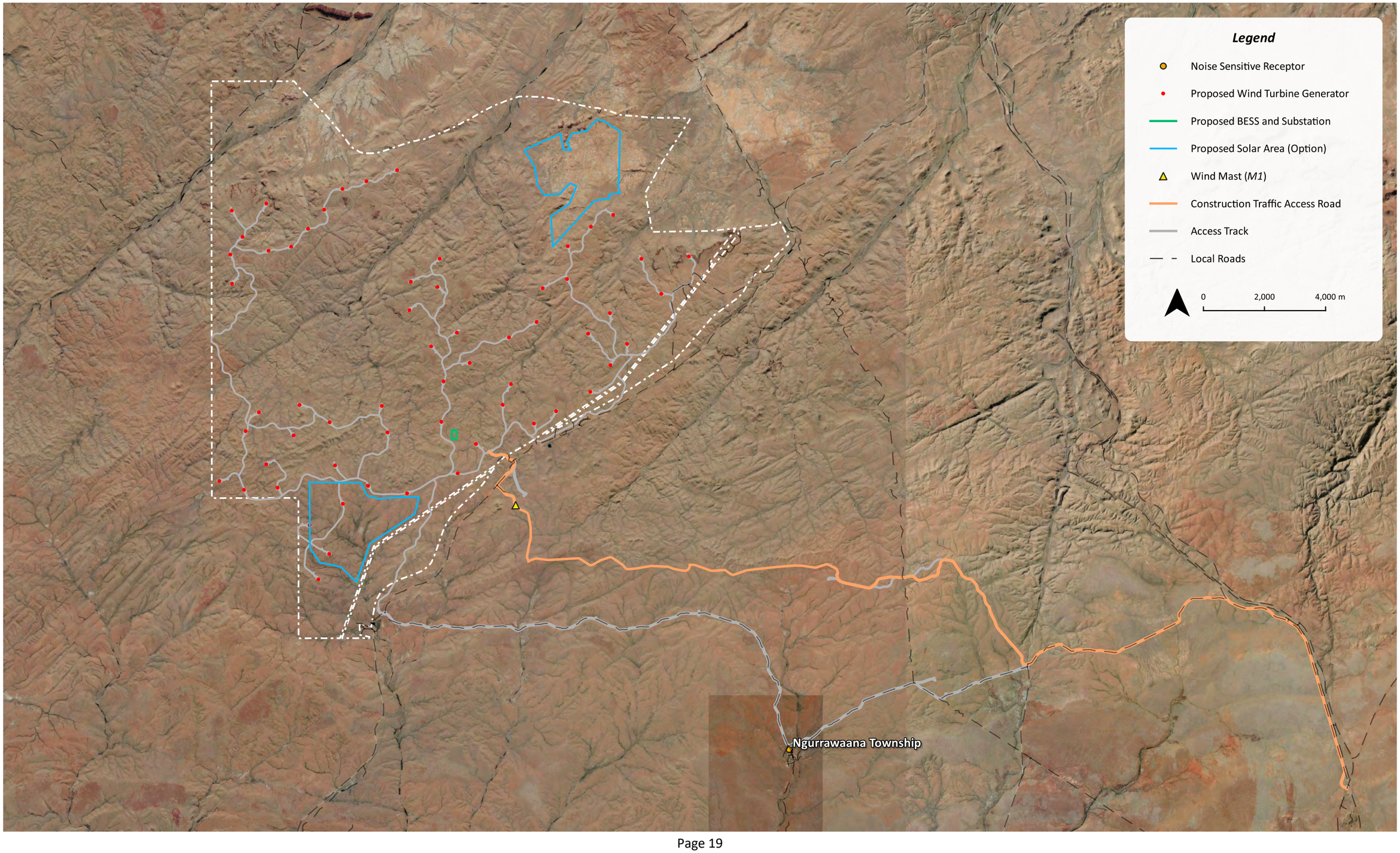
A noise impact assessment has been made for the Baru project area, as part of the proposed Yindjibarndi Renewable Energy Hub.

Criteria have been determined for the operation of the wind farm, solar farm, substation and battery energy storage system components, as well as the noise from traffic associated with construction, based upon the:

- Western Australian EPA's *Environmental Protection (Noise) Regulations 1997* revision dated November 2003.
- South Australian EPA's Wind farms environmental noise guidelines 2009, updated November 2021.
- NSW Road Noise Policy, dated March 2011.

Noise modelling has been conducted to provide predicted noise levels at the relevant noise sensitive receptor, being the Ngurrawaana Township. The predictions from the assessments show that the operation will comply with all of the relevant acoustic requirements.

APPENDIX A: YINDJIBARNDI RENEWABLE ENERGY HUB SITE (BARU PROJECT AREA)



APPENDIX B: CALIBRATION CERTIFICATES

Appendix B.1: Rion NL-42A Sound Level Meter

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM52983

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Rion		
Type No:	NL-42A	**Serial No:**	01224052
Mic. Type:	Rion UC-52	**Serial No:**	184408
Pre-Amp. Type:	Rion NH-24	**Serial No:**	90298

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	999	hPa ±1 hPa	**Date of Receipt :**	24/02/2025
Temperature	24	°C ±1° C	**Date of Calibration :**	28/02/2025
Relative Humidity	51	% ±5%	**Date of Issue :**	03/03/2025

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
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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

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Appendix B.2: Rion NC-75 Calibrator

