ID FLK Willow Developments 1 Pty Ltd

Land: 89 Ross Watt Rd, Gisborne

Road Traffic Noise Assessment

Report Ref: Report 01

Final | 17 May 2022

Job number 27390501

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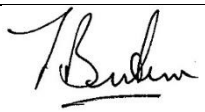
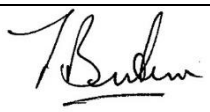
		Signature			
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1 Introduction

ID FLK Willow Developments 1 Pty Ltd (The Client) proposes to develop a parcel of land for residential use located at 89 Ross Watt Road, Gisborne, Victoria (hereafter referred to as the Subject Site).

The scope of this report is to assess the impact of road traffic noise to the Subject Site and design noise mitigation (if required) to comply with the requirements of Department of Transport outlined in Section 3.

Arup Australia Pty Ltd (Arup) has been engaged to undertake a road traffic noise assessment for the development based on site measurements and data provided by The Client in August and September 2021.

Noise monitoring has been conducted in the vicinity of the Subject Site, noise modelling and validation have been completed and noise mitigation has been recommended.

A glossary of acoustic terminology is provided in Appendix A.

2 Site Description

2.1 Existing Site

The Subject Site is currently farmland adjacent to Ross Watt Road and approximately 280 m south of the Calder Freeway. The Subject Site is located to the north of the Gisborne township and southwest of New Gisborne. It is bounded by the following:

- To the north: Ross Watt Road a local road. Farther to the north lies Calder Freeway (M79).
- To the east: Swinburne Avenue, with existing residential properties.
- To the south: Skyline Drive, with existing residential properties.
- To the west: farmland and Rosslynne Reservoir.

There is a nature reserve to the north between the Calder Freeway and Ross Watt Road which largely consists of flat land up to 300 m wide.

Ross Watt Road elevation is approximately 1 m above the Subject Site and the Calder Freeway has an elevation of approximately 2 m above the Subject Site.

Photographs of the existing site are provided in Appendix C.

2.2 Proposed Development

The residential sub-division to the south of 89 Ross Watt Road, Gisborne, extends south towards Jacksons Creek, as shown in Figure 1. The development consists of residential allotments, parks/leisure areas and internal roads.

Figure 1 - Subject Site layout showing noise monitoring locations

3 Criteria

3.1 Road Traffic Noise from Roads under Department of Transport Authority

Road traffic noise conditions will typically be required to be in line with VicRoads *Traffic Noise Reduction Policy*, February 2005 and VicRoads *Requirements of Developers*, 2004.

On this basis the road traffic noise from the Calder Freeway must be mitigated by the developer to meet 63 $dBL_{A10,\ 18\ hour}$ or less in Year 2032 (10 years after completion) measured one metre from the facade of a proposed residential dwelling.

4 Traffic Noise Measurements

Arup undertook noise monitoring at one (1) location at the Subject Site. The traffic noise measurement location is presented in Figure 1. The monitoring location has been selected with the consideration of the proposed property boundaries. Noise monitoring was undertaken between 26 August and 3 September 2021.

A summary of the average measured noise levels is provided in Table 1.

Table 1 - Measured Traffic Noise Levels

Metric	Average Measured Traffic Noise Level, dB
0600 hrs – 0000 hrs, $L_{A10,18h}$	56
2200 hrs – 0600 hrs, $L_{Aeq,8h}$	50
0600 hrs – 2200 hrs, $L_{Aeq,16h}$	56

Meteorological conditions were adverse for some periods during the noise monitoring period and on that basis, adverse days have been excluded. The average of three (3) weekdays has been considered to determine the measured $L_{A10,\ 18hr}$ noise level in accordance with VicRoads Policy.

Full noise monitoring details, including meteorological data and site details are provided in Appendix C.

5 Traffic Noise Modelling

5.1 Methodology

The computer software package SoundPLAN Version 8.1, implementing the CoRTN[1] noise prediction methodology, has been used to predict the Year 2032 $L_{A10,18hour}$ road traffic noise levels at noise sensitive receivers.

