

REVERBERATE

C O N S U L T I N G

55 Milton St, Mt Hawthorne

Acoustic Design Report

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
D_w	Weighted Level Difference—the noise level difference or reduction between two enclosed spaces. It quantifies the acoustic separation between two spaces. It relates to the R_w rating of the separating building elements (such as walls and doors) and also includes all noise flanking paths (such as ceiling voids, joins and seals) and the acoustic absorption in the receiving space. The higher the D_w rating the better the acoustic separation.
$D_{nC,W}$ / CAC	Weighted Ceiling Noise Reduction Index / Ceiling Attenuation Class—these values represent the ability of a ceiling to prevent the transmission of sound. The $D_{nC,W}$ / CAC is a measure of sound reduction between rooms with a common ceiling plenum (or space). The higher the values the better the acoustic separation provided by the ceiling.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L_{90}	Noise level exceeded for 90% of the measurement time. The L_{90} level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{Aeq}	A-weighted L_{eq}
$L_{n,w}$	Weighted Normalised Impact Sound Pressure Level—A measure of the noise impact performance of a floor and ceiling. It is a laboratory tested result and is characterised by how much impact sound reaches the receiving room via the floor and ceiling construction from a standard tapping machine test. The lower the $L_{n,w}$ rating the better the impact isolation.

$L_{nT,w}$	Weighted Standardised Impact Sound Pressure Level— A measure of the impact noise performance of a floor and ceiling between two enclosed spaces. It is an on-site measured level that relates to the laboratory $L_{n,w}$ value. The lower the $L_{nT,w}$ rating the better the impact isolation.
NR	Noise Rating—a single number evaluation of noise level based on the Noise Rating curve The NR level is normally around 5 dB below the 'A' weighted noise level.
NRC	Noise Reduction Coefficient—A single number that represents the absorption of a material and it is the average of the sound absorption coefficients at 250, 500, 1000 & 2000 Hz for that material. NRC 1.0 represents the highest level of absorption.
R_w	Weighted Sound Reduction Index—A laboratory measured value of the acoustic separation provided by a single building element (such as a partition). The higher the R_w the better the noise isolation provided by a building element.
$R_w + C_{tr}$	A measure of the sound insulation performance of a building element with a C_{tr} spectrum adaptation term placing greater emphasis on the low frequency performance.
Reverberation Time	Of a room, for a sound of a given frequency or frequency band, the time that would be required for the reverberantly decaying sound pressure level in the room to decrease by 60 decibels.

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1.Introduction

This Acoustic Design Report is provided for the proposed residential development at 55 Milton St, Mt Hawthorne. The 3-storey development contains 9 apartments.

The main issues associated with this development are:

- Potential Traffic noise intrusion into the site
- Environmental noise emission into surrounding areas
- Acoustic separation and privacy among residences

This report is based on the RAD Architecture Drawing set dated 18/08/2022.

2. Environmental Noise Emission

2.1. Environmental Noise Emission Criteria

The Environmental Protection (Noise) Regulations 1997 (EPR) provide limits for acceptable noise from operations and activities. The Regulations specify the maximum permissible noise levels (termed Assigned Levels) at noise sensitive premises, caused by excessive nearby noise, during various times of the day.

The Assigned Levels have been calculated for all properties using the method shown in Appendix A. The resultant Assigned Levels are presented for a representative premises below in Table 1. The night-time period is the critical assessment period for the site, with the most stringent noise criteria to meet.

Table 1 – Assigned Levels

Receiving Premises	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise Sensitive Premises – Highly Sensitive	0700 to 1900 hours Monday to Saturday	48	58	68
	0900 to 1900 hours Sunday and public holidays	43	53	68
	1900 to 2200 hours all days	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	38	48	58

Note that adjustments are applied to the noise sources for a variety of characteristics. Where tonality, impulsiveness, modulation, or music is evident in the noise reaching the neighbours then these are additionally adjusted, where they cannot be removed from the noise signature.

2.2. Required Treatments

The nearest noise sensitive receptors to the site are the immediate neighbours to the east, west and south, being 53 Milton St, 57 Milton St, and 48 – 52 Tasman St. These residential buildings are all multi-storey so any mechanical plant at 55 Milton St, being ground floor, roof top or balcony located, are to be selected to control noise emissions to meet the assigned levels (inclusive of any tonal adjustments) in Table 1 above.

Where additional treatments are required, these can be developed when the exact equipment specifications and locations are known.

