

Environmental Noise and Vibration Impact Assessment Rozelle Village Pty Ltd 17 February 2012 Document No. 60223256 Acoustics\_EA.RPT001.04

# **Rozelle Village**

**Environmental Noise Impact Assessment** 



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Prepared for

Rozelle Village Pty Ltd

Prepared by

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## 1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Rozelle Village Pty Ltd to provide a Environmental Noise Impact Assessment report for the proposed Rozelle Village development.

Appropriate environmental noise emission criteria for the development have been established in this report and are based upon measured background noise levels, Leichhardt Council Policy, the Office of Liquor, Gaming and Racing (OLGR) noise condition, the Office of Environment and Heritage (OEH) Industrial Noise Policy (INP) and the Road Noise Policy (RNP), the Department of Planning Development near Rail Corridors and Busy Roads – Interim Guideline and the Director General's Requirements issued on 5 April 2011.

The outcomes of the assessment and the proposed noise control measures required to achieve compliance with the criteria are outlined in this report.

Acoustic terminologies used in this report are explained in Appendix A.

## 1.1 Site Description

The site of the proposed development is bounded by residences and commercial premises to the north west, Victoria Road to the north east, commercial premises to the south east and Waterloo Street to the west. The site location is given in Figure 1-1 below.

Figure 1-1 Site location and logging locations



## 1.2 Proposed development

The Rozelle Village development consists of demolishing the existing Leagues club located on Victoria Road,

Rozelle and the development of a new mixed use facility with the following facilities:

- Two residential towers of apartments (304 total): 232 apartments in B1 east / west with Tower B1 east / west height of 27 storeys, 72 apartments in B2 with Tower B2 height of 20 storeys;
- Communal Recreation Facilities (including tennis court and pool);
- SOHOs (Small office home office);
- Balmain Leagues Club;
- Childcare centre;
- Specialty/Retail;
- Medical centre;
- Gymnasium;
- Restaurants;
- Supermarket;
- Community room; and
- Seven levels of basement car parking and associated loading dock activities.

# 2.0 Noise monitoring

AECOM has previously conducted noise monitoring of the area surrounding the proposed Rozelle Village development in August 2009. Since the previous noise monitoring period until now, there has not been any changes to the surrounding area which would significantly alter the acoustic environment. Therefore it is AECOM's opinion that the previous noise monitoring results are still relevant and have been adopted for this assessment.

The noise monitoring was conducted in the vicinity of the development site to determine existing background and traffic noise levels. One noise logger was located at the Victoria Road facade of the existing Balmain Leagues Club to primarily record road traffic noise levels to determine facade treatments to control traffic noise intrusion into the proposed development. A second noise logger was located at 9 Moodie Street to primarily record background noise levels to develop environmental noise emission criteria for the proposed development.

It is noted that residences located along Waterloo Street are the nearest residential receivers to the proposed development site. However, the Waterloo Road residences were deemed to be an unsuitable location for noise monitoring as the noise environment at these residences would have been influenced by the existing Balmain Leagues Club. The Office of Environment and Heritage's (OEH, formerly known as Department of Environment, NSW INP states the following:

## "The noise from the existing development should be excluded from the background noise measurements"

9 Moodie Street was selected as a suitable monitoring location as it has a noise environment representative of that at residences located along Waterloo Street being the same distance from Victoria Road and having similar activities and traffic flow as Waterloo Road but without noise contributions from the existing Balmain Leagues Club.

It is likely that the existing club building is providing 2 dB of acoustic shielding of traffic noise from the levels measured on Moodie Street. Therefore it is assumed that existing noise levels are 2 dB(A) less than those measured on Moodie Street.

Noise monitoring was conducted continuously for the period of one week. Based upon information provided by Community Relations – Bridge to Bay Alliance, some periods have been excluded from the determination of the rating background level as they were heavily influenced by noise from the Victoria Road roadworks. These roadworks continued for a series of months and it was not possible to obtain an entire week of monitoring in the absence of the roadworks. However, the measurements made from 4 August to 11 August, 2009 excluding roadwork periods are considered representative of the background noise levels in the area and have been used to determine environmental noise emission criteria for all nearby sensitive receivers.

The equipment used for site measurements at 9 Moodie Street was a Svan 949 Sound and Vibration Level Meter and Analyser, serial number 8533. The equipment used for site measurements at Balmain Leagues Club was a Svan 949 Sound and Vibration Level Meter and Analyser, serial number 8197. The Svan 949 Sound and Vibration Meter and Analyser are Type 1 sound level meters. Calibration of the meters was checked on site with a Rion NC74 Sound Calibrator (serial number 34283659) at the beginning and end of the measurement period. No significant drift in calibration was observed. All the instrumentation employed during the noise measurements comply with the requirements of AS1259.2-1990 "Acoustics – Sound level meters – Part 2: Integrating – Averaging" and they carry appropriate calibration certificates. The noise measurements have been conducted in accordance with AS1055.1 – 1997.

## 2.1 Road traffic noise measurements

Two noise loggers were used to continuously measure the noise levels produced by traffic using Victoria Road, Waterloo Road and Moodie Street. The monitoring locations were at Balmain Leagues Club, Victoria Road boundary and 9 Moodie Street, refer to Figure 1-1. The loggers were set for sample periods of 15 minutes and continuously logged for a period of eight days from Tuesday 4 August to Wednesday 12 August, 2009 at Balmain Leagues Club and 9 Moodie Street.

The loggers measured the noise levels over the sample period and then determined  $L_{A10}$ ,  $L_{A90}$ ,  $L_{Amax}$ , and  $L_{Aeq}$  levels of the noise environment. The  $L_{A10}$  and  $L_{A90}$  levels are the levels exceeded for 10% and 90% of the sample period respectively. The  $L_{Amax}$  is indicative of the maximum noise levels due to individual noise events such as the pass-by of a heavy vehicle. The  $L_{A90}$  is taken as the background noise level. The  $L_{Aeq}$  level is the equivalent

continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

The calculated noise levels for the daytime and night-time periods are listed in Table 2-1. Graphical representations of the logged noise levels are included in Appendix B.

