NORTHROP

ACOUSTICS REPORT

Gudjaga Gunyahlamai Birth Centre

102–106 Hillcrest Avenue South Nowra NSW 2541

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PREPARED FOR
Papesch
4 Tingira Crescent
Kiama NSW 2533

Acoustics Report

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1. Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Papesch to provide an acoustic report for development application for Gudjaga Gunyahlamai Birth Centre (the Project) to be located at 102-106 Hillcrest Ave. South Nowra, NSW 2541 (the Site).

Based on the ambient noise measurements and requirements of the EPA NSW Noise Policy for Industry, the noise criteria were established. Noise emission levels to the surrounding sensitive receivers from the development were assessed against the project criteria. Where exceedances occurred, recommendations were provided for compliance.

Noise emissions to the surrounding sensitive receivers were assessed against the project criteria. Vehicular noise impacts from the carparks and in terms of impact upon the surrounding road network were considered. Where exceedances occurred, recommendations were provided for compliance.

Provided the recommendations are implemented, noise emissions from the subject development are predicted to comply with the acoustic requirements of Shoalhaven City Council, NSW EPA Noise Policy for Industry and relevant Australian standards and guidelines.

1.1 Referenced Documents

This assessment has been prepared considering the following documentation:

1.1.1 Project Documents:

- Architectural drawings issued by Papesch – see Appendix A
- Traffic Impact Assessment by ptc dated 8th April 2024.
- Waste Collection Plan WMP01, issued by LID dated 18th March 2024
- Waminda [redacted] – Acoustic DA Report SY233386-01-AU-RP01-2 issued 9th February 2024

1.1.2 Consent Authority, Design Guidelines and Standards:

- Shoalhaven Development Control Plan (DCP), 2014
- NSW Noise Policy for Industry (NPfI), 2017, issued by NSW Environmental Protection Authority
- AAAC Guideline for Child Care Centre Acoustic Assessment v3.0 2021
- NSW Road Noise Policy (RNP), 2011

1.1.3 Books, Research Papers, Scientific Journals:

- "Vocal effort levels in anechoic conditions" by Cushing et al. 2011

1.2 Project Understanding

The project involves the development of a Birthing Centre to be operated by Waminda-South Coast Women's Health & Wellbeing Aboriginal Corporation. The centre will include a mixture of medical and social services available to the local aboriginal community.

The building is proposed to be 1 level and located at the northern end of the Site facing Hillcrest Ave. The project will comprise:

- Welcome space/entry.
- Administration areas including reception, offices, meeting rooms, training rooms and staff amenities

- Medical and non-medical consultation rooms
- Birthing suites (4)
- Multi-purpose space
- Medical treatment rooms
- Medical offices
- Ambulance entry and resuscitation area
- Patient amenities
- Back-of-house medical areas
- External areas including a ceremonial space, kids play area, walled courtyard and birthing courtyard

The hours of operation of the birthing centre will be as follows:

- Office areas: 8 am – 6 pm Monday – Friday
- Medical areas: 24 hours, seven days a week

Northrop have been engaged to undertake the following scope:

- Establish existing acoustic environment and applicable noise criteria from noise monitoring data captured at a nearby site (94 Hillcrest Avenue – future [redacted]
- Acoustic assessment for development application

1.3 Site Description

The Site is located at 102-106 Hillcrest Avenue South Nowra, NSW 2541.

The Site is zoned R1 – Residential and is surrounded by other R1 zoned land. The Site is currently a vacant green field site.

The Site is bordered by Hillcrest Avenue to the north, residences and future [redacted] to the west, an existing aged care facility to the south, and residential buildings on the east. Some east boundary residences are accessed from Hillcrest Avenue and some from Old Southern Road. The Site, its surrounding most sensitive receivers and measurement locations are shown in Figure 1.

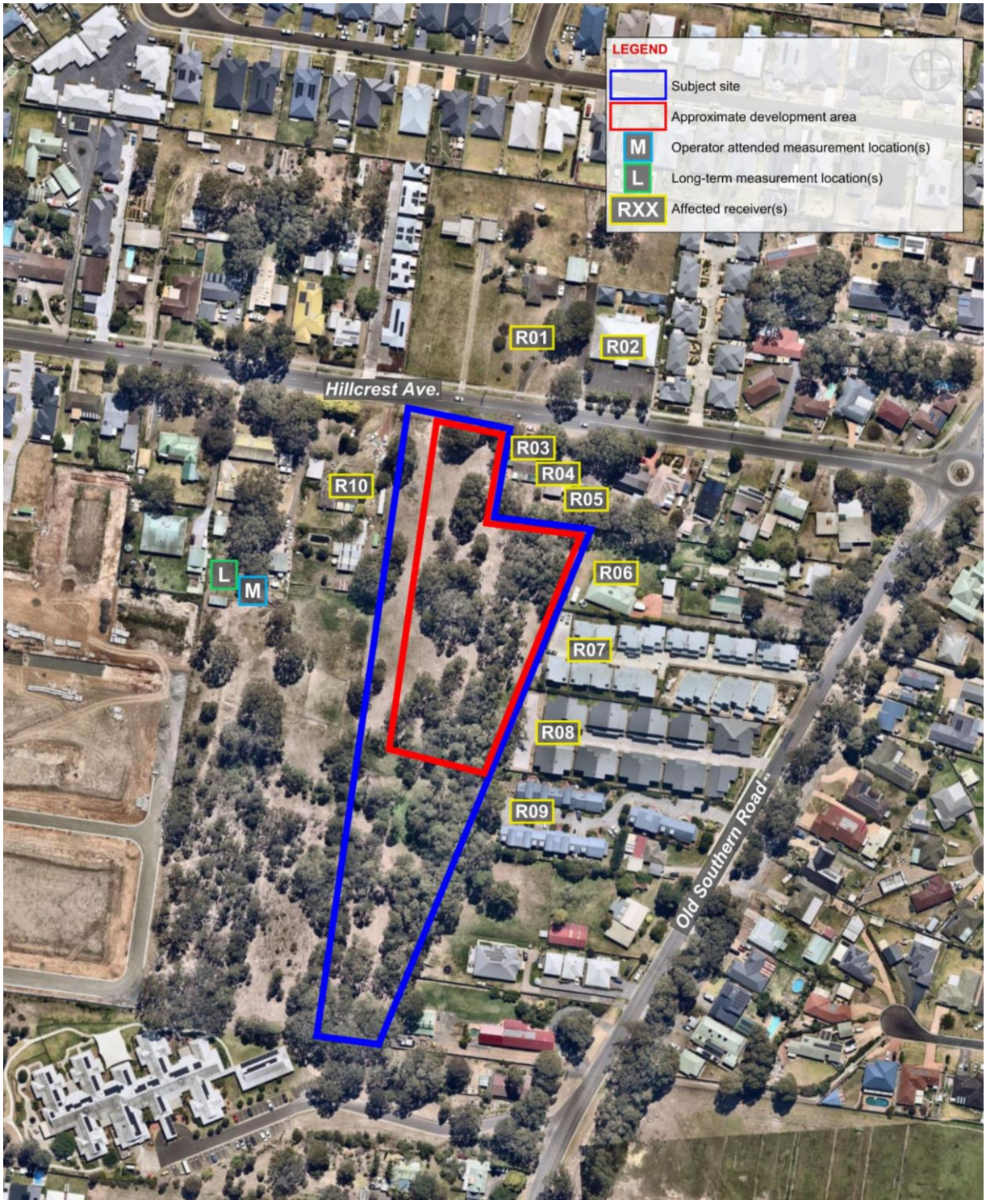


Figure 1: Aerial view of Site including nearest affected noise receivers, long term noise logger location L *and operator attended measurement shown* M

1.4 Sensitive Receivers

The nearest noise sensitive receivers which have potential for noise impact from the Project have been identified, summarised in Table 1 below.