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C51270

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Rion
Type No: NC-75 **Serial No:** 34913547
Class: 1
Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	17/09/2024
Temperature	22	°C ±1° C	**Date of Calibration :**	19/09/2024
Relative Humidity	27	% ±5%	**Date of Issue :**	23/09/2024

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

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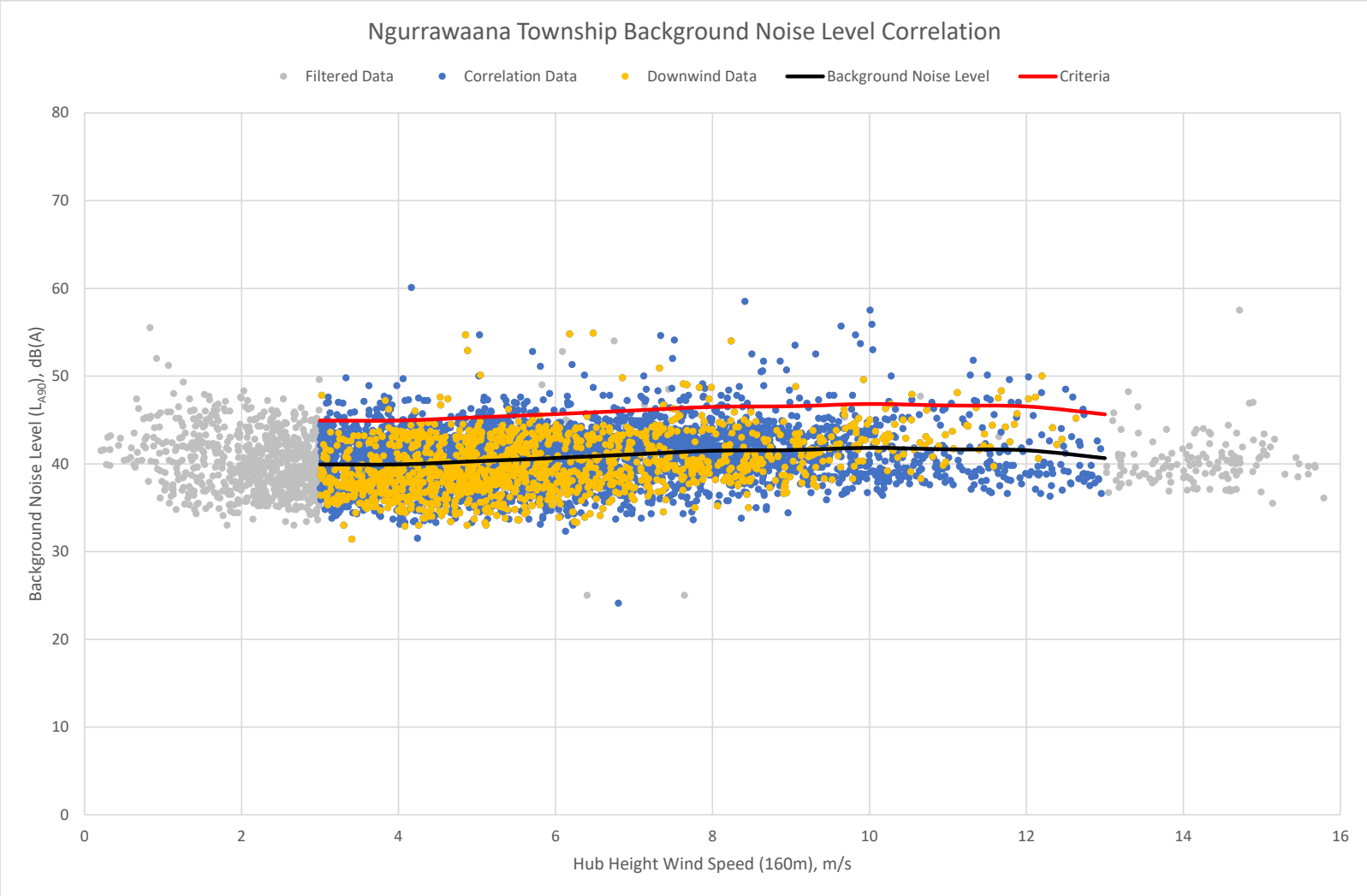
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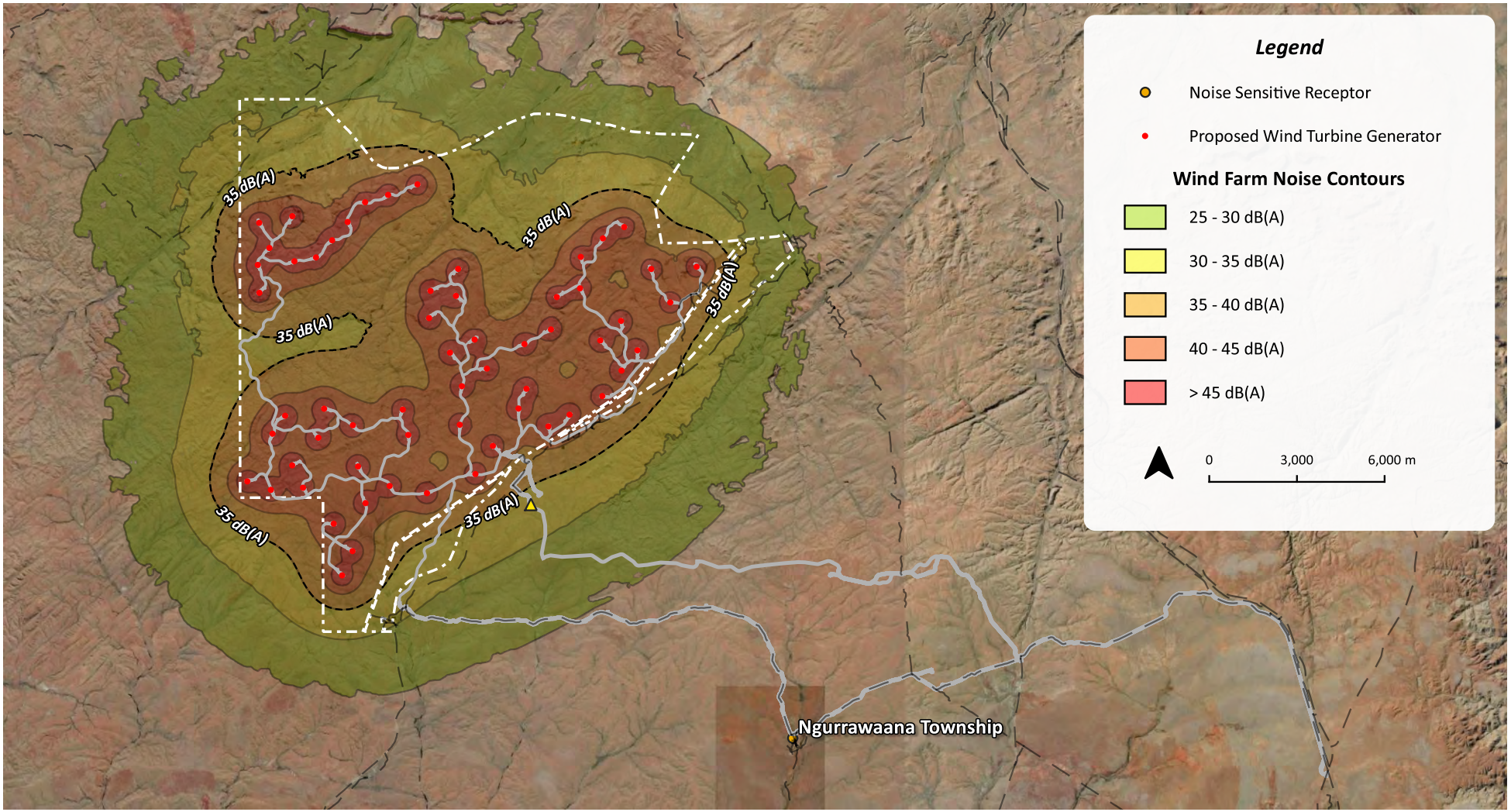
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APPENDIX C: BACKGROUND NOISE AND WIND SPEED CORRELATION GRAPH