3. Internal Sound Insulation Requirements

The proposed residential apartment development has been assessed as Class 2 / Class 3 under the National Construction Code. These buildings must achieve the requirements outlined in Part F5 of the NCC Sound Transmission and Insulation.

3.1. Ratings and Nominated Constructions

The acoustic requirements applicable to this development are outlined in Table 1 below. This Table also summarises the recommended constructions to meet the nominated ratings. These designs are intended to meet the acoustical ratings as outlined in the NCC. Additional design advice may be required for non-acoustical requirements such as fire ratings, structural integrity, buildability, wind loading, etc.

Table 2: Acoustic separation requirements for Class 2 and 3 buildings

Building element	Description	Impact noise requirement	Airborne noise criterion	Minimum proposed Construction	Legend
Walls ²	Separating sole occupancy units	—	$R_w + C_{tr} \geq 50$	Rendered cavity brickwork - 250 mm Midland Acoustic Maxibricks or equivalent	
	Separating a habitable room (other than a kitchen) of a sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen in an adjacent sole occupancy unit	Discontinuous construction	$R_w + C_{tr} \geq 50$	Rendered cavity brickwork - 250 mm Midland Acoustic Maxibricks or equivalent with no ties or resilient ties	
	Separating a sole occupancy unit from a stairway, public corridor, public lobby or the like, or area of different classification ²	—	$R_w \geq 50$	Minimum 230 mm cavity brickwork	
	Separating a sole occupancy unit from a plantroom, or lift shaft ²	Discontinuous construction	$R_w \geq 50$	Minimum 230 mm cavity brickwork with either resilient ties or no ties Or Minimum 150 mm concrete with a free standing 10 mm plaster wall. Gap between stud and concrete is to be no less than 20 mm.	
Doors	Access doors to apartments from public corridors	—	$R_w \geq 30$	Minimum 35 mm solid core with acoustic seals to meet $R_w \geq 30$	Not shown - minimum standard to all

Building element	Description	Impact noise requirement	Airborne noise criterion	Minimum proposed Construction	Legend
Floors	Floor over apartments	$L_{nTw} \leq 55^6$	$R_w + C_{tr} \geq 50$	Floors to wet areas - Minimum 200 mm concrete slab - Tiles laid on rubber underlay All other floors: - Minimum 200 mm concrete slab AND EITHER - carpet on underlay, OR - Cypress Tranquillity/ Cascade Hybrid planks laid on 3mm rubber underlay AND - Suspended 13mm plaster ceiling in the apartment underneath with min 100 mm cavity and acoustic insulation in cavity	Not shown - minimum standard to all
Pumps	The point of connection between the service pipes in a building and any circulating or other pump.	A flexible coupling at the connection	—		Not shown
Services Access Doors and Panels	An access door or panel in a sole-occupancy unit - for all services		$R_w + C_{tr} 25$ for all non-habitable rooms and kitchens	Proprietary product such as from Tyco (no access panels permitted in habitable rooms except Kitchens)	Not shown

Building element	Description	Impact noise requirement	Airborne noise criterion	Minimum proposed Construction	Legend
Services	A duct, soil/waste/supply/stormwater pipe located in a wall or floor cavity, which serves or passes through more than one occupancy unit - adjacent room is non-habitable	—	$R_w + C_{tr} \geq 25$	10 mm plaster ceiling/bulkhead/wall/riser ^{3, 5} and 75 mm acoustic insulation blanket. OR Rendered 90 mm brick.	Not shown minimum standard to all ceilings/risers/bulkheads
	A duct, soil/waste/supply/stormwater pipe located in a wall or floor cavity, which serves or passes through more than one sole occupancy unit - adjacent room is habitable	—	$R_w + C_{tr} \geq 40$	<u>Wall or Riser</u> 110 mm rendered clay brick with 75 mm acoustic insulation ⁴ behind	Not shown – pipe runs not yet available
				<u>Ceiling or Bulkhead</u> 10 mm plaster ceiling/bulkhead/wall/riser ^{3, 5} and 75 mm acoustic insulation blanket, and services acoustically lagged ¹	Not shown – pipe runs not yet available