Table 1: Noise sensitive receivers

Receiver ID	Address	Land use	Approximate location
R01	103 Hillcrest Ave.	Residential	20m North of Site (directly opposite on Hillcrest Avenue)
R02	107 Hillcrest Ave.	Early Learning Centre	20m North of Site (directly opposite on Hillcrest Avenue)
R03	108 Hillcrest Ave.	Residential	Directly adjoining eastern and northern boundaries of Site
R04	110 Hillcrest Ave.	Residential	Directly adjoining northern boundary of Site
R05	112 Hillcrest Ave.	Residential	Directly adjoining northern boundary of Site
R06	169 Old Southern Road	Residential	Directly adjoining eastern boundary of Site
R07	171 Old Southern Road	Residential	Directly adjoining eastern boundary of Site
R08	175 Old Southern Road	Residential	Directly adjoining eastern boundary of Site
R09	177A Old Southern Road	Residential	Directly adjoining eastern boundary of Site
R10	96 Hillcrest Ave.	Residential	Directly adjoining western boundary of Site

1.5 Acoustic Considerations

The following acoustic considerations have been taken into account for the assessment:

- Noise emissions from building services and mechanical equipment
- Noise emissions from car park movements at the site
- Maximum noise level assessment for night-time car park operations
- Noise from operational activities associated with outdoor areas
- Vehicular noise impact from the generated traffic

Site measurements indicate a low ambient noise environment. Therefore, noise intrusion from external noise sources (i.e. road traffic noise) has not been considered further.

2. Existing Environment

A noise survey was undertaken as part of the noise assessment for the development application of the future [redacted] nearby the Site located at 94 Hillcrest Avenue. During the survey, the existing noise environment was established. The survey included long term unattended ambient noise monitoring and operator attended noise measurements. Details are presented in the acoustic report issued for the [redacted] Centre development application (SY233386-01-AU-RP01-1 Waminda [redacted] - Acoustic DA Report).

As the acoustic environment of these two Sites are similar and the noise monitoring is recent, these noise monitoring results have been adopted for this project. The results of these investigations have been used to derive the noise emission criteria applicable to the project in accordance with the NSW EPA Noise Policy for Industry 2017.

2.1 Instrumentation

The survey was conducted with the following instruments:

- Rion NL-52 Type 1 noise logging sound level meter, serial number 00386740.
- NTI Precision Integrating Octave Band Sound Level Meter, Type XL2, A2A-15765-E0 with 1/3 Oct band filter unit, which conforms to applicable standards of IEC 61672-1:2002-05 CLASS1 & IEC 60651 TYPE1.

All equipment was calibrated before and after the measurements. No calibration deviations were recorded. All equipment carry traceable calibration certificates.

2.2 Long-term Noise Logging

The long-term (unattended) noise monitoring survey was conducted with a Rion NL52 noise logging sound level meter and windshield at location *L* shown in Figure 1 from 16th January 2024 to 24th January 2024. The monitor was calibrated before and after the measurements and there was no significant drift in calibration recorded.

During monitoring, the weather was generally calm and dry. For the occasional periods where adverse weather conditions prevailed, the sound data was disregarded.

The results from the sound monitoring are presented in Table 2, while the graphic form of monitoring results are presented in the Appendix C.

Table 2: Long-term noise logging results

Time period	Ambient Noise Levels, L_{eq} dBA	Rating Background Noise Levels (RBL), L_{90} dBA
Day (7am-6pm)	52	43
Evening (6pm-10pm)	49	40
Night (10pm-7am)	44	37

2.3 Operator Attended Measurements

Fifteen minute samples were recorded by operator attended measurements during the day time to verify unattended background sound levels and to characterise the acoustic environment around the Site.

The operator attended sound measurements were performed on 16th January 2024 and 24th January 2024 at location *M*, shown in Figure 1. Results are presented in Table 3.

Table 3: Operator attended measurement results

Location	Date	Start Time	Finish Time	Sound Pressure Level, dBA					Notes
				L_{eq}	L_{max}	L_{10}	L_{90}	L_{min}	
M	16.01.24	11:43 am	11:58 am	58	69	60	55	52	Some insects, intermittent landscaping equipment noise, distant low density traffic

3. Noise Emission Assessment

3.1 Shoalhaven City Council Development Control Plan (2014)

The following acoustic controls have been obtained from Shoalhaven City Council DCP's *Chapter G12 – Dwelling Houses* which shall be considered for the project:

5.5 Visual and Acoustic Privacy

The specific objectives are to:

i. *Ensure the design of the site and buildings minimises impacts on the amenity of future and adjoining/adjacent living areas and principal private open space in relation to visual privacy, overlooking and noise.*
ii. *Reduce the impacts of freestanding privacy screens on surrounding development.*
iii. *Ensure the thoughtful location of noise generating plant, equipment and sources.*

Performance Criteria

P9 Site layout and building design:

- *Protects and minimises noise transfer and nuisance.*
- *Does not adversely impact the amenity of residents or adjoining properties.*

Acceptable Solutions

A9.1 The noise level generated by any equipment must not exceed an $L_{Aeq\ (15min)}$ of 5dB(A) above background noise at the property boundary.

A9.2 All noise generating (mechanical) plant and equipment must be:

- *Acoustically screened (where appropriate).*
- *Sited to minimise noise impacts.*
- *Located at least 3m away from bedroom windows. Note: Noise generating equipment includes, but is not limited to, air conditioning units, swimming pool filters, hot water systems, fixed vacuum systems, mechanical gates and garage doors.*

A9.3 Dwellings adjacent to high levels of external noise shall be designed to minimise the entry of that noise. Note: High levels of external noise may be generated from sources such as classified/main roads, railway line, aircraft noise, industrial land uses.

It is noted that the DCP specifies that mechanical plant noise must not exceed the background noise level by more than 5 dBA. This criterion is also considered in the NPfI noise emission criteria determined below. Therefore, compliance with the NPfI criteria will also satisfy this requirement within the council DCP.

3.2 NSW EPA Noise Policy for Industry 2017

The NPfI sets out noise criteria to control the noise emission from industrial noise sources. Operational noise from the development will be assessed in accordance with the NPfI.

The NPfI assessment procedure has two components:

- Controlling intrusive noise into nearby residences (Intrusiveness Criteria)
- Maintaining noise level amenity for particular land uses (Amenity Criteria)

The Project Noise Trigger Level is the lower (that is, the more stringent) value from between the project intrusiveness noise level and project amenity noise level determined above. The Project Noise Trigger Level provides a benchmark for assessing the noise emissions from a development.

3.2.1 Project Intrusiveness Noise Level

The intrusiveness noise level aims to limit the change in the existing environment due to the introduction of a new noise source. The intrusiveness noise level is defined as:

$$L_{Aeq,15min} = RBL + 5\ dB$$

The rating background noise level (RBL) is determined through the background noise monitoring undertaken in Section above.

From the attended noise monitoring results presented in Table 2, it is evident that the background sound levels measured at location *M* are consistent with the unattended measurements and therefore the RBLs measured at the logger location has been adopted for all the surrounding residential receivers.

The project intrusiveness noise levels are presented in Table 4 below.

Table 4: Project intrusiveness noise level (residential receivers only)

Receiver	Time period[1]	Background RBL, dBA	Project intrusiveness noise level – $L_{eq,15min}$ dBA
Residential	Day	43	48
	Evening	40	45
	Night	37	42

[1]Time periods defined as: Day 7am to 6pm Monday to Saturday and 8am to 6pm Sunday; Evening 6pm to 10pm Monday to Sunday; Night 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays

3.2.2 Project Amenity Noise Level

For the purpose of limiting continual increase in noise levels, recommended noise levels are defined to maintain acoustic amenity for different types of land uses. The recommended amenity noise levels are described in Table 2.2 of the NPfI.

Based on the RBLs presented in and Table 2.3 of the NPfI, the residential receivers can be considered as suburban. The recommended amenity noise levels applicable to the Project are detailed in Table 5.

Table 5: Amenity noise levels

Receiver	Time period[1]	Recommended amenity noise level – $L_{eq,\ period}$ dBA	Project amenity noise level – $L_{eq,\ period}$ dBA[2]	Project amenity noise level – $L_{eq,15min}$ dBA[3]
Residential (suburban)	Day	55	50	53
	Evening	45	40	43
	Night	40	35	38
School classroom – internal[4]	Noisiest 1 hour period when in use	35	–	–

Active recreation area	When in use	55	–	–

[1]Time periods defined as: Day 7am to 6pm Monday to Saturday and 8am to 6pm Sunday; Evening 6pm to 10pm Monday to Sunday; Night 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays

[2]Recommended amenity noise level minus 5 dB

[3]In accordance with the NPfI, a 3 dBA correction has been applied to convert from a period level to a 15 minute level

[4]Applicable for early learning centre

3.2.3 Project Noise Trigger Levels

The Project Noise Trigger Level is the more stringent of the project intrusiveness noise level and project amenity noise level. The site-specific Project Noise Trigger Levels have been determined for the nearby sensitive receivers and have been detailed in Table 6 apply for residential receivers. For non-residential receivers, recommended amenity levels (Table 5) apply.

