Acoustic Engineering

Town Planning Acoustic Report

15 Grandview Road, Wheelers Hill, VIC

Project No: 204737-A
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Document Control

Document Title: Town Planning Acoustic Report

Project: 15 Grandview Road, Wheelers Hill, VIC

Project No: 204737-A

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Revision History

Doc.	Rev.	Date	Purpose	Prepared by:	Reviewed by:
TPR	0	13/12/2023	Not for endorsement	Krishna Bhuva	Irena Peoples
TPR	1	20/12/2023	For endorsement	Krishna Bhuva	Irena Peoples
TPR	2	31/10/2024	Revised outdoor play area noise control measures	Campbell Johnstone	Te-liang Chong

Executive Summary

DDEG has been appointed to provide acoustic engineering consulting services associated with the proposed childcare centre development at 15 Grandview Road, Wheelers Hill, VIC. Advice in relation to the following acoustic engineering elements has been requested, and is presented in this document:

Table 1 Acoustic Engineering Elements and Reference Criteria

Acoustic Engineering Element	Reference Criteria
Environmental noise emissions due to children and other activities within indoor and outdoor areas of the site	▪ AAAC – Guideline for Child Care Centre Acoustic Assessment
Environmental noise emissions due to mechanical plant serving the building.	▪ Environment Protection Regulations 2021 ▪ Part I of EPA Publication 1826 – Noise Protocol
Environmental noise emissions due to on-site vehicle movements and other car park activity	▪ Part I of EPA Publication 1826 – Noise Protocol (as guideline only)
Environmental noise emissions due to deliveries and private waste collections	▪ EPA Publication 1254 – Noise Control Guidelines

A review of the above elements has been undertaken and it is considered that the proposed project will satisfy the reference criteria with inclusion of the following acoustic engineering measures:

Table 2 Recommended Acoustic Engineering Measures

System	Acoustic Engineering Measure
Outdoor Play Areas	▪ The outdoor play area should be segmented into three smaller play areas using fencing and/or gates, as indicated in Figure 5. The maximum number of children occupying each play area simultaneously must not exceed the numbers outlined in Table 15. ▪ Outdoor Play Area B (as highlighted in Figure 5) must be used for passive play activities only, which are expected to be quieter than 'active' play activities. Passive play activities may include (but would not be limited to) painting, garden exploration, reading, block play or drawing. ▪ If Outdoor Play Area B is to be utilised for active play activities, the maximum number of children outdoors simultaneously within this area would then drop to 7 children. ▪ An operational noise management plan / procedure should be prepared and implemented for the childcare centre. At minimum, all administrative controls outlined above must be captured in the operational noise management plan / procedure. ▪ Replace the existing non-acoustic fence surrounding the premises with a minimum 2.5 m high solid acoustic fence at the locations highlighted in red in Figure 5. ▪ Install a minimum 3 m high solid acoustic fence surrounding Outdoor Play Area B, as highlighted in blue in Figure 5. ▪ All acoustic fencing should be lined on the childcare centre side with sound absorbing material. The selected sound absorbing material should meet the acoustic specifications specified in Table 16. ▪ Refer to Section 7 for further details.
Mechanical Plant Noise	▪ Outdoor AC units have been modelled at the locations presented in Figure 6. ▪ Based on the adopted AC condenser unit model and locations, noise emissions due to outdoor air conditioning condenser units are expected to comply with the EPA Noise Protocol Part I noise limits for the periods covering the centre's proposed hours of operation. ▪ Further acoustic review of mechanical plant noise emissions is recommended if any of the following occurs: – If more than 11 air conditioning condenser units are installed, or if the units selected have an individual Sound Power Level of more than 70 dB(A); – If the air conditioning condenser units are to be installed at any location other than the adopted locations shown in Figure 6; – If car park supply or exhaust fans are to be installed to ventilate the basement car park. ▪ Refer to Section 8 for further details.

<table>
<tr><th>System</th><th>Acoustic Engineering Measure</th></tr>
<tr><td>Car Park Noise</td><td>▪ No further acoustic treatment is required to address noise emissions from the proposed basement car park.
▪ Refer to Section 9 for further details.</td></tr>
<tr><td>Deliveries and Private Waste Collection</td><td>▪ Deliveries and private waste collections should only be conducted between the hours presented in the table below, as recommended by the EPA Noise Control Guidelines.
<table>
<tr><th>Activity Type</th><th>Permitted Times</th></tr>
<tr><td>Deliveries</td><td>▪ 7 am to 10 pm Monday to Saturday
▪ 9 am to 10 pm Sundays and Public Holidays</td></tr>
<tr><td>Private Waste Collections</td><td>▪ 7 am to 8 pm Monday to Saturday
▪ 9 am to 8 pm Sundays and Public Holidays</td></tr>
</table>
▪ Refer to Section 10 for further details.</td></tr>
</table>

Contents

1 Introduction

1.1 Purpose

DDEG has been appointed to provide acoustic engineering consulting services in relation to the proposed childcare centre at 15 Grandview Road, Wheelers Hill, VIC.

This document has been prepared in reponse to a Council request for information (RFI) on the Planning Permit Application which has been submitted for the project.

The scope of this document comprises:

- Assessment of potential noise impacts due to use of proposed indoor and outdoor play areas.
- Assessment of noise due to proposed mechanical plant in relation to the statutory requirements.
- Review of potential noise impacts associated with use of the car park at pick-up and drop-off times.

A glossary of the acoustic nomenclature used in this document is presented in Appendix A.

1.2 Reference Documentation

This document is based on information contained in the following documents and drawings:

Table 3 Reference Documentation

Document	Prepared by	Issue
Preliminary Issue Architectural Drawings; Job No. 22401; Drawing Nos. TP05 to TP07; All Revision E.	Aqua Design Architects	09/07/2024
Email To: Campbell Johnstone CC: Tim Huang; Yubin Wu Subject: Re: 15 Grandview Road, Wheelers Hill	Estella Qing	Mon 28/10/2024 5:14 PM
Email To: Krishna Bhuva CC: Min Yee Lim Subject: Re: 15 Grandview Road ~~	Tim Huang, Aqua Design Architects	Fri 10/11/2023 9:50 AM
Request for Information (RFI), Ref No. TPA/55261	City of Monash	22/09/2023

1.3 Document Limitations

The following limitations are applicable with respect to the acoustic advice presented in this document:

- DDEG has prepared this document for the sole use of the relevant stakeholders and approval authorities and for the specific purpose expressly stated in the document. No other party should rely on this document without the prior written consent of DDEG. DDEG undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document.
- The information contained in this document provides advice in relation to acoustics and vibration only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics and vibration engineering including and not limited to structural integrity, fire rating, architectural buildability and fitness-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.
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- The recommendations, data and methodology presented in this document are based on the listed reference documentation. The recommendations apply specifically to the project under consideration and must not be utilised for any other purpose. Any modifications or changes to the project from that described in the listed reference documentation may invalidate the advice provided in this document, necessitating a revision.
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2 Project Characteristics

2.1 Site Location

The project site is located at 15 Grandview Road, Wheelers Hill, VIC, as shown in Figure 1. The topography in the area of the site is flat.

Figure 1 Aerial Image of Site (Aerial Photo Source: Google Maps)

2.2 Proposed Project

The project comprises construction of a proposed single-storey 122-place childcare centre with basement carparking.

Figure 2 shows the proposed ground floor plan.

Figure 2 Proposed Floor Plan – Ground Floor (Image Source: Aqua Design Architects)

2.3 Operating Hours

The proposed operating hours of the childcare centre are as follows:

- 6:30 am to 6:30 pm Monday to Friday;
- Closed Saturday and Sunday.

2.4 Occupancy Characteristics

The proposed childcare centre will have a maximum capacity of 122 children.

3 Legislation and Guidelines

3.1 Summary of Relevant Documents

Table 4 presents a summary of the relevant legislation and guidelines applicable to the proposed project. Further details are presented in the subsequent subsections.

Table 4 Summary of Relevant Statutory Requirements and Guidelines

Document	Status	Relevance to this Project
Environment Protection Regulations 2021 (EPRs) (State of Victoria, 2021)	Legislation	Defines unreasonable or aggravated noise from commercial, industrial and trade premises.
EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (EPA Noise Protocol) (EPA Victoria, 2021)	Legislation	Prescribes the methods for determining the statutory environmental noise limits that apply to noise emissions from industrial, commercial, and trade premises within Victoria, and the methods to be used for assessment. Mechanical plant noise emissions due to the development will be subject to the requirements of the EPA Noise Protocol. Noise from non-commercial vehicles (i.e. the anticipated main source of noise from the proposed car park) is not assessed by the Noise Protocol, however, in the absence of other relevant Victorian noise policies or guidelines, the noise limits prescribed by the Noise Protocol will be adopted as a guideline to the acceptable level of noise.
EPA Publication 1254 – Noise Control Guidelines (EPA Victoria, 2021)	Guideline	Provides guidance on interpretation and application of the Environment Protection Regulations. Provides guidance in relation to appropriate delivery and waste collection times to control noise impacts on adjacent residences.
Association of Australasian Acoustical Consultants – Guideline for Child Care Centre Acoustic Assessment (AAAC, 2020)	Guideline	Provides guidelines in relation to noise due to sources not covered by the EPA Nosie Protocol, such as playground noise, and noise emissions due to activities inside the building.

3.2 Environment Protection Regulations 2021

Noise emissions from residential premises, and from commercial, industrial and trade premises, and from entertainment venues, must comply with the *Environment Protection Regulations 2021* (EPRs) (State of Victoria, 2021).

The EPRs prescribe the time periods, relevant noise sources, base noise limits, and specify the noise levels above which noise emitted is defined as 'Aggravated Noise'.

For the purpose of assessing noise emissions in relation to the requirements of the EPRs, prediction, measurement, and assessment of noise from commercial, industrial and trade premises, and from entertainment venues must be conducted in accordance with *EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (EPA Noise Protocol) (EPA Victoria, 2021).

3.3 EPA Publication 1826 – Noise Protocol Part I

Part I of *EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (EPA Noise Protocol) (EPA Victoria, 2021) prescribes the procedures used to determine limits for, and assess, environmental noise emissions from sources such as mechanical equipment and activities associated with commercial, industrial or trade operations.

The limits prescribed by the EPA Noise Protocol apply at or within Noise Sensitive Areas, such as residential dwellings, as defined in Appendix A.

The limits are dependent on a number of factors including:

- The time of day at which the noise emissions occur;
- The planning zone types in the area of the Noise Sensitive Area; and
- The background noise levels at the Noise Sensitive Area.

In accordance with the EPA Noise Protocol, noise emissions from the source under consideration are measured so as to obtain an L_{Aeq} Sound Pressure Level that is representative of the audible noise at the Noise Sensitive Area over a continuous 30-minute period. Adjustments to the measured level are applied where necessary to account for characteristics such as duration, intermittency, reflections, impulsiveness, tonality, and measurement location. The adjusted noise level is termed the Effective Noise Level, and it is the Effective Noise Level that is assessed in relation to the noise limits.

