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## ACOUSTIC REPORT

**PROPOSED RESIDENTIAL VILLAGE  
14 TRIAN ROAD, CARABOODA WA 6033**

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## INTRODUCTION

Acoustics & Audio Production has been engaged to undertake a noise assessment for the proposed holiday village, located at 14 Trian Road, CARABOODA WA 6033.

The purpose of this assessment is to focus on both the residential and environmental noise protection requirements of the site in question, by assessing all current and potential future noise sources received within the proposed site, including noise from the site being received by the nearest noise sensitive receivers. The aim is to achieve compliance with the Environmental Protection (noise) Regulations 1997 and State Planning Policy 5.4.

If exceedances within the stated criteria are found, then establish the required attenuation measures to control noise intrusion and emission to acceptable levels.

As part of the assessment, the following was carried out:

- Assess the current and future acoustical environment against the State Planning Policy 5.4.
- For future traffic flows, determine noise that would be received at residences within the development from vehicles traveling along Wanneroo Road.
- Assess the predicted noise levels for compliance with the appropriate criteria based on both the existing acoustical environment and future traffic noise.
- Assess the proposed site against the Environmental Protection (Noise) Regulations 1997 (EPR 1997).
- If exceedances are predicted, then provide noise mitigation options for compliance with the appropriate criteria.

## SUMMARY

Under the Western Australian Planning Commission (WAPC) *“Road and Rail Transportation Noise and Freight Consideration in Land Use Planning”* (SPP5.4), I believe that the appropriate criteria for this assessment are listed below for “Noise Limits”.

### EXTERNAL

$L_{Aeq(Day)}$  of 60dB(A); and

$L_{Aeq(Night)}$  of 55dB(A).

### INTERNAL

$L_{Aeq(Day)}$  of 40dB(A) in living and work areas; and

$L_{Aeq(Night)}$  of 35dB(A) in bedrooms.

Noise received at an outdoor area should also be reduced as far as possible, with the aim of achieving a  $L_{Aeq}$  of 50dB(A) during the night period.

Without any mitigation, noise received at the proposed residential development associated with Wanneroo Road has been calculated to exceed the night “Noise Limits” by 3dB(A), and therefore Package B of the State Planning Policy 5.4 is required for the residential units at the proposed site.

Predicted noise emissions from the site were found to fall within the assigned outdoor levels of  $L_{A10}$  47dB (0700 to 1900 Monday to Saturday),  $L_{A10}$  42dB (0900 to 1900 Sunday, public holidays and 1900 to 2200 any day) and  $L_{A10}$  37dB (2200 to 0700 any day) at all of the identified surrounding noise sensitive receivers associated with the proposed site under full operation and is a 'worst case scenario' setting.

With the implementation of the recommendations put forth in this report, noise received by the residential section of the proposed site would comply with the "Noise Limits" stipulated in SPP5.4 and the AS2107:2000 "Recommended design sound levels and reverberation times for building interiors".

## ACOUSTIC CRITERIA

### WAPC PLANNING POLICY

The Western Australian Planning Commission (WAPC) released (on 22 September 2009) the State Planning Policy 5.4 "Road and Rail Transportation Noise and Freight Consideration in Land Use Planning". Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

#### "5.3 – NOISE CRITERIA"

*Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.*

*These criteria do not apply to –*

- *Proposals for redevelopment of existing major roads or railways, which are dealt by a separate approach as described in section 5.4.1; and*
- *Proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

*The outdoor noise criteria set out in Table 1 apply to the emissions of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations –*

- *For new road and rail infrastructure proposals, at 1m from the most exposed, habitable façade of the building receiving the noise, at ground level only; and*
- *For new noise-sensitive proposals, at 1m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

*Further information is provided in the guidelines.*

**Table 1 – Outdoor Noise Criteria**

Time of Day	Noise Target	Noise Limit
<b>Day (6 am – 10 pm)</b>	$L_{Aeq(Day)} = 55 \text{ dB(A)}$	$L_{Aeq(Day)} = 60 \text{ dB(A)}$
<b>Night (10 pm – 6 am)</b>	$L_{Aeq(Night)} = 50 \text{ dB(A)}$	$L_{Aeq(Night)} = 55 \text{ dB(A)}$