5.2 Noise Modelling Inputs

The noise model includes the input data presented in Table 2 below.

Table 2 - Noise model inputs

Description	File Name	Source	Date Received
Subdivision layout	210812 7213_UD_SLP04-1-Subdivision Layout Plan Page 002	Breese Pitt Dixon	13/08/21
Design elevation line	7213-S-F-RFL-3D Triangles-1-Existing Conditions.dwg	Breese Pitt Dixon	22/09/21
Existing traffic volumes	11492 – WEEK 2 – Calder Fwy – North of Station Rd.xlsx	Trans Traffic Survey	13/09/21

5.2.1 Existing Traffic Volumes

Due to the uncertainties arising from the impacts of COVID-19 with regards to traffic flow, The Client engaged Trans Traffic to deploy traffic counters along the Freeway. The traffic counter aligns with the noise measurement periods.

The measured total volume is approximately 47% lower than the 2020 estimated volume published by Vicroads, as shown in Table 4.

The measured traffic volumes and corresponding measured road traffic noise levels have been used to determine appropriate calibration factors for the traffic noise model. Measured AADT volumes are presented in Table 3.

Table 3 - Traffic volume data Calder Freeway (Vehicles/Day 24 h AADT Measured Year 2021)

	Northbound	Southbound
AADT Measured	6673	6581
% Heavy Vehicles	15	16

[1] Department of Transport Welsh Office HMSO, *Calculation of Road Traffic Noise (CoRTN),* April 1988

5.2.2 Future Traffic

For the Year 2032 the traffic volumes have been based on estimated traffic volumes provided by Vicroads Open Data[2]. The published percentage heavy vehicle and traffic growth rates have been applied to the VicRoads' estimated 2020-year traffic volumes (which excludes any reduction in traffic volume due to COVID restrictions) to determine 2032 traffic volumes. Calculated future AADT volumes are presented in Table 4.

Table 4 - Traffic volume data Calder Freeway (Vehicles/Day 24 h AADT Predicted Year 2032)

Direction	Northbound	Southbound
2020 Estimated AADT	14000	14000
Growth (%/year)	2.7	2.6
2032 Predicted AADT	18767	18567
% Heavy Vehicles	12	15

5.2.3 Noise Model Assumptions

The following assumptions have been incorporated in the noise modelling:

- Receiver height: 1.5 m above ground level
- Facade reflection: +2.5 dB
- Ground Factor: 0.8 (outside site) 0.5 (inside site)
- A factor of 0.95 has been used to convert AADT traffic volumes to 18-hour traffic volumes.
- Traffic speed: 110 km/h

5.3 Noise Model Calibration

The traffic noise model has been calibrated by comparing the predicted noise levels from the noise model using measured existing traffic volumes with the measured road traffic noise levels provided in Section 4. Noise from local roads, including Ross Watt Road, have not been included in the calibration as contribution from this source is considered insignificant compared to the Calder Freeway.

The average measured noise level and the predicted noise level are presented in Table 5.

[2] Department of Transport Open Data Hub *https://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/* Accessed on 14/10/2021

Table 5: Measured and predicted noise level.

Location No.	Road Traffic Noise Level $dBL_{A10,18hr}$	
	Average Measured	Predicted
1	56	58

The acoustic model over-predicts with respect to measured noise level by 2 dB. Based on this, a site calibration factor of minus (-) 2 dB has been used for the acoustic model.

5.3.1 Noise Modelling Approach

In summary, the process used to determine the future year noise levels was as follows:

- Traffic volume counters were deployed to account for expected abnormal traffic volumes due to COVID restrictions in place at the time of the noise monitoring
- Noise model was calibrated using measured traffic volume and measured road noise
- Future noise levels were predicted based on current estimated traffic volumes and growth rates published by Vicroads. These predicted volumes do not account for abnormal traffic volumes due to COVID restrictions.

5.4 Noise Model Limitations

This assessment includes limitations to accuracy, scope and detail due to the environmental circumstances of the new development and available design information, this includes:

- 3D CAD terrain data for the Subject Site has been provided and used as the basis of the acoustic model. The terrain data for the future Subject Site has been based on the provided data. Changes to the terrain data may impact the noise assessment.