#### Table 2-1 Traffic noise levels over the measurement period

	Day		Night	
Location	L <sub>Aeq, 1hr</sub> , dB(A)		L <sub>Aeq, 1hr</sub> , dB(A)	L <sub>Aeq, 9hr</sub> , dB(A)
Balmain Leagues Club, Victoria Road Facade	77	76	75	72
9 Moodie Street, Rozelle	62	60	56	54

\*Note: Measured noise levels from 10 pm to 6 am Sunday 9<sup>th</sup> Monday 10<sup>th</sup> and Tuesday 11<sup>th</sup> August, 2009 have been excluded from the Balmain Leagues Club results as road works associated with the inner west busway appear to have influenced noise levels during these periods.

## 2.2 Ambient noise level measurements

Background noise levels were monitored in two locations near the development site. The monitoring locations were at Balmain Leagues Club on the Victoria Road boundary and 9 Moodie Street, Rozelle. The loggers were set for sample periods of 15 minutes. The loggers at Balmain Leagues Club and 9 Moodie Street continuously logged for a period of eight days from Tuesday 4 August to Wednesday 12 August, 2009.

The background noise level is defined by the OEH as 'the underlying level of noise present in ambient noise when all unusual extraneous noise is removed'. It can include sounds that are normal features of a location and may include birds, traffic, insects etc. The background noise level is considered to be represented by the  $L_{A90}$  descriptor. The noise levels measured at the proposed development site were analysed to determine a single assessment background level (ABL) for each day, evening and night period in accordance with the OEH's NSW Industrial Noise Policy (INP), for each monitoring location.

The ABL is established by determining the lowest ten percentile level of the  $L_{A90}$  noise data acquired over each period of interest. Table 2-2 presents individual ABL's for each day's assessment periods.

The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring period. Table 2-2 also presents the existing  $L_{Aeq}$  ambient noise level selected for each day, evening and night-time period, in accordance with the INP. An overall representative  $L_{Aeq}$  noise level is determined by logarithmically averaging each assessment period for the entire monitoring period.

As mentioned previously the loggers were located so as not to be affected by noise from the existing club.

Measurement Date	L <sub>A90</sub> Background Noise Levels, dB(A)			L <sub>Aeq</sub> Ambient Noise Levels, dB(A)			
	Day	Evening	Night	Day	Evening	Night	
Balmain Leagues Club, Victoria Road Facade							
Tuesday 4 August, 2009		60	50		75	71	
Wednesday 5 August, 2009	63	61	51	76	75	72	
Thursday 6 August, 2009	62	60	52	77	76	72	
Friday 7 August, 2009	63	60	54	77	75	73	
Saturday 8 August, 2009	62	60	56	76	75	73	
Sunday 9 August, 2009	62	59	-	76	74	-	
Monday 10 August, 2009	62	60	-	77	76	-	
Tuesday 11 August, 2009	64	61	-	77	77	-	
RBL/Log Average	62	60	52	77	75	72	
9 Moodie Street, Rozelle							
Tuesday 4 August, 2009		44	38		59	54	
Wednesday 5 August, 2009	47	44	37	61	59	55	
Thursday 6 August, 2009	47	45	38	61	57	53	
Friday 7 August, 2009	49	45	40	61	59	53	
Saturday 8 August, 2009	48	44	40	60	58	53	
Sunday 9 August, 2009	46	43	36	60	57	53	
Monday 10 August, 2009	46	44	37	60	56	53	
Tuesday 11 August, 2009	48	44	38	62	59	56	
RBL/Log Average	47	44	38	61	58	54	

Notes:

• Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays.

• Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays.

• Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and Public Holidays.

Measured noise levels from 10 pm to 6 am Sunday 9<sup>th</sup> Monday 10<sup>th</sup> and Tuesday 11<sup>th</sup> August, 2009 have been excluded from the Balmain Leagues Club results as road works associated with the inner west busway appear to have influenced noise levels during these periods. Road works on Victoria Road do not appear to affect the L<sub>A90</sub> and L<sub>Aeq</sub> noise levels during other periods and/or at other locations.

The noise loggers located at Balmain Leagues Club and 9 Moodie Street, Rozelle were also configured to monitor 1/3 octave band noise levels. The octave band spectrums for the quietest 15 minutes between the hours of 7 am and 12 midnight and 12 midnight and 7 am for each location for the noise monitoring period are presented below in Table 2-3.

	L <sub>90</sub> Background Noise Level, dB								
Time Period	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
Balmain Leagues Club, Victoria Road Facade									
7:00 am to 12 midnight	58	62	58	54	49	48	45	35	29
12 midnight to 7:00 am	56	60	58	51	44	43	38	30	29
9 Moodie Street, Rozelle									
7:00 am to 12 midnight	43	43	42	36	34	35	29	21	22
12 midnight to 7:00 am	40	41	38	33	30	31	25	20	22

## 3.0 Noise criteria

The proposed development has the potential to contribute to the existing external noise environment. Noise will be generated by the traffic movements of residents and visitors to the development and operation of mechanical services plant servicing the various components of the development. In order to ensure nearby residential properties are not adversely affected by noise emission, as described above, environmental noise criteria are established and must be applied at the most affected residential boundary for mechanical services and industrial noise and at 1 metre from the affected building façade for road traffic noise.

This section will establish criteria in order to address the following acoustical issues:

- Internal mechanical services noise levels;
- Road traffic noise intrusion;
- External environmental noise emission levels for mechanical service;
- Operational noise emission from external areas of the childcare centre and club;
- Office of Liquor, Gaming and Racing criteria;
- Noise emitted from additional traffic associated with the development; and
- BCA 20011 acoustic requirements.

## 3.1 Recommended ambient internal noise levels

The internal noise level in the development will be generated by the air conditioning and mechanical ventilation plant servicing the development and traffic noise intrusion.