*The 5 dB differences between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway exists, it should be practicable to achieve outdoor levels within the acceptable margin.*

*Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.*

*The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criterion takes into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly.*

#### 5.3.1 interpretation and application for noise-sensitive development proposals

*In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –*

- Acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- A reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot<sup>1</sup>.*

<sup>1</sup> For non-residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

*If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.*

*In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5 dB margin, mitigation measures should be implemented by the developer with a view of achieving the target levels in at least one outdoor living area on each residential lot<sup>1</sup>. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.*

*In areas where the outdoor noise limit is likely to be exceeded (i.e. above  $L_{Aeq(Day)}$  of 60 dB(A) or  $L_{Aeq(Night)}$  of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customized noise mitigation measures should be implemented with a view of achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.*

*For residential buildings, acceptable indoor noise levels are  $L_{Aeq(Day)}$  of 40 dB(A) in living and work areas and  $L_{Aeq(Night)}$  of 35 dB (A) in all bedrooms<sup>2</sup>. For all other noise sensitive buildings, acceptable indoor noise under this policy comprise of noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors.*

*These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15 to 20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.*

*If the policy objectives for noise sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."*

The Policy, under Section 5.7, also provides information regarding "Notifications on Titles".

<sup>2</sup> For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

## APPROPRIATE CRITERIA

Based on the above, the following criteria are proposed for this development:

### EXTERNAL

Day	Maximum of 60 dB(A) $L_{Aeq}$
Night	Maximum of 55 dB(A) $L_{Aeq}$
Outdoor Living Areas*	Maximum of 50 dB(A) $L_{Aeq(night\ period)}$

### INTERNAL

Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

\*This is a suggested noise level; noise is to be reduced as far as practicable possible.

## ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997 CRITERIA

The allowable noise levels at the surrounding noise sensitive areas are determined by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 & 8 stipulate that the allowable external noise levels determined by the calculation of an influencing factor (Table 2), which is then added to the base levels shown below in Table 6.

**Table 2 – Baseline Assigned Outdoor Noise Level**

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		$L_{A10}$	$L_{A1}$	$L_{Amax}$
Noise Sensitive Premises	0700 – 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 – 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Period)	40 + IF	50 + IF	65 + IF
	1900 – 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 – 0700 hours all days (Night)	35 + IF	45 + IF	55 + IF

Note:  $L_{A10}$  is the noise level exceeded for 10% of the time.  
 $L_{A1}$  is the noise level exceeded for 1% of the time.  
 $L_{Amax}$  is the maximum noise level.  
 IF is the influencing factor.

The influencing factor, applicable at all of the nearest noise sensitive receivers has been calculated as 2dB due to the proximity to the secondary road, Wanneroo Road.

Based on the information in Table 3 no influencing factor is added to the base line assigned noise levels as stipulated in The Environmental Protection (Noise) Regulations 1997, therefore assigned outdoor levels are as shown below.

**Table 4 – Assigned Outdoor Noise Level**

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise Sensitive Premises	0700 – 1900 hours Monday to Saturday	47	57	67
	0900 – 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Period)	42	52	67
	1900 – 2200 hours all days (Evening)	42	52	57
	2200 – 0700 hours all days (Night)	37	47	57

It must be noted the assigned noise levels above apply outside the receiving premises and at a point at least 3 meters away from any substantial reflecting surfaces. For the purpose of this assessment, the noise emissions were assessed at a point 1 meter away from the most affected building facades and a -2dB adjustment as made to the predicted noise levels to account for reflected noise.

## WASTE COLLECTION

Regulation 14A provides requirements for the collection of waste. Such activities are exempt from having to comply to regulation 7, provided they are undertaken in accordance with regulation 14A(2) as follows:

- During daytime hours as defined as;
  - 0700 to 1900 Monday to Saturday (excluding Public Holiday), or
  - 0900 to 1900 on a Sunday or Public Holiday.

## EXISTING ACOUSTICAL ENVIRONMENT

### NOISE MONITORING

A Cirrus CR171 Type 1 Sound Level Meter was used at the boundary of 14 Trian Road, CARABOODA and 2766 Wanneroo, CARABOODA. The purpose of this was to measure the existing ambient noise levels experienced at the proposed site location and nearest noise sensitive receivers.

