WAVEFORM ACOUSTICS

Albert St Blackburn
T: 0402477774
info@waveformacoustics.com.au
www.waveformacoustics.com.au

Project – 25 Liege Ave, Noble Park, Child Care Centre
Date – 21.3.24
23847
C Praba – Smart Town Planning
E info@smarttownplanning.com.au
P 0410 348 448

ACOUSTIC REPORT INFORMATION SHEET

Project
25 Liege Ave, Noble Park, Child Care Centre Acoustics Assessment

Prepared for
Praba – Smart Town Planning

Prepared by
Rohan Barnes from Waveform Acoustics

REVISIONS REGISTER	ISSUE DATE
Draft Acoustic Report	12.2.24
Final Acoustic Report	21.3.24

DOCUMENT REGISTER	ISSUE DATE
Letter of engagement	25.1.24
Plans	1/12/23

1.0 – EXECUTIVE SUMMARY

Waveform Acoustics has been engaged by Praba of Smart Town Planning to provide an Acoustic Report in relation to the proposed Child Care Centre at 25 Liege Ave, Noble Park.

In particular the report provides details of how noise transmission between the proposed centre and the sensitive residential interface will be managed. Measures may be required to attenuate noise impacts from the site.

The client has advised of the following details as follows:

- Hours of operation, 06:30 – 18:30, Monday – Friday
- 40 children on site

A site inspection was carried out and unattended noise monitoring was conducted onsite from 2/2/24 to 6/2/24. This measured the existing background levels present at the site in order to determine the target noise levels from children's outdoor play, as well as set limits for any plant & equipment that will be used on site.

As a procedural basis, we have used the systems and measures as set out in the Association of Australian Acoustical Consultants Guidelines for Child Care Acoustic Assessment (September 2020). We have used the procedures from this guideline to set target noise levels for children's play, as well as identify sound power levels of children to model noise impacts. This guideline describes sound power levels of children, which we have used in SoundPLAN modelling software in order to demonstrate the noise impacts from children's play.

It is our opinion based on the available environmental noise data, plans received and technical performance information from suppliers for products selected for the development, strict implementation of the requirements outlined in this acoustic assessment report will enable the centre to achieve the nominated noise compliances.

Best Regards,

Rohan Barnes MAAS
Principal Consultant

2.0 – LEGISLATION AND GUIDELINES

In the preparation of the report the following legislation and guidelines were used:

EPA publication 1826.4: 'Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues' (Noise Protocol).
This publication provides a protocol for the purpose of determining noise limits for new and existing commercial, industrial and trade premises and entertainment venues as defined by the Regulations. It sets the methodology for assessing the effective noise level to determine unreasonable noise under Regulations 118, 125 and 130. The measurement procedures of this Noise Protocol are also used to determine aggravated noise under Regulations 121, 127 and 131.

Environment Protection Regulations 2021
The objectives of these Regulations are to further the purposes of, and give effect to, the Environment Protection Act 2017 by imposing obligations in relation to environmental protection in Victoria.

State Environmental Protection General Environmental Duty 2021
New environment protection laws will mean that anyone engaging in an activity posing a risk of harm to human health and the environment, from pollution or waste, must manage that risk to prevent harm as far as reasonably practicable. This general environmental duty applies to all Victorians. It means you will need to proactively assess and manage the risks of harm from your activities. Eliminating or reducing risk is important because industry activities could impact - Noise – affecting people's sleep; communication, cognition and learning; domestic or recreational activities; tranquillity and enjoyment inside and outside

AAAC Guidelines for Child Care Acoustic Assessment
This guideline sets out a recommended assessment method for the submission of a Noise Impact Assessment to accompany a Development Application for Child Care Centres, and typical recommendations for the control of noise from such centres

3.0 – ACOUSTIC ASSESSMENT

DETAILS OF TESTING

An ARL Ngara noise logger recorded the environmental noise data calibrated prior to and after measurement. This equipment recorded background noise levels within the site.

EQUIPMENT REGISTER	S/N	CALIBRATION DATE
ARL Ngara Noise Logger	878270	due 25.11.26
SV 33A Calibrator	73304	due 4.12.24

DATE & TIME	LOCATION
2/2/24, 06:15 – 6/2/24, 16:15	Within the existing site, approx. halfway into the middle of the site, adjacent to the NSR to the north.

ATMOSPHERIC[1]

Date	Temperature (C°) min/max	Rain (mm)	Windspeeds (km/h) 9am/3pm
2/2/24	16.4/20.8	0.0	22/20
3/2/24	11.6/31.9	0.0	9/9
4/2/24	13.8/38.0	0.0	Calm/31
5/2/24	19.5/20.0	0.0	24/20
6/2/24	12.8/21.1	0.0	20/26

Atmospheric conditions have been considered when processing data. The majority of the logging period was done in suitable wind conditions within the 0 – 3 of the Beaufort Wind Scale.

[1] https://web.archive.org/web/20240207040217/http://www.bom.gov.au/climate/dwo/202402/html/IDCJDW3052.202402.shtml

3.1 – ACOUSTIC ASSESSMENT, cont.

1826.4 NOISE PROTOCOL, PLANT AND MACHINERY

EPA 1826.4 DETERMINED LIMITS FOR MECHANICAL SERVICES

PERIOD*	1826.4 ZONING LEVEL	EXISTING LEVEL, dB L_{A90}	DETERMINED LIMIT, dB L_{Aeq}
DAY	50	43	**50 (Neutral)**
EVENING	44	45	**48 (High)**
NIGHT	39	46	**49 (High)**

**Please refer to Appendix – Operating Hours for details of operating periods.*

This table describes the external noise limits set in the EPA 1826.4 Noise Protocol in relation to mechanical services type noise, not music.