## 3.1.1 Traffic noise intrusion

Internal noise levels due to traffic noise must comply with the State Environmental Planning Policy (Infrastructure) 2007 (SEPP 2007) and the DoP's document 'Development near Rail Corridors and Busy Roads – Interim Guidelines'. It should be noted that the criteria detailed in the SEPP are identical to those in the Interim Guidelines. The SEPP 2007 criteria for road traffic noise intrusion are 40 dB(A) for living areas and 35 dB(A) for sleeping areas.

## 3.1.2 Traffic induced vibration and ground-borne noise

The DoP's document 'Development near Rail Corridors and Busy Roads – Interim Guidelines presents vibration criteria for sensitive receivers. Road traffic does not generate significant levels of vibration on normal roads therefore this issue has not be addressed further in this report.

It is understood that the development of a CBD Metro Station and rail operations were previously planned in the vicinity of Rozelle Village. If this were to proceed it is likely that the railway track will be constructed so as to achieve vibration isolation from the rail tunnel (eg by use of floating slab track technology). As a result no further treatment will be required to be incorporated into the proposed Rozelle Village development in order to meet the requirements of the SEPP in terms of vibration and ground-borne noise.

## 3.1.3 Building services noise

Internal noise levels due to mechanical services noise are recommended to comply with Australian Standard AS/NZS 2107:2000 "Acoustics – Recommended design sound levels and reverberation times for building interiors" which recommends satisfactory and maximum internal noise levels for building interiors based on room designation and location of the development with respect to external noise sources. Internal noise levels due to air conditioning and mechanical ventilation plant should not exceed the maximum levels recommended in this Standard. The levels for areas relevant to the development are given in Table 3-1. Generally the midpoint of the internal noise level range should be adopted as the internal design noise criterion for mechanical plant noise.

The store and the state	Recommended Design Sound Level, dB(A)			
Type of Occupancy/Activity	Satisfactory	Maximum		
Residential Buildings – Houses and apartments near n	najor roads			
Living areas	35	45		
Sleeping areas	30	40		
Work areas	35	45		
Apartment common areas (eg foyer, lift lobby)	45	55		
Common Areas				
Childcare centre	35	45		
Medical centre	40	45		
Corridors and lobbies	40	50		
Cafeterias and food courts	45	55		
Coffee bars	45	50		
Restaurants	45	50		
Pool	45	50		
Enclosed carparks	55	65		
Retail show rooms	45	50		
Small retail stores (general)	45	50		
Speciality shops (where detailed discussion is necessary in transactions)	40	45		
Supermarkets	50	55		
Shopping malls	45	55		
Small office	40	45		
Fitness centre	50	55		

#### Table 3-1 Recommended design sound levels for residential areas

The recommended noise levels are given in terms of equivalent continuous A-weighted noise levels (L<sub>Aeq</sub>).

## 3.2 Recommended reverberation times

A room's 'liveliness' can be quantified through the measurements of its 'reverberation time'. In layman terms, reverberation is the build up of sound within a room due to multiple reflections from the room's surfaces. The reverberation time is a measure of how long it takes for a burst of sound to decay 60 dB and is given the abbreviation of  $RT_{60}$ . A 'lively' room (e.g. a tiled bathroom with lots of hard surfaces) has a long reverberation time, and an acoustically 'dead' room (e.g. a carpeted office with mineral fibre ceiling tiles) has a short reverberation time.

Reverberation control is necessary for two important reasons:

- Excessive reverberation makes speech more difficult to follow as the sounds of one word are blurred into the next. In extreme cases it may be necessary to talk more slowly in order to be understood; and
- A noise source, such as air conditioning equipment or even people talking, will generate greater sound
  pressure levels in a reverberant space because the sound energy takes longer to decay.

A noise source in a 'lively' room can be up to approximately 5-7 dB(A) louder than in an acoustically dead room. Therefore, it is important when designing 'quiet' spaces that the surface area of sound absorptive finishes is maximised.

Table 3-2 Recommended reverberation times AS2107:2000

Type of Occupancy/Activity	Recommended Reverberation Time (s)			
Residential Buildings – Houses and apartments near major roads				
Living areas	-			
Sleeping areas	-			
Work areas	-			
Apartment common areas (eg foyer, lift lobby)	Note 1			
Common Areas				
Childcare centre	0.4 – 0.5			
Medical centre	0.4 - 0.6			
Corridors and lobbies	0.4 - 0.6			
Cafeterias and food courts	Note 1			
Coffee bars	< 1.0			
Restaurants	< 1.0			
Pool	Note 1			
Enclosed carparks	-			
Show rooms	Note 1			
Small retail stores (general)	Note 1			
Speciality shops (where detailed discussion is necessary in transactions)	Note 1			
Supermarkets	Note 1			
Shopping malls	Note 1			
Small office	0.4 - 0.6			
Fitness centre	Note 1			

Note 1: Reverberation should be minimised as far as practicable for noise control.

## 3.3 Traffic noise criteria

Noise from traffic movements to and from the site including truck and car movements will be assessed using the OEH's document *NSW Road Noise Policy* (RNP). Two vehicle access points are proposed for the Rozelle Village development site. The main vehicle access will belocated on Victoria Road and a secondary residents only access at Waterloo Street. Essentially the Victoria Road access will provide access to all public car parking spaces for the development's non residential land uses such as the retail areas, gym, commercial etc and the site's loading dock facility.

Victoria Road is classified as an arterial road, Darling Street is classified as sub-arterial road and Waterloo Street, Moodie Street and Cambridge Street are classified as local roads.

Table 3-3 presents the OEH's road traffic noise assessment criteria for residential land use developments with potential to create additional traffic on existing roads. The external criteria are assessed at 1 metre from the affected residential building façades and at a height of 1.5 metres from the floor.