APPENDIX D: PREDICTED NOISE CONTOURS



Yindjibarndi Renewable Energy Hub

Marnda Project

Noise Impact Assessment

S8467C2

June 2025

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Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000
Phone: +61 (8) 8231 2100
Email: info@sonus.com.au
www.sonus.com.au

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1 INTRODUCTION

A noise impact assessment has been made of the Marnda project area, as part of the proposed Yindjibarndi Renewable Energy Hub (the **Project**).

The Project is to be located approximately 60km south-east of Karratha. The Marnda project area will comprise wind farm and solar farm components.

The noise assessment considers the following:

- 73 Wind Turbine Generators (**WTGs**) at the locations shown in Appendix A.
- Operation of a solar farm up to 250MW in capacity, at one of the locations shown in Appendix A.
- Traffic noise relating to the construction of the Project, noting that traffic volumes during operation will be lower than during construction. Other noise sources related to construction are not considered.
- The nearest noise sensitive receptor being the Township of Ngurrawaana (the **Ngurrawaana Township**) as shown in Appendix A.
- Noise level data for the selected WTG, the Vestas *V172-7.2MW* with serrated trailing edges, in the *PO7200* operating mode, with a hub height of up to 160m and a tip height of up to 246m.
- The WTG being free of any excessive levels of tonality, or any other special audible characteristics, when assessed at the noise sensitive receptors.
- Background noise testing conducted between 26 March 2025 and 7 May 2025. It is noted that the existing generator serving the Ngurrawaana Township significantly contributes to the noise levels experienced by dwellings. If the generator is to be removed, background noise monitoring should be re-conducted (without the generator operating) to establish appropriate background noise levels for the Ngurrawaana Township.

The project layout is shown in Appendix A.

It is noted that the hub height for the WTGs has not yet been finalised and has therefore been conservatively assessed at a height of 160m. It has been assumed that, where compliance can be shown for a hub height of 160m, all lesser hub heights would also comply.

2 REGULATIONS AND GUIDELINES

The Western Australian EPA's *Environmental Protection (Noise) Regulations 1997,* dated November 2003 (the **Regulations**), has formed the basis of the assessment for the noise resulting from the Project.

The noise produced by wind turbines is both unique and complex and requires careful consideration when assessing any noise impacts. The Regulations form an overarching framework for the assessment of a wide range of noise producing activities, without providing specific assessment approaches for particular noise sources. The Western Australian Planning Commission (**WAPC**) recognises this in their document *Position Statement: Renewable energy facilities March 2020* (the **Position Statement**), which aims to promote the consistent consideration and assessment of renewable facilities.

The Position Statement requires the noise from wind turbines to achieve the requirements of the Regulations, but also makes reference to the South Australian Environmental Protection Authority's document *Wind Farms Environmental Noise Guidelines (2009)* for assessment purposes. The latest version of this document is the *Wind farms environmental noise guidelines,* as updated in November 2021 (the **SA Guidelines**). Despite referencing the assessment methodology of the SA Guidelines, this method is not easily reconcilable with the method presented in the Regulations.