DETERMINED LIMITS:

Day: **50dB L_{Aeq}**

Evening: **48dB L_{Aeq}**

Night: **49dB L_{Aeq}**

Any items of plant and machinery such as but not limited to air conditioning systems, exhaust and extraction systems must be within the limits as set out above.

Any new plant and equipment for the facility is yet to be specified. Chosen equipment must have noise output, location and barrier requirements verified by an acoustic consultant.

4.0 – EXPECTED NOISE GENERATED BY OUTDOOR PLAY AREAS

As outdoor play is an aspect of the child care centre, measures need to be taken to ensure that Noise Sensitive Receivers (NSR) are not impacted by the noise generated by children's play.

TARGET NOISE LEVELS:

- The noise generated cannot exceed the **background levels +10dB over a 15-minute period** at the assessment location when children's play is less than 4 hours per day, with 2 hours in the morning and 2 hours in the afternoon.
- The noise generated cannot exceed the **background levels +5dB over a 15-minute period** at the assessment location when children's play is greater than the previously described 4 hours per day.
- If background levels are less than 40dB L_{A90} over the Period, **the target noise level is 45dB $L_{Aeq,15min}$.**

As a conservative approach, we have assumed there will be unrestricted play hours, meaning target noise levels for the purpose of this report have been determined as **background levels +5dB(A) over a 15-minute period**.

PERIOD*	MEASURE TYPE	EXISTING LEVEL, dB L_{A90}	DETERMINED LIMIT, dB L_{Aeq}
DAY	**L_{A90} + 5dB(A)**	43	**48**
EVENING	**L_{A90} + 5dB(A)**	45	**50**
NIGHT	**L_{A90} + 5dB(A)**	46	**51**

**Please refer to Appendix – Operating Time Periods for details of operating periods.*

As we would typically expect noise from children's play to be associated with the Day Period, we will use the Day Period limits to determine the noise exposure on the nearby NSRs.

(The assessment location is defined as the most effected point on or within any residential receiver property boundaries)

SOUND POWER LEVELS

The noise levels of boys and girls is assumed to be similar. A typical range for effective sound power levels for groups of ten children playing is given in the following table:

From the AAAC Guidelines for Child Care Acoustic Assessment

Number and Age of Children	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dB	63	125	250	500	1K	2K	4K	8K
10 Children, 0 – 2 years old	78	54	60	66	72	74	71	67	64
10 Children, 2 – 3 years old	85	61	67	73	79	81	78	74	70
10 Children, 3 – 5 years old	87	64	70	75	81	83	80	76	72

To calculate the effective sound power level the specific number of children will be required, and the following formula used:

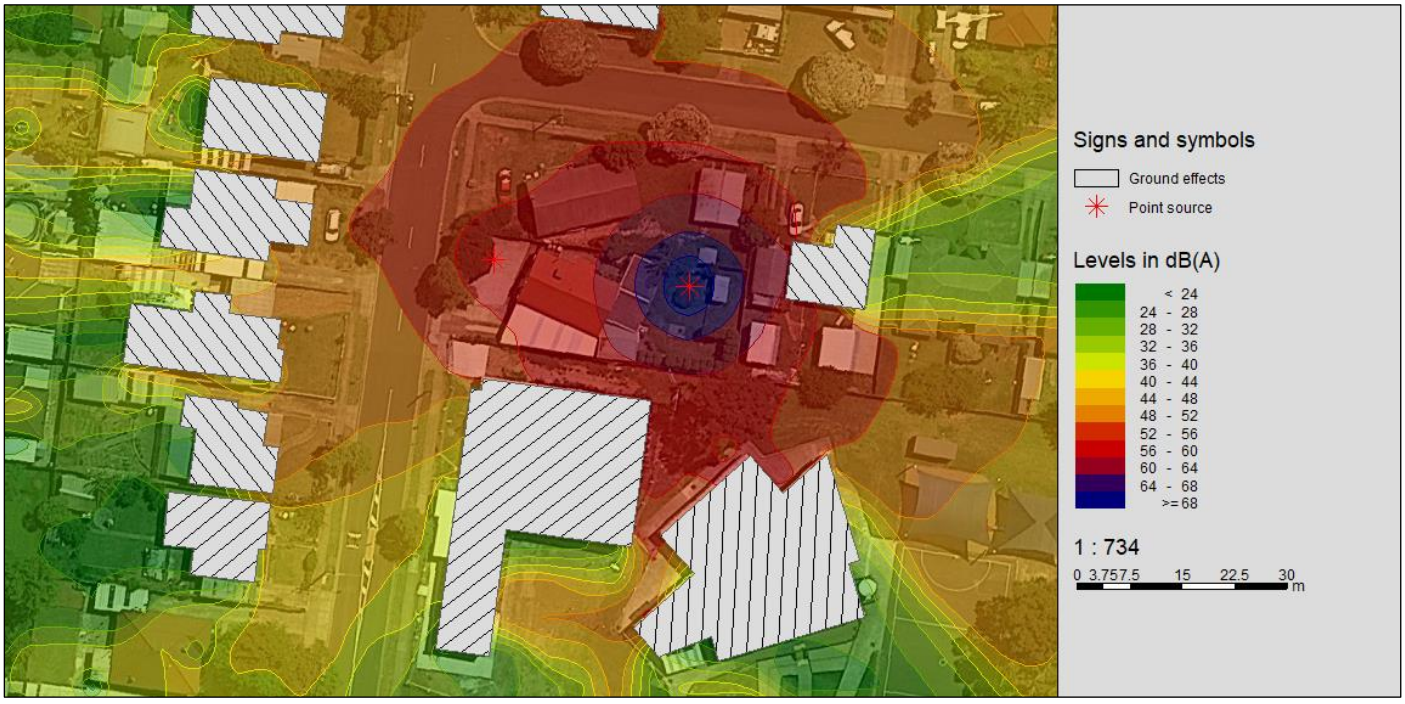
If the children play at separate times, then the calculation at a single point is as follows:

- *Effective Sound power Level for 'n' children = Effective sound power level for 10 children + 10 log (n/10)*

Using the above formula, we can determine the sound power and octave band power levels for the number of children present in the outdoor play area. From this point, we modelled the noise exposure on the nearby residents using SoundPLAN software.