Table 3-3 Road traffic noise assessment criteria for residential land uses

Deed Cotomony		Assessment criteria - dB(A)		
Road Calegory	Type of projectiland use	Day (7am – 10pm)	Night (10pm – 7am)	
Freeway/arterial /sub-arterial roads	3. Existing residences affected by <b>additional</b> <b>traffic</b> on existing freeways/arterial/sub- arterial roads generated by land use developments	L <sub>Aeq(15hr)</sub> 60	L <sub>Aeq(9hr)</sub> 55	
Local roads	6. Existing residences affected by <b>additional traffic</b> on existing local roads generated by land use developments	L <sub>Aeq(1hr)</sub> 55	L <sub>Aeq(1hr)</sub> 50	

Note: In cases where noise from an existing road already exceeds the above criteria:

1. The OEH recommends that "where feasible, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments."

2. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB(A).

In addition to above assessment criteria, the RNP requires any increase in the total traffic noise level at a location due to a proposed project or traffic-generating development to be considered. The relative increase criteria outlined in the RNP is presented in Table 4.

## Table 4 Relative increase criteria for residential land uses

Read Catagory	Turne of preject/land use	Assessment criteria - dB(A)			
Road Category	rype of project/land use	Day (7am – 10pm)	Night (10pm – 7am)		
Freeway/arterial /sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic L <sub>Aeq(15hr)</sub> + 12 dB (external)	Existing traffic L <sub>Aeq(9hr)</sub> +12 dB (external)		

## 3.4 Environmental noise emission criteria

Leichhardt Council advise that the OEH's NSW Industrial Noise Policy should be used to assess noise emission from developments.

## 3.4.1 Office of Environment and Heritage's criteria

The NSW OEH's Industrial Noise Policy (INP) for the assessment and control of industrial noise sets out guidelines for industrial noise. These guidelines will apply to all mechanical plant installed at the development.

The assessment procedure for industrial noise sources has two components:

- Controlling intrusive noise impacts in the short term for residences; and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

## 3.4.1.1 Intrusive noise impacts

The INP states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noise sources are generally considered to be acceptable if the equivalent continuous (energy-averaged) A-weighted level of noise from the source ( $L_{Aeq}$ ), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the INP. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

Table 3-5 Environmental noise emission intrusiveness criterion

Period	RBL (L <sub>A90</sub> ), dB(A)	Intrusiveness Criterion (RBL + 5), dB(A)						
Balmain Leagues Club, Victoria Road Facade								
Day	62	67						
Evening	60	65						
Night	52	57						
9 Moodie Street, Rozelle								
Day	47	52						
Evening	44	49						
Night	38	43						
Waterloo Street, Rozelle*								
Day	45	50						
Evening	42	47						
Night	36	41						

\*Based on noise levels measured on Moodie Street - 2dB(A) due to shielding

## 3.4.1.2 Protecting noise amenity

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in the INP. That is, the background noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the Background Creep or Amenity Criterion.

For a residential receiver in an suburban area, the recommended amenity criteria are shown in Table 3-6.

Table 3-6 Recommnded  $L_{Aeq}$  noise levels from industrial noise sources

	Indicative Noise		Recommended L <sub>Aeq</sub> Noise Level, dB(A)			
Type of Receiver	Amenity Area	Time of Day	Acceptable	Recommended Maximum		
Residential	Urban	Day	60	65		
		Evening	50	55		
		Night	45	50		
Commercial	All	When in Use	65	70		

When the existing noise level from *industrial noise sources* is close to the "Acceptable Noise Level" (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the INP. However, industrial noise is not significant at this site with the dominant source being road traffic. Where existing road traffic noise is high enough to render stationary noise sources effectively inaudible, the ANL can be modified so that the amenity criteria is not unduly stringent in an environment where traffic noise is the dominant source of environmental noise. However this is not the case at the proposed development location.

## 3.4.1.3 Resultant OEH environmental noise criteria

A summary of the intrusive and amenity criteria is given in Table 3-7. These criteria must be applied at the most affected residential boundary.

Period	RBL (L <sub>A90</sub> )	Intrusiveness Criterion	Existing L <sub>Aeq</sub>	Amenity Criterion	Final Environmental Criterion				
Balmain Leagues Club, Victoria Road Facade									
Day	62	67	77	67	67				
Evening	60	65	75	65	65				
Night	52	57	72	62	57				
9 Moodie Street, Rozelle									
Day	47	52	61	60	52				
Evening	44	49	58	50	49				
Night	38	43	54	45	43				
Waterloo Street,	Rozelle*								
Day	45	50	59	60	50				
Evening	42	47	57	50	47				
Night	36	41	52	45	41				

Table 3-7 Summary of environmental noise criteria

\*Based on noise levels measured on Moodie Street - 2dB(A) due to shielding

These criteria apply to environmental noise emissions from the development including mechanical services and other plant noise, loading dock noise and car parking noise.

## 3.5 Childcare centre operational noise emission criteria

The Association of Australian Acoustical Consultants (AAAC) has published a document titled "Guideline for Child Care Centre Acoustic Assessment". This guideline provides noise criteria to assess operational noise emission from child care centres. The *'criteria for Child Care Centres are based around an emergence above the background noise level, except where existing noise levels are high.'* 

A summary of the child care centre noise criteria is presented in Table 3-8 below.