Table 6: Project Noise Trigger Levels

Land use	Time period[1]	Project intrusiveness noise level – $L_{eq,15min}$ dBA	Project amenity noise level – $L_{eq,15\ min}$ dBA	Project Trigger Levels – $L_{eq,15min}$ dBA
Residential	Day	48 (43 + 5)	53 (55 – 5 + 3)	48
	Evening	45 (40 + 5)	43 (45 – 5 + 3)	43
	Night	42 (37 + 5)	38 (40 – 5 + 3)	38

[1]Time periods defined as: Day 7am to 6pm Monday to Saturday and 8am to 6pm Sunday; Evening 6pm to 10pm Monday to Sunday; Night 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays

3.3 Operational Noise Emissions

3.3.1 Noise Sources

3.3.1.1 Car Park Movements

The following noise sources shown in Table 7 have been used in the assessment of car park movements within the Site, based on previous measurements in Northrop's database.

Table 7: Car noise source levels

Noise source	Sound Power Level, dB
Car driving at 10km/h	81 $L_{eq,15min}$
Car door slam	92 L_{max}

The traffic report issued by ptc predicts 47 car park movements each for both AM and PM peak hours. Considering the opening hours for the office areas are 8am – 6pm, it has been assumed that the AM peak hour occurs during day period and PM peak hour occurs during evening period. The assessment has assumed a maximum of 47 car park movements over 1 hour in both day and evening periods, spread evenly over 1 hour. No figures have been provided for night time car park movements, the assessment has assumed a maximum of 10 car park movements over 1 hour during night period, spread evenly over 1 hour.

3.3.1.2 Trucks and Waste Collection

Waste Collection Plan WMP01, issued by LID shows two waste collection areas proposed within the Site, both of which have been considered in the assessment. Noise emissions from truck movements and reverse alarms have been considered in the assessment. It has been assumed that only 1 truck will be on Site at any given time, and that truck movements will occur during day period only. A 5 dB penalty has been applied to the reverse alarm for tonality. It has been assumed that a truck would reverse for a maximum of 7 seconds, so the reverse alarm has been adjusted to a 15 minute level.

Table 8 below presents octave band sound power levels for ceremonial space used in the assessment.

Table 8: Truck noise source levels

Noise source	Sound Power Level, $L_{eq,15min}$ dBA
Truck	103
Reverse alarm	86

3.3.1.3 Ceremonial Space

The ceremonial space is proposed for gatherings to be held approximately quarterly during the day time. Noise emissions for people speaking in this area have been considered in the assessment. Noise source levels from people's voices have been derived from the levels provided in Cushing et. al. The number of people attending the gatherings is not known, the assessment has assumed 20 people speaking at a normal vocal level, and a 50% mix each of female and male voices. For a conservative assessment, the noise levels at lower frequencies (i.e. 63 Hz) have been assumed to be the same as the values presented at 125 Hz.

Table 9 below presents octave band sound power levels for ceremonial space used in the assessment.

Table 9: Ceremonial space noise source levels

SWL, dB (per octave band)	63	125	250	500	1000	2000	4000	8000
20 speakers at normal vocal level	72	72	80	80	77	72	68	63

3.3.1.4 Kid's Play Area

The kid's play area is proposed for use during the day period for "nature play". Approximately 10 kids are anticipated in the area when in use. The AAAC Guideline v3.0 for Child Care Centre Acoustic Assessment provides effective sound power levels for groups of 10 children playing, which have been used in the assessment. It has been assumed that "nature play" involves passive play only. The ages of the children are not known. To be conservative, sound power levels for children aged 3-5 years have been used in the assessment.

Table 10 below presents octave band sound power levels for kid's play area used in the assessment.

Table 10: Kid's play area noise source levels

SWL, dB (per octave band)	63	125	250	500	1000	2000	4000	8000
10 children 3-5 years (passive play)	58	64	69	75	77	74	70	66

3.3.1.5 Other Outdoor Areas

The birthing courtyard is proposed to be a private quiet and peaceful space and the walled courtyard is proposed to be a staff breakout / lunch space. Noise emissions are expected to be minimal so these areas have not been assessed.

3.3.2 Noise Modelling Methodology

Using Cadna-A (version 2023) noise modelling program, noise emissions from the Site have been assessed and calculated to the nearest affected receivers.

The noise model takes the following into account:

- Distance from source to receiver
- Ground type between the source and the receiver
- Shielding from buildings and structures

Noise modelling inputs are shown in Table 11.

Table 11: Noise modelling inputs

Modelling Inputs	Description
Calculation method	ISO 9613
Source height	Cars – 0.5 m above ground level Trucks – 1.5 m above ground level Adults in external areas – 1.8 m above ground level Kids in external areas – 1 m above ground level
Receiver height	1.5m above ground level 4.5m above ground level for 1st floor windows
Receiver location	As shown in Figure 1
Ground contours	1m ground contours obtained from ELVIS
Ground absorption	0.5

3.3.3 Predicted Noise Levels

Resultant sound pressure levels from noise sources within the Site have been calculated to the nearest affected receivers. Modelled noise emission results are summarised in Table 12.

Table 12: Modelling results – untreated case

Receiver	Type	Period	Calculated $L_{Aeq, 15min}$, dB(A)	Criteria, dB(A)	Complies?
R1	Residential	Day	47	48	Yes
		Evening	32	43	Yes
		Night	< 30	38	Yes
R2	Early Learning Centre	Day (internal)	< 30[1]	35 (internal)	Yes
		Day (external)	42	55 (external)	Yes
R3	Residential	Day	58	48	No
		Evening	43	43	Yes
		Night	36	38	Yes
R4	Residential	Day	53	48	No
		Evening	39	43	Yes
		Night	32	38	Yes

R5	Residential	Day	50	48	No
		Evening	36	43	Yes
		Night	<30	38	Yes
R6	Residential	Day	45	48	Yes
		Evening	31	43	Yes
		Night	< 30	38	Yes
R7	Residential	Day	51	48	No
		Evening	36	43	Yes
		Night	< 30	38	Yes
R8	Residential	Day	52	48	No
		Evening	32	43	Yes
		Night	< 30	38	Yes
R9	Residential	Day	45	48	Yes
		Evening	< 30	43	Yes
		Night	< 30	38	Yes
R10	Residential	Day	47	48	Yes
		Evening	33	43	Yes
		Night	< 30	38	Yes

[1]10dB loss through façade has been applied to derive internal level

Calculation results indicate exceedance over the noise emission criteria at some receivers. Mitigation measures are required to ensure Project Noise Trigger Levels are not exceeded.

3.3.3.1 Mitigation Measures

The following mitigation measures are recommended to comply with noise emission criteria:

- Schedule on-site waste collection for day period only (7 am – 6 pm)
- If amplified speech or music is proposed for the gathering space, speakers shall be limited such that noise emissions do not exceed that criteria at the boundary. As use of speakers is not yet determined for the project, it is recommended that an assessment is undertaken at detailed design when details are known
- Install an acoustically rated boundary fence at the eastern boundary and walled courtyard minimum $R_w + C_{tr}$ 25 to a height of 1.8 m to obstruct line of sight between noise sources and nearest affected receivers. Fence shall have no gaps, including to the bottom. Extent of fences are shown in Figure 2, below.

Figure 2: Site markup showing the extent of the recommended acoustically rated boundary fences

The noise levels after application of the acoustically rated boundary fences show compliance with the noise emission criteria, modelled results are summarised in Table 13.

Table 13: Modelling results – with mitigation measures applied

Receiver	Type	Period	Calculated $L_{Aeq, 15min}$, dB(A)	Criteria, dB(A)	Complies?
R1	Residential	Day	47	48	Yes
		Evening	32	43	Yes
		Night	25	38	Yes
R2	Early Learning Centre	Day (internal)	< 30[1]	35 (internal)	Yes
		Day (external)	40	55 (external)	Yes
R3	Residential	Day	50	48	No
		Evening	34	43	Yes
		Night	< 30	38	Yes
R4	Residential	Day	46	48	Yes
		Evening	31	43	Yes
		Night	< 30	38	Yes
R5	Residential	Day	43	48	Yes
		Evening	< 30	43	Yes
		Night	< 30	38	Yes
R6	Residential	Day	39	48	Yes
		Evening	< 30	43	Yes

		Night	< 30	38	Yes
R7	Residential	Day	50	48	No
		Evening	34	43	Yes
		Night	< 30	38	Yes
R8	Residential	Day	50	48	No
		Evening	< 30	43	Yes
		Night	< 30	38	Yes
R9	Residential	Day	44	48	Yes
		Evening	< 30	43	Yes
		Night	< 30	38	Yes
R10	Residential	Day	43	48	Yes
		Evening	< 30	43	Yes
		Night	< 30	38	Yes

[1]10dB loss through façade has been applied to derive internal level

Based on results presented in Table 12, the predicted noise levels exceed the day criteria at Receivers R3, R7 and R8. The model shows this exceedance occurs for garbage truck collections, which occur 1-2 times per week. An exceedance of up to 2 dBA is considered a marginal exceedance which is not noticeable to the human ear so is considered acceptable in this case.