3.4 EPA Publication 1254 – Noise Control Guidelines

EPA Publication 1254 – Noise Control Guidelines (EPA Victoria, 2021) provides guidance relating to assessment and management of noise from a range of specific sources. It addresses a number of sources that are not explicitly covered by other policies and guidelines, and provides complementary guidance for some types of noise that are also addressed by other noise legislation, policies and guidelines.

The guidelines are primarily intended to assist in the resolution of complaints or to avert a possible noise nuisance. Many of the guidelines do not require an actual measurement of the noise, but rather prescribe parameters (such as operating hours or minimum separation distances) outside of which an activity would be likely to be unreasonable noise.

4 Town Planning Requirements

Request for Information (RFI), Ref No. TPA/55261 issued by City of Monash on 22/09/2023 specifies items that need to be addressed in the planning permit application for the development. Table 5 presents the relevant acoustic items:

Table 5 Relevant Acoustic Items from Request for Information (RFI)

Text from Request for Information (RFI)
An acoustic report prepared by a suitably qualified person to demonstrate noise levels from inside and outside the building and any impacts to adjoining properties. This report shall also investigate the need for acoustic fencing along common boundaries.

5 Noise Sensitive Areas

Table 6 and Figure 3 identify the nearest and potentially most-affected Noise Sensitive Areas (NSAs) in the vicinity of the project site, as defined by the relevant environmental noise legislation.

Assessment of environmental noise emissions due to the project will be undertaken at these locations. It is expected that compliance with the environmental noise criteria at these locations will also result in compliance at all other nearby NSAs.

It is possible that nearby NSAs will not be occupied during some or all of the operating hours of the proposed childcare centre. However, for the purposes of the following assessment, all nearby NSAs will be assumed to be occupied for all operating hours of the proposed childcare centre.

Table 6 Details of Potentially Most-Affected Noise Sensitive Areas (NSAs)

NSA Ref.	Address	No. Storeys	NSA Type	Notes
1	7 Wendy Court, Wheelers Hill	2	Single dwelling	-
2	6 Wendy Court, Wheelers Hill	2	Single dwelling	-
3	17-19 Grandview Road, Wheelers Hill	1	Units	-
4	14 and 16 Grandview Road, Wheelers Hill	1	Single dwelling	-
5	242 Jells Road, Wheelers Hill	3	Apartments	Retirement village

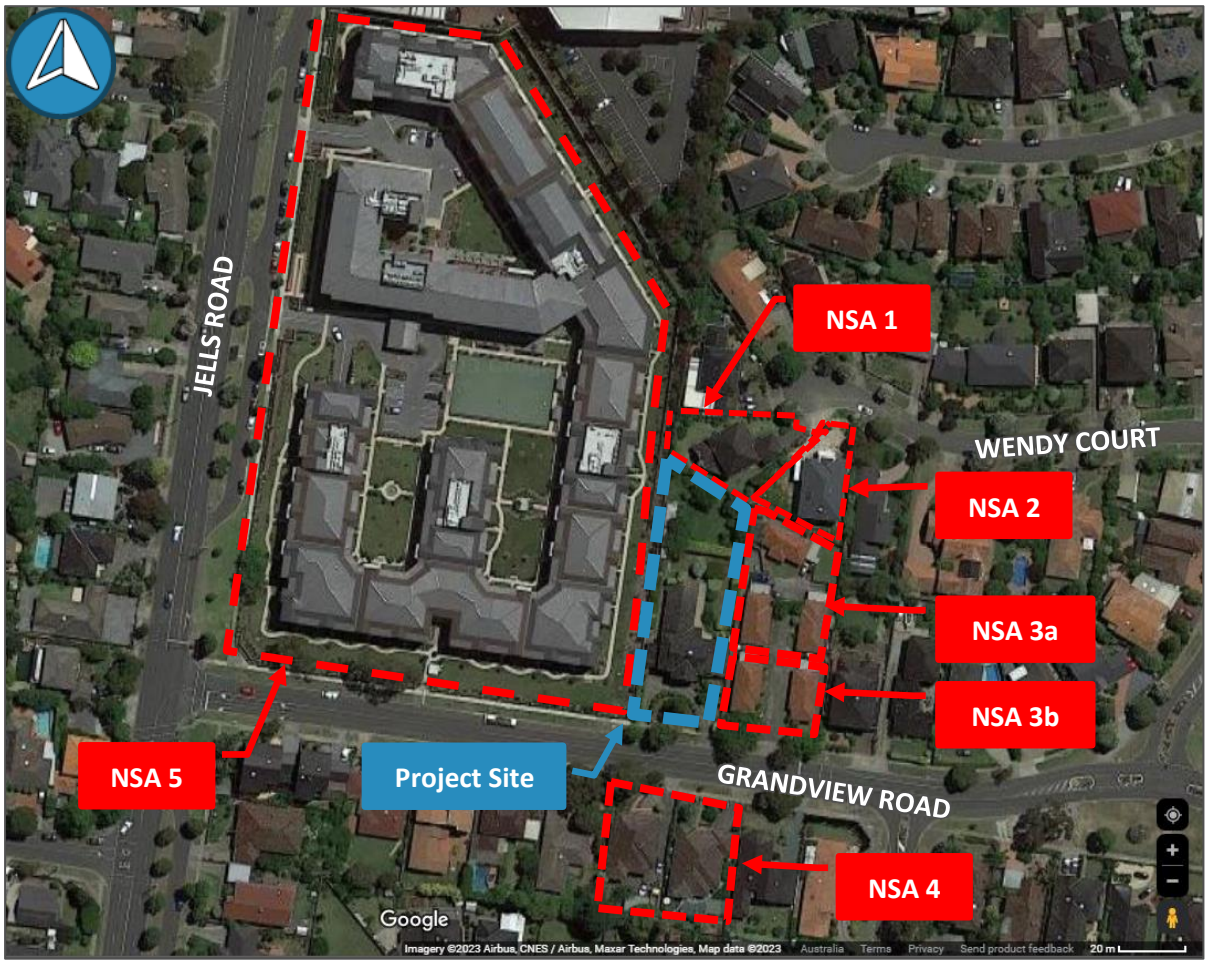


Figure 3 Locations of Potentially Most-Affected Noise Sensitive Areas (NSAs) (Aerial Photo Source: Google Maps)

6 Existing Acoustic Conditions

6.1 Exterior Soundscape

During our site visits on 1 and 9 November 2023, the soundscape in the vicinity of the site and potentially most-affected Noise Sensitive Areas consisted of bird noise, insect noise, and wind-induced vegetation noise. Intermittent traffic noise from Grandview Road to the south could be heard but was not a dominant feature of the soundscape.

6.2 Background Noise Levels

Environmental noise logging was performed at the site to establish the background noise levels. The measurements were performed at a location in the backyard of 15 Grandview Road, Wheelers Hill between 1 and 8 November 2023. Details of the measurement location and measurement methodology are presented in Appendix B.

Table 7 presents a summary of the measured background noise levels, as determined in accordance with the procedures given by the EPA Noise Protocol. Graphs showing the variation of background noise level over the full measurement period are presented in Appendix C.

Table 7 Background Noise Levels – EPA Noise Protocol Part I

Period	Applicable Times During Proposed Operating Hours	Background Noise Level, dB(A)	
		L_{A90} Overall	Lowest $L_{A90,15min}$
Day	▪ 7 am to 6 pm Monday to Friday	42	36
Evening	▪ 6 pm to 6:30 pm Monday to Friday	40	42
Night	▪ 6:30 am to 7 am Monday to Friday	42	39

6.3 Attended Short-Term Noise Measurements

6.3.1 North-Western Boundary

Attended noise measurements were performed at the site near the unattended noise logging location between 2:14 pm and 2:24 pm on 1 November 2023. Details of the measurement location and measurement methodology are presented in Appendix B.

The purpose of the attended noise measurements was to cross-check with the noise logging results. Table 8 presents a summary of the measured noise levels.

Table 8 Measured Sound Pressure Levels

Measurement Date and Time	Overall $L_{Aeq,10min}$ Noise Level, dB(A)	
	at Location 1A	at Location 1B
1 November 2023, 2:14 pm to 2:24 pm	46	46

Comparison between the noise data from the attended measurements at Location 1B and data recorded simultaneously by the unattended noise logger at Location 1A indicates that the noise levels measured at 2.5 m above ground (Location 1A) are the same as the noise levels measured at 1.5 m above ground (Location 1B).

The background noise levels at the selected noise logging location are therefore considered to be representative of the background noise levels at the potentially most-affected receptors.

6.3.2 Facing Grandview Road

Because of the influence of traffic on Grandview Road, the background noise levels at the front of residences which face Grandview Road will not be accurately represented by the results of the unattended noise logging conducted in the backyard of the project site.

In order to establish the difference in background noise levels between the noise logging location and the facade facing Grandview Road, attended noise measurements were conducted near the front of the project site. Details of the measurement location and measurement methodology are presented in Appendix B.

Table 9 presents a summary of the measured background noise levels measured.

Table 9 Measured Sound Pressure Levels

Measurement Date and Time	Background $L_{A90,10min}$ Noise Level, dB(A)	
	at Location 1A	at Location 2
1 November 2023, 2:32 pm to 2:42 pm	44 dB(A)	49 dB(A)

Comparison between the noise data from the attended measurement at Location 2 and data recorded simultaneously by the unattended noise logger indicates that the background (L_{A90}) noise levels at facades facing Grandview Road are approximately 5 dB higher than the noise levels measured at the north-western boundary of the project site. Consequently, the values recorded by the noise logger will be increased by 5 dB to represent background noise levels for Noise-Sensitive Areas facing Grandview Road.

7 Children Play Areas Noise

7.1 Assessment Criteria

The noise impact assessment method for childcare centres recommended by the Association of Australasian Acoustical Consultants '*Guideline for Child Care Centre Acoustic Assessment*' (AAAC Guideline) (AAAC, 2020) will be adopted to assess the noise emissions due to children's outdoor play at the centre.

The noise guidelines presented in Table 10 are recommended for noise emissions from outdoor play areas to nearby residential properties in accordance with the AAAC Guideline. The assessment locations are the most affected point on or within any residential receiver property boundary such as outside an external window, at an outdoor private open space, or on a balcony.

The noise guidelines are based on the existing levels of background noise at the nearby Noise Sensitive Areas, which for some of the NSAs will be influenced by traffic noise from Grandview Road. It has been determined that the background noise levels in the front yards of the neighbouring residential properties on Grandview Road are 5 dB higher than the background noise levels measured at the logging location. As such, a higher limit has been set for facades facing Grandview Road. For assessing the noise levels at all other NSAs and parts of NSAs set back from Grandview Road, the background noise level measured in the backyard of 15 Grandview Road will be used.

Two sets of criteria have therefore been adopted for this project, depending on whether the most-affected facade faces Grandview Road or not.