It is understood that the Department of Water and Environmental Regulation (**DWER**) has previously provided advice regarding reconciling the Regulations and the SA Guidelines for other similar projects. They note that further WA government guidance specific to wind turbine assessments is under development, however in the interim, an appropriate approach is to adopt the SA Guidelines in conjunction with the Regulations and background noise monitoring. In summary, this approach involves:

- For non-associated receivers, adopting a base limit of 35 dB(A) to reflect the night period assigned levels from the Regulations.
- For associated receivers, adopting a base limit of 45 dB(A).
- Noting the steady state nature of the wind turbine noise source, using the L_{eq} metric for assessment consistent with the SA Guidelines in lieu of the L_{10} metric from the Regulations.
- All-time noise limits applicable for both day and night period, consistent with the SA Guidelines.
- Use of the L_{90} measurement metric detailed in the SA Guidelines for assessing compliance with the assigned levels.

In recognition of the above, the assessment of noise from the wind turbines has been conducted in accordance with the SA Guidelines, incorporating the WA specific changes recommended above. The noise from other sources, such as the solar farm, have been assessed in accordance with the Regulations.

It is noted that the noise emissions from the propulsion and braking systems of motor vehicles operating on a road is excluded from the Regulations. While the noise from construction activities is considered under the Regulations, the Regulations do not consider traffic associated with construction in the definition of construction works. In addition, the Regulations do not apply for construction works between 7:00am and 7:00pm. A different method is therefore required for the assessment of traffic noise associated with construction.

The WAPC document *State Planning Policy 5.4 – Road and Rail Noise* (**SPP 5.4**), dated September 2019, provides an assessment framework for the noise associated with traffic on new roads near to sensitive receivers. The requirement for a noise assessment depends on the distance a sensitive receiver is from the road. The distances within which an assessment is required (the trigger distances) provided in SPP 5.4 are as follows:

- For roads with 500 or more heavy vehicles per day and/or 50,000 per day traffic volumes, an assessment is required for sensitive receivers within 300m.
- For roads with 100 or more heavy vehicles per day and/or 23,000 per day traffic volumes, an assessment is required for sensitive receivers within 200m.

As traffic counts are not currently available for the Project, it has been assumed that there will be at least 100 heavy vehicles using the roads during construction per day. The smallest distance between a sensitive receiver and the road used for construction traffic is approximately 5.8km. This is much greater than the relevant trigger distance and therefore SPP 5.4 does not apply. Notwithstanding, an assessment of traffic noise associated with construction has still been conducted. It is considered that the NSW Road Noise Policy, dated March 2011 (the **RNP**) is the most appropriate framework for this assessment. It is noted that the criteria presented in the RNP are comparable to those in SPP 5.4, albeit with a shorter assessment period (therefore providing a more conservative assessment).

3 BACKGROUND NOISE MONITORING

3.1 Monitoring Procedure

The background noise levels were measured at the Ngurrawaana Township in the vicinity of the Project (see Appendix A) between 26 March 2025 and 7 May 2025. The background noise monitoring was conducted in accordance with the SA Guidelines as well as *Part 3 – Noise measurement* of the Regulations.

The noise monitoring equipment was located such that the measured background noise levels are representative of the background noise environment experienced at dwellings of the Ngurrawaana Township. Details of the monitoring location and equipment are shown in Table 1.

Table 1: Background Noise Monitoring Locations

Receptor	Noise Logger Model	Serial Number	Coordinates (GDA2020 / MGA Zone 50)		Monitoring Period
			Easting	Northing	
Ngurrawaana Township	*Rion NL-42A*	01224052	498460	7632201	26/3/25 – 7/5/25

3.2 Equipment

The background noise levels were measured using a Rion *NL-42A* (Type 2) sound level meter, which has a noise floor less than 20 dB(A). The sound level meter was field calibrated at the beginning and end of the measurement period with a Rion *NC-75* Calibrator (serial number 34913547) with no significant drift observed. Calibration certificates for the equipment used can be seen in Appendix B. The microphone was fitted with a weatherproof windshield, with the microphone positioned approximately 1.5 m above ground level.

Local rainfall and wind speed at approximately the microphone height were logged at a nearby location. The rainfall and wind speed data were collected to determine the periods when weather on the microphone may have influenced the measured background noise levels.

3.3 Data Collection

The background noise level ($L_{A90,10}$) was measured continuously in 10-minute intervals at the monitoring location over the monitoring period.

During the background noise monitoring regime, hub height wind speeds were measured at the site. The hub height wind speed was measured in 10-minute intervals concurrently with the background noise. Table 2 provides details of the wind mast used to measure the wind speed, as well as the measured values used to perform the analysis.

Table 2: Wind Mast Details

Mast ID	Datalogger Channels	Coordinates (GDA2020 / MGA Zone 50)	
		Easting	Northing
M1	*v2_CAL_Avg* *dir1_CAL_avg*	489363	7640429

The SA Guidelines specify that the background noise should be correlated with wind speeds at the WTG hub height. Wind speeds at a height of 160m have been used for the assessment.

3.4 Monitoring Results

Prior to the correlation and analysis, the following noise data were removed:

- Data points corresponding to any periods of measured rainfall (including the 10-minute periods before and after the recorded period) and/or where the measured wind speed exceeded 5 m/s at the microphone height for more than 90% of the measurement period.
- Data points corresponding to wind speeds below the cut-in wind speed (3 m/s) and above the wind speed of rated power (13 m/s).
- Data points associated with the setup and/or collection of the equipment.