3.3.4 Building Services Equipment Noise Emissions

At the time of writing, the mechanical and building services equipment have not been finalised. It is recommended that an assessment of noise emissions from the mechanical plant is undertaken at detailed design stage to ensure cumulative noise from the plant comply with the Project Noise Trigger Levels as shown in Table 6.

It is anticipated that in principle noise engineering measures can be utilised to meet the noise criteria if required. Examples of engineering measures are:

- Selection of low noise equipment
- Locating noisy equipment as far from sensitive internal and external areas as much as possible – minimum 3m from any bedroom windows as required by Shoalhaven council DCP
- Installing internally lined ductwork
- Use of duct attenuators
- Wrapping equipment in mass loaded vinyl
- Acoustic barrier that obstructs line of sight between plant and affected receivers
- Housing plant equipment in acoustic enclosures

It is anticipated that the project plant noise can be controlled using standard engineering control measures.

3.3.5 Maximum Noise Level Assessment

As the Centre is proposed to be operational 24 hours, the potential for sleep disturbance at the residential receivers during the night period has been considered using the NPfI maximum noise level event assessment.

3.3.5.1 Maximum Noise Level Criteria

In accordance with the NPfI, where the subject development/premises night-time noise levels at a residential location exceed the following screening levels, a detailed further assessment should be undertaken.

- $L_{eq,15min}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{Fmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater.

The maximum noise screening levels are detailed in Table 14.

Table 14: Maximum noise level criteria

Receiver type	Screening level – $L_{eq,15min}$ dBA	Screening level – L_{Fmax} dBA
Residential	37 + 5 = 42	52

3.3.5.2 Maximum Noise Level Predictions

It is anticipated that the maximum noise level from the development during night time would likely be from a car door slam from the car park area.

Based on previous measurements, a car door slam can produce a maximum sound power of 92 L_{Fmax} dBA. The Cadna-A noise model was used to predict the noise level at the affected external receivers. The calculation takes the recommended acoustically rated boundary fences into consideration.

Modelling results predict a worst case sound pressure level of 54 dBA at R6, which exceeds the sleep disturbance screening level. In accordance with the NPfI, further investigation is required. Based on studies as presented in the RNP the following shall be considered:

From the research on sleep disturbance to date it can be concluded that:

- *maximum internal noise levels below 50–55 dB(A) are unlikely to awaken people from sleep*
- *one or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly.*

The maximum noise level events are not predicted to exceed 60 dBA externally therefore sleep disturbance is not anticipated.

4. Road Traffic Noise

4.1 NSW Road Noise Policy

Noise on the surrounding road network from the vehicles associated with the development should be assessed in accordance with NSW Road Noise Policy (RNP), criteria presented in Table 15.

Table 15: Road traffic noise criteria for residential receivers affected by additional traffic from land use developments

Receiver type	Road category	Road traffic noise criteria (dBA)	
		Day time[1]	Night time[1]
Residential	Local roads	55 $L_{eq,1hr}$	50 $L_{eq,1hr}$

[1]Day time defined as 7am to 10pm and night time is 10pm to 7am.

Additionally, the RNP further states:

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

Therefore, if the road traffic noise associated with additional traffic from the development exceeds the road traffic noise criteria in Table 15 and the relative increase is more than 2 dBA, then mitigation measures should be considered for the affected receivers.

4.2 Road Traffic Noise Impact Assessment

The operation of the development is expected to increase the traffic noise levels on surrounding roads. As site access is via Hillcrest Avenue, this road is expected to experience the highest increase in traffic noise generated from the development within the surrounding road network. The traffic report issued by ptc has determined the existing and generated peak traffic volumes for the project. AM and PM peak traffic counts at the intersection of Hillcrest Avenue and Holloway Road were used to obtain the traffic volumes on Hillcrest Avenue. Existing and generated peak traffic volumes for the project are summarised in Table 16 below.

Table 16: Peak traffic volumes

Road	Period	Vehicles during peak hour (v/h)	
		Existing	Generated by development
Hillcrest Ave	AM peak	1028	47
	PM peak	770	47

The relative noise levels at Hillcrest Avenue have been calculated, results are presented in Table 17.

Table 17: Generated traffic noise increase

Road	Period	Existing traffic (v/h)	Generated traffic (v/h)	Resulting noise increase, dBA	Permitted noise increase dBA	Complies?
Hillcrest Ave	AM peak	1028	47	0.19	2	Yes
	PM peak	770	47	0.25	2	Yes

The above results indicate that the noise increase from the generated traffic will be within the 2 dBA permitted level of NSW RNP, hence mitigation measures will not be required.

5. Conclusion

This report forms part of the development application submission for the proposed Gudjaga Gunyahlami Birth Centre located at 102-106 Hillcrest Avenue, South Nowra to Shoalhaven City Council.

A noise survey was recently conducted on a nearby site to measure the ambient noise. As the acoustic environment of these two Sites are similar and the noise monitoring is recent, these noise monitoring results have been adopted for this project. The results of these investigations have been used to derive the noise emission criteria applicable to the project in accordance with the NSW EPA Noise Policy for Industry 2017.

Provided the recommendations are implemented, noise emissions from the subject development are predicted to comply with the acoustic requirements of Shoalhaven City Council, NSW EPA Noise Policy for Industry and relevant Australian standards and guidelines.

5.1 Summary of Assessment and Recommendations

- **Operational activities** – exceedances over the noise emission criteria are expected at some residential receivers. Recommendations include:
  - Schedule on-site waste collection for day period only (7 am – 6 pm)
  - Limiting any use of speakers for the gathering space, such that noise emissions do not exceed that criteria at the boundary. It is recommended that an assessment is undertaken at detailed design when details of speaker use and type are known
  - Installation of acoustically rated boundary fences is recommended on parts of the western and eastern boundary.

  See Section 3.3.3.1 for details.
- **Building services equipment** – an assessment of noise emissions from the mechanical and building services equipment should be undertaken at detailed design stage to ensure cumulative noise does not exceed the project specific criteria at the nearest affected receivers. Noise generating equipment shall be located minimum 3m from any bedroom windows as required by Shoalhaven DCP. Details in Section 3.3.4.
- **Maximum noise levels / sleep disturbance** – maximum noise level events are not predicted to exceed 60 dBA externally therefore sleep disturbance is not anticipated. Details in Section 3.3.5.
- **Road traffic noise** – vehicular noise impacts upon the surrounding road network were assessed. Results indicate that no impacts from generated traffic due to the development.

Appendix A: Drawings

The following drawings were used in the preparation of this report.