Notes to Table above

1. Water supply pipes must be in a cavity of discontinuous construction and not be fixed to the wall leaf of any other SOU other than the one which the pipe supplies, with a clearance of at least 10 mm to the other wall leaf. Pipes and ducts behind plaster need to be lagged with Pyrotek '4525C', Bradford 'Acoustilag 45', Acoustica 'Greenlag SQ' or equivalent. Alternative 'quiet' pipe constructions such as Rehau Raupiano, which lessen the need for wrapping can be submitted for approval
2. Acoustically rated walls to extend full height to underside of soffit/roof. Where this does not occur, ceilings to be acoustically rated
3. Any additional penetrations for lighting, ventilation grilles, sprinklers etc. to be acoustically treated
4. Unless noted otherwise, all acoustic insulation to be 14 kg/m³ acoustic grade glasswool insulation or equivalent. Nominal thickness 75 mm unless otherwise noted
5. Plaster to be upgraded to 10 mm Sound rated with a 50 mm acoustic insulation blanket where ceilings have more than 2 sealed downlights and a 150 mm exhaust fan
6. Minimum requirement for floor impact isolation in WA is based on the WA Supreme Court Ruling WASC 291 delivered August 2019, which determined that the minimum acceptable level of impact isolation produce a noise level of no more than 55 dB to comply with the Strata Titles Act. The NCC/BCA requirement not to exceed 62 dB is not necessarily compliant with the Strata Titles Act 1985 – Schedule 2, i.e., *"...treated to an extent sufficient to prevent the transmission of noise likely to disturb the peaceful enjoyment of the proprietor"*
7. Walls are not to be chased, and pipes are not to be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and must have a clearance not less than 10 mm to the other wall leaf.
8. Plasterboard is not to be glued to concrete or masonry walls. Where required, plaster to be a skim coat to the render, or plasterboard may be fixed using 28 mm furring channels.
9. Electrical outlets must be offset by at least 300 mm on either side of a wall between SOUs

3.2. Return air paths in ceilings containing wastepipes

Where ceiling return air paths are used in bulkheads or ceiling cavities for air conditioning, any waste or stormwater pipes located within 3m of a RA grille will require the grille to have an acoustically lined cushion head behind it.

3.3. NCC/BCA Clarifications

The section below outlines specific National Construction Code BCA requirements, which, in our opinion, are not applicable to this project. These clarifications are referred to the certifier to confirm our interpretation.

3.3.1. Apartment Floors over Carparks

The BCA states in Clause F5.4 (a) (ii)

Floors separating apartments from a plantroom, lift shaft, stairway, public corridors, public lobby or the like, or parts with a different classification [such as storeroom or carpark] to be impact-rated

Reverberate Consulting is of the opinion that this impact rating is only applicable for floors where the apartment is under the plantroom, stairway, corridor, or similar, not for floors where the apartment is over the other space. There is no noise sensitive activity in the carpark below which requires impact isolation treatment, so it is recommended that no impact isolation treatment is to be installed on apartment floors over carparks.

4. Wall Markups

Figure 1 and Figure 2 below outline the recommended treatments for wall constructions these are based on the constructions and legend outlined in Table 2 above.