5.0 – NOISE MODELLING

The following modelling demonstrates the expected levels from children's play with *no acoustic barriers* in order to determine the line-of-sight exposure to the NSR.



5.1 – NOISE MODELLING, cont.

RESULTS TABLE

RECEIVER	LIMIT	LEVEL	LIMIT EXCEEDANCE
2 Maxine Ct	48	62.0	**14.0**
23 Liege Ave West (elevated receiver position)	48	56.5	**8.5**
23 Liege Ave East (elevated receiver position)	48	67.2	**19.2**
26 Liege Ave	48	50.7	**2.7**
28 Liege Ave	48	52.2	**4.2**
30 Liege Ave	48	49.3	**1.3**
32 Liege Ave	48	49.4	**1.4**

Based on the results of the noise modelling of children in the play areas, we would predict that the there will exceedances of the target noise levels where the boundaries are shared with the residential dwellings.

It our opinion that acoustic fencing and barriers for the play areas will be required to mitigate the noise from children's play appropriately.

The NSR to the north is currently under construction. It is a number of double storey apartment buildings, with windows facing into the play area of the child care centre. In our opinion, acoustic fencing and barriers are the most reasonably practicable approach to mitigating noise, however there is risk of windows overlooking the play areas, so appropriate heights must be set.

6.0 – REQUIREMENTS FOR COMPLIANCE

ACOUSTIC FENCING – GROUND LEVEL BOUNDARIES

In order to ensure compliance with the AAAC target noise levels for children's outdoor play, an acoustic fence needs to be constructed around the ground level boundaries of the site (see Appendix – Site Map). Based on the modelled noise levels, a standard boundary fence will not be sufficient in reducing noise to compliant levels.

We are proposing the following options:

OPTION 1 – TIMBER FENCING SOLUTION

ACOUSTIC PERFORMANCE (MODELLED IN INSUL SOFTWARE)

		OCTAVE BAND CENTRE FREQUENCY (Hz)						
	R_W	63	125	250	500	1K	2K	4K
ATTENUATION (dB)	**27**	**15**	**19**	**23**	**27**	**25**	**26**	**34**

Construction of acoustic fencing:

- 2.4m minimum height
- Minimum surface density 12kg/m^2
- Fence construction:
  - 150mm x 25mm timber palings
  - Each paling to overlap a minimum of 30mm
- There are to be no breaks in the acoustic fence system, as any penetrations will reduce the efficacy of the system.

OPTION 2 – COLORBOND FENCING SOLUTION

ACOUSTIC PERFORMANCE (MODELLED IN INSUL SOFTWARE)

		OCTAVE BAND CENTRE FREQUENCY (Hz)						
	R_W	63	125	250	500	1K	2K	4K
ATTENUATION (dB)	**40**	**14**	**15**	**29**	**43**	**53**	**55**	**55**

Construction of acoustic fencing:

- 2.4m minimum height
- Colorbond metal sheet for inner lining (facing the proposed site)
  - 0.42 BMT
- 3mm cement sheet
- 140mm cavity
- 14kg/m^3 glasswool insulation batts, 90mm thickness
- Colorbond metal sheet for outer lining (facing the NSR)
  - 0.42 BMT
- There are to be no breaks in the acoustic fence system, as any penetrations will reduce the efficacy of the system.

OPTION 3 – PROPRIETARY SYSTEM

A proprietary system by Modular Walls could be used, specifically the AcoustiMax75 system[2] at 2.4m in height.

Positioning of the fence has been marked up in Appendix – Site Plan

[2] https://modularwalls.com.au/product/acoustimax/

6.1 – REQUIREMENTS FOR COMPLIANCE

ACOUSTIC BARRIERS – UPPER PLAY AREA PERIMETER
As there is risk of exposure to the dwellings to north and east of the site (north being a double storey dwelling currently under construction), acoustic barriers of a suitable height need to surround the upper play areas.

A glass balustrade system of the following specification must be erected:

- 2m in height (see Appendix – Site Map)
- A minimum thickness of 6.38mm laminated security glass
    - *It is likely that minimum thicknesses for balustrades are greater, but in terms of acoustics, 6.38mm is the minimum. Thicker options are preferable.*
- There are to be no breaks in the barrier, and no gaps or penetrations, as it will compromise the acoustic performance of the barrier.

Positioning of the barrier has been marked up in Appendix – Site Plan

PARKING CONDITIONS
As the site will begin operation within the Night Period, measures need to be taken to avoid impacting the amenity of the nearby receivers. As there are to be residential receivers directly adjacent this parking area, we would anticipate noise from cars, car doors and foot traffic in these early hours to impact the NSR, which could result in harm by way of sleep disturbance.

Sleep disturbance is defined as levels exceeding 65dB L_{Amax} measured externally at an openable window or 55dB L_{Amax} measured within a sensitive area, windows open. A slamming car door, or some makes and models of cars starting are likely to produce levels within this range.

As such, we have recommended acoustic fencing in this area.

Additionally, management should ensure that noise levels are managed, reminding people using this area in the morning to be considerate of the residential area.

SIGNAGE TO BE DISPLAYED AT ENTRANCE OF CENTRE
It will be important for the child care centre to reasonable mitigate noise wherever practical. As such, we recommend signage be displayed near the entrances of the centre to remind those dropping off and collecting their children to be mindful of the nearby residents, and to keep noise levels to a minimum.

COMMERICAL RECEIVERS
The AAAC guidelines specify a noise limit of 65dB $L_{Aeq-15min}$ when measured within any commercial property.