These limitations are considered and addressed as part of this assessment and form part of the discussion in following sections. In many cases, the limitations and associated risks have been mitigated by calibration of the noise model.

6 Results

The unmitigated traffic noise levels are predicted to exceed the traffic noise limits provided by VicRoads *Traffic Noise Reduction Policy* and typical permit conditions for developments adjacent to Freeways. The unmitigated scenario is presented in Appendix B.

Two noise walls on the northern boundary of the development are required to meet VicRoads' requirements.

6.1 Noise Barrier Design

Two separate 2 m high noise barriers have been modelled at the north-east and north-west ends of the site boundary, nearest to the Calder Freeway. The noise barrier design is presented in Appendix B.

The noise barrier is required to have a surface density of at least 20 kg/m^2 and an overall weighted Sound Reduction Index (R_w) through the noise barrier material of at least 30 dB when tested in accordance with AS119[3]. To prevent noise penetration, the noise walls are to be installed without holes or gaps.

6.2 Noise Modelling Results

Traffic noise modelling demonstrates that compliance with noise policy will be achieved when the noise barrier has been constructed as specified. The results are presented in Table 6. In all cases, the ground level predicted noise levels comply with VicRoads traffic noise limit of $L_{10\ 18hr}$ 63 dB(A).

Table 6: Predicted noise levels at Subject Site

Location	**Predicted Road Traffic Noise Level dB$L_{A10,18hr}$**
Ground Level dwelling along the northern boundary	62 – 63

The mitigated Year 2032 traffic noise levels will comply with the traffic noise limits provided by VicRoads *Traffic Noise Reduction Policy* and typical permit conditions for developments adjacent to freeways.

[3] AS 1191 Acoustics, Method for laboratory measurement of airborne sound transmission insulation of building elements, 2002.

7 Summary

Arup has undertaken a road traffic noise assessment for the proposed development site located 89 Ross Watt Rd, Gisborne. Road traffic noise levels impacting the Subject Site from the Calder Freeway were predicted for the Year 2032 using a calibrated computer model. The predicted levels exceed the criteria without mitigation. On this basis, two (2) noise barriers were designed to mitigate the road traffic noise such that the noise criterion is met for the Year 2032. The alignment of the noise barriers is shown in Appendix B.

Appendix A

Acoustic Terminology

Background Noise Level

The background noise level is the noise level that is generally present at a location at all or most times. Although the background noise may change over the course of a day, over shorter time periods (e.g. 15 minutes) the background noise is almost constant. Examples of background noise sources include steady traffic (e.g. motorways or arterial roads), constant mechanical or electrical plant and some natural noise sources such as wind, foliage, water and insects.

Decibel

The decibel scale is a logarithmic scale which is used to measure sound and vibration levels. Human hearing is not linear and involves hearing over a large range of sound pressure levels, which would be unwieldy if presented on a linear scale. Therefore a logarithmic scale, the decibel (dB) scale, is used to describe sound levels.

An increase of approximately 10 dB corresponds to a subjective doubling of the loudness of a noise. The minimum increase or decrease in noise level that can be noticed is typically 2 to 3 dB.

dB(A)

dB(A) denotes a single-number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level.

The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).

Some typical dB(A) levels are shown below.

Sound Pressure Level dB(A)	Example
130	Human threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside nightclub
90	Heavy trucks at 5 m
80	Kerbside of busy street
70	Loud stereo in living room
60	Office or restaurant with people present
50	Domestic fan heater at 1m
40	Living room (without TV, stereo, etc)
30	Background noise in a theatre
20	Remote rural area on still night

Sound Pressure Level dB(A)	Example
10	Acoustic laboratory test chamber
0	Threshold of hearing

L_{10}

The L_{10} statistical level is often used as the "average maximum" level of a sound level that varies with time.

Mathematically, the L_{10} level is the sound level exceeded for 10% of the measurement duration. L_{10} is often used for road traffic noise assessment. As an example, 63 dB $L_{A10,18hr}$ is a sound level of 63 dB(A) or higher for 10% of the 18 hour measurement period.