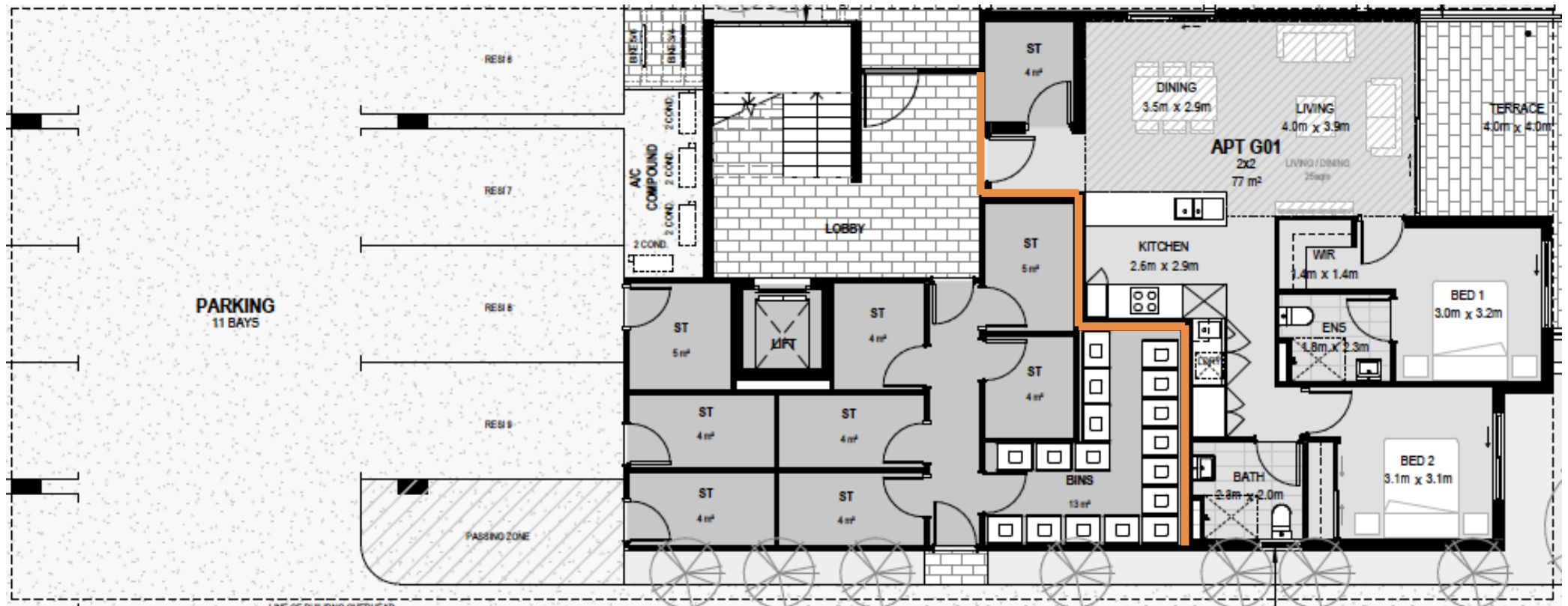


Figure 1: Ground Floor

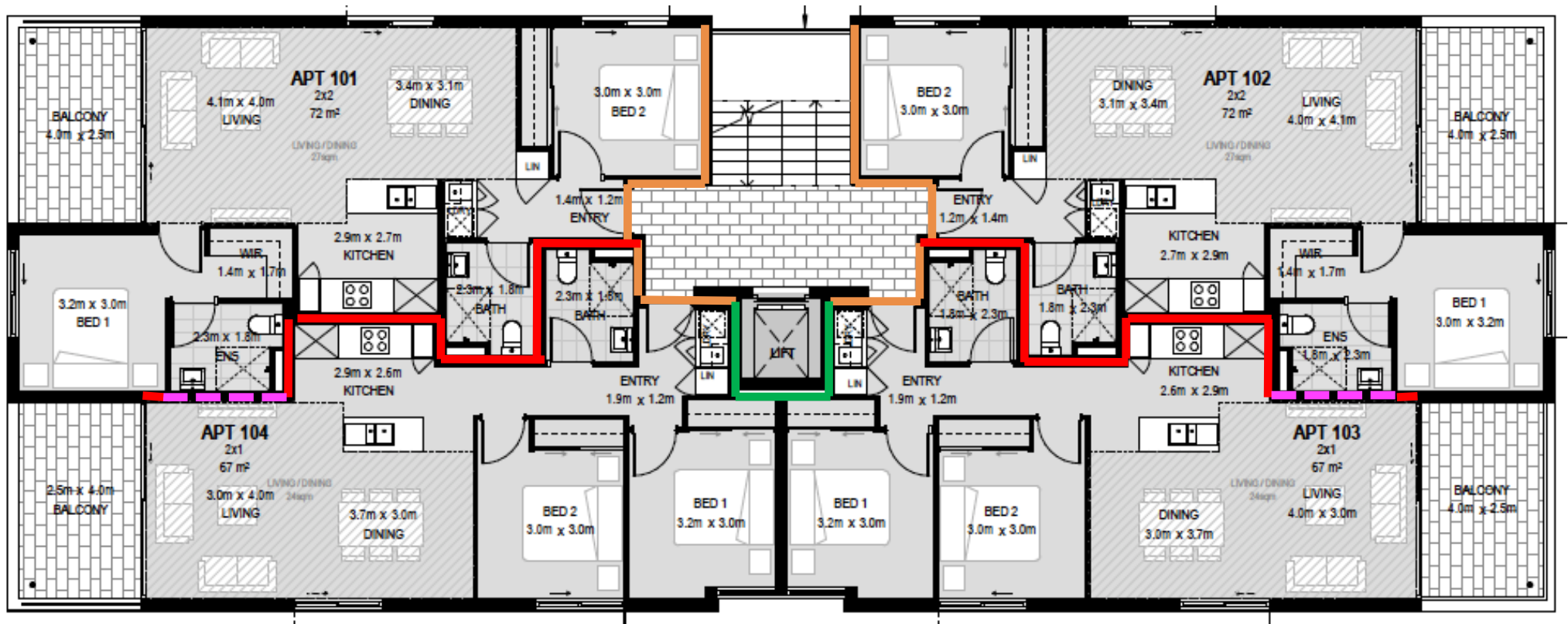


Figure 2: Level 1 & 2

5. Traffic Noise Intrusion

Traffic Noise intrusion has been assessed against the requirements of the State Planning Policy 5.4 (SPP5.4), September 2019. This assessment is outlined below