Based on these predicted noise emissions and no commercial receivers in the area, we do not anticipate any risk of these limits being exceeded.

7.0 – GENERAL ENVIRONMENTAL DUTY (GED)

Environmental laws introduced in 2021 requires that anyone engaging in an activity posing a risk of harm to human health and the environment, from pollution or waste, must manage that risk to prevent harm as far as reasonably practicable. *Refer Appendix – General Environmental Duty for further details regarding the GED.*

The following table provides an assessment of risks from noise hazards associated with the proposed operations in accordance with requirements under the GED.

Risk assessments conducted in conjunction with the table in Appendix – Risk Management Matrix.

IDENTIFIED HAZARD	POTENTIAL CAUSES	INITIAL RISK RATING (WITHOUT CONTROLS)	RECOMMENDED CONTROLS	RESIDUAL RISK RATING (WITH CONTROLS IMPLEMENTED)
Potential plant and equipment noise	In the case that addition plant and equipment is installed, proximity to NSR may cause exceedances with determined limits	**Medium Risk (B3)** • Moderate (B) • Possible (3)	Have an acoustic consultant verify any equipment and positioning before installation Schedule operational noise testing.	**Low Risk (A2)** • Minor (A) • Unlikely (2)
Noise generated by children's play	No effective acoustic screening from play areas	**Medium Risk (B4)** • Moderate (B) • Likely (4)	See 6.0 of this report which discusses acoustic fencing and restricting play times	**Low Risk (A2)** • Minor (A) • Unlikely (2)
Noise generated in parking area	Early morning noise generated in the Night Period may disturb sleep of nearby residents.	**Medium Risk (B4)** • Moderate (B) • Likely (4)	See 6.1 of this report which discusses acoustic fencing, signage to be displayed and management procedures	**Low Risk (A2)** • Minor (A) • Unlikely (2)

PLANT AND EQUIPMENT NOISE:

- Final positioning and noise output of any equipment on site should be chosen with advise from an acoustic consultant
- After 3 months of operation, testing to ensure compliance is required

NOISE FROM CHILDREN'S PLAY

- We would expect with the implementation of acoustic fencing as described in this report, to appropriately mitigate noise from children's play.
- Hours of play should only take play during the Day Period in order to reduce the risk of sleep disturbance

NOISE FROM PARKING AREA

- Fencing to reduce noise impacts in the Night Period
- Management must remind people to be mindful of nearby residents.

8.0 – SUMMARY

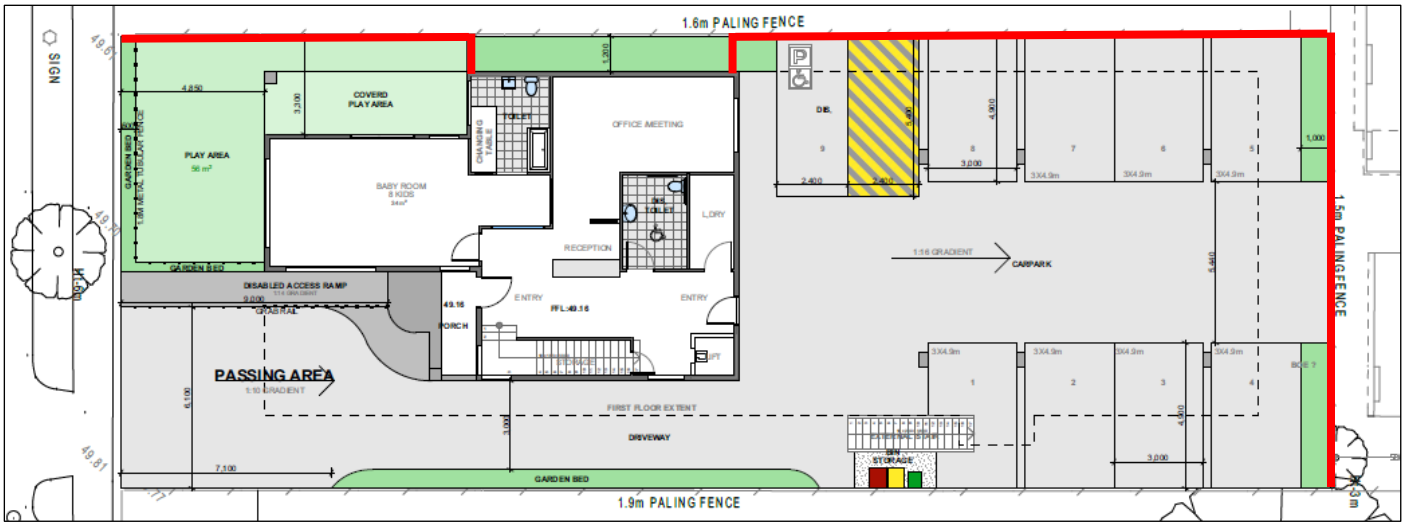
Based on the available environmental noise data and plans received, implementation of the measures outlined in this acoustic assessment report would be expected to minimise the noise impact on the neighbouring residences from the child care centre and any plant and machinery.

This report gives consideration to acoustic matters associated with the operation of the child care centre, with recommended acoustic treatments and relevant practices to maintain compliance to the EPA 1826.4 Noise Protocol.