Table 3 summarises the number of data points at the monitoring location before and after the removal of data points.

Table 3: Total Collected Data Points

Receptor	Data points	Data points after filtering	Downwind points	Downwind points after filtering
Ngurrawaana Township	6000	5087	1613	1396

The resultant background noise data for the monitoring location were correlated with the wind speed data measured at the wind mast. The correlated noise data were then split into wind speed bins as required by the SA Guidelines. Each wind speed bin is 1m/s wide and is centred on the integer wind speeds between the cut-in wind speed and the wind speed of rated power. The arithmetic average noise level for each wind speed bin was then determined to give the background noise level at each integer wind speed. The correlation graph can be seen in Appendix C.

Based on the bin analysis, the background noise level ($L_{A90,10}$) corresponding to the integer wind speeds of 3m/s (cut-in wind speed) to 13m/s (approximate wind speed of rated power) are provided in Table 4.

Table 4: Background noise levels [dB(A)]

Receptor	Background Noise Level for Hub Height (160m) Wind Speed Bins [dB(A)]										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
Ngurrawaana Township	40	40	40	41	41	41	42	42	42	42	41

The noise monitoring showed that background noise levels were substantially higher than typical for remote locations (such as the Ngurrawaana Township). Upon review, it was found that the diesel generator that serves the township (located to the north of the township) was running throughout noise monitoring period, and significantly contributed to the measured noise levels. The assessment has assumed that the generator will continue to run at all times (including during the operation of the Project). If the generator is to be removed, background noise monitoring should be re-conducted (without the generator operating) to establish appropriate background noise levels (and subsequent criteria) for the Ngurrawaana Township in the absence of this generator.

4 CRITERIA

4.1 Operation of WTGs

As discussed in Section 2, the most contemporary edition of the South Australian *EPA's Wind farms environmental noise guidelines 2009*, as updated in November 2021, has been applied for the demonstration of compliance.

It is understood that the Ngurrawaana Township is associated with the Project and would typically be compared to less onerous criteria. The SA Guidelines however typically only consider sensitive receivers to be associated where they are located within the project boundary. Therefore, the Ngurrawaana Township has been compared against the more onerous criteria for non-associated residences, taking into account the relevant WA adjustments.

As the background noise measurements were impacted by a noise source that may not always be present, determining criteria based on these levels may not be appropriate. Notwithstanding, criteria determined based on the background noise measurements can be seen in Table 5.

Table 5: Noise criteria [dB(A)]

Receptor	Noise Criteria for Hub Height (160m) Wind Speed Bins [dB(A)]										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
Ngurrawaana Township	45	45	45	46	46	46	47	47	47	47	46

The assessment has therefore been compared against a baseline average noise level ($L_{Aeq,10min}$) criterion of 35 dB(A) for all integer wind speeds from the cut-in wind speed to the wind speed of rated power.

The adopted baseline criterion is similar to the L_{A10} assigned level of 35 dB(A) provided by the Regulations, for a noise sensitive premises in a highly sensitive area that is subject to noise at any time of the day.

4.2 Operation of Other Infrastructure

The criteria for the operational noise from other infrastructure, i.e., the solar farm, are given by the Regulations. Table 6 gives a summary of the criteria.

Table 6: Summary of Criteria from the Regulations

Type of premises receiving noise	Time of day	Assigned level		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to: 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

The Regulations also note that noise emitted from a premises when received at other premises must not significantly contribute to a level of noise that exceeds the assigned level. A noise emission is taken to significantly contribute to a level of noise if the noise emission exceeds a level that is 5 dB below the assigned level.

The influencing factors provide additions to the assigned levels based upon the noise environment surrounding the noise sensitive premises. Achieving the assigned level without influencing factors shows compliance with the Regulations. Given the potential for early morning operation of the solar farm, it is the criteria for the night period that are deemed most relevant. Based on this, conservatively not considering any influencing factors, and ensuring there is no significant contribution to the overall noise levels, the ancillary infrastructure must achieve a L_{A10} of 30 dB(A), a L_{A1} of 40 dB(A), and a L_{Amax} of 50 dB(A) during the night period.

The Regulations also provide guidance on intrusive or dominant noise characteristics, such as impulsiveness, modulation and tonality, which are defined in Table 7.

Table 7: Intrusive or Dominant Noise Characteristics

Characteristic	Definition
Impulsiveness	A variation in the emission of noise where the difference between $L_{A\ peak}$ and $L_{A\ Slow\ max}$ is more than 15 dB when determined for a single representative event
Modulation	A variation in the emission of noise that is: (a) more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and (b) present for at least 10% of the representative assessment period; and (c) regular, cyclic and audible;
Tonality	Noise emission of tonal characteristics where the difference between — (a) the A-weighted sound pressure level in any one-third octave band; and (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands, is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels

Where these noise characteristics are present, the adjustments shown in Table 8 should be applied, up to a maximum of + 15 dB.

Table 8: Noise Characteristic Adjustments

Where tonality is present	Where modulation is present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB

4.3 Construction Related Traffic Noise

Noise relating to road traffic due to construction of the Project has been assessed against the RNP. The RNP aims to identify the strategies that address the issue of road traffic noise from:

- Existing roads
- New road projects
- Road redevelopment projects
- New traffic-generating developments

The Project can be defined as a new traffic-generating development. The RNP defines the criteria to be used in assessing the impact of such noise. The assessment criteria are defined by road categories, the type of project or land use and the time of day under which the noise is created. Table 9 shows the assessment criteria for road traffic noise within residential land uses. The criteria applicable to the assessment has been made **BOLD**.