5.1. Noise intrusion criteria

State Planning Policy 5.4 requires that the external traffic noise levels at new residential premises do not exceed a Noise Target of:

$$L_{Aeq(Day)} = 55 \text{ dB}$$

$$L_{Aeq(Night)} = 50 \text{ dB}$$

SPP5.4 states that the Outdoor Targets are to be met at all outdoor areas as far as is reasonable and practical to do so. Where these Outdoor Targets cannot be met, Quiet House Design principals are to be implemented.

5.2. Traffic/Train Noise Levels – Screening Assessment

The forecast traffic noise levels at the site have been considered from the State's transport corridors. These forecast noise levels have been presented in Table 3 for top floor apartments.

Table 3: Forecast Transport noise levels

Assessment Location	Road	Number of Lanes	Separation Distance - m	Shielding	Forecast $L_{Aeq(Day)}$ dB
Apartment 201	Mitchell Freeway	8	215	Yes	52
	Joondalup Train line	-	243	Yes	NA ¹
Apartment 202	Mitchell Freeway	8	225	Yes	51
	Scarborough Beach Rd	4	320	Yes	NA
	Joondalup Train line	-	251	Yes	NA
Apartment 203	Brady St	4	93	Yes	54
	Scarborough Beach Rd	4	320	Yes	NA
Apartment 201	Brady St	4	94	Yes	54

¹ Forecast noise levels are not applicable as separation distances exceed the SPP5.4 trigger distances as follows:

300m for Strategic freight and major traffic roads,

200m for Other significant freight/traffic roads

100m for passenger train line.

The above table shows that the daytime noise exposure forecasts of between 51 and 54 dB meet the State Planning Policy 5.4 noise target of 55 dB on the top floor. The forecast noise levels on lower floors would be quieter still, due to increased shielding from neighbouring buildings. On this basis it is concluded that daytime transport noise intrusion levels comply with the planning policy noise target at all facades at the site.

The corresponding night time noise levels are approx. 7 to 10 dB quieter than daytime, based on the measured component of night-time traffic flow on the surrounding roads being approx. 4 to 8% of the total daily traffic.

The night-time noise levels therefore also comply with the Planning Policy noise target of 50 dB.

On this basis no acoustic treatments are recommended to the façade of apartments at 55 Milton St, to control traffic noise intrusion to the apartments.

6. Conclusion

Reverberate Consulting has assessed traffic noise intrusion into the proposed development, and the acoustic isolation requirements for 55 Milton St, Mt Hawthorne .

The acoustic isolation requirements have been developed in accordance with the requirements of the National Construction Code BCA in Sections 3 and 4, and in Figure 1 & Figure 2 of this report.

Traffic noise levels have been assessed in Section 5 accordance with the requirements of State Planning Policy 5.4. Transportation noise levels have been forecast at the façade of the proposed development. No treatments were found to be required.

Appendix A: Determination of Assigned Level

The Environmental Protection (Noise) Regulations 1997 (EPR) provide limits for acceptable noise from operations generating excessive noise. The Regulations specify the maximum permissible noise levels (termed assigned levels) at noise sensitive premises, caused by surrounding noises, during various times of the day. Time of day affects the assigned levels for noise-sensitive premises, as follows –

- Lowest levels at night (10 pm to 7 am any day, or to 9 am Sundays and Public Holidays);
- Higher levels during the evenings (7 pm to 10 pm) and on Sundays and Public Holidays (9 am to 10 pm); and
- Highest levels during the day (7 am to 7 pm Monday to Saturday).

The baseline assigned levels from the Regulations are shown below in Table 4.

Table 4 – Baseline Assigned Levels

Receiving Premises	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise Sensitive Premises - Highly Sensitive	0700 to 1900 hours Monday to Saturday	45+IF	55+IF	65+IF
	0900 to 1900 hours Sunday and public holidays	40+IF	50+IF	65+IF
	1900 to 2200 hours all days	40+IF	50+IF	55+IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+IF	45+IF	55+IF
Noise Sensitive Premises - any area other than highly sensitive area	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

The Assigned Levels above are then increased using an Influencing Factor (IF) as defined in the Regulations. The Influencing Factor is greater than zero where there are significant areas of land uses, within 100 m and 450 m radii of the receptor, including:

- industrial land use zonings;
- commercial zonings; and
- the presence of roads carrying significant traffic.