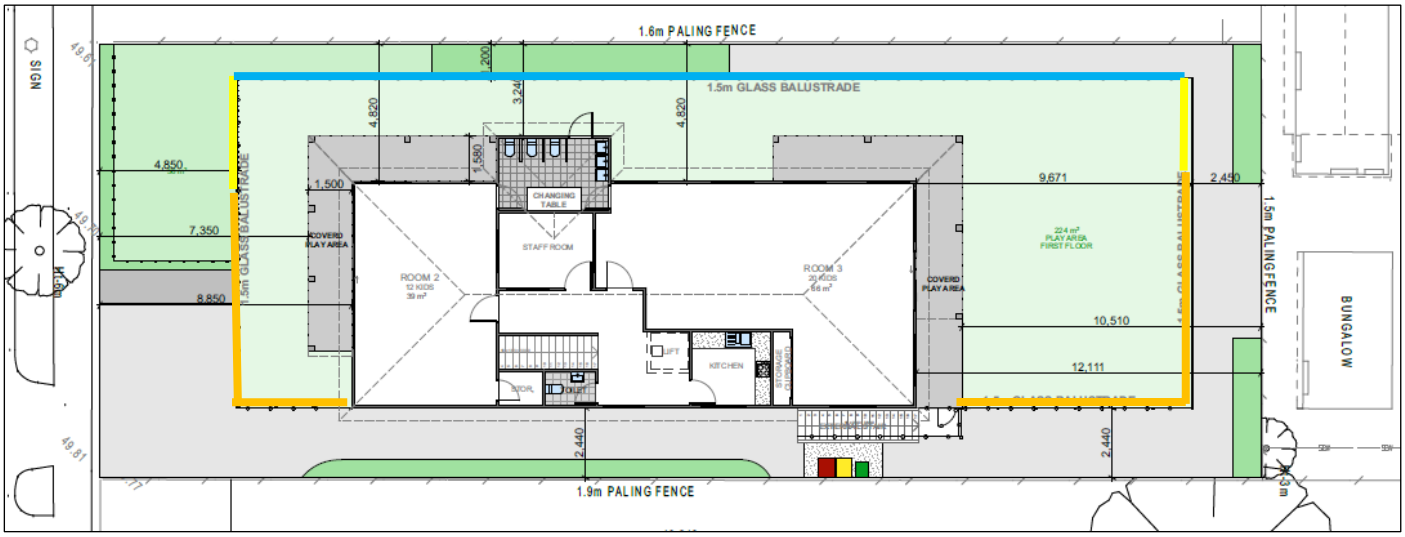
Where clarification is required or the recommended acoustic treatments may be found to impact on other services or statutory requirements, independent advice, as appropriate, is to be sought in respect to any such impact that these acoustic works may have on the building design and construction.

Rohan Barnes
Waveform Acoustics

APPENDIX – SITE PLAN



In red, required acoustic fencing.



In blue, 2m balustrade acoustic barrier, in orange, 1.5m balustrade sections. In yellow, a section where the 2m can taper into the 1.5m balustrade.

This barrier needs to be constructed of suitable acoustic material, with no penetrations or breaks within these sections.

APPENDIX – SITE MAP

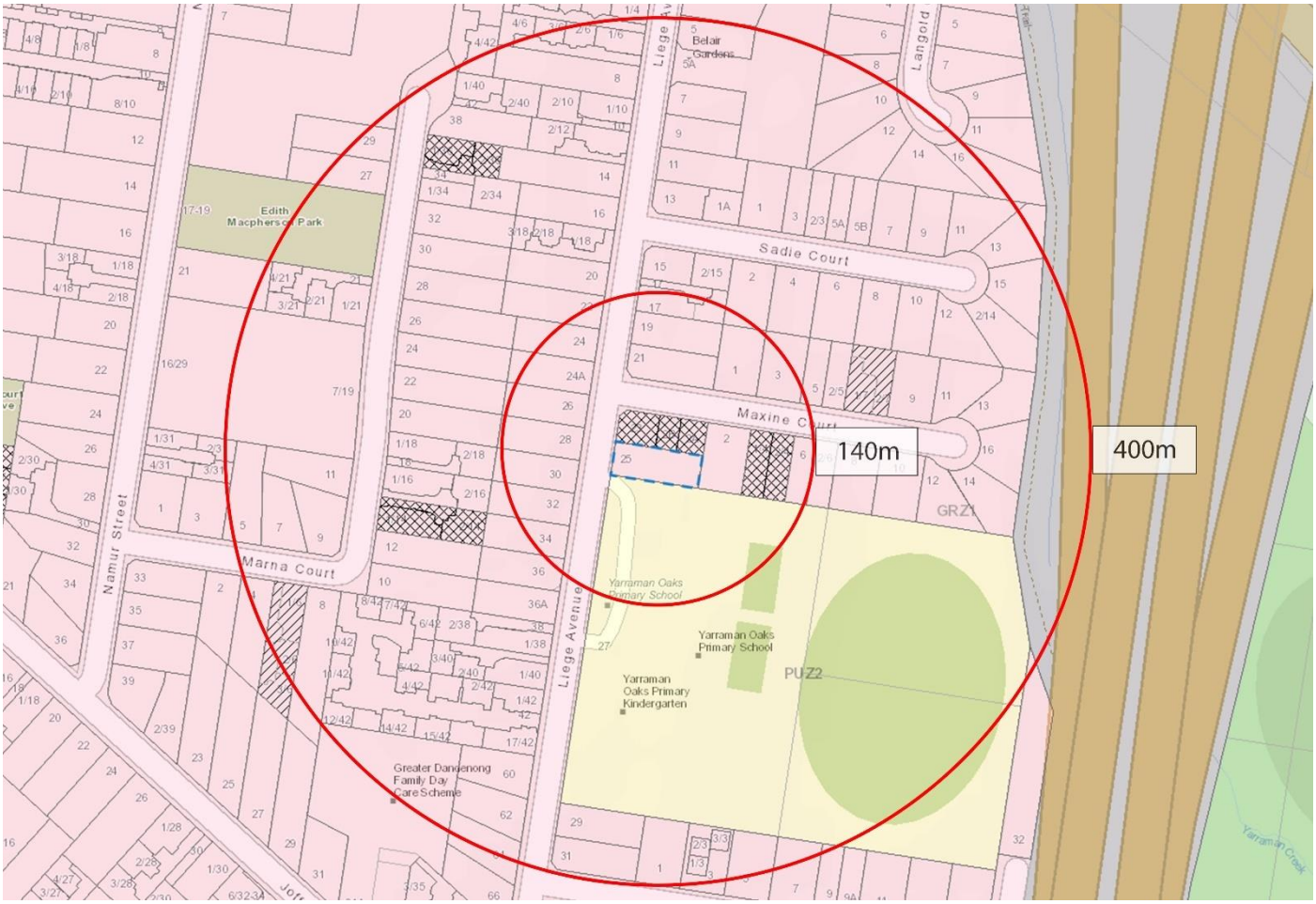
In red, proposed new child care site. In orange, adjacent school area. Green is the residential Noise Sensitive Receivers.