Table 10 AAAC Guideline Noise Criteria for Outdoor Play Activity

AAAC Guideline Criteria	Relevant AAAC Guideline Criteria	
	Areas of NSAs Facing Grandview Road	Areas of NSAs Not Facing Grandview Road
Up to 4 hours total outdoor play per day: Greater of: $L_{Aeq,15min}$ ≤ Background* + 10 dB(A) or 45 dB(A)	$L_{Aeq,15min}$ ≤ 51 dB(A) (day)	$L_{Aeq,15min}$ ≤ 46 dB(A) (day)
Over 4 hours total outdoor play per day: Greater of: $L_{Aeq,15min}$ ≤ Background* + 5 dB(A) or 45 dB(A)	$L_{Aeq,15min}$ ≤ 46 dB(A) (day)	$L_{Aeq,15min}$ ≤ 45 dB(A) (day)

* Background noise level measured as $L_{A90,15min}$ Sound Pressure Level.

Whilst the above criteria have been considered for guidance in this assessment, it is noted that certain aspects of the AAAC Guideline do not align well with contemporary early learning practice and good urban design. In particular:

- The allowance of higher limits for less than 4 hours of play in outdoor areas has the potential to result in restrictions being placed on the duration of children's outdoor play as an acoustic treatment measure. Outdoor play is recognised to have significant health and learning benefits that would be negatively impacted by restrictions on outdoor play time.
- Strict compliance with the AAAC Guideline can lead to excessive noise barrier height requirements, giving rise to visual and shadowing impacts for adjacent properties and/or the childcare centre.
- Adopting a background +10 dB(A) approach without restricting the total hours of outdoor play has been accepted by the *Victorian Civil and Administrative Tribunal* (VCAT) as an appropriate criterion for assessing the noise emissions due to children's outdoor play (VCAT Reference No. P2294/2014).

Having regard to the above points, a background +10 dB(A) approach has been adopted as a more practicable target for avoiding unreasonable noise emissions to residential dwellings due to outdoor play. This aligns with the AAAC Guideline recommendations for less than 4 hours outdoor play.

Based on the above discussion, the noise criteria presented in Table 11 have been adopted for noise levels received at nearby residential properties due to outdoor play activity at the childcare centre.

Table 11 Adopted Noise Criteria for Outdoor Play Activity

Receptor Type	Noise Source	Adopted Noise Criterion
Facades facing Grandview Road	Outdoor Play Areas	$L_{Aeq,15min} \leq 51$ dB(A)
Facades not facing Grandview Road	Outdoor Play Areas	$L_{Aeq,15min} \leq 46$ dB(A)

It is worth noting that compliance with the AAAC Guideline noise limits is not a legislative requirement for noise due to children playing in outdoor play areas. Instead, the noise limits are being used as a guideline to the level of noise which may be deemed acceptable.

7.2 Assessment Input Parameters

SoundPLAN environmental noise modelling software was used to model the future noise emissions from children play areas at the proposed childcare centre, based on the maximum number of children on-site and on the site plan as in the referenced documentation.

For the purpose of this acoustic assessment, the following input parameters have been used:

- The assessment has been based on the childcare centre operating hours as specified in Section 2.3;

- Sound Power Levels of children playing have been based on the guidelines provided by the AAAC Guideline. These levels are presented in Table 12 overleaf:

Table 12 Sound Power Levels for Groups of 10 Children Playing

Age Group, Years Old	Number of Children Playing	Sound Power Level of the Group, dB(A)
0 – 2	10	78
2 – 3	10	85
3 – 6	10	87

- The total number of children to be accommodated in the proposed childcare centre is 122. Based on the reference documentation, the assessment has been based on the number of children allocated as per Table 13. Figure 4 presents the outdoor play areas modelled in the assessment.

Table 13 Maximum Number of Children in Outdoor Play Areas

Outdoor Play Area	Age Group, Years Old	No. of Children in Play Area
Outdoor Play Area	0-2	32
	2-3	26
	3-6	64
Total		**122**

- It is unlikely that all 122 children will play outdoors at the same time, however, to simulate a potential worst-case scenario, acoustic calculations have been carried out considering all children playing outside at the same time.
- Baseline boundary fencing (i.e. without acoustic treatment) has been taken as standard paling fencing installed along the full boundary of the site (see Figure 4). For the purpose of the calculations, this fencing has been taken to have no acoustic screening effect.

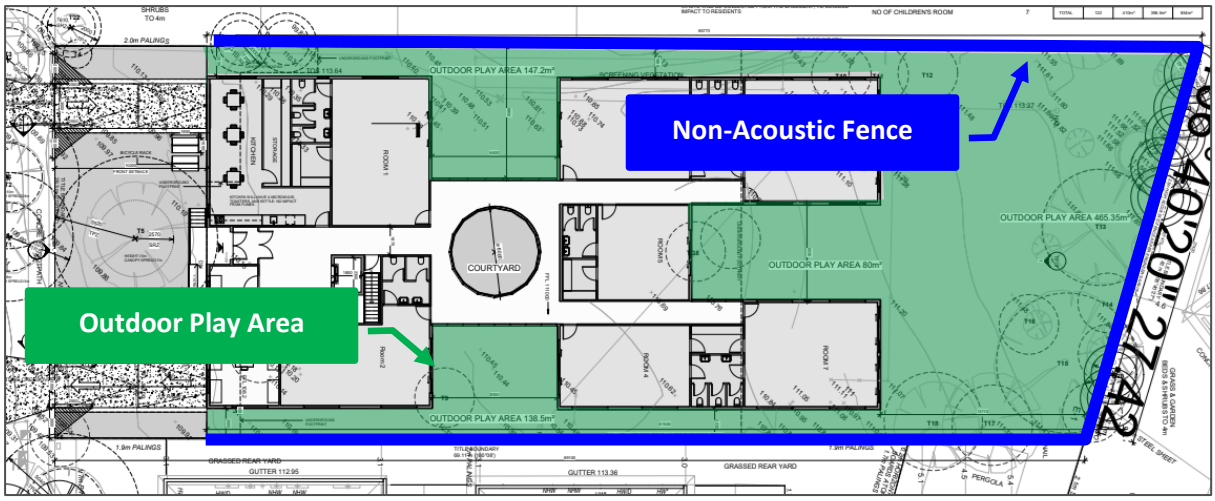


Figure 4 Outdoor Play Area Locations (Image Source: Aqua Design Architects)

- Full details of the noise modelling input parameters, assumptions, and data sources are presented in Appendix E.

7.3 Calculated Noise from Outdoor Play Area (Without Acoustic Treatment)

Table 14 presents the calculated noise levels at the nearby residences, due to children playing in outdoor areas as per the input parameters specified above.

Table 14 Calculated Noise Levels from Outdoor Play Areas – Without Acoustic Treatment

NSA Ref.	Calculated Noise Level, L_{Aeq}, dB(A)	Adopted Noise Criterion and Compliance, dB(A)
NSA 1	65	$L_{Aeq} \leq 46$ ✗
NSA 2	58	$L_{Aeq} \leq 46$ ✗
NSA 3a	64	$L_{Aeq} \leq 46$ ✗
NSA 3b	64	$L_{Aeq} \leq 51$ ✗
NSA 4	44	$L_{Aeq} \leq 51$ ✓
NSA 5	60	$L_{Aeq} \leq 46$ ✗

Based on the results presented above, noise at the surrounding residences due to children playing in the outdoor play areas is expected to require acoustic treatment measures to comply with the adopted AAAC Guideline criterion.

7.4 Acoustic Treatment for Control of Outdoor Play Area Noise

The following acoustic treatment measures are recommended to reduce noise at the surrounding residences due to children playing in the outdoor play areas:

7.4.1 Administrative Controls

- The outdoor play area should be segmented into three smaller play areas using fencing and/or gates, as indicated in Figure 5. The maximum number of children occupying each play area simultaneously must not exceed the numbers outlined in Table 15.

Table 15 Maximum Allowable Number of Children in Outdoor Play Areas

Outdoor Play Area	Age Group, Years Old	Allowable Type of Play	Maximum No. of Children in Play Area Simultaneously
A	0-2	Active / Passive Play	28
B	0-6	Passive Play Only	28 (See notes below)
C	2-3	Active / Passive Play	18

- Outdoor Play Area B (as highlighted in Figure 5) must be used for passive play activities only, which are expected to be quieter than 'active' play activities. Passive play activities may include (but would not be limited to) painting, garden exploration, reading, block play or drawing.
- If Outdoor Play Area B is to be utilised for active play activities, the maximum number of children outdoors simultaneously within this area would then drop to 7 children.

- An operational noise management plan / procedure should be prepared and implemented for the childcare centre. At minimum, all administrative controls outlined above must be captured in the operational noise management plan / procedure.

7.4.2 Engineering Controls

- Replace the existing non-acoustic fence surrounding the premises with a minimum 2.5 m high solid acoustic fence at the locations highlighted in red in Figure 5.
- Install a minimum 3 m high solid acoustic fence surrounding Outdoor Play Area B, as highlighted in blue in Figure 5.
- The acoustic fence should be constructed from minimum 25 mm thick timber palings, 1.6 mm thick steel, 9 mm thick fibre cement sheet, 8 mm thick solid Perspex or polycarbonate, masonry, or other suitable sheeting material of at least 15 kg/m^2. Note, the above materials and thicknesses are minimum specifications for acoustic purposes only. Other engineering requirements may dictate thicker materials or other specific requirements.
- There must be no gaps between the fence panels / palings, or between bottom of the fence and the ground. A typical detail for an acoustic timber fence is presented in Appendix F.

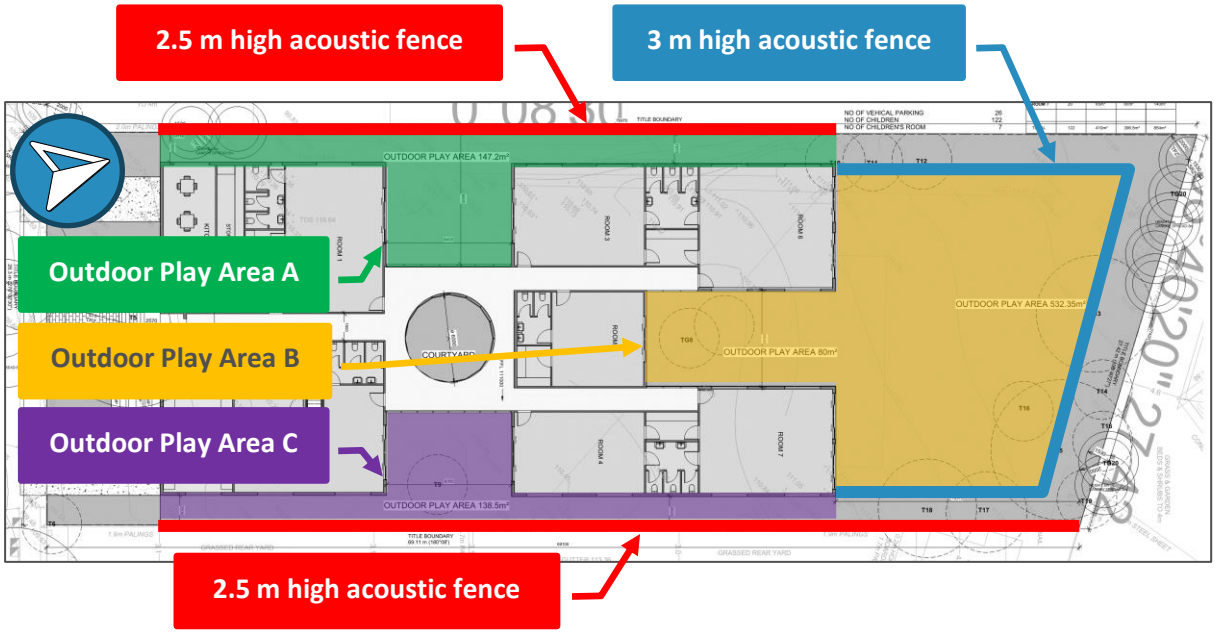


Figure 5 Recommended Acoustic Treatment (Image Source: Aqua Design Architects)

- All acoustic fencing should be lined on the childcare centre side with sound absorbing material. The selected sound absorbing material should meet the acoustic specifications specified in the following table:

Table 16 Minimum Sound Absorption Coefficients for Acoustic Screen Lining

Octave Band Centre Frequency, Hz	125	250	500	1k	2k	4k	NRC
Sound absorption coefficient	0.2	0.75	0.95	0.95	1.0	0.9	0.95

The selected sound absorbing material must be suitable for prolonged exposure to the outdoor environment. The physical and acoustic properties of the sound absorbing material must not be detrimentally affected by exposure to moisture or UV, or else measures must be incorporated into the design to shelter the sound absorbing material from moisture and UV. Acoustically acceptable sound absorbing products suitable for outdoors include Stratocell Whisper 50 mm, Pyrotek Reapor 50 mm, or approved equivalent.