The Influencing Factor IF has been calculated for the applicable noise sensitive receptors in the current study. The percentage of industrial and commercial land within the prescribed circles centred on the noise sensitive premises, and the presence of roads with more than 6000 vehicles per day have been assessed for the properties.

Example Influencing Factor calculations are calculated in the Table below. These are based on the land use planning categories outlined in Figure 3. These factors have been added to the baseline Assigned Levels to produce the overall Assigned Levels in Table 1, Section 2.1 of this report.

Property = #53 Milton St

Type of Land	450 m Radius	100 m radius	Total	
Industrial Land	0.0%	0.0%	0.00	dB
Commercial Land	10.9%	0.0%	0.55	dB
Roads within 100 m (> 6K VPD)			0	
• Nil				
Roads within 450 m (> 15K VPD)			2	dB
• Mitchell Freeway				
TOTAL Influencing Factor			3	dB

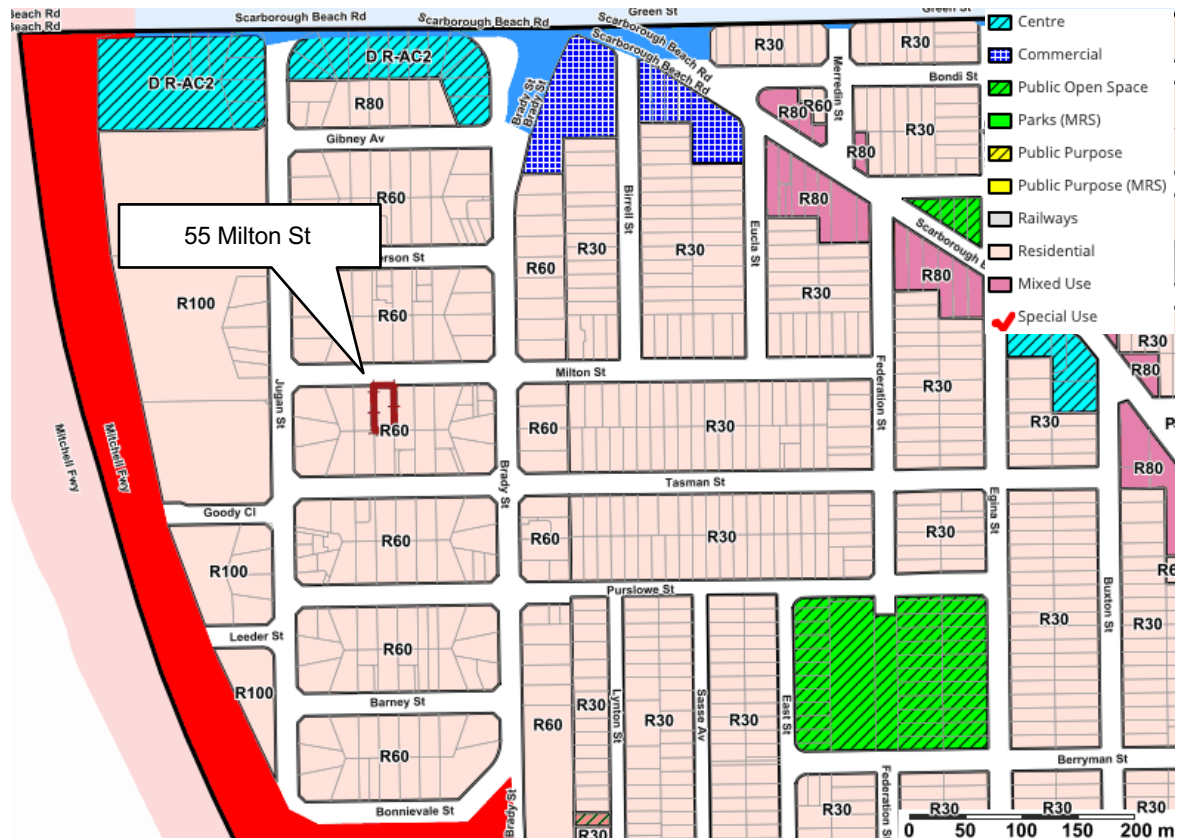


Figure 3: Land use zoning (LPS), City of Vincent Intramaps