APPENDIX – SITE PHOTOS

Logger position within existing site. In picture is the double storey development to the north.

To the south of the proposed child care centre is a school. A school is typically not an NSR.

APPENDIX – ZONING MAP



APPENDIX – GENERAL ENVIRONMENTAL DUTY

EPA General Environmental Duty 2021 sets out the following guidelines to follows:

- Understand your duties under the EP Act
- Identify Hazards
- Assess Risks
- Manage the Risks
- Implement Controls

UNDERSTAND YOUR DUTIES UNDER THE EP ACT

Anyone engaging in an activity that poses risk of harm to human health and the environment, from pollution or waste, or noise must eliminate or reduce that risk. You also need to eliminate or reduce risk as far as reasonably practicable. You can do this by putting appropriate controls in place that are proportionate to the risk.

Your approach to managing risk will depend on the complexity and scale of your activities or project, as well as the nature of the risks you need to manage.

EPA Victoria specifies a four (4) step risk management process, involving: identifying the hazards, assessing risk, implementing controls and ongoing checking. The process is outlined by the Victorian EPA[3] and is summarised as follows:

[3] Environmental Protection Authority Victoria, Assessing and controlling risk: A guide for business. Publication 1695.1, August 2018

STEP ONE: IDENTIFY HAZARDS

Hazards associated with commercial and industrial activities include anything that can cause harm to people or the environment. Common hazards include:

- Noise
- Odour
- Dust
- Chemical hazards
- Fire hazards

STEP TWO: ASSESS THE RISKS

The hazards identified during step 1 must be assessed to determine how they could lead to harm, how severe that harm could be and how likely it is to happen.
Risk assessment is a process for building knowledge and understanding of hazards and their associated risks so decisions can be made on how best to control them.

The following steps should be taken:

- Assess the likelihood of a hazard causing an impact
- Assess the consequences, or severity, of each impact
- Calculate a risk rating for each hazard

STEP THREE: IMPLEMENT CONTROLS

The options for controlling risk are prioritised from the highest level of effectiveness to the lowest.

When selecting controls the following hierarchy should be followed:

STEP FOUR: CHECK CONTROLS

Controls that are put in place to prevent or mitigate risks must be monitored to ensure they work as planned.

Checking controls involves the same methods as in the initial hazard identification step (step 1), and 'closes the loop' in which risk control measures can be maintained.

Common methods used to check the effectiveness of controls are:

- Regular site inspections and audits
- Consulting with employees, contractors, occupants and landlords
- Inspecting, testing and maintenance of risk control systems
- Using available information, such as manufacturer/supplier instructions
- Analysing records and data, such as incident and near miss reports

If these checks are made on a regular basis, then failures in controls can be identified as well as opportunities for improvement.

APPENDIX – RISK ASSESSMENT MATRIX

	CONSEQUENCE					
	A – Minor	**B – Moderate**	**C – Major**	**D – Severe**	**E – Extreme**	
	First aid treatment. Fully recoverable.	Medical / professional treatment required. Fully recoverable	Extensive / professional medical treatment. Fully recoverable over an extended period.	Severe injury, permanent incapacitation. Impact requires change to work function.	Catastrophic, single or multiple deaths.	**HUMAN HEALTH, HEALTH & SAFETY**
LIKELIHOOD	Negligible or no environmental damage. No residual pollution impacts.	Impacts within the immediate vicinity of the impact; and short-term residual impact <1 year	Impacts are within the local area; and /or medium-term residual impact (2-5yrs)	Impact extends across the region (within a state); and/or longer-term residual impact (5-20yrs	Impacts extends beyond the region (e.g. between states or nationally); and/or long term residual impacts >20yrs	**ENVIRONMENT**
(5) Almost Certain Expected to occur. High probability of occurring, e.g. >90%.	Medium	High	High	**Extreme**	**Extreme**	
(4) Likely Likely (e.g. >75% chance) of occurring under normal circumstances.	Medium	Medium	High	High	**Extreme**	
(3) Possible Could reasonably be expected under normal circumstances.	Low	Medium	Medium	High	High	
(2) Unlikely Unusual, not likely to occur under normal circumstances	Low	Low	Medium	Medium	High	
(1) Very unlikely. Rare circumstance, highly unusual.	Low	Low	Low	Medium	High	

APPENDIX – ASSESSING NOISE FROM COMMERCIAL, INDUSTRIAL AND TRADE PREMISES

1. Assessment location, alternative assessment location and alternative assessment criteria.

1.1 Assessment location

(56) Noise from commercial, industrial and trade premises must be assessed at a location in a noise sensitive area where the maximum effective noise level occurs or, for proposed premises, is predicted to occur.

1.2 Alternative assessment location

(57) Notwithstanding clause 56, an alternative assessment location may be specified where:

a. two or more premises contribute to the effective noise level and a measurement point is required that is not influenced by any noise source from any other commercial, industrial or trade premises;

b. atmospheric conditions affect the effective noise level at the noise sensitive area and a measurement point is required closer to the commercial, industrial or trade premises under investigation that is not affected by atmospheric conditions;

c. a measurement point in a noise sensitive area is not readily accessible and a more suitable measurement point is required; or

d. extraneous noise affects the effective noise level at the noise sensitive area and a measurement point is required at a location that is not affected by extraneous noise.