Table 9: Road traffic noise assessment criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway / arterial / sub-arterial roads	• Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ (15\ hour)}$ 55 (external)	$L_{Aeq,\ (9\ hour)}$ 50 (external)
	• Existing residences affected by noise from redevelopment of existing redevelopment of existing freeway/arterial/sub-arterial roads • Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial road generated by land use developments	$L_{Aeq,\ (15\ hour)}$ 60 (external)	$L_{Aeq,\ (9\ hour)}$ 55 (external)
Local Roads	• **Existing residences affected by noise from new local road corridors** • Existing residences affected by noise from redevelopment of existing local roads • Existing residences affected by additional traffic on existing local roads generated by land use developments	**$L_{Aeq,\ (1\ hour)}$ 55 (external)**	**$L_{Aeq,\ (1\ hour)}$ 50 (external)**

5 METHODOLOGY

5.1 Operation of WTGs

The predictions of environmental noise from the WTGs have been based on the noise propagation model described by *ISO 9613-2:1996 "Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation"* (**ISO 9613-2**)[1] and the *SoundPLANnoise* noise modelling software. ISO 9613-2 is one of the recommended models under the SA Guidelines for the prediction of wind turbine noise. The noise propagation model considers the following:

- sound power levels and noise source locations
- separation distances between noise sources and residences
- topography of the area
- influence of the ground and air absorption
- meteorological conditions

ISO 9613-2 provides a methodology for predicting noise levels at sensitive land uses under meteorological conditions favourable to noise propagation. Specifically, the ISO 9613-2 model predicts noise based on the assumption of downwind noise propagation (resulting in higher noise levels) from all WTGs to all noise sensitive receptors simultaneously, therefore representing a conservative approach.

[1] It is noted that an updated revision of ISO 9613-2 was released in 2024. This version of the standard has not been adopted for this assessment, as it is understood that the conditions and assumptions considered by the IOA Guide have not yet been validated for the 2024 version of the standard. Assessment of the noise using ISO 9613-2:2024 could be considered separately (if required) in addition to the approved methodology of the IOA Guide and ISO 9613-2:1996.

Inputs to the noise prediction model are in accordance with the Institute of Acoustics *"A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise"* (May 2013) (the **IOA Guide**), which includes the following requirements:

- 10°C air temperature
- 70% relative humidity
- intermediate ground absorption
- barrier attenuation of no greater than 2 dB(A)
- noise sensitive receptor point located 4m above ground level (required by the IOA Guide, despite receptor points being at a lower level than this)
- application of a 3 dB(A) correction where a "concave" ground profile exists as defined by the IOA Guide

These inputs are in accordance with the SA Guidelines, which specifically references the IOA Guide for suitable noise model inputs.

5.2 Operation of the Other Infrastructure

To predict the noise from other infrastructure, a noise model of the Project has been created using the *SoundPLANnoise* noise modelling software to predict the resultant noise levels at the noise sensitive receptors. Environmental noise predictions have been made using the CONCAWE[2] noise propagation model within the *SoundPLANnoise* noise modelling software. The sound propagation model considers the following influences:

- Sound power levels and locations of noise sources (including height of sources).
- Separation distances between noise sources and receivers.
- Shielding provided by the ground topography.
- Influence of the ground and air absorption.
- Meteorological conditions.

[2] CONCAWE - The oil companies' international study group for conservation of clean air and water – Europe, 'The propagation of noise from petrochemical complexes to neighbouring communities', May 1981.

In addition, the following meteorological inputs have been used for the CONCAWE model in accordance with the recommendations contained in the DWER Draft Guideline *Assessment of environmental noise emissions (May 2021)*.

- Wind Speed: 3 m/s.
- Pasquill Stability Class: F.
- Temperature: 15°C.
- Relative Humidity: 50%.

6 ASSESSMENT

6.1 Operation of WTGs

The predicted noise level for the worst-case (highest noise level) wind speed, corresponding to hub height wind speeds of 10m/s and above, resulting from the assessment is 33 dB(A) at the Ngurrawaana Township. Noise contours are provided in Appendix D.

Based upon the assessment, the baseline average noise level ($L_{eq,10min}$) criterion of 35 dB(A) is achieved for the operation of the WTGs.

As the criteria are achieved at an indicative hub height of 160m, it can be assumed that the criteria would also be achieved at lower hub heights.

6.2 Operation of Other Infrastructure

The approximate capacity for the solar farm is 250MW. As the design for this element of the Project is still ongoing, a number of assumptions have been made for the noise produced. Based on the stated capacity of the solar farm, an overall sound power level of 113 dB(A) has been determined based on past experience. The worst-case (closest) potential solar farm location has been considered.

The noise from some electrical equipment, particularly inverters, has the potential to exhibit tonality. In accordance with the Regulations, an adjustment of + 5 dB is required where intrusive or excessive tonality is present. As a conservative measure, this adjustment has been applied to the predicted noise levels.

The highest predicted noise level at the Ngurrawaana Township as a result of the operation of other infrastructure, i.e., the solar farm, has been predicted to be no more than 26 dB(A), with the inclusion of an adjustment for tonality. This will achieve the relevant criterion of 30 dB(A) at night at this location.