7.5 Calculated Noise from Outdoor Play Area (With Acoustic Treatment)

Table 17 presents the calculated noise levels at the nearby residences, due to children playing in outdoor areas with acoustic treatment measures as specified in Section 7.4 implemented.

Table 17 Calculated Noise Levels from Outdoor Play Areas – With Acoustic Treatment

NSA Ref.	Calculated Noise Level, L_{Aeq}, dB(A)	Adopted Noise Criterion and Compliance, dB(A)
NSA 1	46	$L_{Aeq} \leq 46$ ✓
NSA 2	42	$L_{Aeq} \leq 46$ ✓
NSA 3a	46	$L_{Aeq} \leq 46$ ✓
NSA 3b	46	$L_{Aeq} \leq 51$ ✓
NSA 4	41	$L_{Aeq} \leq 51$ ✓
NSA 5	46	$L_{Aeq} \leq 46$ ✓

7.6 Noise from Indoor Play Areas

Indoor areas of the childcare centre will benefit from sound insulation provided by the building envelope construction. Even with windows open for ventilation, noise levels at the surrounding residences due to indoor play areas would be less than due to outdoor play areas.

On this basis, acoustic treatment to the building is not required to control noise from indoor areas of the childcare centre.

8 Mechanical Plant Noise

8.1 Assessment Criteria

Environmental noise emissions from the project site must be designed to comply with the requirements of Part I of *EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (EPA Noise Protocol) (EPA Victoria, 2021)

Table 18 presents the noise limits adopted at the potentially most-affected Noise Sensitive Areas (see Section 5) in accordance with Part I of the EPA Noise Protocol. Details of the EPA Noise Protocol Zoning Level and noise limit calculations are presented in Appendix D.

Table 18 EPA Noise Protocol Part I Noise Limits

Period	Applicable Times During Proposed Operating Hours	Noise Limit, L_{eff}, dB(A)	
		Receivers Facing Grandview Road	Receivers Not Facing Grandview Road
Day	▪ 7 am to 6 pm Monday to Friday	52	50
Evening	▪ 6 pm to 6:30 pm Monday to Friday	47	44
Night	▪ 6:30 am to 7 am Monday to Friday	49	45

8.2 Outdoor Air-Conditioning Condenser Units

SoundPLAN version 7.4 environmental noise modelling software was used to model the future noise emissions from mechanical plant equipment based on the following input parameters:

- The mechanical plant noise calculations are based on heating and cooling for the building being provided by split system air conditioning units. As air conditioning equipment specifications for the proposed building are not yet available, approximate heating / cooling requirements have been calculated based on a general estimate of 150 W/m^2. Allowance for 11-off 11.2 kW air conditioning condenser units has been included in the modelling. The Sound Power Level of the units has been modelled based on Daikin model RXYMQ4AV4A, which has a claimed Sound Power Level of 70 dB(A).
- For calculation purposes, the air conditioning outdoor units have been modelled on the rooftops of the buildings as shown in Figure 6. A total of five and six units have been included in plant zone 1 and plant zone 2 respectively.
- In accordance with the EPA Noise Protocol, a tonality adjustment of +2 dB(A) has been applied to the calculated air conditioning condenser unit Effective Noise Levels to account for potential tonal characteristics.

Further details of the noise modelling input parameters, assumptions, and data sources are presented in Appendix E.

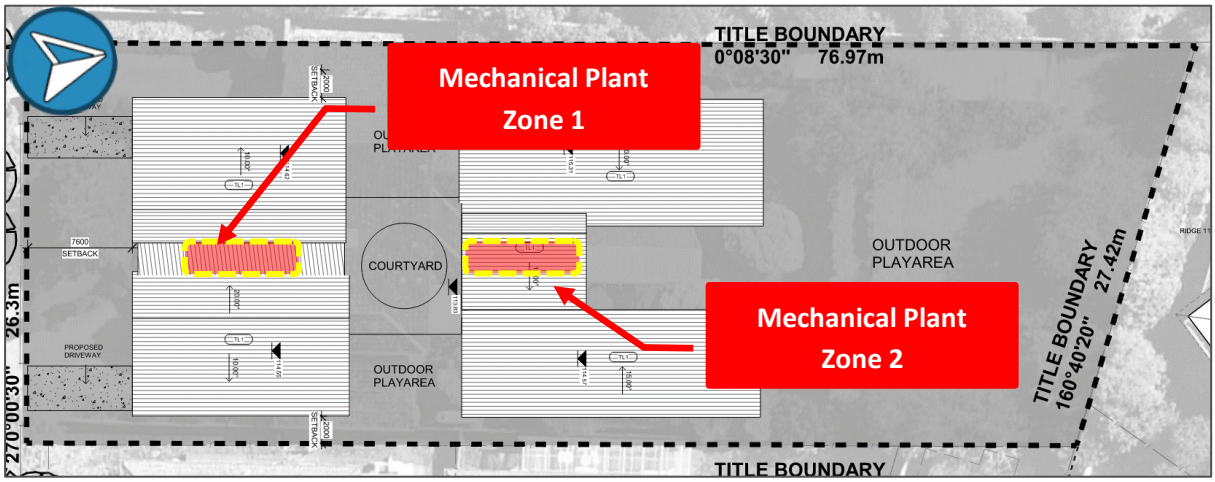


Figure 6 Adopted AC Condenser Unit Location – Rooftop (Image Source: Aqua Design Architects)

8.3 Calculated Noise from AC Outdoor Units – Without Noise Control Measures

Table 19 presents the calculated noise levels at the nearest NSAs based on the above input parameters.

Table 19 Calculated Noise Levels from Mechanical Plant – Without Noise Control Measures

NSA Ref.	Calculated Noise Level, L_{Aeq}, dB(A)	EPA Noise Protocol Compliance		
		Day Period	Evening Period	Night Period
NSA 1	39	L_{Aeq} ≤ 50 ✓	L_{Aeq} ≤ 44 ✓	L_{Aeq} ≤ 45 ✓
NSA 2	37	L_{Aeq} ≤ 50 ✓	L_{Aeq} ≤ 44 ✓	L_{Aeq} ≤ 45 ✓
NSA 3a	40	L_{Aeq} ≤ 50 ✓	L_{Aeq} ≤ 44 ✓	L_{Aeq} ≤ 45 ✓
NSA 3b	40	L_{Aeq} ≤ 52 ✓	L_{Aeq} ≤ 47 ✓	L_{Aeq} ≤ 49 ✓
NSA 4	36	L_{Aeq} ≤ 52 ✓	L_{Aeq} ≤ 47 ✓	L_{Aeq} ≤ 49 ✓
NSA 5	47	L_{Aeq} ≤ 50 ✓	L_{Aeq} ≤ 44 ○	L_{Aeq} ≤ 45 ○

○ The calculated exceedance of the EPA Noise Protocol Part I noise limits by up to 3 dB(A) during the 'Evening' and 'Night' periods at NSA 5 is considered to be due to conservativism in the calculation method, since all condenser units have been modelled as operating continuously at full power. During the 'Evening' and 'Night' periods, it is likely that fewer units will be running, and/or that they will be running at part load, since temperatures will be lower than during the day. It is therefore considered that compliance with the EPA Noise Protocol Part I noise limits for all periods will be achieved without noise control measures.

8.4 Kitchen Exhaust and Ventilation

It is understood that kitchen and toilet exhaust fans at the childcare centre will be domestic-type in-line fans located in the ceiling space and ducted to an external wall or roof. Noise emissions from these fans are not expected to require acoustic treatment to control noise impacts to nearby residential receptors.

8.5 Triggers for Further Acoustic Review

Further acoustic review to confirm compliance with Part I of the EPA Noise Protocol should be undertaken at detailed design stage if any of the following occurs:

- If more than 11 air conditioning condenser units are installed, or if the units selected have an individual Sound Power Level of more than 70 dB(A).
- If the air conditioning condenser units are to be installed at any location other than the adopted rooftop locations shown in Figure 6.
- If car park supply or exhaust fans are to be installed to ventilate the basement car park. For acoustics, locating the fans in the basement and ducting them to the rooftop via internally-lined ductwork would be preferable to installing the fans on the rooftop.

9 Car Park Noise

9.1 Assessment Criteria

There are no statutory environmental noise limits or EPA Guidelines which apply to noise emissions from the on-site car park. In the absence of established policy or guidelines, noise emissions from the on-site car park have been assessed in relation to the EPA Noise Protocol Part I noise limits (as specified in Table 18 of Section 8.1). For car park noise, these limits are non-mandatory and used as a guideline only.

9.2 Assessment

The car park for the childcare centre is proposed to be located in the basement. Based on a desktop review, it is considered that noise due to vehicle movements within the basement car parking area is unlikely to adversely affect the health and safety of the nearby residents, and will comply with the EPA Noise Protocol Part I noise criteria that have been adopted as a guideline, for all relevant periods.

10 Deliveries and Private Waste Collections Noise

Based on the reference documentation, existing levels of background noise, and road traffic noise at the site, it is considered that the noise due to deliveries and private waste collections associated with the centre will not adversely impact on the nearby residences provided that such deliveries and collections are conducted between the hours presented in the table below, in accordance with Section 6 and 9 of the EPA Noise Control Guidelines (EPA Victoria, 2021)

Table 20 Deliveries and Private Waste Collections Schedules

Activity Type	Permitted Times
Deliveries	▪ 7 am to 10 pm Monday to Saturday ▪ 9 am to 10 pm Sundays and Public Holidays
Private Waste Collections	▪ 7 am to 8 pm Monday to Saturday ▪ 9 am to 8 pm Sundays and Public Holidays

Delivery vehicle engines, including ancillary motors for refrigeration equipment should be turned off whilst making the delivery.