(58) The alternative assessment location must be chosen so that the noise at the alternative assessment location is representative of the noise exposure within noise sensitive areas.

(59) An alternative assessment location may be specified either within or outside a commercial, industrial or trade premises.

1.3 Alternative assessment criterion

(60) Where an alternative assessment location is used, an alternative assessment criterion must be determined for that location, for each relevant operating time period.

(61) The alternative assessment criterion must be set so that compliance with this noise level will result in the noise limit at the noise sensitive area not being exceeded, for the relevant operating time period.

(62) The alternative assessment criterion must be calculated having regard to:

a. the sound paths to the noise sensitive area and other factors which may affect the propagation of sound.

b. the character of the noise from commercial, industrial and trade premises that will be experienced in noise sensitive areas, and the value of the relevant duration or noise character adjustments as described in clauses 79 to 81 and clauses 82 to 88.

c. the cumulative contribution from other industrial, commercial or trade premises affecting noise sensitive areas, as required in Regulation 119.

d. the uncertainty of the calculation method used.

Note: The value of a specific alternative assessment criterion is determined from the relevant noise limit, the difference between the sound paths from the industry being assessed to the noise sensitive area, and the sound paths to the alternative assessment location. It may also be influenced by the character of the noise. However, to ensure that meeting an alternative assessment criterion is consistent with complying to the relevant noise limit that applies within the considered noise sensitive area, an alternative assessment criterion is not subject to the base noise limits set out in Regulation 118(2) or to the maximum value of 55 dB(A) for the night period set out in Regulation 118(3).

2. Effective noise levels

(63) The effective noise level is determined, for noise from commercial, industrial and trade premises, as a 30-minute equivalent sound pressure level LAeq,30min adjusted, where relevant for:

a. duration (A_{dur})

b. noise character i. tonality (A_{tone})

ii. impulse (A_{imp})

iii. intermittency (A_{int})

c. measurement position

i. reflection (A_{refl})

ii. indoor (A_{ind})

(64) The effective noise level is calculated using Equation 1:

ENL = L_{Aeq} + A_{dur} + A_{tone} + A_{imp} + A_{int} + A_{refl} + A_{ind} (Equation 1)

(65) For the purpose of determining the effective noise level the noise is measured using the Fast time weighting and the A-frequency weighting network.
(66) The L_{Aeq} and relevant adjustments must be applied to one decimal place.
(67) The effective noise level is rounded to the nearest decibel.

Existing premises

(68) For existing premises, the effective noise level is determined based on measurements within the noise sensitive area or at an alternative assessment location, in accordance with clauses 71 to 90.
(69) Notwithstanding clause 68 the effective noise level for existing premises can be calculated in accordance with clause 70 to facilitate the assessment of noise.

Proposed premises or proposed extensions of existing premises

(70) For proposed premises or proposed extensions of existing premises, the effective noise level must be calculated having regard to:
a. all existing noise sensitive areas or future noise sensitive areas relevant to approved developments;
b. the sound paths to the noise sensitive area and other factors which may affect the propagation of sound;

c. the character of the noise that will be experienced in noise sensitive areas, and the value of the relevant duration and noise character adjustments to apply (clauses 79 to 81 and clauses 82 to 88);
d. the cumulative contribution from existing and approved premises affecting noise sensitive areas;
e. the uncertainty of the calculation method used.

3. Measurement of noise from commercial, industrial and trade premises

3.1 Measurement point

Outdoor measurement

(71) The measurement point must be located within a noise sensitive area or at an alternative assessment location.
(72) If the measurement point is in a noise sensitive area, it must be located outdoors unless the conditions for an indoor measurement apply in accordance with clause 74.
(73) The measurement point within a noise sensitive area must be located at a point where the maximum effective noise level occurs.

Indoor measurement

(74) The measurement point must be located indoors, in a sensitive room within a noise sensitive area, when:
a. the noise (including vibration induced noise) is transmitted into the affected room through a solid wall, floor or ceiling from another part of the same building or an adjoining building; or
b. an outdoor measurement that represents noise exposure within the noise sensitive area cannot be made (neither within the noise sensitive area, nor at an alternative assessment location), even when a microphone is placed through a window opening on a boom. (75) If an indoor measurement is made in a sensitive room, all its windows and doors must be closed.

3.2 Atmospheric conditions

(76) Where the effective noise level at the noise sensitive area is likely to be affected by atmospheric conditions, an alternative assessment location located near to the commercial, industrial or trade premises must be used unless there is no appropriate alternative assessment location (refer clause 77).
(77) If an alternative assessment location is not appropriate, the effective noise level is calculated as the arithmetic average of three measurements taken on different days within a 30-day period at the noise sensitive area.
(78) The measurements in clause 77 must represent the worst-case scenario of exposure, giving regard to the operation conditions of the noise source and atmospheric conditions favourable to the propagation of sound.

3.3 Duration adjustment

(79) If noise emissions from the commercial, industrial or trade premises investigated do not occur over the whole continuous 30-minute period, the duration adjustment applies.

(80) The duration adjustment is determined from the ratio of the total time for which the source is operating over the measurement period (per cent on time) using Equation 2:

A_{dur} = 10 log10 (total time source operating / measurement period) dB (Equation 2)

(81) When determining the duration adjustment for noise that is impulsive in nature, any impulse noise emission is deemed to be audible for 10 seconds after the occurrence of the emission.

3.4 Adjustments for noise character

Tonality adjustment

(82) When the noise is tonal in character then an adjustment is made based on observations of the noise.