6.3 Construction Related Traffic Noise

Estimates for the traffic generated by the construction of the Project have been established based on similarly sized projects. The assessment of construction related traffic noise has been based on the following assumptions:

- The understanding that the nearest access road to the township will not be used during construction, and that the next nearest access road is located at a setback distance of approximately 5.8km from the Ngurrawaana Township.
- A peak hour traffic volume comprising 30 light vehicles and 33 heavy vehicles.
- A speed limit of 40kmh.

Based on the above, the peak hour average noise level ($L_{eq,1hr}$) predicted at the Ngurrawaana Township is less than 20 dB(A), thereby achieving both the day and night criteria of the RNP.

7 CONCLUSION

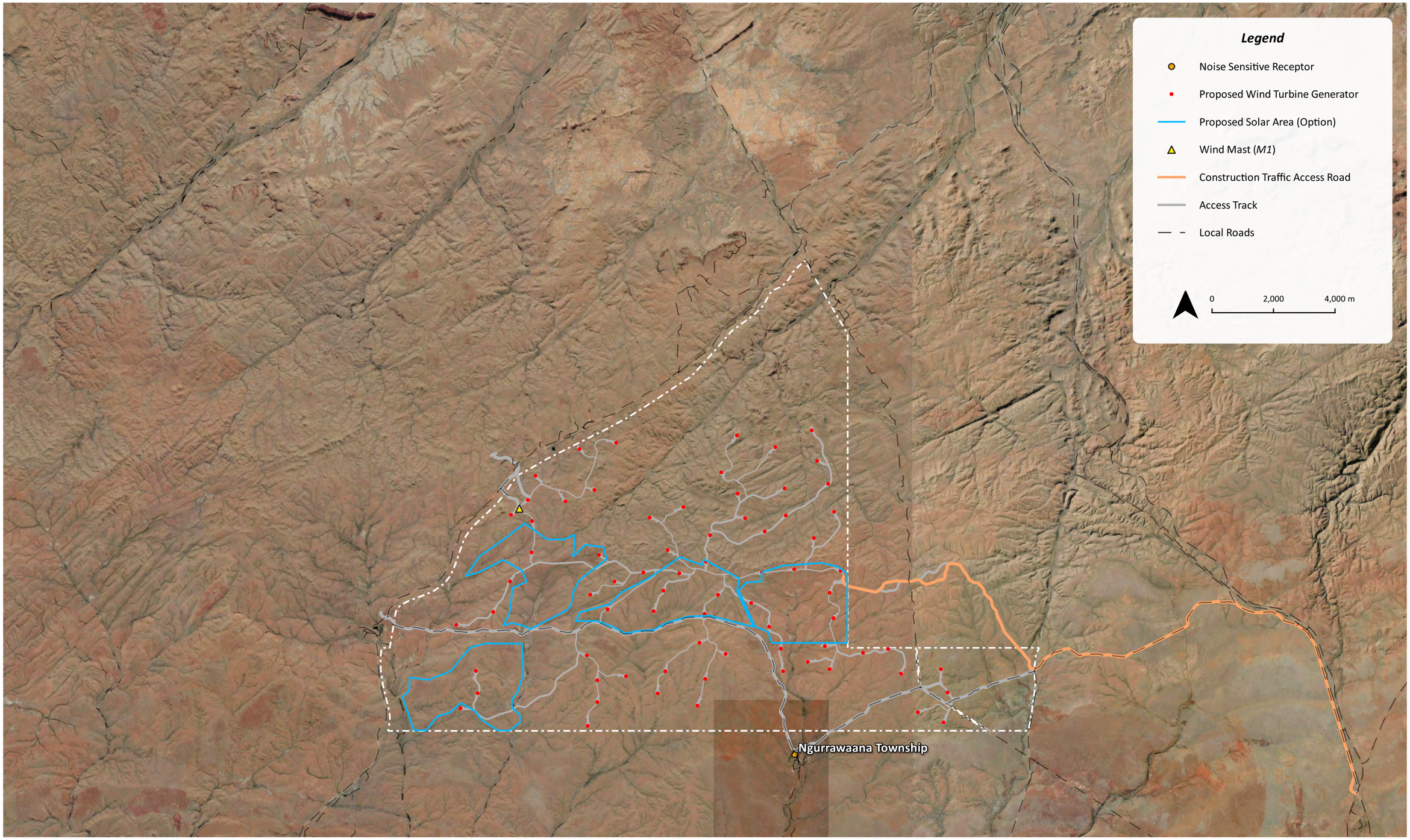
A noise impact assessment has been made for the Marnda project area, as part of the proposed Yindjibarndi Renewable Energy Hub.

Criteria have been determined for the operation of the wind farm and solar farm components, as well as the noise from traffic associated with construction, based upon the:

- Western Australian EPA's *Environmental Protection (Noise) Regulations 1997* revision dated November 2003.
- South Australian EPA's Wind farms environmental noise guidelines 2009, updated November 2021.
- NSW Road Noise Policy, dated March 2011.

Noise modelling has been conducted to provide predicted noise levels at the relevant noise sensitive receptor, being the Ngurrawaana Township. The predictions from the assessments show that the operation will comply with all of the relevant acoustic requirements.