Table 3-8– Child care centre operational noise criteria

Source and receiver types	Criteria description	Project specific criteria
Residential Receivers		
Outdoor Play Area (up to 2 hours (total) per day)	Background + 10 dB	L <sub>eq,15 min</sub> ≤ 55 dB(A)
Outdoor Play Area (More than 2 hours per day)	Background + 5 dB	L <sub>eq,15 min</sub> ≤ 50 dB(A)
Indoor play area, mechanical plant, pick up and drop off	Background + 5 dB	L <sub>eq,15 min</sub> ≤ 50 dB(A)
Commercial Receivers	-	L <sub>eq,15 min</sub> ≤ 65 dB(A)
Traffic Noise	-	L <sub>eq,1 hr</sub> ≤ 50 dB(A)

## 3.6 Office of Liquor, Gaming and Racing criteria

The OLGR, through the Liquor Act 1982 and the Registered Clubs Act 1976, is the Regulatory Authority responsible for noise emission from licensed premises. The OLGR criterion states that the  $L_{10}$  noise level emitted by licensed premises is not to exceed the background noise level by more than 5 dB between 7 am and 12 midnight in any octave band (between 31.5 Hz and 8000 Hz). Between 12 midnight and 7 am, the  $L_{10}$  level of noise from the licensed premises shall not exceed the background in any octave band (between 31.5 and 8000 Hz) and shall not be audible within any habitable room of a residence. The OLGR noise criteria are shown in Table 3-9.

## Table 3-9– Music and people noise criteria

	OLGR Criteria, dB									
Time Period	Octave	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
Balmain Leagues Club, Victoria Road Facade										
7:00 am to 12 midnight	63	67	63	59	54	53	50	40	34	59
12 midnight to 7:00 am	56	60	58	51	44	43	38	30	29	50
9 Moodie Street, Rozelle										
7:00 am to 12 midnight	48	48	47	41	39	40	34	26	27	44
12 midnight to 7:00 am	40	41	38	33	30	31	25	20	22	35
Waterloo Road, Rozelle*										
7:00 am to 12 midnight	46	46	45	39	37	38	32	24	25	42
12 midnight to 7:00 am	38	39	36	31	28	29	23	18	20	33

\*Based on noise levels measured on Moodie Street - 2dB(A) due to shielding

## 3.7 Construction acoustic performance – BCA compliance

The objective of Part F of the BCA is to safeguard occupants from illness or loss of amenity as a result of undue sound being transmitted between adjoining sole-occupancy units, from common spaces to sole occupancy units and from parts of different classifications to sole-occupancy units.

## 3.7.1 Relevant BCA clauses

Clauses relevant to the acoustic compliance with the BCA have been extracted from Part F of the BCA and are listed below in Italics.

## 3.7.1.1 Performance requirements

The BCA performance requirement FP5.1 for a Class 2 or 3 building states:

Floors separating-

- (a) sole-occupancy units; or
- (b) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or a part of a different classification.

must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.

The BCA performance requirement FP5.2 for a Class 2 or 3 building states:

Walls separating sole-occupancy units or a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby, or the like, or parts of a difference classification, must provide insulation against the transmission of-

- (a) airborne sound; and
- (b) impact generated sound, if the wall is separating a bathroom, sanitary compartment, laundry or kitchen in one-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit, sufficient to prevent illness or loss of amenity to the occupants.

The BCA performance requirement FP5.3 for a Class 2 or 3 building states:

The required sound insulation of a floor or a wall must not be compromised by -

- (a) the incorporation or penetration of a pipe or other service element; or
- (b) a door assembly

## 3.7.1.2 Sound insulation of floors between units for a Class 2 or 3 building

The 'Sound Insulation Rating of Floors' provision F5.4 of the BCA states:

- (a) A floor in a Class 2 or 3 building must have an  $R_w + C_{tr}$  (airborne) not less 50 and an  $L'_{nw}+C_l$  (impact) not more than 62 if it separates-
  - (i) sole occupancy units; or
  - (ii) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.

## 3.7.1.3 Sound insulation of walls between units for a Class 2 or 3 building

The 'Sound Insulation Rating of Walls' provision F5.5 of the BCA states:

- (a) A wall in a Class 2 or 3 building must-
  - (i) have an  $R_w + C_{tr}$  (airborne) not less than 50, if it separates sole-occupancy units; and
  - (ii) have an  $R_w$  (airborne)not less than 50, it is separates sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and
  - (iii) be of discontinuous construction if it separates:
    - (A) a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or
    - (B) a sole-occupancy unit from a plant room or lift shaft.
- (b) A wall in a Class 2 or 3 building that separates a sole occupancy unit from a stairway, public corridor, public lobby or the like, may incorporate a door provided the door assembly has an R<sub>w</sub> not less than 30.
- (c) Where a wall required to have sound insulation has a floor above, the wall must continue to-
  - (i) the underside of the floor above; or
  - (ii) a ceiling that provides the sound insulation required for the wall.
- (d) Where a wall required to have sound insulation has a roof above, the wall must continue to
  - (i) the underside of the roof above; or
  - (ii) a ceiling that provides the sound insulation required for the wall.

## 3.7.1.4 Waste water pipes for a Class 2 or 3 building

The 'Sound Insulation Rating of Services' provision F5.6 of the BCA states:

- (a) If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an  $R_w + C_{tr}$  (airborne) not less than-
  - (i) 40 if the adjacent room is a habitable room (other than a kitchen); or
  - (ii) 25 if the adjacent room is a kitchen or non-habitable room.
- (b) If a storm water pipe passes through a sole-occupancy unit it must be separated in accordance with (a)(i) or (ii).

## 3.8 Construction noise objectives

The NSW OEH Interim Construction Noise Guidelines (ICNG) are used for construction noise assessment. This document supersedes their previous publication the Environmental Noise Control Manual (ENCM) and is used as the basis for establishing construction noise criteria.

Under the ICNG, a construction noise management plan is required to be compiled by the Contractor, prior to construction commencing. Noise management levels must be set for the daytime and must be complied with where reasonably practicable. Work that is proposed outside of standard working hours, as defined in the *ICNG*, generally requires strong justification.

The noise management plan should detail the "best practice" construction methods to be used, presenting a reasonable and feasible approach. The plan should identify the extent of the residential area affected and assess the impact on residents. The plan should detail any community relation programs that are planned e.g. prior notification for particularly noisy activities, letter box drop regarding out of hours construction work to be undertaken and a 24 hour contact phone number for residents to call should they have any complaints or questions.

The ICNG defines what is considered to be feasible and reasonable as follows:

#### Feasible

A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.