The monitor was located in a free field position, with the microphone approximately 1.4m above the ground surface level. Noise monitoring was conducted generally in accordance with Australian Standard AS1055:1997 *Acoustics- Description and measurement of environmental noise*.

All sound levels, both measured and calculated, have been assessed in accordance with the *State Planning Policy 5.4*.



## NOISE SENSITIVE RECEIVER LOCATION

The nearest potential receiver locations were identified as the following:

- (R1) 2766 Wanneroo Road
- (R2) 14 Trian Road
- (R3) 26 Trian Road
- (R4) 273 Karoborup Road
- (R5) 269 Karoborup Road
- (R6) 243 Karoborup Road
- (R7) 26 Kiro Street
- (R8) 2830 Wanneroo Road

These locations have been chosen as representative of the nearest noise sensitive receivers, and the closest is located the west of the operational area of proposed site. Refer to Figure 1 below for location.



**Figure 1: Noise sensitive receiver locations & proposed site location.**  
(Source: Google Maps)



## MEASURED NOISE LEVELS

Table 5 below, shows measured existing traffic noise levels from the attended noise survey conducted at the proposed site 14 Trian Road, CARABOODA and all the nearest noise sensitive receiver identified.

**Table 5: Measured Ambient Noise Levels dB(A) at the nearest noise sensitive receiver.**

Date	Receiver	Location	Measured Level (dB)			
			L <sub>Aeq</sub>	L <sub>A10</sub>	L <sub>A1</sub>	L <sub>A(max)</sub>
31/05/2018	R1	2766 Wanneroo Road	56.0	59.3	64.4	76.7
	R2	14 Trian Road	55.3	58.9	65.1	78.2
	R3	26 Trian Road	53.7	57.9	62.5	77.2
	R4	273 Karaborup Road	49.3	54.2	59.0	72.7
	R5	269 Karaborup Road	48.7	52.1	58.4	68.4
	R6	243 Karaborup Road	49.2	53.7	58.1	70.6
	R7	26 Kiro Street	47.1	52.4	55.9	67.0
	R8	2830 Wanneroo Road	55.0	57.6	63.9	75.8

## METEOROLOGICAL INFORMATION

Table 6 below shows the meteorological conditions at the time of conducting the onsite noise survey

**Table 6 – Meteorological Conditions 31/05/2018**

Parameter	Result
Temperature (°C)	16°C
Wind Speed (m/s)	3.6m/s
Wind Direction	North
Humidity (%)	90%

Note: The acoustical modeling software allows for simultaneous modeling of wind in all directions.

## MODELING

Modeling of future noise received at the proposed residential development from Wanneroo Road was carried out using SoundPlan, which uses the Calculation of Road Traffic Noise (CoRTN) algorithms. The input data for the model included:

- Increased traffic volume, assuming 2.5% growth over 20 years.
- A +2.5 dB adjustment to allow for façade reflection.

The traffic data currently available on the Main Roads website are as listed in Table 7. Table 3 also lists the percentage of heavy vehicles and the calculated future traffic flows (20 years from now).

**Table 7 – Summary of Future Traffic Flow**

Parameter	Wanneroo Road
Future Traffic Flow (vpd)	19,986
Percentage Heavy Vehicles	14.7%

For the noise modeling for future traffic it has been assumed that the percentage of future heavy vehicles remains the same as for the current traffic flows. In this case, I believe that this is a conservative approach, as it is expected that the percentage of heavy vehicles would fall over time.

For this assessment, noise received during the night period was compared to that of the day period, reference is made to the DEFRA publication. Based on the DEFRA publication, the difference between the  $L_{A10,18hr}$  and the  $L_{Aeq,8hr}$  and the  $L_{Aeq,16hr}$  for Wanneroo Road has been determined to be 5 dB(A). It was assumed that these differences would apply in the year 2038.

It is expected that the difference between the  $L_{Aeq,8hr}$  and the  $L_{Aeq,16hr}$  is less than 5 dB(A), therefore achieving compliance with the day period criteria will also result in achieving compliance with the night period criteria.

Noise modeling was undertaken for the following scenarios:

1. 2038 traffic flows, without any noise mitigation.
2. 2038 traffic flows with barriers to the lot boundaries.