11 Conclusion

This document has presented a town planning acoustic assessment for the proposed childcare centre at 15 Grandview Road, Wheelers Hill, VIC.

The assessment has been undertaken with regard to the acoustic requirements prescribed by the *Environment Protection Regulations 2021* (State of Victoria, 2021), and *EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues* (EPA Victoria, 2021), as well as recommendations from *EPA Publication 1254 – Noise Control Guidelines* (EPA Victoria, 2021), and the *Association of Australasian Acoustical Consultants (AAAC) – Guideline for Child Care Centre Acoustic Assessment* (AAAC, 2020).

Acoustic engineering advice for the proposed project has been presented in Sections 7 to 10.

Subject to implementation of the advice presented in this document, it is considered that the proposed project will satisfy the applicable acoustic legislation and guidelines.

12 References

AAAC. (2020). *Guideline for Child Care Centre Acoustic Assessment, Version 3.0.* Association of Australasian Acoustical Consultants.

EPA Victoria. (2021, May). EPA Publication 1254 - Noise Control Guidelines. Victoria.

EPA Victoria. (2021, May). EPA Publication 1826 – Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues. Victoria.

ISO. (1996). ISO 9613-2:1996 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation. International Standards Organisation.

State of Victoria. (2021). *Environment Protection Regulations 2021 - Statutory Rule Number 47/2021.*

Appendix A Glossary of Acoustic Terms

dB / dB(A) — Decibels or 'A'-weighted Decibels, the units of Sound Pressure Level and Sound Power Level. 'A'-weighting adjusts the levels of frequencies within the sound spectrum to better reflect the sensitivity of the human ear to different frequencies at Sound Pressure Levels typical of everyday sounds. [Unit: dB / dB(A)]

The following are examples of the decibel readings of every day sounds;

- 0 dB The faintest sound we can hear
- 30 dB A quiet library or in a quiet location in the country
- 45 dB Typical office space. Ambience in the city at night
- 60 dB The sound of a vacuum cleaner in a typical lounge room
- 70 dB The sound of a car passing on the street
- 80 dB Loud music played at home
- 90 dB The sound of a truck passing on the street
- 100 dB The sound of a rock band
- 120 dB Deafening

Effective Noise Level — "Effective noise level" means the level of noise emitted from the commercial, industrial or trade premises and adjusted if appropriate for character and duration.

$L_{A90,T}$ — The value of A-weighted Sound Pressure Level which is exceeded for 90 percent of the time during given measurement period T. This is commonly used to represent the background noise level. [Unit: dB / dB(A)]

$L_{Aeq,T}$ — The Equivalent Continuous A-weighted Sound Pressure Level measured over the period T (also known as Time-Average Sound Pressure Level). The Equivalent Continuous A-weighted Sound Pressure Level is the constant value of A-weighted Sound Pressure Level for a given period that would be equivalent in sound energy to the time-varying A-Weighted Sound Pressure Level measured over the same period. In simple terms, this can be thought of as the average Sound Pressure Level. [Unit: dB / dB(A)]

L_{eff} — See 'Effective Noise Level'.

Noise Sensitive Area — For the purposes of assessment of noise levels in relation to *Environment Protection Regulations 2021*, a Noise Sensitive Area is defined as:

a) That part of the land within the boundary of a parcel of land that is–
   i. within 10 metres outside the external walls of any of the following buildings–
      A. a dwelling (including a residential care facility but not including a caretaker's house);

B. a residential building;
C. a noise sensitive residential use; or

ii. within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings–
A. a caretaker's house;
B. a hospital;
C. a hotel;
D. a residential hotel;
E. a motel;
F. a specialist disability accommodation;
G. a corrective institution;
H. a tourist establishment;
I. a retirement village;
J. a residential village; or

iii. within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours)–
A. a child care centre;
B. a kindergarten;
C. a primary school;
D. a secondary school; or

b) subject to paragraph c), in the case of a rural area only, that part of the land within the boundary of–
i. a tourist establishment;
ii. a campground;
iii. a caravan park; or

c) despite paragraph b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue–
i. a tourist establishment;
i. a campground;
i. a caravan park.

NRC Noise Reduction Coefficient. A single number representation of the amount of sound energy absorbed by a given material or surface. It is the arithmetic average of the octave band sound absorption coefficients at 250, 500, 1000, and 2000 Hz. The value generally ranges from 0 to 1 with 0 being highly sound reflective and 1 being highly sound absorptive.

Sound Power Level	A measure of the total sound energy radiated by a source, per unit time. Mathematically, it is ten times the logarithm to the base ten of the ratio of the sound power (W) of the source to the reference sound power; where the reference sound power is $1x10^{-12}$ W. [Unit: dB]
Sound Pressure Level	A measure of the magnitude of a sound wave. Mathematically, it is twenty times the logarithm to the base ten of the ratio of the root mean square sound pressure at a point in a sound field, to the reference sound pressure; where sound pressure is defined as the alternating component of the pressure (Pa) at the point, and the reference sound pressure is $2x10^{-5}$ Pa. [Unit: dB]

Appendix B Noise Measurement Methodology

B.1 Measurement Location

Table B.1 presents details of the noise measurement locations. Figure B.1 to Figure B.3 present a map and photographs of the noise measurement locations.

Table B.1 Noise Measurement Location Details

Location Reference	Measurement Description	Microphone Height Above Ground Level
1A	Environmental noise logging	2.5 m
1B	Attended noise measurement – North-Western Boundary	1.5 m
2	Attended noise measurement – Southern Boundary	1.5 m

Figure B.1 Noise Measurement Locations (Aerial Photo Source: Google Maps)

Figure B.2 Noise Measurement Location 1 – Photo Facing West

Figure B.3 Noise Measurement Location 2 – Photo Facing South

B.2 Measurement Procedure

Noise measurements were performed at the site to establish the environmental noise levels. Table B.2 presents details of each measurement:

Table B.2 Details of Measurement Period

Location Ref.	Measurement Type		Start Time	Start Date	End Time	End Date
	Attended	Unattended				
1A	☐	☒	2:00 PM	Wednesday 1/11/2023	10:30 PM	Wednesday 8/11/2023
1B	☒	☐	2:14 PM	Wednesday 1/11/2023	2:24 PM	Wednesday 1/11/2023
2	☒	☐	2:32 PM	Wednesday 1/11/2023	2:42 PM	Wednesday 1/11/2023

The equipment was configured to provide the measurement results as a continuous series of 1 second A- and Z-weighted Sound Pressure Levels. Metrics used for the assessment were then post-processed from this data.

A foam windscreen was installed on each microphone to minimise the effect of wind-induced pressure fluctuations on the measurements.

B.3 Instrumentation

All acoustic instrumentation used for the measurements held a current certificate of calibration from a National Association of Testing Authorities (NATA) accredited laboratory or from the manufacturer at the time of the measurements.

A field check to confirm correct calibration of the instrumentation was performed at the beginning and end of the measurement period using a laboratory calibrated portable Sound Level Calibrator. At the time of each check the instrumentation was found to be reading correctly and the deviation between consecutive checks was found to be less than 1 dB.

Details of the acoustic instrumentation used for measurements are presented in Table B.3.

Table B.3 Acoustic Instrumentation Details

Location Reference	Instrument Description	Serial No.	Date of Last Laboratory Calibration
1A	Convergence Instruments NSRT_mk2 Type 1 Sound Level Meter	Atp+jdUYcf2VgLHiyyr5ND	14/06/2018
1B, 2	Svantek 977 Class 1 Sound Level Meter	45763	22/03/2023
-	Svantek SV35A Portable Sound Level Calibrator	58054	4/07/2023*

* In accordance with AS 1055.1-1997 and National Association of Testing Authorities Guidelines, Sound Level Calibrators require calibration annually.