Architectural Drawings

Architectural drawings issued by Papesch

Drawing No.	Title	Revision	Date Issued
00.01	COVER PAGE	A - WIP	20.05.2024
10.01	DCP AND LEP ANALYSIS	A - WIP	20.05.2024
10.02	WIDER CONTEXT PLAN	A - WIP	20.05.2024
10.03	LOCAL CONTEXT PLAN	A - WIP	20.05.2024
10.04	SITE ANALYSIS PLAN	A - WIP	20.05.2024
10.05	SITE PLAN	A - WIP	20.05.2024
11.01	SITE SURVEY	A - WIP	20.05.2024
11.10	WASTE MANAGEMENT PLAN	A - WIP	20.05.2024
13.01	DEMOLITION PLAN	A - WIP	20.05.2024
13.02	TREE REMOVAL PLAN	A - WIP	20.05.2024
20.01	PROPOSED - GROUND FLOOR PLAN	A - WIP	20.05.2024
20.02	PROPOSED - ROOF PLAN	A - WIP	20.05.2024
30.01	ELEVATIONS	A - WIP	20.05.2024
31.01	SECTIONS	A - WIP	20.05.2024
60.01	WINDOW SCHEDULE	A - WIP	20.05.2024
60.02	WINDOW & SKYLIGHT SCHEDULE	A - WIP	20.05.2024
61.01	EXTERNAL DOOR SCHEDULE	A - WIP	20.05.2024
70.10	SECTION J COMMITMENTS	A - WIP	20.05.2024
70.20	SHADOW PLANS	A - WIP	20.05.2024
70.60	NOTIFICATION PLAN	A - WIP	20.05.2024
80.01	MATERIALS & FINISHES	A - WIP	20.05.2024
80.02	3D PERPECTIVES 01	A - WIP	20.05.2024

Appendix B: Glossary of Acoustic Terminology

Decibel – dB – relative unit of measurement for acoustic power, pressure and intensity defined by the ratio of square of the sound pressure, power or intensity to a reference sound pressure, power, or intensity value (usually the threshold of human hearing at 1 kHz). Any value expressed as "level" will use decibels as units. Humans have a large sound-sensitivity range, so values are expressed in decibels for a more practical range. Values expressed in decibels such as sound pressure level and sound power level cannot be added arithmetically, as their pressure or power values are expressed as a logarithmic ratio. Two equal sound levels combined will result in a sound pressure level of 3dB higher than the sound level of one source (e.g., 60 dB + 60 dB = 63 dB). Levels with 10 or more dB difference will not be added (e.g., 50 dB + 60 dB = 60 dB). All values in this report expressed in decibels assume reference pressure of 20 µPa.

A-weighted decibel – dB(A), dBA – frequency weighted sound levels in decibels correlated with perceived human hearing at low and medium levels. dB(A) and dBA are used to express the units; A used as a subscript e.g., L_{Aeq} or L_{A90} denotes an A-weighting applied to that value.

Sound Pressure Level – SPL, L – sound pressure measured in decibels. Logarithmic values relative to a reference value are used to convert the large range of sound pressure (in Pascals) audible to humans to a more practical range. Sound pressure level is a measured value and is dependent on distance from the sound source(s) and acoustic environment.

Sound Power Level – SWL – sound power in decibels. Logarithmic values relative to a reference value are used to convert the large range of sound power (in Watts) audible to humans to a more practical range. Sound power level is a calculated value that is inherent to a sound source and is independent of distance and acoustic environment.

Octave band (and centre frequency) – octave bands divide the spectrum of audible sound into equal parts. An octave band is denoted by its "centre frequency," in Hertz, Hz. Each octave or octave band includes a range of frequencies whose upper frequency limit is twice that of its lower frequency limit. For example, the 1000 Hz octave band contains sound energy at all frequencies from 707 Hz to 1414 Hz, rounded to 710 Hz and 1410 Hz for practical reasons. One-third octave bands span one-third of an octave and are often used for more precise applications.

L_{eq} or $L_{eq,T}$ – The equivalent continuous sound level is the energy average of the varying noise over the sample period (often specified in the subscript) and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise. L_{eq} is measured in dB.

L_{Aeq} or $L_{Aeq,T}$ – A-weighted L_{eq} measured in dBA.

L_{90} or $L_{90,T}$ – The noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{90} level for 10% of the time. This measure is commonly referred to as the background noise level or RBL. L_{90} is measured in dB.

L_{A90} or $L_{A90,T}$ – A-weighted L_{90} measured in dBA.

L_{max} or $L_{max,T}$ – The Maximum Noise Level over a sample period (often specified in the subscript) is the maximum level, measured on fast response, during the sample period.

L_{Amax} or $L_{Amax,T}$ – A-weighted L_{max} measured in dB(A).

L_{10} or $L_{10,T}$ – The noise level which is exceeded for 10% of the sample period (often specified in the subscript). During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A10} or $L_{A10,T}$ – A-weighted L_{max} measured in dB(A).

L_{min} or $L_{min,T}$ – The Minimum Noise Level over a sample period (often specified in the subscript) is the minimum level, measured on fast response, during the sample period.

L_{Amin} or $L_{Amin,T}$ – A-weighted L_{min} measured in dB(A).

Rating Background Noise Level – RBL – as defined in the Noise Policy for Industry, the median measured $L_{A90,15minute}$ over the given measurement period (day, evening or night) at a given potentially sensitive noise receiver.

Intrusiveness Noise Level – as defined by the Noise Policy for Industry, is used to determine the Project Noise Trigger Levels for residential areas. The Intrusiveness Noise Level aims to protect against significant changes in noise levels. The Intrusiveness Noise Level, $L_{Aeq,15minute}$ equals the Rating Background Noise Level plus 5 dB(A).

Amenity Noise Level – ANL – as defined by the Noise Policy for Industry 2017, the Amenity Noise Level represents the objective for total industrial noise at a given receiver location, depending on the receiver category and land use zoning. ANLs for various receiver categories are found in Table 2.2 of the Noise Policy for Industry 2017.

Project Amenity Noise Level – as defined by the Noise Policy for Industry 2017, the Amenity Noise Level represents the objective for a single industrial noise source at a given receiver location, depending on the receiver category and land use zoning. The Recommended Amenity Noise Level for industrial developments equals the Amenity Noise Level minus 5 dB(A). The Project Amenity Noise Level is used to determine the Project Noise Trigger Level.

Project Noise Trigger Level – PNTL – the site-specific noise benchmark for assessing a proposal for a new “industrial” development as determined through Noise Policy for Industry 2017 methodology. The PNTL represents the level, if exceeded, would indicate potential noise impact on the surrounding community and so “trigger” a management response.

Acoustic insulation – a general term to describe the ability or effectiveness of a building element such as a wall, window, door, or floor to reduce sound transmission depending on its composition and construction. Insulation materials such as fiberglass and polyester – often referred to as “insulation” – can be used in walls, floors, ceilings etc. to reduce interstitial reflections in the cavity which may increase the acoustic insulation performance.

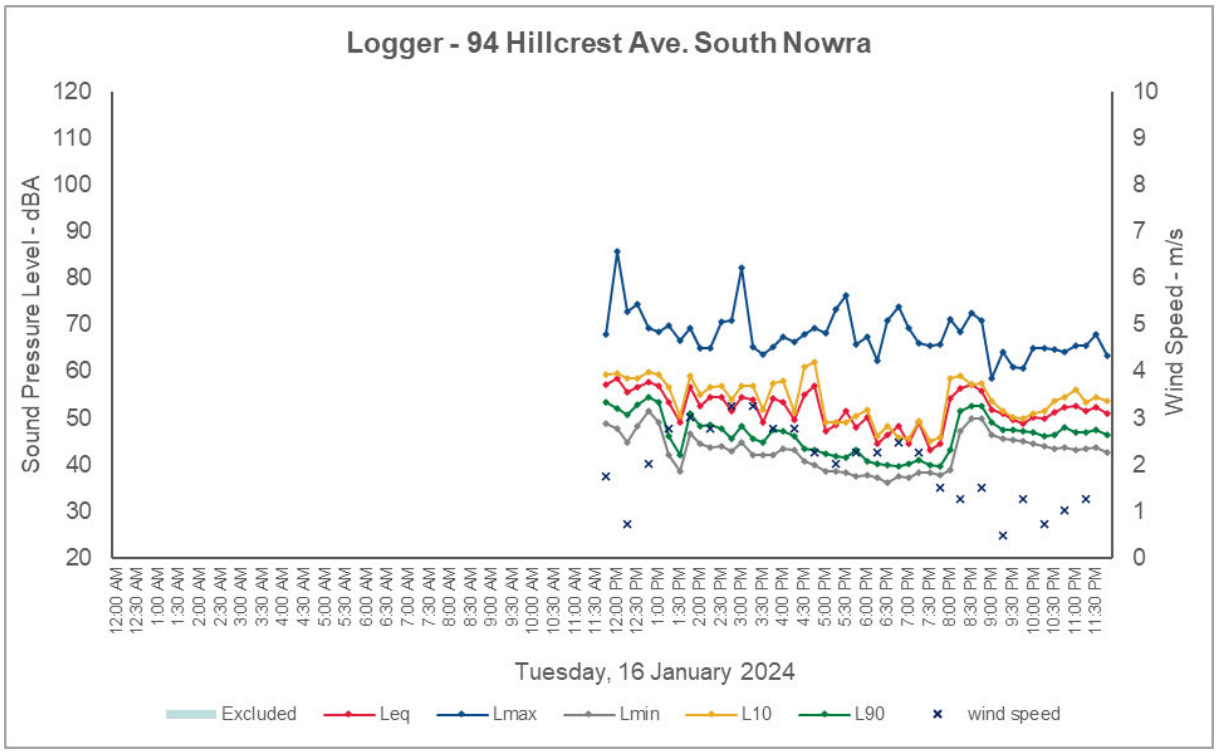
R_w – Weighted Sound Reduction Index – the design value representing the effective sound reduction of a building element. Each increasing increment in R_w is equivalent to 1 dB of noise reduction. R_w is based on laboratory measurement, where negligible flanking is present. Spectrum adaptation terms C and C_{tr} are often added to the measured R_w result to account for low frequency noise. R_w is measured in (linear) dB.