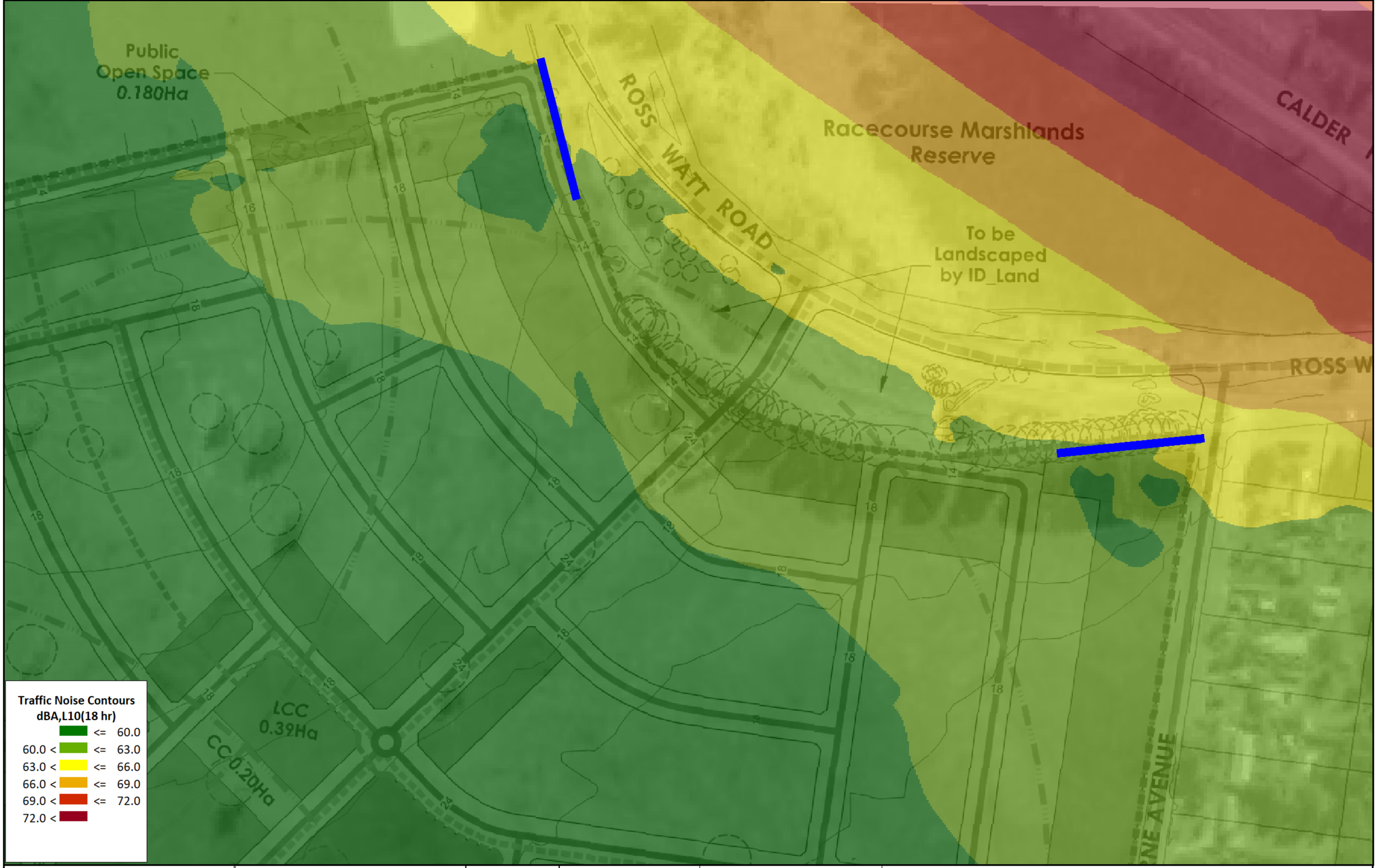
L_{90}

The L_{90} statistical level is often used as the "average minimum" or "background" level of a sound level that varies with time.