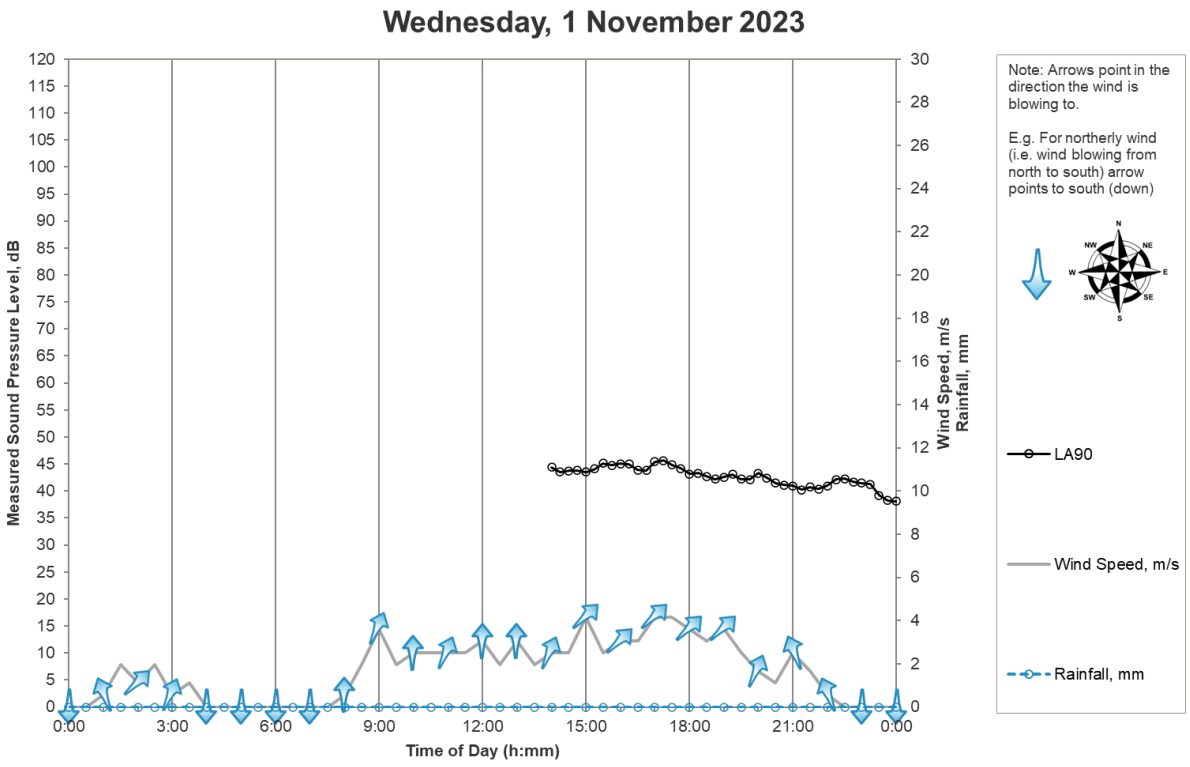
B.4 Meteorological Data

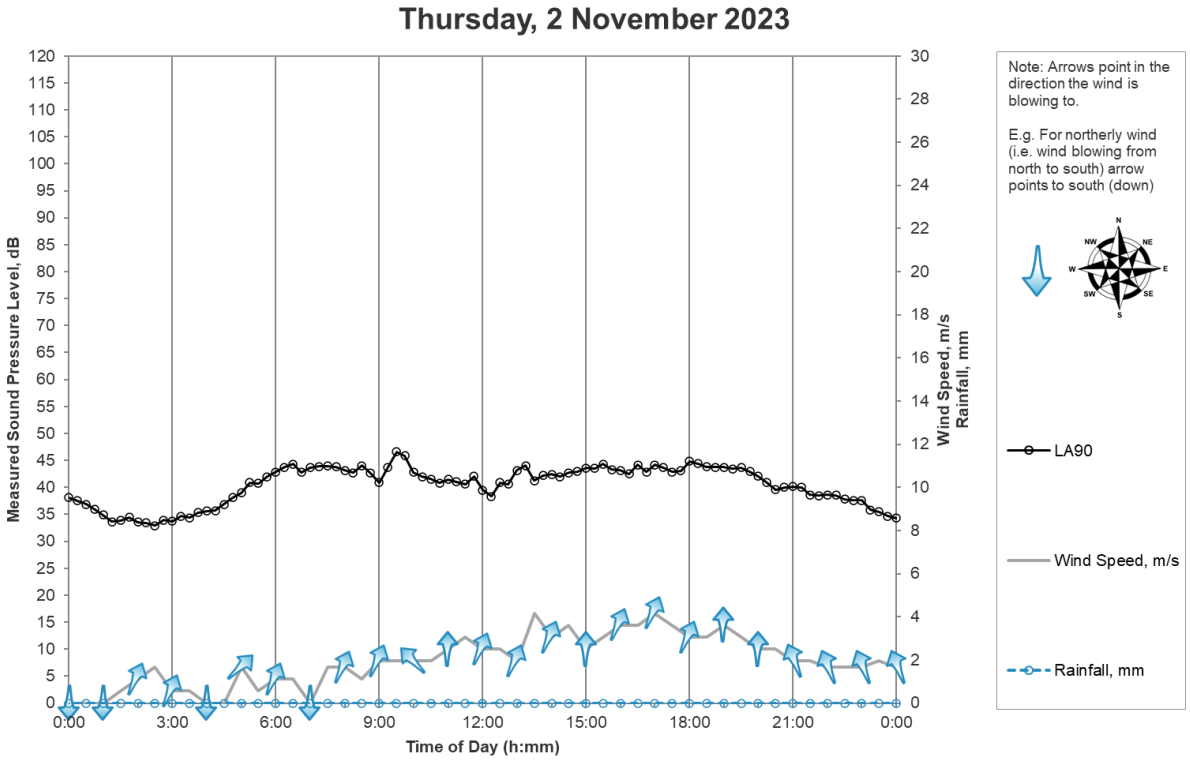
Weather observations during the monitoring period were taken from the Bureau of Meteorology Weather Station at Scoresby, approximately 7 km away. Appendix C shows the meteorological observations plotted against the measured L_{A90} Sound Pressure Levels for the duration of the measurement period.

B.5 Weather Conditions

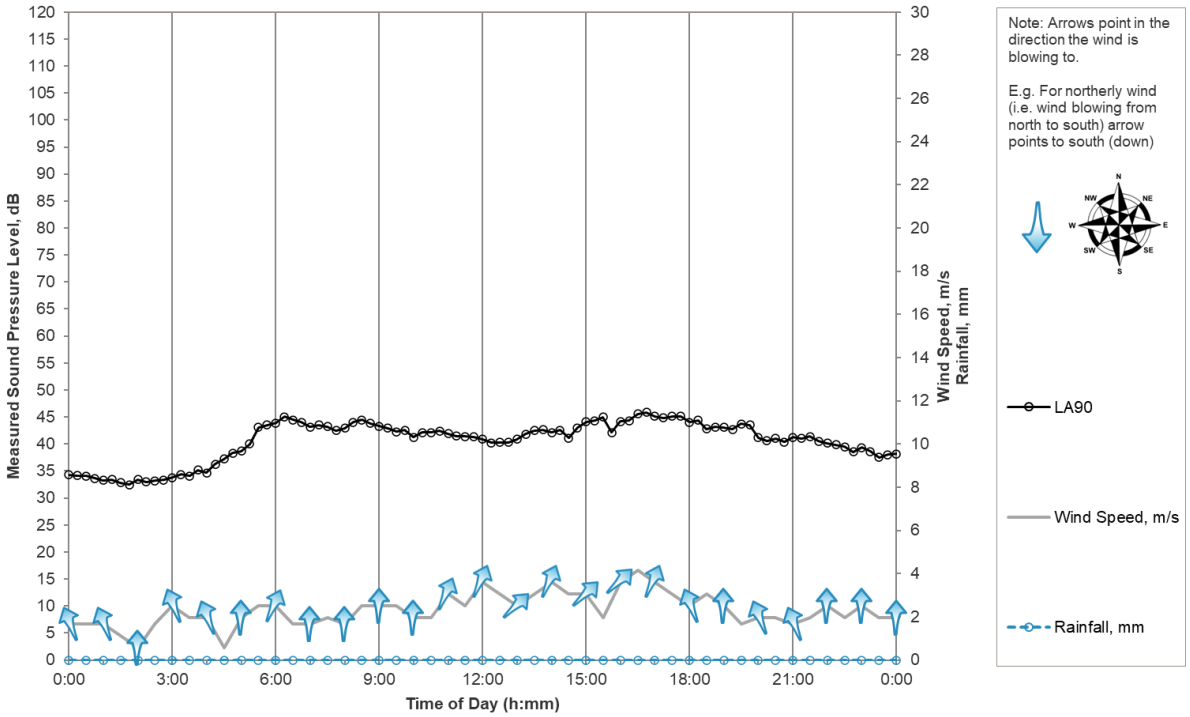
The weather during the attended measurements was fine with calm winds. Nearby road surfaces were dry at the time of the measurements.