## Reasonable

Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.

The ICNG recommends that a quantitative assessment is carried out for all 'major construction projects'.

Predicted noise levels at nearby noise sensitive receivers (residential, commercial and industrial premises) are compared to the levels provided in Section 4 of the *ICNG*. Where an exceedance of the criteria is predicted the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact.

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Criteria for residential receivers are set using the information in .

Table 3-10 Noise at residences using quantitative assessment

Time of Day	Management Level, L <sub>Aeq,15min</sub> , dB(A)	How to Apply
ecommended andard hours: onday to Friday 7 am to 6 pm aturday 8 am to 1 pm o work on Sundays or iblic holidays		<ul> <li>The noise affected level represents the point above which there may be some community reaction to noise.</li> <li>Where the predicted or measured L<sub>Aeq (15 min)</sub> is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	<ul> <li>The highly noise affected level represents the point above which there may be strong community reaction to noise.</li> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:         <ul> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences</li> <li>if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul> </li> </ul>
Outside recommended standard hours	Noise affected RBL + 5 dB	<ul> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> <li>For guidance on negotiating agreements see section 7.2.2 (ICNG).</li> </ul>

\* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher

at upper floors of the noise affected residence.

Criteria for other sensitive land uses, such as schools, hospitals or places of worship are shown in Table 3-11.

Table 3-11 Noise at sensitive land uses (other than residences) using quantitative assessment

Land Use	Management Level, L <sub>Aeq,15min</sub> (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas(characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

Criteria for industrial and commercial premises are shown below:

- Industrial premises: external LAeq (15min) 75 dB(A)
- Offices, retail outlets: external L<sub>Aeq (15min)</sub> 70 dB(A)

The assessment of noise intrusion and emission is detailed in this section of the report with regard to the established criteria detailed in Section 3.0. The noise assessment has been based upon the following architectural drawings:

PA 102 – PA127 dated 10 February 2012.

## 4.1 Traffic noise

The existing traffic flows and nett increase in traffic flows provided by Halcrow Pacific Pty Ltd in their report Working Paper No. 4 – Paramics Modelling Results Report dated 10 February 2012 have been studied. It has been concluded that if the proposed development were to go ahead, traffic on surrounding roads would increase as detailed in Table 4-1.

Location	Existing		Nett Increase		% Increase		Increase in Noise Levels, dB(A)	
	7-8 am	8-9 am	7-8 am	8-9 am	7-8 am	8-9 am	7-8 am	8-9 am
Victoria Road								
- Iron Cove Bridge	5742	5044	-95	-124	-1.65	-2.46	0	0
- Terry St / Wellington St	5580	4851	-170	-66	-3.05	-1.36	0	0
- Wellington St / Darling St	4641	4084	62	59	1.34	1.44	0	0
- Darling St / Evans St	4668	4114	-54	94	-1.16	2.28	0	0
- North of Robert St	4892	4631	73	97	1.49	2.09	0	0
- The Crescent / Robert St	6157	6399	74	111	1.20	1.73	0	0
Darling Street								
- East of Victoria Rd	742	848	-6	-24	-0.81	-2.83	0	0
- Waterloo St / Victoria Rd	1018	1032	29	93	2.85	9.01	0	0
- West of Manning St	1079	1123	145	137	13.44	12.20	0.5	0.5
Moodie Street								
- West of Victoria Rd	236	154	27	67	11.44	43.51	0.5	1.5
Waterloo Street								
- Darling St / Moodie St	109	125	73	101	66.97	80.80	2	2.5
Wellington Street								
- East of Victoria Rd	607	528	116	195	19.11	36.93	1	1.5
Terry Street								
- East of Victoria Rd	397	563	97	4	24.43	0.71	1	0

Table 4-1 Summary of traffic flow increase in the am peak periods (vehicles/hr)

Location	Existing		Nett Increase		% Increa	se	Increase in Noise Levels, dB(A)	
	4-5 pm	5-6 pm	4-5 pm	5-6 pm	4-5 pm	5-6 pm	4-5 pm	5-6 pm
Victoria Road								
- Iron Cove Bridge	6135	5590	-107	234	-1.74	4.19	0	0
- Terry St / Wellington St	5919	5310	-5	292	-0.08	5.50	0	0
- Wellington St / Darling St	4938	4419	211	240	4.27	5.43	0	0
- Darling St / Evans St	4942	4441	83	138	1.68	3.11	0	0
- North of Robert St	5191	4687	77	129	1.48	2.75	0	0
- The Crescent / Robert St	6840	6355	178	173	2.60	2.72	0	0
Darling Street								
- East of Victoria Rd	950	897	26	72	2.74	8.03	0	0
- Waterloo St / Victoria Rd	1319	1142	70	246	5.31	21.54	0	1
- West of Manning St	1383	1018	57	292	4.12	28.68	0	1
Moodie Street								
- West of Victoria Rd	224	225	68	96	30.36	42.67	1	1.5
Waterloo Street								
- Darling St / Moodie St	104	125	81	101	77.88	80.80	2.5	2.5
Wellington Street								
- East of Victoria Rd	633	402	-128	221	-20.22	54.98	-1	2
Terry Street								
- East of Victoria Rd	6390	624	163	185	25.51	29.65	1	1

Table 4-2 Summary of traffic flow increase in the pm peak periods (vehicles/hr)