(83) The following adjustments apply –

a. when the tonal character of the noise is just detectable then A_{tone} = +2 dB;

b. when the tonal character of the noise is prominent then A_{tone} = +5 dB. (84) When a tone is present, but observations do not provide certainty with regards to the value to apply for the tonal adjustment, the adjustment may be determined using the objective tonal method in accordance with Annex C.

Impulse adjustment

(85) When the noise is impulsive in character the following adjustments apply:

a. when the impulsive character of the noise is just detectable then A_{imp} = +2 dB.

b. when the impulsive character of the noise is prominent then A_{imp} = +5 dB. (86) When determining the duration adjustment for noise that is impulsive in character, any impulse noise emission is deemed to be audible for 10 seconds after the occurrence of the emission.

Intermittency adjustment

(87) An intermittency adjustment applies when the noise:

a. increases in level rapidly, and by at least 5 dB, on at least two occasions during a 30-minute period; and

b. maintains the higher level for at least a one minute duration. (88) The intermittency adjustment is determined using Table 5.

Table 5: Intermittency adjustment for noise from commercial, industrial and trade premises

Time Period	Increase in level	Adjustment
Day period	> 10 dB	+ 3 dB
Evening period or Night period	5-10 dB	+ 3 dB
	> 10 dB	+ 5 dB

3.5 Adjustments for measurement position

Reflection adjustment

(89) If the microphone position is located between 1, and 2 metres from an acoustically reflective surface, the reflection adjustment is applied by subtracting 2.5 dB from the measured noise level, so that A_{refl} = -2.5 dB.

Indoor adjustment

(90) If the measurement is conducted indoors, an indoor adjustment applies and is determined using Table 6.

Note: The intent of the indoor adjustment is to allow for the assessment of noise emissions from commercial, industry and trade premises, against the noise limits that are defined as outdoor noise levels, when an outdoor measurement would not allow for this assessment. The indoor adjustment is not meant to be used to determine or assess the effectiveness of the design response and construction of buildings affected by noise from commercial, industry and trade premises.

Table 6: Indoor adjustment for noise from commercial, industrial and trade premises

Circumstances		Adjustment
• The noise reduction performance of the building envelope is known, in octave or one third octave bands, from design specifications, calculations or measurements, and; • The frequency spectrum of the indoor noise has been measured.		Site specific adjustment based on the noise reduction performance of the building envelope (taking into account the volume and acoustic properties of the room).
• Where the noise reduction performance is unknown, the adjustment is based on the following assessment of the building envelope:	- Meets or exceeds energy efficiency requirements set out in the Building Code of Australia 2006 (BCA 2006) including sealing requirements.	+20 dB
	- Does not meet energy efficiency requirements or sealing requirements set out in the BCA 2006.	+15 dB

APPENDIX – OPERATING TIME PERIODS

From the Environmental Protection Regulations 2021:

116 Definitions—operating time periods
In this division (3), in relation to noise emitted from *commercial, industrial and trade premises*—
day period means –

- Monday to Saturday (except public holidays), from 7am to 6pm

evening period means –

- Monday to Saturday, from 6pm to 10pm; and
- Sunday and public holidays, from 7am to 10pm

night period means –

- 10pm to 7am the following day.

GLOSSARY OF ACOUSTIC TERMS

Decibel (dB)	A logarithmic unit used to express the ratio between two sound pressures or powers. It is a relative measurement with reference to a specific threshold (usually 0 dB for sound pressure).
dB(A)	A-weighted decibels, which apply a frequency weighting to sound measurements to better represent the human ear's sensitivity to different frequencies.
dB(C)	C-weighted decibels, the C-weighting curve is relatively flat and does not emphasize any specific frequency range. It covers the entire audible frequency range with equal weighting. C-weighting is less commonly used in general sound level measurements, but it may be used in specific applications, such as measuring peak sound levels or when the sound being measured contains substantial low-frequency content.
Octave Band	A frequency band in which the upper frequency is twice the lower frequency (e.g., 63 Hz - 125 Hz).
Third-Octave Band	A frequency band with higher resolution, splitting each octave into 3 centre frequency measurement points.
LAeq	Equivalent Continuous Sound Level, an average sound level over a specific time period, often used to represent overall noise exposure.
LAmax	Maximum A-weighted sound level, the highest instantaneous sound level during a particular time period.
LAmin	Minimum A-weighted sound level, the lowest instantaneous sound level during a particular time period.
LA90	The A-weighted sound pressure level which is exceeded for 90% of the time interval considered.
LOCT10	The 'C' weighted or linear sound pressure level for a specified octave band that is exceeded for 10% of the time.
Sound Pressure (SPL)	The amplitude of sound waves in a specific medium, typically measured in decibels (dB).
Sound Power (SWL)	The total amount of acoustic energy radiated by a sound source, measured in watts (W) or decibels (dB).
Frequency	The number of complete cycles of a sound wave occurring per second, measured in Hertz (Hz).
Sound Level Meter (SLM)	An instrument used to measure sound pressure levels in decibels.
Reverberation Time (Rt)	The time it takes for a sound to decay by 60 dB after the sound source has stopped, indicating the acoustic characteristics of a room.
Tonality	Refers to the presence of a distinct pitch or frequency in the noise. It suggests that the noise contains specific frequencies that are more pronounced or dominant than others. For example, a steady hum or whine might exhibit tonality because it has a clear and consistent pitch.
Impulsiveness	Describes sudden, brief bursts of noise or sound energy within a continuous noise environment. These bursts are often characterized by their rapid onset and short duration. Examples of impulsive noise include the bang of a door slamming or the roar of an engine starting.
Intermittency	Refers to the irregular or sporadic nature of noise, where there are periods of sound interspersed with periods of relative quiet or lower sound levels. It's the quality of being occasional or not continuous. This could include noise sources that turn on and off intermittently, such as machinery operating in cycles or intermittent traffic noise.