Appendix C Graphed Noise Measurement Results

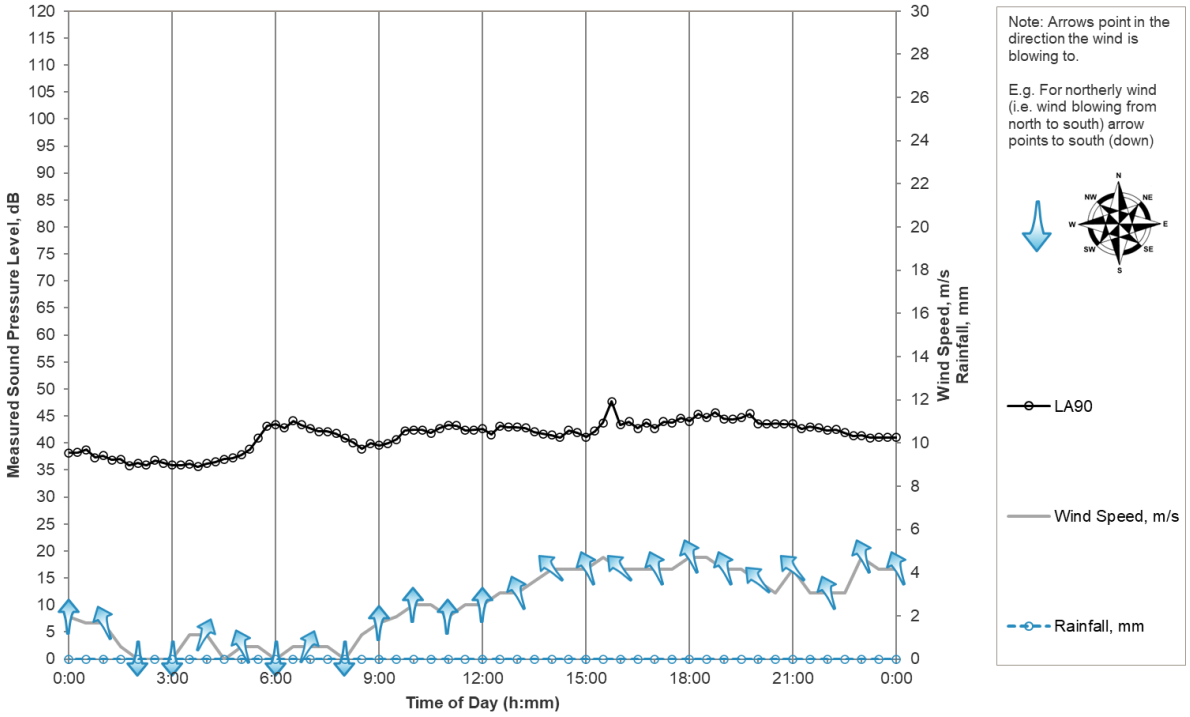




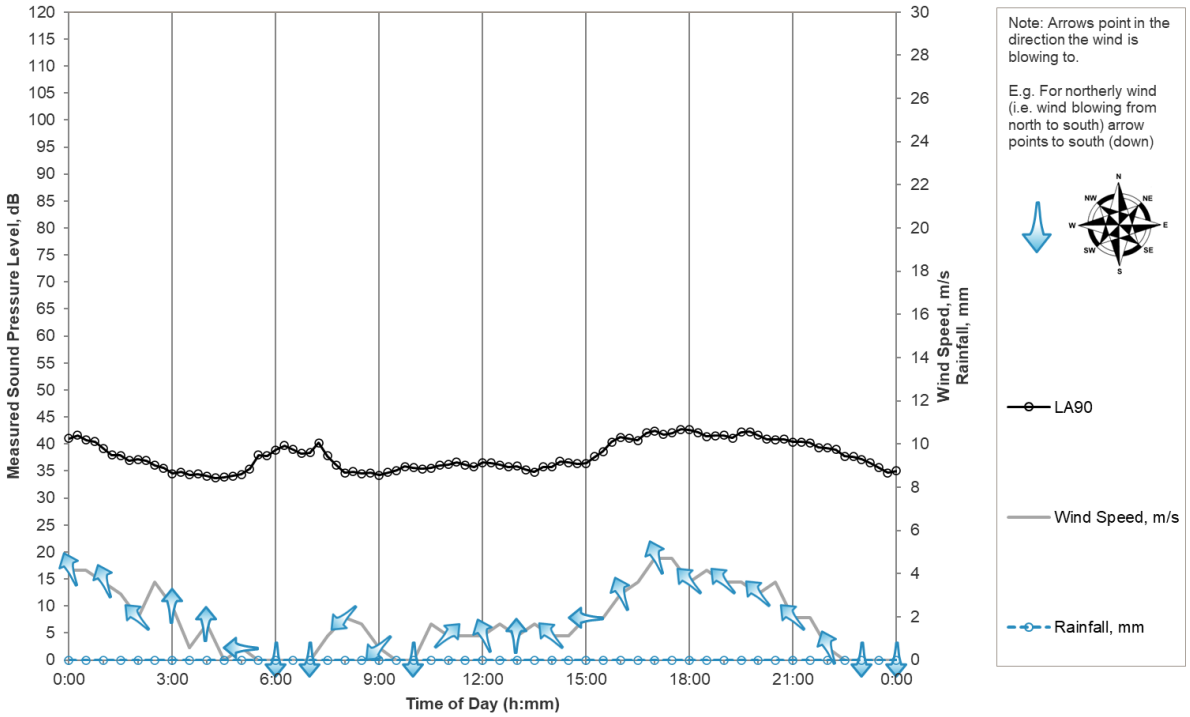
Friday, 3 November 2023



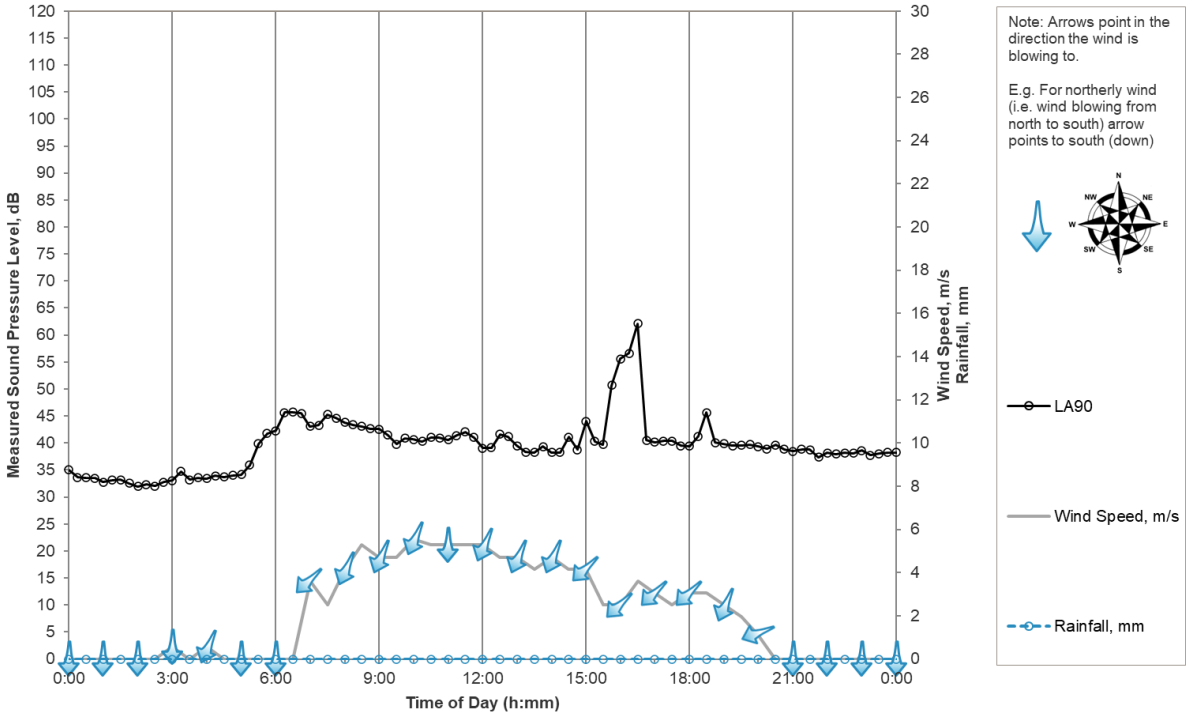
Saturday, 4 November 2023



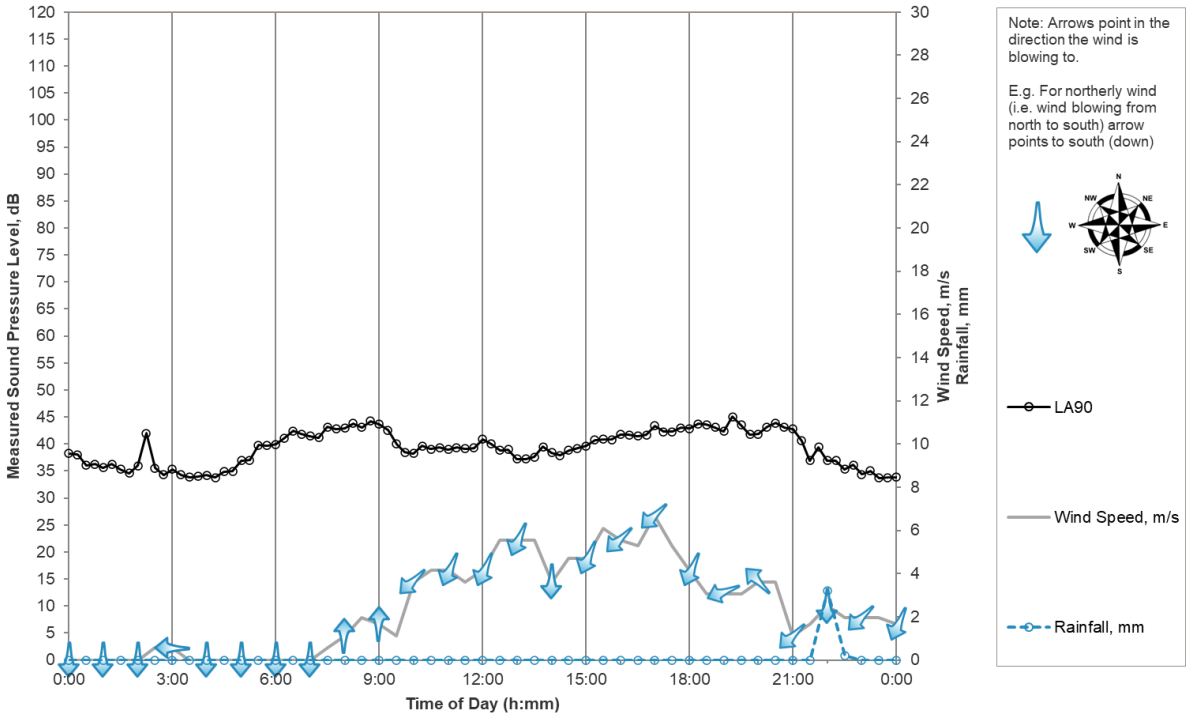
Sunday, 5 November 2023



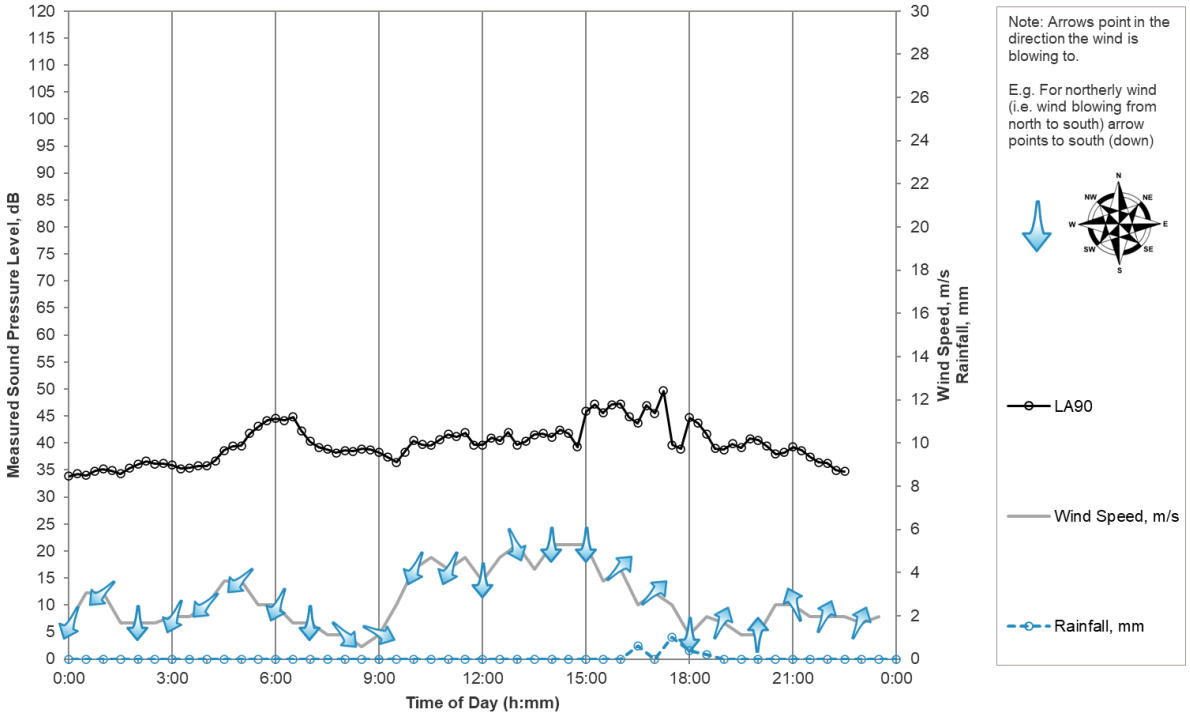
Monday, 6 November 2023



Tuesday, 7 November 2023



Wednesday, 8 November 2023



Appendix D EPA Noise Protocol Zoning Level and Noise Limit Calculations

D.1 7 Wendy Court, Wheelers Hill

Zoning Map

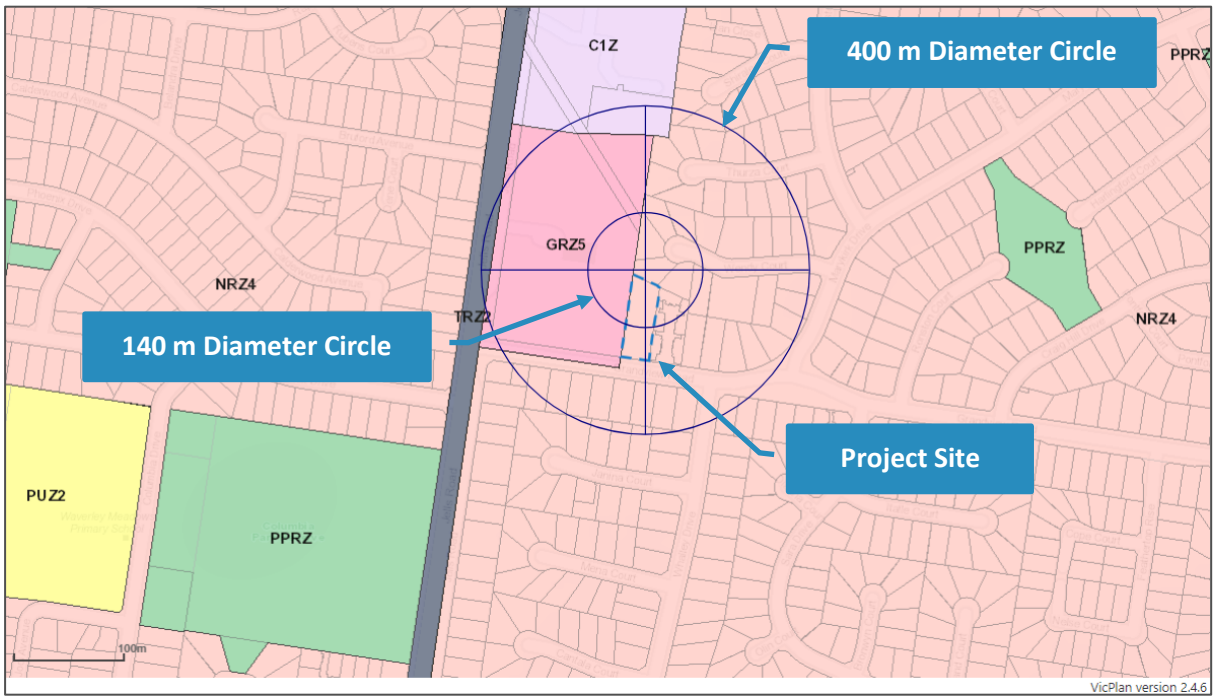


Figure D.1 Zoning Circles (Image Source: https://mapshare.vic.gov.au/vicplan/)