Location	Existing		Nett Increase		% Increase		Increase in Noise Levels, dB(A)	
	11-12 noon	12-1	11-12 noon	12-1	11-12 noon	12-1	11-12 noon	12-1
Victoria Road								
- Iron Cove Bridge	4893	5125	314	196	6.42	3.82	0	0
- Terry St / Wellington St	4682	4864	348	236	7.43	4.85	0	0.5
- Wellington St / Darling St	3584	3847	363	144	10.13	3.74	0	0.5
- Darling St / Evans St	3754	4052	338	39	9.00	0.96	0	0
- North of Robert St	4055	4359	254	86	6.26	1.97	0	0
- The Crescent / Robert St	5600	5989	263	84	4.70	1.40	0	0
Darling Street								
- East of Victoria Rd	959	969	173	138	18.04	14.24	0.5	0
- Waterloo St / Victoria Rd	1067	982	324	387	30.37	39.41	0.5	1
- West of Manning St	1173	977	335	383	28.56	39.20	1.00	1
Moodie Street								
- West of Victoria Rd	378	317	46	97	12.17	30.60	1	1.5
Waterloo Street								
- Darling St / Moodie St	187	208	76	91	40.64	43.75	2	2
Wellington Street								
- East of Victoria Rd	527	583	130	200	24.67	34.31	1	1.5
Terry Street								
- East of Victoria Rd	525	705	114	74	21.71	10.50	0.5	0.5

Table 4-3 Summary of traffic flow increase in the Saturday peak periods (vehicles/hr)

With the exception of Waterloo Street, any changes in road traffic noise levels on surrounding streets, occurring as a result of the proposed development, are under the 2 dB allowable increase. It should be noted that the road traffic noise levels in Waterloo Street comprise noise from traffic on Waterloo Street, Moodie Street, Darling Street and Victoria Road. Although the noise generated by traffic on Waterloo Street is likely to increase by 2.5 dB, the overall increase in road traffic noise on Waterloo Street is likely to be less than 2 dB given the minor increases in traffic noise levels from the other roads.

## 4.2 Mechanical services noise emission

Preliminary selections of mechanical plant have not been made at the time of writing this report. AECOM advises that all external mechanical plant will be assessed or re-assessed during the detailed design stage to ensure compliance with the acoustic criteria established in Section3.4.

The reviewed architectural drawings indicate that majority of mechanical plant serving the lower commercial and retail levels will be located in basement plant rooms. Mechanical plant serving the residential towers will be located in roof top plant rooms of the towers. Generally, noise emission from the plant located in the basement plant rooms can be sufficiently attenuated by the proposed development structure to comply with the relevant noise criteria at the nearest sensitive receivers. Noise emission from the plant located in the roof top plant room can be sufficiently mitigated by typical acoustic treatments to comply with the relevant noise criteria at the nearest sensitive receivers. Typical acoustic treatments include the use of acoustic louvres and barriers, plenums, in-duct attenuators, and acoustically treated supply and exhaust air fans.

## 4.3 Club areas

Acoustic strategies must be incorporated to the club design to control noise emission from the club, such as patron noise emission, entertainment/music noise emission and noise emission from gaming machines, to comply with the relevant criteria presented in Section 0 and 3.6 at the nearest sensitive receivers.

Noise emission from the club areas to lower level residential dwellings of the development will be required to meet the criteria presented in Section 3.4. Appropriate constructions must be designed and implemented during the detailed design stage, with the assistance of a qualified acoustic engineer, to ensure the criteria in Section 0 is met in the lower level residential apartments.

Typical acoustic treatments to control club noise emission will involve the use of absorptive finishes, acoustic barriers, restricting hours of use for any outdoor club areas, limiting of gaming machine volume levels and suitable slab-ceiling constructions. In addition, glazing solutions recommended for the development's residential areas will take into consideration noise intrusion from club activities to the internal residential areas.

## 4.4 Childcare centre

Acoustic strategies must be incorporated to the childcare centre to control noise emission from the childcare centre, and also to control noise intrusion into acoustically critical spaces of the childcare centre such as the sleeping areas.

AECOM has conducted an assessment of the potential noise impact from the operation of the child care centre on the nearest residential receivers. The assessment was based on the following assumptions representative of the worst case scenario.

- 30 children between the age of 0 to 2 playing on the outdoor terrace;
- 30 children between the age of 2 to 3 playing on the outdoor terrace;
- 30 children between the age of 3 to 6 playing on the outdoor terrace;
- The outdoor terrace of the child care is only operational during daytime period between 7:00am and 6:00pm; and
- The nearest sensitive residential receiver to the child care centre is the residence at 30 Waterloo Street, Rozelle.

The assessment based on the above representative worst case scenario indicates that the child care centre operational noise level at the nearest sensitive receiver is likely to be 48 dB(A). This resultant noise level can be assessed as complying with the AAAC guidelines set out in section3.5.

## 4.5 Swimming pools

The architectural design includes two swimming pools within the proposed development. One of the pools is within the gym/fitness centre on level 1 directly above a specialty retail space. The other pool is located within the residential communal area on level 3 directly above the childcare centre on level 2. AECOM recommends that regenerated noise from the use of the swimming pools must be assessed at detailed design stage to ensure the adjacent specialty retail space and childcare centre will be not adversely affected and comply with recommended internal noise level targets presented in section 3.1. Operational noise and vibration from plant equipment associated with the swimming pools must also be controlled to comply with relevant criteria.

## 4.6 Car park noise emission

All car parking associated with the proposed development will be located in basement carparks. Noise emission from the vehicle movements within the car park will be sufficiently attenuated by the proposed development structure to comply with the relevant criteria presented in Section 3.4.

Based upon the existing traffic flows and net increase in traffic flows provided by Halcrow, the maximum number of vehicle movements through the Waterloo Road access point will be 88 per hour. This will result in an environmental noise emission of 43 dB(A) at the nearest residential receivers located directly across Waterloo Road from the access point. This complies with the day and evening noise emission criteria. It is expected that vehicle movements during the night period will be significantly lower than the peak flow and compliance with the night criteria will also be achieved.

## 4.7 Loading dock noise emission

Access to the loading dock will be via Victoria Road and the loading dock is located on Basement Level 2. Noise emission from the loading dock will be sufficiently attenuated by the proposed development structure to comply with the relevant criteria presented in Section 3.4.