Computer modeling SoundPlan 7.4 with the algorithms CONCAWE has also been used to predict the noise emissions associated with both the proposed café/restaurant and office to be received at the nearest noise sensitive receiver. Input data used within the model are:

- Meteorological Information; and
- Topographical Data; and
- Ground Absorption Data; and
- Source Sound Power Levels; and
- Acoustical Screening Locations.

## METEOROLOGICAL INFORMATION

Meteorological information used in Table 8 below is considered to represent the 'worst case' conditions for sound propagation. With wind speeds greater than those shown, noise levels may be further enhanced; however it is likely that wind, vegetation and traffic noise will become the dominant noise source at those levels.

**Table 8 – Meteorological Conditions**

Parameter	Day (0700 -1900)	Night (1900 – 0700)
Temperature (°C)	20	15
Wind Speed (m/s)	4	3
Wind Direction	All	All
Humidity (%)	50	50
Pasquil Stability Factor	E	F

Note: The acoustical modeling software allows for simultaneous modeling of wind in all directions.

## TOPOGRAPHICAL DATA

The ground and surrounding area was assumed to be flat. Noise modeling has been undertaken on the noise sensitive premises within the proposed site.

## GROUND ABSORPTION

Ground absorption varies from a value of 0 to 1, 0 representing an acoustically reflective ground (e.g. water and bitumen) and 1 representing acoustically absorbing surface such as grass. In this case, a ground absorption value of 0.8 is used.

## SOURCE SOUND LEVELS

Source sound levels used within the modeling are based on technical data acquired from similar previous investigations and are listed below in Table 9 below. All noise levels have been corrected for impulsiveness or tonality as per the Australian Standard AS 1055:1997 – ‘Acoustics – Description and measurement of environmental noise’.

**Table 9 – Source Sound Power Levels dB(A)**

Description	Octave Band Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Restaurant/Café	73	84	88	90	83	80	77	66	90
AC Condenser	77	75	65	66	75	75	73	70	80
Cool room condenser, ‘daytime’ mode	79	83	82	79	76	71	66	63	81
Cool room condenser, ‘nighttime’ mode	74	78	77	74	71	66	61	58	76
Kitchen exhaust fan	76	80	75	84	82	77	71	62	85
Toilet exhaust fan, each	63	64	70	64	67	63	55	50	70
Refrigerated deliveries	65	68	88	92	97	97	91	80	102
Normal deliveries, $L_{Amax}$	111	109	105	99	97	96	95	-	104
Waste collection, $L_{Amax}$	115	117	112	107	105	104	103	-	112

With regards to the above, please note the following:

- The Restaurant/Café is assumed to be occupied by 152 patrons; of whom 50% are assumed talking simultaneously at voice level of 70dB  $L_{Aw}$  per person. These patrons were modeled at a height of 1.2m within the Restaurant/Café, with the software then calculating internal reverberant noise levels allowing for normal conversation to occur.
- ‘Refrigerated deliveries’ represent source noise levels from a truck mounted refrigeration compressor and this source was modeled as a point source 2m above local ground level. The ‘ $L_{Amax}$ ’ source levels represent intermittent events such as pallets, crates and waste bins being dropped on the ground. These were modeled as point sources to 1m above ground level.
- Patron conversation noise has been assumed at 70dB  $L_{Aw}$  per person at a height of 1.6m outside at the proposed site.
- All mechanical plant was modeled as a point source 0.5m above roof level.

## RESULTS

The noise contribution from individual noise sources was predicted at both the residential areas of the proposed site and all of the nearest noise sensitive receivers identified in this report. The calculations are based on the following conditions occurring simultaneously:

- Restaurant/café under full capacity;
- Office in full operation;
- Residential units fully booked;
- Pool area utilized;
- Resident conversational noise outside; and
- Baby animal nursery in full operation.

The results of the noise modeling under 'worst-case' scenario conditions are represented in Table 10 below. As the restaurant/café, office and pool area is closed before 10:00 pm therefore this assessment will be based on the evening (1900 to 2200) assigned outdoor noise levels as stipulated in the *Environmental Protection (Noise) Regulations 1997*.

Table 11 below shows the calculated noise to be received at the nearest noise sensitive receivers associated with the residential units under full occupancy and assessed against the nighttime assigned noise levels stipulated in the *Environmental Protection (Noise) Regulations 1997*.