APPENDIX A: YINDJIBARNDI RENEWABLE ENERGY HUB SITE (MARNDA PROJECT AREA)



APPENDIX B: CALIBRATION CERTIFICATES

Appendix B.1: Rion NL-42A Sound Level Meter

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM52983

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Rion		
Type No:	NL-42A	**Serial No:**	01224052
Mic. Type:	Rion UC-52	**Serial No:**	184408
Pre-Amp. Type:	Rion NH-24	**Serial No:**	90298

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	999	hPa ±1 hPa	**Date of Receipt :**	24/02/2025
Temperature	24	°C ±1° C	**Date of Calibration :**	28/02/2025
Relative Humidity	51	% ±5%	**Date of Issue :**	03/03/2025

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

CHECKED BY: ..... **AUTHORISED SIGNATURE:** ..... Hein Soe

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.

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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

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Acoustic and Vibration Measurements

Page 1 of 2 Calibration Certificate
AVCERT10.12 Rev.2.0 14/04/2021

7.2 : Rion NC-75 Calibrator

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C51270

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Rion
Type No: NC-75 **Serial No:** 34913547
Class: 1
Owner: Sonus Pty Ltd
17 Ruthven Ave
Adelaide SA 5000
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure	992	hPa ±1 hPa	**Date of Receipt :**	17/09/2024
Temperature	22	°C ±1° C	**Date of Calibration :**	19/09/2024
Relative Humidity	27	% ±5%	**Date of Issue :**	23/09/2024

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....
Hein Soe

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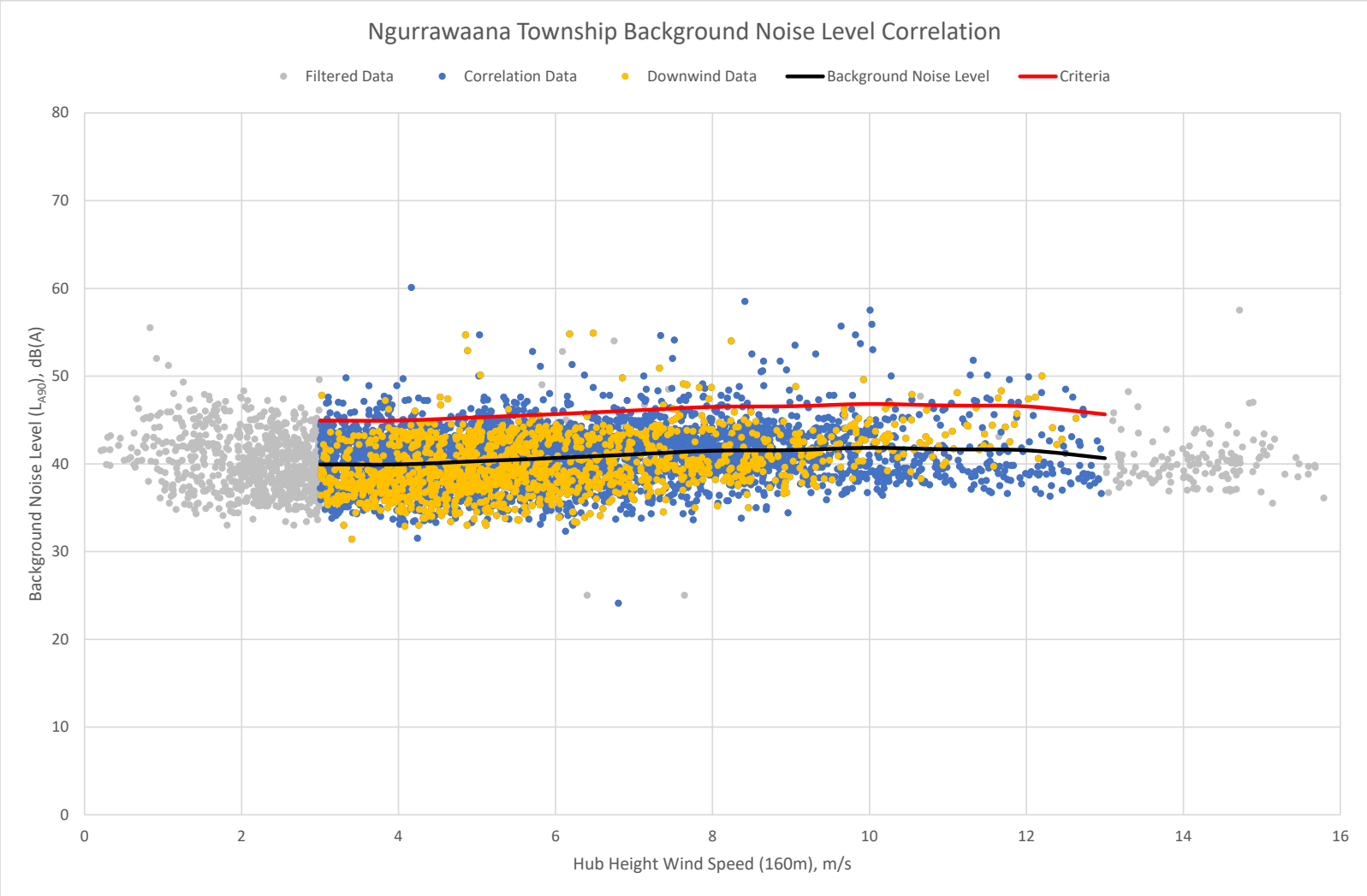
The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

Acu-Vib Electronics
ACOUSTICS AND VIBRATIONS
Head Office & Calibration Laboratory
Unit 14, 22 Hudson Avenue, Castle Hill NSW 2154
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APPENDIX C: BACKGROUND NOISE AND WIND SPEED CORRELATION GRAPH



APPENDIX D: PREDICTED NOISE CONTOURS