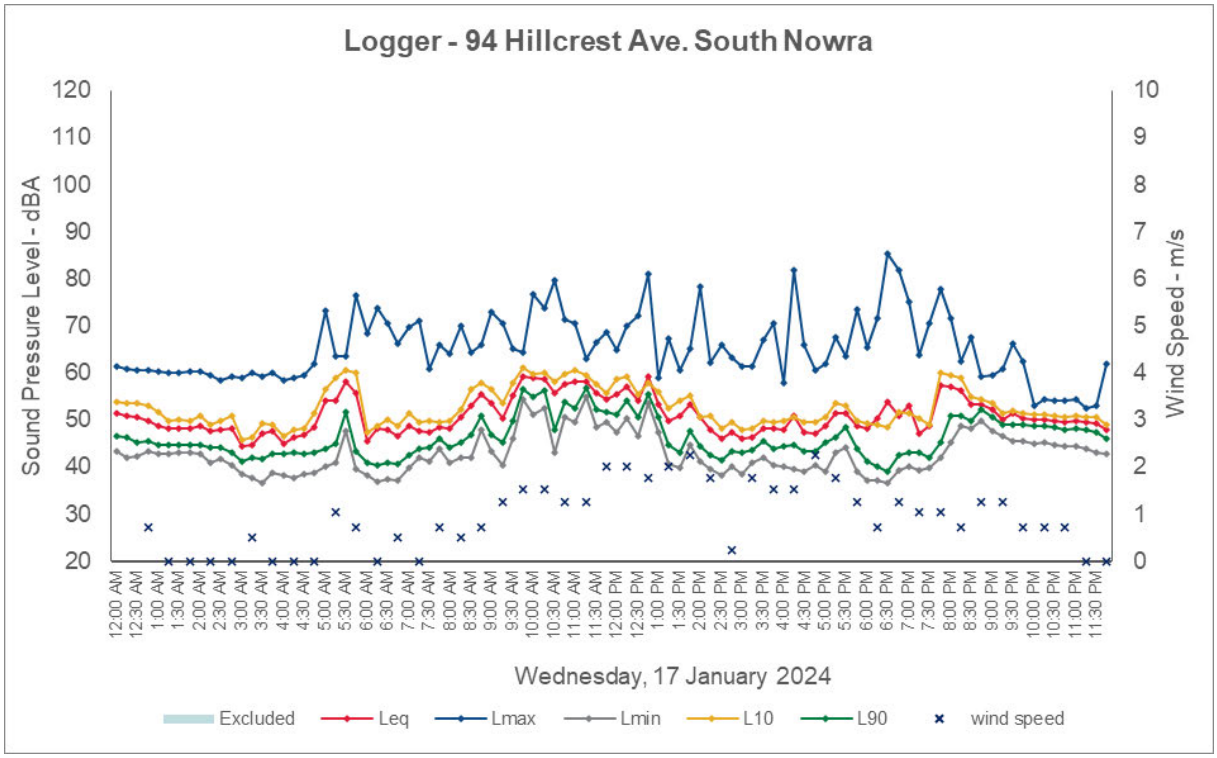
Appendix C: Long Term Noise Monitoring Results

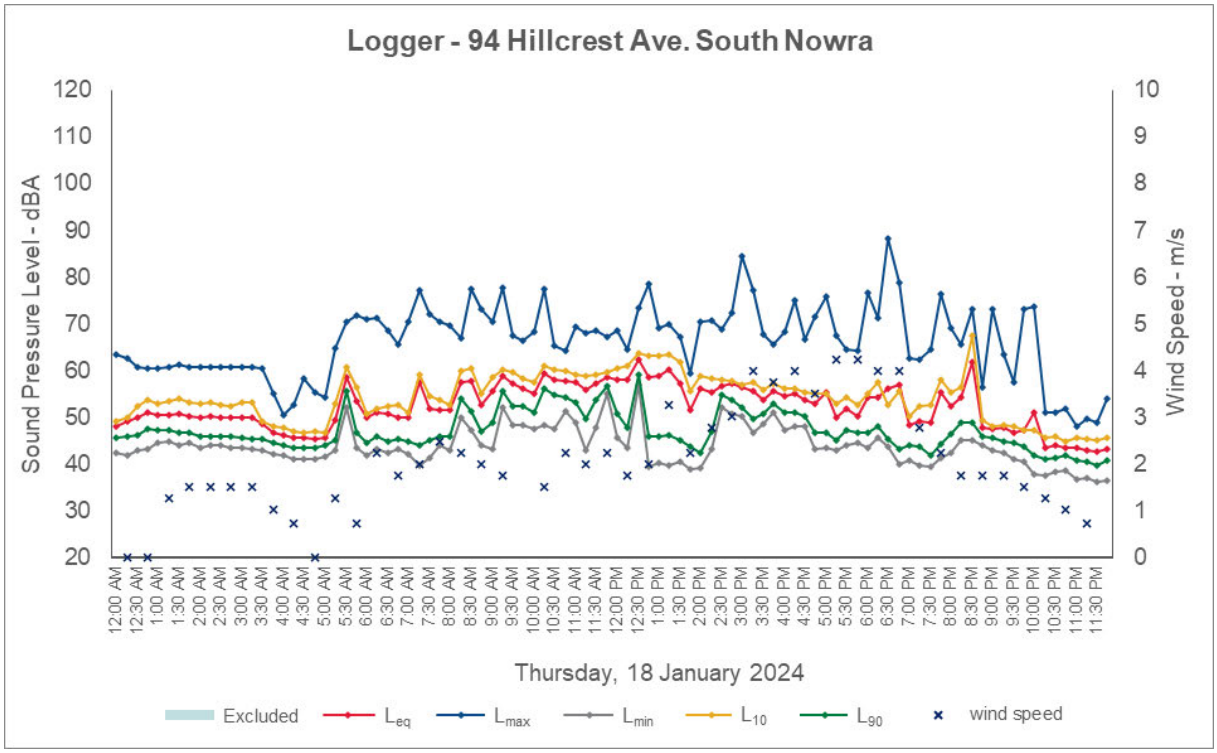
The details are of the noise logging measurements are shown below. The measurements are in accordance with the NSW EPA Noise Policy for Industry (2017).

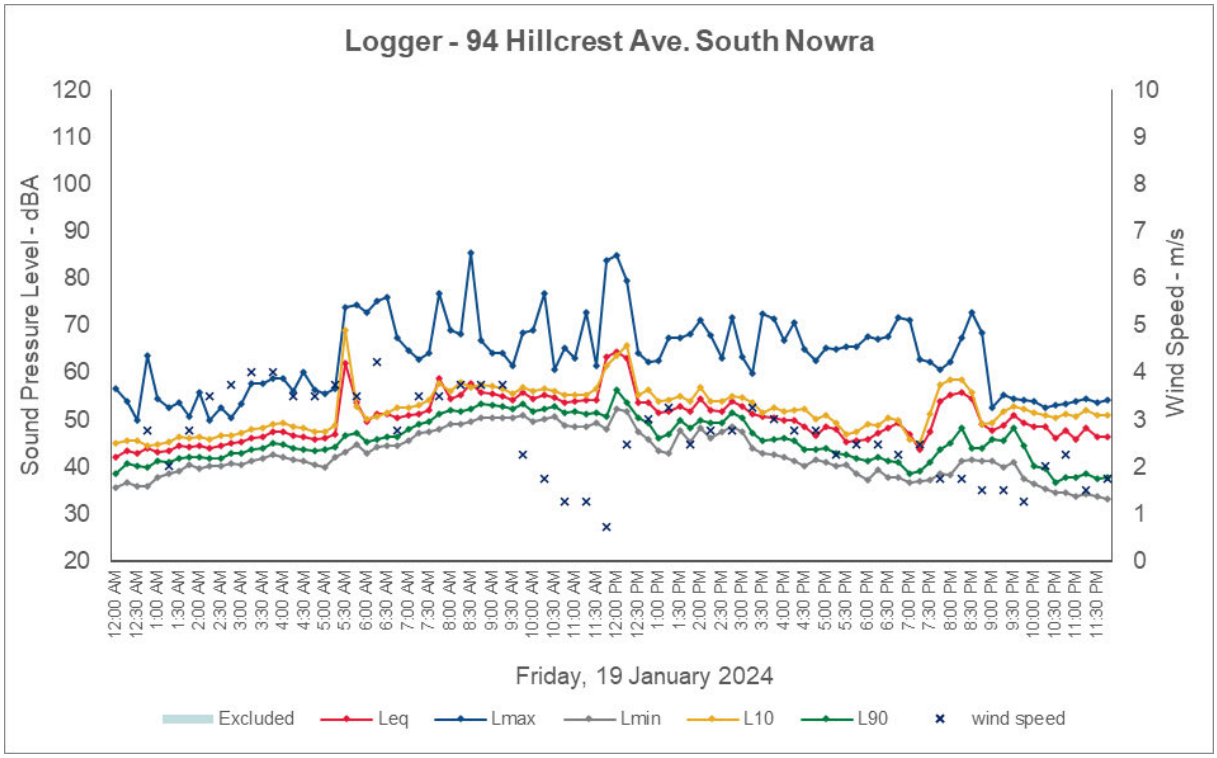
To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are plotted in the graphs below, are here defined.