**Table 10 – Summary of proposed sites operational and residential noise calculated at the boundary of the nearest noise sensitive receivers.**

Noise Sensitive Receiver	Predicted scenario noise levels, dB L <sub>A10</sub> (Evening 1900 – 2200)		
	Calculated, dB L <sub>A10</sub>	Target, dB L <sub>A10</sub>	Compliant
R1	39	42	Yes
R2	41	42	Yes
R3	40	42	Yes
R4	38	42	Yes
R5	38	42	Yes
R6	38	42	Yes
R7	36	42	Yes
R8	39	42	Yes

**Table 11 – Summary of the proposed site's residential noise under full capacity, calculated at the boundary of the nearest noise sensitive receivers.**

Noise Sensitive Receiver	Predicted scenario noise levels, dB L <sub>A10</sub> (Nighttime 2200 – 0700)		
	Calculated, dB L <sub>A10</sub>	Target, dB L <sub>A10</sub>	Compliant
R1	28	32	Yes
R3	29	32	Yes
R4	27	32	Yes
R5	27	32	Yes
R6	27	32	Yes
R7	24	32	Yes
R8	28	32	Yes

## ASSESSMENT

In accordance with the WAPC State Planning Policy 5.4, an assessment of the noise that would be received within the proposed residential development located at 14 Trian Road, CARABOODA, from both vehicles travelling along Wanneroo Road and patron noise from the restaurant/café and office have been undertaken.

In accordance with the policy, the following would be the acoustic criteria applicable to the project:

### EXTERNAL

Day	Maximum of 60 dB(A) $L_{Aeq}$
Night	Maximum of 55 dB(A) $L_{Aeq}$
Outdoor Living Areas	Maximum of 50 dB(A) $L_{Aeq}$ (night period)

### INTERNAL

Sleeping Areas	35 dB(A) $L_{Aeq}$ (night)
Living Areas	40 dB(A) $L_{Aeq}$ (day)

We note that along Wanneroo Road, the difference between the  $L_{Aeq,8hr}$  and the  $L_{Aeq,16hr}$  is calculated to be less than 5 dB(A), therefore achieving compliance within the day period criteria will also result in achieving compliance with the night period criteria.

Without any noise amelioration, noise received by the proposed development exceeds the “Noise Limits” by up to 3dB. However, with the implementation of the recommendations put forth within the report, noise received by the residence have been calculated to comply with the “Noise Limits” and achieve the “Noise Target” as stipulated by the WAPC.

## PROPOSED RESTAURANT/CAFÉ, OFFICE, POOL NOISE

Based upon the results of Table 9, the noise emissions from various operations scenarios were assessed. These are detailed in the following sections.

This scenario represents a typical busy day and includes the following noise sources:

- Restaurant/Café, office fully occupied and with all operable glazing open;
- Mechanical Plant operating;
- Office under full operation;
- Pool occupied;
- Baby animal nursery; and
- Full capacity of residence.

Combining the noise levels from Table 9 and the other noise sources identified in various locations at the proposed site for the relevant scenarios, noise levels ranging from  $L_{A10}$  41dB up to  $L_{A10}$  46dB(A) are predicted at the nearest noise sensitive receivers identified, and therefore fall within the assigned outdoor evening noise criterion. This assessment period was used as the restaurant/café, pool, office and baby animal nursery are not utilized after the evening.

Calculations have been made with respect to noise associated with the residential units under full occupancy being received at the surrounding nearest noise sensitive premises, and have all been found to fall within the most stringent assigned outdoor nighttime noise criterion of  $L_{A10}$  37dB.

## MINIMUM ACOUSTICAL PERFORMANCE REQUIREMENTS

### RESIDENTIAL UNITS

#### WALLS

- Walls separating sole-occupancy units are to achieve a minimum acoustical performance rating of  $R_W + C_{tr}$  50dB; and
- Walls separating a sole-occupancy unit from a plant room, lift shaft, public corridor, public lobby or the like, are to achieve a minimum acoustical performance rating of  $R_W + C_{tr}$  50dB.

#### FLOORS

- Airborne sound transmission rating not less than  $R_W + C_{tr}$  45dB; and
- Impact vibration transmission rating not more than  $R_W + C_{tr}$  62dB.