Mathematically, L_{90} is the sound level exceeded for 90% of the measurement duration. As an example, 45 dB $L_{A90,15min}$ is a sound level of 45 dB(A) or higher for 90% of the 15 minute measurement period.

Appendix B

Noise Barrier Alignment



Project Name: 89 Ross Watt Rd, Gisborne	Project Number:		LEGEND 2m Noise Wall	89 Ross Watt Rd - Road Traffic Noise Prediction Year 2032 - Mitigated
Noise levels are shown 1.5m above ground level with a +2.5 dB(A) facade reflection	SCALE 0 15 30 60 90 120 m			Map 2
Author: JMW	Date: 13/05/2022			ARUP

Appendix C

Noise Monitoring Data

C1 Noise Monitoring Location

C1.1 Location 2

Description	Details
Noise Logger	Acoustic Research Laboratories Ngara Noise Logger, S/N 87807F
Location	Approximately 21 m south, 30m west of northeast corner of Subject Site, free field.
Coordinates (Latitude, Longitude)	-37.472285, 144.586508

Looking North

Looking South

C2 Hourly Noise Measurement Results

C2.1 Location 2

Date			Friday		Monday		Wednesday	
			27/08/2021		30/08/2021		01/09/2021	
Time (hrs)			L_{Aeq}	L_{A10}	L_{Aeq}	L_{A10}	L_{Aeq}	L_{A10}
			(dB)	(dB)	(dB)	(dB)	(dB)	(dB)
00:00	-	01:00	40	44	46	51	46	49
01:00	-	02:00	39	43	45	50	48	52
02:00	-	03:00	38	42	46	50	48	51
03:00	-	04:00	41	45	48	52	49	53
04:00	-	05:00	46	49	51	54	52	56
05:00	-	06:00	48	51	54	57	55	57
06:00	-	07:00	52	54	57	59	57	60
07:00	-	08:00	54	55	58	60	56	58
08:00	-	09:00	52	54	57	59	54	56
09:00	-	10:00	50	52	56	58	51	53
10:00	-	11:00	48	51	58	60	51	53
11:00	-	12:00	50	52	58	60	55	57
12:00	-	13:00	53	55	58	60	55	57
13:00	-	14:00	53	55	58	60	56	57
14:00	-	15:00	59	57	60	63	55	57
15:00	-	16:00	51	54	58	60	76	56
16:00	-	17:00	53	54	59	61	53	56
17:00	-	18:00	53	55	58	60	55	57
18:00	-	19:00	51	53	56	58	55	57
19:00	-	20:00	51	53	56	58	53	56
20:00	-	21:00	51	54	53	56	51	54
21:00	-	22:00	50	54	53	56	49	53
22:00	-	23:00	48	52	51	54	50	53
23:00	-	00:00	51	54	49	53	71	63
$L_{A10,\ 18\ hour}$ (dB)				54		59		56
$L_{Aeq,\ 16\ hour}$ (dB)				54		59		56
$L_{Aeq,\ 15\ hour}$ (dB)				52		57		55
$L_{Aeq,\ 9\ hour}$ (dB)				43		49		50
$L_{Aeq,\ 8\ hour}$ (dB)				46		52		52

C3 Weather Data

Weather data has been taken from the nearest BOM weather station with compatible data, Ballarat Aerodrome, ID 089002.