## 4.8 Acoustic separation of residential areas

## 4.8.1 Sole-occupancy unit to sole-occupancy unit

Wall and floor-ceiling constructions providing acoustic performances as specified by the BCA, and presented in Section 3.7, will provide sufficient acoustic separation between sole-occupancy units. The BCA has developed these minimum acoustic requirements to allow for areas of different usages, such as bathrooms, kitchens, bedrooms and other habitable areas, to be located adjacent though in separate sole-occupancy units whilst maintaining a suitable level of acoustic privacy.

Walls and floor-ceilings separating sole-occupancy units from other sole-occupancy units must provide the acoustic performances specified in the BCA.

## 4.8.2 Sole-occupancy unit to area of other use

Wall and floor-ceiling constructions providing the acoustic performance specified by the BCA, and presented in Section 3.7, will provide adequate acoustic separation between sole-occupancy units and most areas of a different usage.

Where plant rooms or other significant noise producing areas are located near to or adjacent to residential areas, the separating construction should also provide sufficient noise reductions so that noise levels within the residential areas comply with the satisfactory levels presented in Section 3.1. At the time of writing, sufficient details, such as plant selections, to determine the required constructions are not currently available. Construction details to limit the noise levels in the residential areas to the levels presented in Section 3.1 must be developed, in coordination with a qualified acoustic engineer, during the detailed design stage when required details are made available.

## 4.9 Residential glazing

In order to meet the requirements of the SEPP, detailed in Section 3.1, architectural recommendations have been provided below. It is noted the design of the residential components of the development are set back from Victoria Road, the lower levels therefore provide significant acoustic shielding to the residential component. Acoustic panelling is to be installed on all balcony soffits, in addition, the glazing systems presented in Table 4-4 are recommended to control internal noise levels in the habitable areas of the residential component of the proposed development.

Building	Levels	Bedrooms	Living rooms	Various
Podium	All	-	-	10(12)6
B1 East	1-9	10(12)6	10(12)6	-
	10-25	10.76(12)12.76	10.76(12)12.76	-
B1 West	All including SOHOs	10(12)6	10(12)6	-
B2	1-2, 15-17	10.76(12)12.76	10(12)8.38	-
	3-14	10.76(16)12.76	10.76(12)12.76	-

#### Table 4-4 Recommended glazing systems

Note:

10(12)6 Double glazed system comprising 10 mm monolithic glass and 6 mm monolithic glass either side of a 12 mm air gap

10(12)8.38 Double glazed system comprising 10 mm monolithic glass and 8.38 mm laminated glass either side of a 12 mm air gap

- 10.76(12)10.76 Double glazed system comprising 12.76 mm laminated glass and 10.76 mm laminated glass either side of a 12 mm air gap
- 10.76(16)12.76 Double glazed system comprising 12.76 mm laminated glass and 10.76 mm laminated glass either side of a 16 mm air gap

5.0

Conclusion

This report presents the results of a Noise and Vibration Impact Assessment of the proposed Rozelle Village development located on Victoria Road, Rozelle. Noise emission from the proposed development has been assessed. The environmental noise emission for the development is based upon the requirements of the OEH and the measured ambient noise levels at the site in accordance with Leichhardt Council.

The impact of noise emission from new or revitalised developments can be widespread when noise issues are not correctly considered. However, the acoustic assessment indicates that standard noise amelioration strategies will sufficiently treat noise emission to minimise possible acoustic impacts on neighbouring areas.

Predicted traffic noise increases generally comply with the applicable criteria outlined by the Road Noise Policy.

Environmental noise emission from the site will be controlled at all neighbouring residential premises by standard noise control techniques.

Based upon the assessment documentation there are no undue acoustic impacts and applicable criteria will be complied with at the nearest sensitive receivers.

Appendix A

# Glossary of Acoustic Terminology

# Appendix A Glossary of Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source					
Sound pressure level	The amount of sound at a specified point					
Decibel [dB]	The measurement	The measurement unit of sound				
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).					
Decibel scale	The decibel scale is logarithmic in order to produce a better representat of the response of the human ear. A 3 dB increase in the sound pressu level corresponds to a doubling in the sound energy. A 10 dB increase the sound pressure level corresponds to a perceived doubling in volume Examples of decibel levels of common sounds are as follows:					
	0dB(A)	Threshold of human hearing				
	30dB(A)	A quiet country park				
	40dB(A)	Whisper in a library				
	50dB(A)	Open office space				
	70dB(A)	Inside a car on a freeway				
	80dB(A)	Outboard motor				
	90dB(A)	Heavy truck pass-by				
	100dB(A)	Jackhammer/Subway train				
	110 dB(A)	Rock Concert				
	115dB(A)	Limit of sound permitted in industry				
	120dB(A)	747 take off at 250 metres				
Frequency [f]	The repetition rate corresponds to the high pitched sound	of the cycle measured in Hertz (Hz). The frequency pitch of the sound. A high frequency corresponds to a l and a low frequency to a low pitched sound.				
Equivalent continuous sound level [L <sub>eq</sub> ]	The constant soun time, would result i energy.	d level which, when occurring over the same period of n the receiver experiencing the same amount of sound				
L <sub>max</sub>	The maximum sou period	nd pressure level measured over the measurement				
L <sub>min</sub>	The minimum sour period	nd pressure level measured over the measurement				
L <sub>10</sub>	The sound pressur For 10% of the me	The level exceeded for 10% of the measurement period. asurement period it was louder than the $L_{10}$ .				
L <sub>90</sub>	The sound pressur For 90% of the me	e level exceeded for 90% of the measurement period. asurement period it was louder than the L <sub>90</sub> .				

Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The $L_{90}$ sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The $L_{\text{eq}}$ sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for <b>each day</b> of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the <b>entire length</b> of noise monitoring.

\*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols", the OEH's NSW Industrial Noise Policy and the OEH's Environmental Criteria for Road Traffic Noise.

# Appendix B

# Graphical Noise Monitoring Results

# Appendix B Graphical Noise Monitoring Results

## Balmain Leagues Club – Victoria Road Facade







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AECOM











## 9 Moodie Street, Rozelle



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