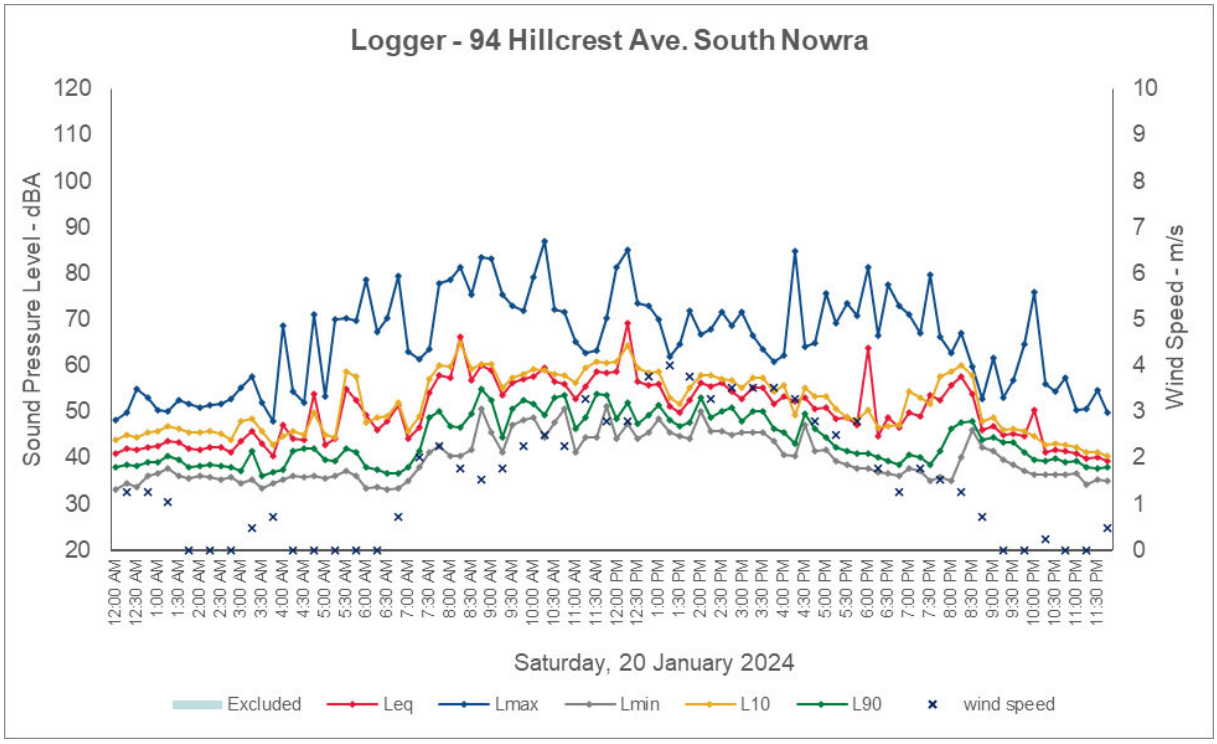
The sections marked in blue have been omitted due to rain that may have affected the measurements.