Date/Time EST (24 Hr)	Wind Direction	Wind Speed [m/s]	Road to Logger Wind Speed* [m/s]	Rain [mm]
27/08/2021 0:00	ESE	1.9	0.7	0
27/08/2021 1:00	ESE	2.2	0.9	0
27/08/2021 2:00	SSE	1.6	0.6	0
27/08/2021 3:00	SE	1.9	0	0
27/08/2021 4:00	SE	1.3	0	0
27/08/2021 5:00	SE	1.3	0	0
27/08/2021 6:00	SSE	0.9	0.3	0.4
27/08/2021 7:00	ESE	0.9	0.3	0
27/08/2021 8:00	E	0.3	0.2	0
27/08/2021 9:00	SE	0.9	0	0
27/08/2021 10:00	WSW	0.9	0.8	0
27/08/2021 11:00	WNW	0.9	0.3	0
27/08/2021 12:00	WNW	1.6	0.6	0
27/08/2021 13:00	NW	1.6	0	0
27/08/2021 14:00	WNW	1.3	0.5	0
27/08/2021 15:00	WNW	1.9	0.7	0
27/08/2021 16:00	WSW	1.3	1.2	0
27/08/2021 17:00	CALM	0	0	0
27/08/2021 18:00	S	1.3	0.9	0
27/08/2021 19:00	ESE	1.6	0.6	0
27/08/2021 20:00	ESE	1.9	0.7	0
27/08/2021 21:00	S	0.9	0.6	0
27/08/2021 22:00	E	1.3	0.9	0
27/08/2021 23:00	CALM	0	0	0
30/08/2021 0:00	NNE	0.9	0.8	0
30/08/2021 1:00	NNE	1.3	1.2	0
30/08/2021 2:00	NNE	1.3	1.2	0
30/08/2021 3:00	NNE	1.0	1.0	0
30/08/2021 4:00	N	2.2	1.6	0
30/08/2021 5:00	N	2.5	1.8	0

Date/Time EST (24 Hr)	Wind Direction	Wind Speed [m/s]	Road to Logger Wind Speed* [m/s]	Rain [mm]
30/08/2021 6:00	N	2.2	1.6	0
30/08/2021 7:00	N	2.5	1.8	0
30/08/2021 8:00	N	2.5	1.8	0
30/08/2021 9:00	N	3.0	2.1	0
30/08/2021 10:00	N	3.3	2.3	0
30/08/2021 11:00	N	4.7	3.4	0
30/08/2021 12:00	N	5.2	3.7	0
30/08/2021 13:00	N	5.5	3.9	0
30/08/2021 14:00	NNW	5.2	2.0	0
30/08/2021 15:00	N	4.7	3.4	0
30/08/2021 16:00	N	4.7	3.4	0
30/08/2021 17:00	N	4.7	3.4	0
30/08/2021 18:00	N	3.9	2.7	0
30/08/2021 19:00	NNE	3.6	3.3	0
30/08/2021 20:00	NNE	4.4	4.1	0
30/08/2021 21:00	N	4.7	3.4	0
30/08/2021 22:00	N	4.4	3.1	0
30/08/2021 23:00	NNE	4.7	4.4	0
1/09/2021 0:00	S	0.3	0.2	0
1/09/2021 1:00	NNE	1.9	1.8	0
1/09/2021 2:00	NNE	1.6	1.5	0
1/09/2021 3:00	E	0.9	0.6	0
1/09/2021 4:00	ENE	1.0	1.0	0
1/09/2021 5:00	CALM	0	0	0
1/09/2021 6:00	NNW	1.3	0.5	0
1/09/2021 7:00	NNE	1.6	1.5	0
1/09/2021 8:00	N	2.5	1.8	0
1/09/2021 9:00	N	2.8	2.0	0
1/09/2021 10:00	N	3.3	2.3	0
1/09/2021 11:00	N	3.6	2.5	0
1/09/2021 12:00	N	3.6	2.5	0
1/09/2021 13:00	N	4.1	2.0	0
1/09/2021 14:00	N	4.7	3.4	0
1/09/2021 15:00	N	4.9	3.5	0
1/09/2021 16:00	N	4.4	3.1	0
1/09/2021 17:00	N	4.4	3.1	0

Date/Time EST (24 Hr)	Wind Direction	Wind Speed [m/s]	Road to Logger Wind Speed* [m/s]	Rain [mm]
1/09/2021 18:00	N	2.5	1.8	0
1/09/2021 19:00	NNE	3.0	2.7	0
1/09/2021 20:00	NNE	3.6	3.3	0
1/09/2021 21:00	NNE	3.3	3.0	0
1/09/2021 22:00	N	2.8	2.0	0
1/09/2021 23:00	N	2.8	2.0	0