#### GLAZING

- Bedrooms windows to achieve a minimum  $R_W + C_{tr}$  31dB; and
- Living and work areas to achieve a minimum  $R_W + C_{tr}$  28dB.

#### EXAMPLE CONSTRUCTIONS:

$R_W + C_{tr}$  31dB

- Single pane glazing to  $R_W$  36dB; or
- 10.38mm monolithic or laminated glass; or
- 10.38mm laminated or toughened safety glass; or
- 6mm – 12mm – 8mm double insulated glass unit (IGU)

$R_W + C_{tr}$  28dB

- Single pane glazing to  $R_W$  33dB; or
- 6.38mm monolithic or laminated glass; or
- 6.38mm toughened safety glass; or
- 6mm – 12mm – 6mm double insulated glass unit (IGU)

#### EXTERNAL DOORS

External doors are to achieve a minimum acoustical rating of  $R_W + C_{tr}$  31dB.

#### EXAMPLE CONSTRUCTIONS:

##### FULLY GLAZED HINGED DOOR

- Certified  $R_W$  34dB acoustically rated door and frame including full perimeter seals;
- 10.38mm monolithic or laminated glass; or
- 10.38mm laminated or toughened safety glass.

### **SOLID CORE TIMBER FRAME, SIDE HINGED**

- Certified  $R_w$  32dB acoustically rated door and frame system including full perimeter seals; or
- 40mm solid core timber without glass unit; or
- 40mm solid core with 6.38mm glass insert.

Note: A full perimeter seal is a foam or silicon based rubber based compressible strip, fibrous seal with vinyl fin interleaf, or the like. Brush/pile type seals without this seal included are not allowed.

## **RESTAURANT**

### **WALLS**

- Walls are to achieve a minimum acoustical performance rating of  $R_w + C_{tr}$  50dB.

### **GLAZING**

- Windows to achieve a minimum  $R_w + C_{tr}$  28dB.

### **EXAMPLE CONSTRUCTION - $R_w + C_{tr}$ 28dB**

- Single pane glazing to  $R_w$  33dB; or
- 6.38mm monolithic or laminated glass; or
- 6.38mm toughened safety glass; or
- 6mm – 12mm – 6mm double insulated glass unit (IGU)

### **EXTERNAL DOORS**

External doors are to achieve a minimum acoustical rating of  $R_w + C_{tr}$  31dB.

### **EXAMPLE CONSTRUCTIONS:**

#### **FULLY GLAZED HINGED DOOR**

- Certified  $R_w$  34dB acoustically rated door and frame including full perimeter seals;
- 10.38mm monolithic or laminated glass; or
- 10.38mm laminated or toughened safety glass.

#### **SOLID CORE TIMBER FRAME, SIDE HINGED**

- Certified  $R_w$  32dB acoustically rated door and frame system including full perimeter seals; or
- 40mm solid core timber without glass unit; or
- 40mm solid core with 6.38mm glass insert.

Note: A full perimeter seal is a foam or silicon based rubber based compressible strip, fibrous seal with vinyl fin interleaf, or the like. Brush/pile type seals without this seal included are not allowed.

### **MECHANICAL PLANT**

- Any fans/air conditioning should be selected on a basis of quiet operation;
- Any roof mounted air-conditioning units or the like are to be position as far from (and out of the line of site of) the nearest noise sensitive receiver;
- Kitchen axial roof fans, air conditioning and the like are to be:
  - Roof mounted on appropriate anti-vibrational mounts.



## OFFICE

### WALLS

- External walls are to achieve a minimum acoustical performance rating of  $R_W + C_{tr}$  50dB; and
- Internal walls are to achieve a minimum acoustical performance rating of  $R_W + C_{tr}$  45dB.

### GLAZING

- Windows are to achieve a minimum  $R_W + C_{tr}$  28dB.

#### EXAMPLE CONSTRUCTION - $R_W + C_{tr}$ 28dB

- Single pane glazing to  $R_W$  33dB; or
- 6.38mm monolithic or laminated glass; or
- 6.38mm toughened safety glass; or
- 6mm – 12mm – 6mm double insulated glass unit (IGU)

### EXTERNAL DOORS

External doors are to achieve a minimum acoustical rating of  $R_W + C_{tr}$  31dB.