Zone Areas

Zone Type Designation	Applicable Zones	% Area of 140m Circle	% Area of 400m Circle
Type 1	NRZ4, GRZ5	100%	96%
Type 2	C1Z	0%	3%
Type 3	TRZ2	0%	1%

Influencing Factor: 0.01

Zoning Levels and Noise Limits During Proposed Operating Hours

Period	Zoning Level, dB(A)	L_{A90} Background Noise Level, dB(A)	Background Noise Classification	EPA Noise Protocol Noise Limits, dB(A)
Day	50	42	Neutral	50
Evening[1]	44	40	Neutral	44
Night[1]	39	42	High	45

1 Proposed operating hours do not comprise the full period. Refer to Table 18 for details.

D.2 14 Grandview Road, Wheelers Hill

Zoning Map

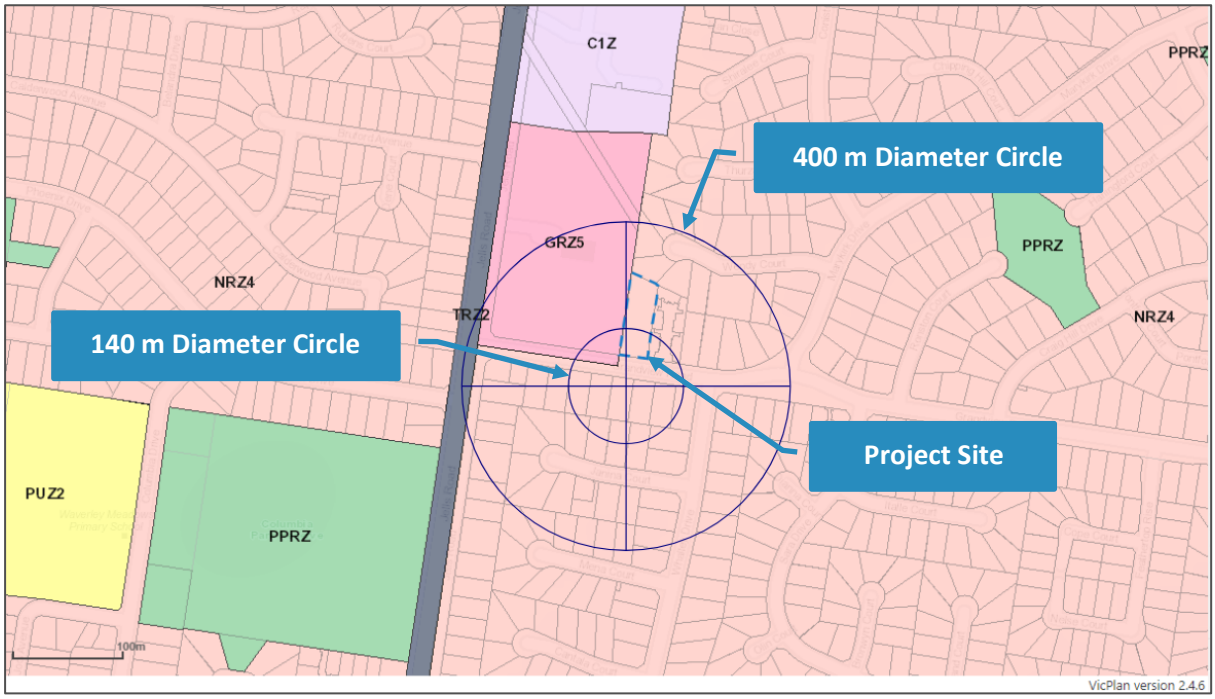


Figure D.2 Zoning Circles (Image Source: https://mapshare.vic.gov.au/vicplan/)

Zone Areas

Zone Type Designation	Applicable Zones	% Area of 140m Circle	% Area of 400m Circle
Type 1	NRZ4, GRZ5	100%	99%
Type 2	-	0%	0%
Type 3	TRZ2	0%	1%

Influencing Factor: 0.01

Zoning Levels and Noise Limits During Proposed Operating Hours

Period	Zoning Level, dB(A)	L_{A90} Background Noise Level, dB(A)	Background Noise Classification	EPA Noise Protocol Noise Limits, dB(A)
Day	50	46	High	52
Evening[1]	44	44	High	47
Night[1]	39	46	High	49

1 Proposed operating hours do not comprise the full period. Refer to Table 18 for details.

D.3 Explanatory Notes to EPA Noise Protocol Noise Limit Derivation

In accordance with the EPA Noise Protocol, the Influencing Factor (IF) for an assessment location is calculated as follows:

$$IF = 0.25(Sum\ of\ Type\ 2\ fractions\ for\ both\ cicles) + 0.5(Sum\ of\ Type\ 3\ fractions\ for\ both\ circles)$$

The Zoning Levels are calculated according to the following equations:

$$Day\ Period\ Zoning\ Level = 18 \times IF + 50$$
$$Evening\ Period\ Zoning\ Level = 17 \times IF + 44$$
$$Night\ Period\ Zoning\ Level = 17 \times IF + 39$$

The Background Noise Levels are classified as follows:

Period	Classification Criteria	Background Noise Classification
Day	Background Noise Level > Zoning Level - 6 dB(A)	High
	Background Noise Level < Zoning Level - 12 dB(A)	Low
	Otherwise	Neutral
Evening and Night	Background Noise Level > Zoning Level - 3 dB(A)	High
	Background Noise Level < Zoning Level - 9 dB(A)	Low
	Otherwise	Neutral

The noise limits are determined based on the background noise classification, according to the following equations:

Period	Classification	Noise Limit
Day	High	Background Noise Level + 6 dB(A)
	Neutral	Zoning Level
	Low	0.5 x (Zoning Level + Background Noise Level) + 4.5 dB(A)
Evening and Night	High	Background Noise Level + 3 dB(A)
	Neutral	Zoning Level
	Low	0.5 x (Zoning Level + Background Noise Level) + 3 dB(A)

The Environment Protection Regulations 2021 specify that the noise limits may not be less than 45 dB(A) for the Day period, 40 dB(A) for the Evening period, and 35 dB(A) for the Night period.

Appendix E Modelling Parameters

E.1 General Parameters

Parameter	Description
Software	SoundPLAN Version 7.4
Calculation Method	ISO 9613-2:1996 (ISO, 1996)

E.2 Geometrical Parameters

Parameter	Description
Site Layout	▪ As per reference documentation.
Terrain	▪ Ground modelled as flat.
Ground absorption	▪ All play areas modelled as mostly soft ground using a ground factor of 0.85. ▪ All other areas modelled as a combination of hard and soft ground using a ground factor of 0.4.
Buildings	▪ On-site buildings modelled as per referenced architectural drawings. ▪ Buildings in the vicinity of the project site modelled according to the latest Google Earth satellite imagery.
Receptors	▪ Facade noise levels calculated at receiver positions located at 1 m in front of the building facade and 1.5 m above floor level for each floor.

E.3 Environmental Parameters

Parameter	Description
Air absorption Calculation	ISO 9613-2:1996
Air Temperature	10 degrees Celsius
Air Pressure	1013.3 mbar
Humidity	70%
Propagation Conditions	▪ The propagation conditions used in the modelling are the standard ISO 9613-2 conditions. These represent downwind propagation with: – Wind direction ± 45 degrees of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region, with the wind blowing from source to receiver; and – Wind speed between approximately 1 m/s and 5 m/s, measured at a height of 3 m to 11 m above ground. ▪ The modelled conditions would similarly represent average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

Parameter	Description
	▪ Such conditions result in enhanced noise propagation and can be considered to represent a typical worst-case scenario for noise propagation.

E.4 Noise Source Parameters

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Children Noise</td><td>
Children playing in the outdoor play area have been modelled as:

An area source the same size as the outside play areas at 1.0 m above ground level.
The modelled octave band spectrum Sound Power Levels for the combined outdoor play areas under the baseline modelling scenario (i.e. without acoustic treatment) are as follows:

<table>
<tr><th>Frequency, Hz</th><th>63</th><th>125</th><th>250</th><th>500</th><th>1K</th><th>2K</th><th>4K</th><th>Total dB(A)</th></tr>
<tr><td>Sound Level, dB(Z)</td><td>73</td><td>79</td><td>84</td><td>90</td><td>92</td><td>89</td><td>85</td><td>96</td></tr>
</table>

The modelled octave band spectrum Sound Power Levels for Outdoor Play Area A are as follows:

<table>
<tr><th>Frequency, Hz</th><th>63</th><th>125</th><th>250</th><th>500</th><th>1K</th><th>2K</th><th>4K</th><th>Total dB(A)</th></tr>
<tr><td>Sound Level, dB(Z)</td><td>58</td><td>64</td><td>70</td><td>76</td><td>78</td><td>75</td><td>71</td><td>82</td></tr>
</table>

The modelled octave band spectrum Sound Power Levels for Outdoor Play Area B are as follows:

<table>
<tr><th>Frequency, Hz</th><th>63</th><th>125</th><th>250</th><th>500</th><th>1K</th><th>2K</th><th>4K</th><th>Total dB(A)</th></tr>
<tr><td>Sound Level, dB(Z)</td><td>62</td><td>68</td><td>73</td><td>79</td><td>81</td><td>78</td><td>74</td><td>85</td></tr>
</table>

The modelled octave band spectrum Sound Power Levels for Outdoor Play Area C are as follows:

<table>
<tr><th>Frequency, Hz</th><th>63</th><th>125</th><th>250</th><th>500</th><th>1K</th><th>2K</th><th>4K</th><th>Total dB(A)</th></tr>
<tr><td>Sound Level, dB(Z)</td><td>64</td><td>70</td><td>76</td><td>82</td><td>84</td><td>81</td><td>77</td><td>87</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Air Conditioning Condenser Unit Noise</td><td>The air conditioning condenser units have been modelled as:
Point sources 0.7 m above roof level.
The modelled octave band spectrum Sound Power Levels for each condenser unit have been based on a Daikin RXYMQ4AV4A, as follows:
<table>
<tr><th>Frequency, Hz</th><th>63</th><th>125</th><th>250</th><th>500</th><th>1K</th><th>2K</th><th>4K</th><th>Total dB(A)</th></tr>
<tr><td>Sound Level, dB(Z)</td><td>74</td><td>71</td><td>71</td><td>68</td><td>65</td><td>61</td><td>56</td><td>70</td></tr>
</table></td></tr>
</table>

Appendix F Timber Paling Acoustic Fence