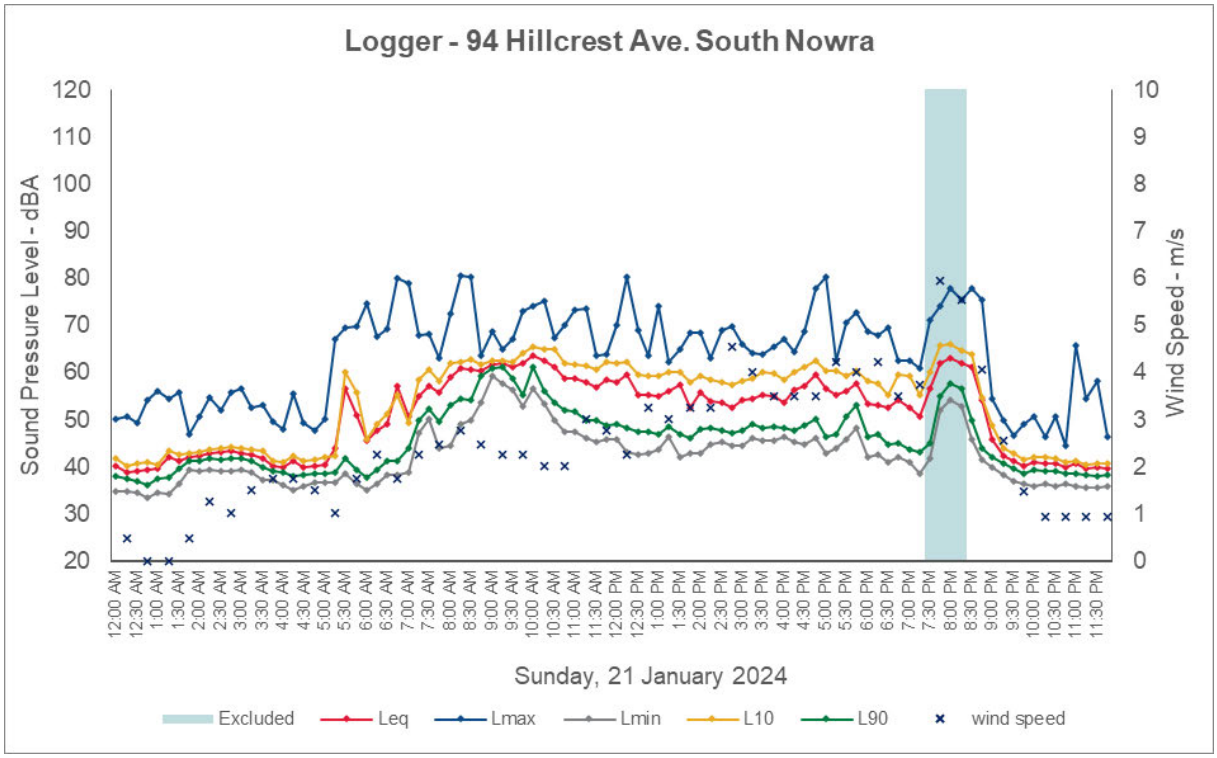


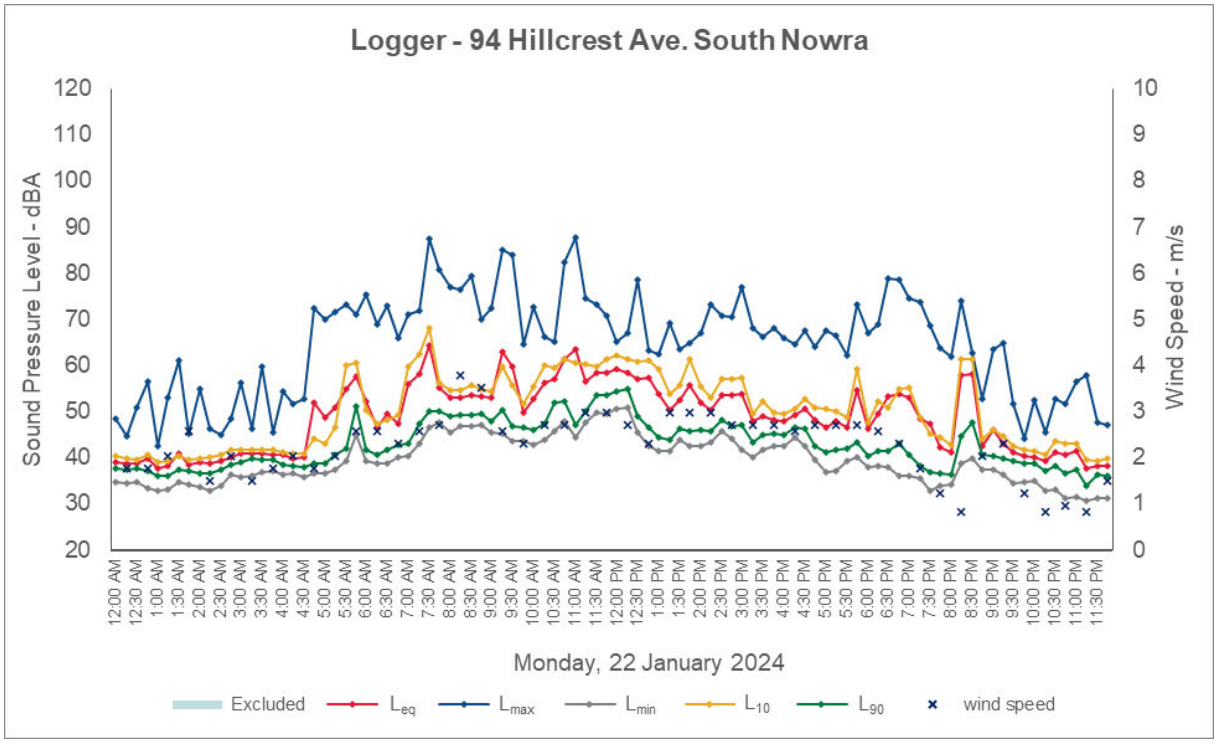

Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Wednesday, 17 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed

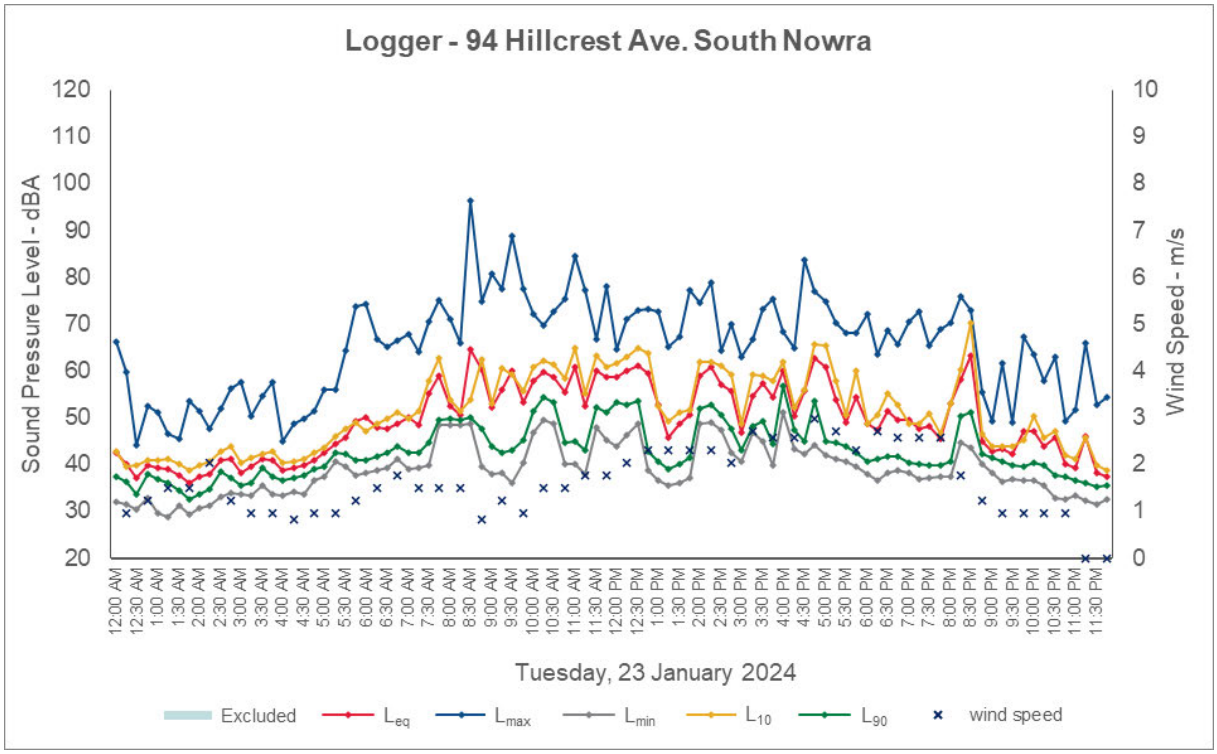

Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Thursday, 18 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed

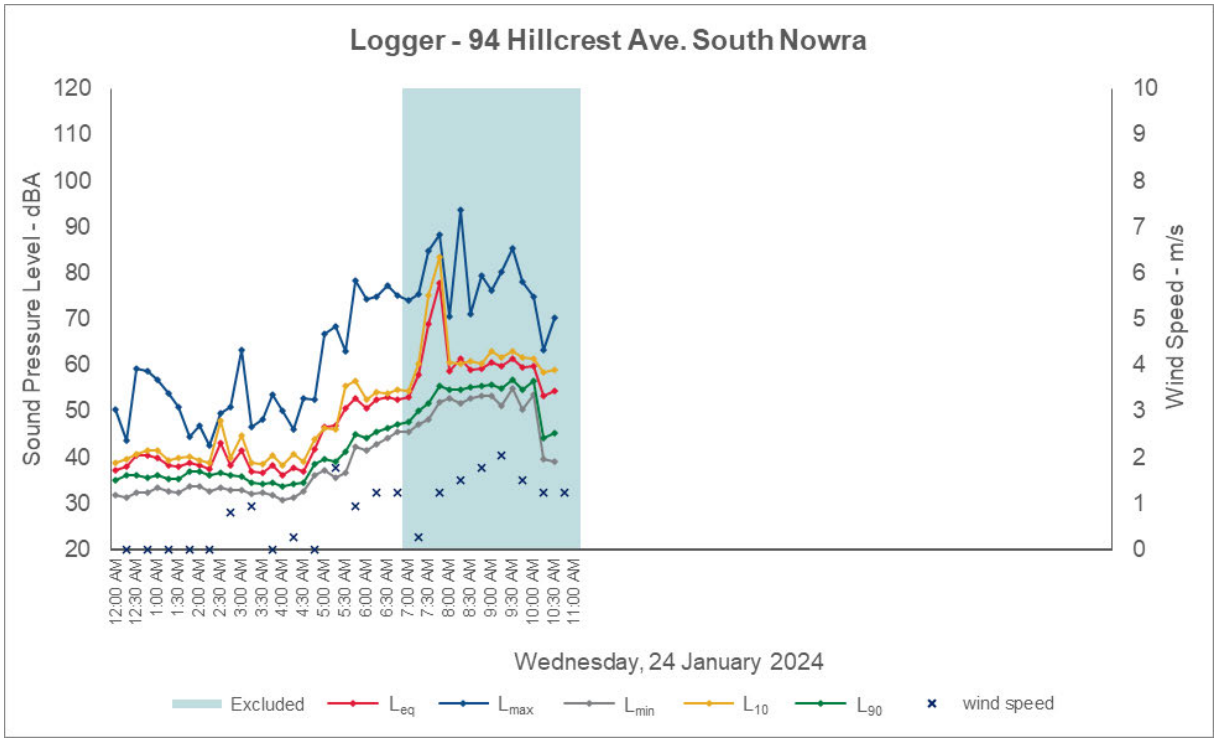

Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Friday, 19 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed


Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Saturday, 20 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed


Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Sunday, 21 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed


Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Monday, 22 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed


Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Tuesday, 23 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed


Logger - 94 Hillcrest Ave. South Nowra
Sound Pressure Level - dBA
Wind Speed - m/s
Wednesday, 24 January 2024
Excluded
Leq
Lmax
Lmin
L10
L90
wind speed

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