Example Constructions:

#### FULLY GLAZED HINGED DOOR

- Certified  $R_W$  34dB acoustically rated door and frame including full perimeter seals;
- 10.38mm monolithic or laminated glass; or
- 10.38mm laminated or toughened safety glass.

#### SOLID CORE TIMBER FRAME, SIDE HINGED

- Certified  $R_W$  32dB acoustically rated door and frame system including full perimeter seals; or
- 40mm solid core timber without glass unit; or
- 40mm solid core with 6.38mm glass insert.

Note: A full perimeter seal is a foam or silicon based rubber based compressible strip, fibrous seal with vinyl fin interleaf, or the like. Brush/pile type seals without this seal included are not allowed.

## GENERAL ACOUSTICAL PERFORMANCE REQUIREMENTS

### MECHANICAL VENTILATION REQUIREMENTS

Mechanical ventilation requirements will need to comply with AS 1668.2 – *The use of mechanical ventilation and air conditioning within buildings*. Fresh intake and relief paths will need to be fully ducted to allow windows to be closed, and be located in positions furthest from the traffic noise source where practicable.

If a ventilation system is provided in addition to operable windows on all sides facing or side on to the transport noise corridor, it must either provide:

- Closed roof eaves and wall openings on those sides; or
- Acoustically rated openings and ductwork arrangements to provide a minimum sound reduction performance of  $R_W$  40dB into sensitive spaces.

- All ducts to be baffled to wall / ceiling;
- Airflow at the entrance and exit to the ventilation fans should be as smooth as possible to minimize air turbulence.

## SERVICES

- Only use acoustically treated waste pipes, supply pipes, storm water pipes and ductwork in the ceiling cavities and risers;
- Ensure all flexible connectors in pipes are operational and not 'bridged';
- Do not introduce unnecessary bends and elbows in pipes and ducts;
- Use resilient fixings of pipes and ducts to party walls;
- Only attach pipes and ducts to the side of the wall to which the services belong. Do not bridge across all discontinuities; and
- A flexible coupling must be used at the point of connection between the services pipes in a building and any circulating or other pump.

## PENETRATIONS & GAPS

- All penetrations in acoustically rated building elements, are to be designed to not reduce the acoustical rating of the building elements;
- Ensure there are no residual gaps around full height walls;
- Ensure joints at wall and floor perimeters are sealed and airtight, using an approved mastic;
- Joints in dissimilar materials may open up if there is building movement, therefore ensure that the acoustical seal in joints will accommodate the anticipated building movement;
- Sealing should be effective, resilient, resistant to the surrounding environment and designed to last the life of the building; and
- No vents to outside walls/eaves.

Note: Any penetrations in part of the building envelope must be acoustically treated so as not to degrade the performance of the building elements affected. Most penetration in external walls such as pipes, cables and ducts can be sealed through caulking gaps with non-hardening mastic or suitable mortar.

## CONCLUSION

An assessment of the proposed café and shop under 'worst-case' scenario of noise emissions has been based on noise modeling. Noise levels were predicted at the closest noise sensitive receivers, being the adjacent residential properties to the North, North East, East, South East and South of the proposed site.

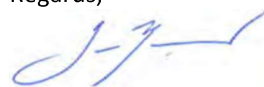
Based on the preliminary information provided it was found that the proposed restaurant/café, office, pool baby animal nursery noise emissions fall within the assigned noise levels (as stipulated in the *Environmental Protection (Noise) Regulations 1997*).

Future traffic noise was found to exceed the assigned nighttime "noise limits" by up to 3dB(A). Therefore, to ensure that both the living and sleeping areas in the residential units of the proposed site fall within the noise limits outlined in the State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*" and the Australian Standard AS/NZS 2107:2000 "*Recommended design sound levels and reverberation times for building interiors*", the recommendations put forth within this report are to be implemented.

On the condition that the recommendations detailed in this report are implemented, general compliance to both the State Planning Policy 5.4 "*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*", Australian Standard AS/NZS 2107:2000 "*Recommended design sound levels and reverberation times for building interiors*" and the *Environmental Protection (Noise) Regulations 1997* assessment criteria would be met.

I trust the above meets your requirements on the matter. Should you have any queries do not hesitate to contact our office.

Regards,



Ian Burman

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