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Project: DOOLEYS EXTERNAL CAR PARK NOISE IMPACT ASSESSMENT

Prepared for: Dooleys Lidcombe Catholic Club Ltd

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# **EXECUTIVE SUMMARY**

Marshall Day Acoustics has conducted a noise impact assessment for a multi-level carpark associated with Dooleys Lidcombe Catholic Club proposed by Bouygues Construction. The proposed carpark will be constructed in place of several residential properties and will comprise of 5 levels of carparking inclusive of a roof top carpark with a total of 610 parking spaces.

This report assesses the operations of the car park against the requirements of the EPA's NSW Industrial Noise Policy (INP) and the EPA's Noise Guide for Local Government (NGLG).

Designs for the proposed multi-level carpark have been reviewed and the noise emissions from the proposed operation have been calculated to the nearest noise sensitive receivers. Based on the traffic volumes provided by GTA Consultants and the proposed design, noise emissions from the use of the carpark have been calculated and demonstrates compliance with the INP noise level criteria at the nearest residential receivers.

Furthermore, sleep arousal assessment based on maximum noise levels from vehicular activities on-site through the night-time period may be marginally exceeded at one residential receiver, located at 1 Board Street. However, existing traffic noise of vehicles passing along Board Street will already be at a similar or higher level to vehicle noise associated with the proposed carpark. Potential noise control measures to avoid sleep disturbance at this property would be to include 1 metre high concrete upturns along the eastern half of the southern façade for each parking level inclusive of the roof level parking area.

A graphical explanation of these noise control measures is shown in Figure 5 in the Discussion section of this report. An alternative potential noise control measure would be to mandate that all car parking spaces along the southern edge of the carpark are to be 'rear to curb' only (with the rear of the cars facing south across all parking levels). This would ensure keeping engine noise at the furthest possible distance from the resident.

Is should be noted that the above predictions assume that the front (northern) windows of 1 Board Street include a bedroom(s). If there are no bedroom windows on the front (northern) façade of the house the above treatments are unlikely to be required.



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### 1.0 INTRODUCTION

Construction of a multi-level carpark associated with Dooleys Lidcombe Catholic Club (Dooleys Club) has been proposed. Marshall Day Acoustics (MDA) has been engaged by Bouygues Construction to conduct an assessment of the potential noise impact from the proposed multi-level car park.

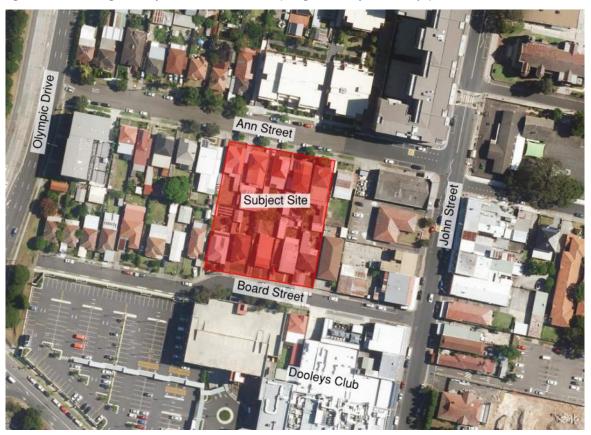
### 2.0 DEVELOPMENT DESCRIPTION

The current site consists of several residential properties. The proposed multi-level car park will be constructed in place of the current residential properties and will comprise of 5 levels of car parking inclusive of a roof top car park with a total of 610 parking spaces.

# 2.1 Subject Site

The subject site is located between Ann Street and Board Street, Lidcombe, directly adjacent to Dooleys Club. High density residential dwellings are located to the north and the east of the site. Low density residential dwellings are located to the west of the site. Dooleys Club is located to the south of the subject site across Board Street. The subject site is shown below in Figure 1.

Figure 1: Aerial image of subject site and surrounds (image courtesy of SIX Maps)





### 2.2 Relevant noise receivers

Details of the nearest noise sensitive receivers are provided below in Table 1.

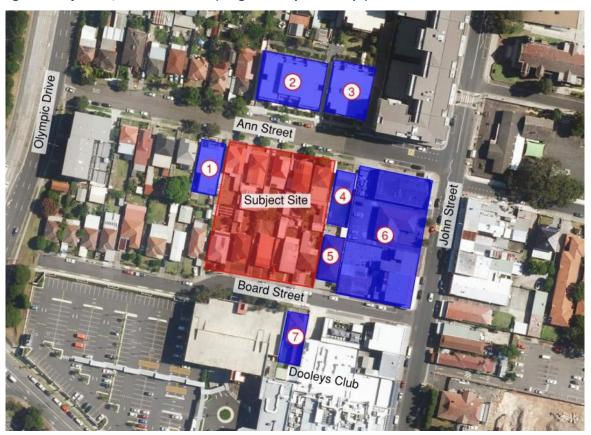
Table 1: Details of the nearest affected noise receivers

Receiver	Location	Туре	Description
1	13 Ann Street	Residential	Single storey residence
2	12 Ann Street	Residential	3 Storey residential units
3	2-10 Ann Street	Residential	4 Storey residential units
4	1 Ann Street	Residential	Assumed maximum 2 storey residential housing
5	2 Board Street	Residential	Single storey residence
6	36-44 John Street	Residential	Multi storey unit block (due completion 2017), 11 storey

Note: For the purpose of our assessment Receiver 4 is being treated as a maximum 2 story residential property as the site is currently being used to house a construction crane.

An aerial view showing the most sensitive residential and commercial receivers is provided in Figure 2.

Figure 2: Subject site, receiver locations (Image courtesy of SIX Maps)





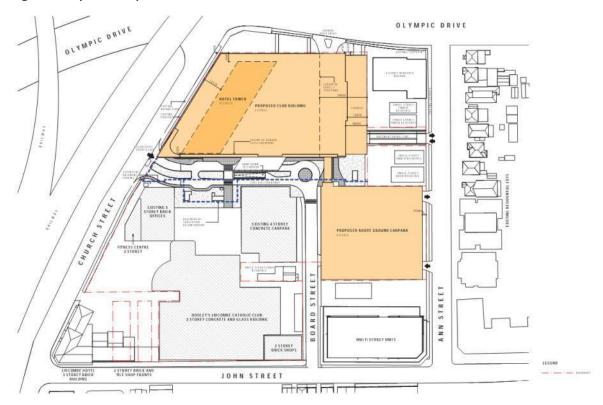
### 2.3 Proposed Works

The proposed works include the following:

- 5 level parking facility inclusive of roof top parking, built in place of the existing residential properties
- Total 610 car parking spaces

The proposed site plan is provided in Figure 3.

Figure 3: Proposed site plan



Predicted traffic volume assumptions for the carpark have been provided in the Dooleys Lidcombe Catholic Club Proposed Development Car Parking and Traffic Report ref. 16S1267000 (GTA Traffic Report) prepared by GTA Consultants, dated 8/7/2016. Traffic volumes have been provided in hourly blocks and overall period volumes. For calculation of 15-minute values we have assumed movements are spread equally within the hour. We have been advised by GTA Consultants the traffic volume projections have been extrapolated in the following manner:

- 1. Daytime non-peak hourly traffic = 80% of AM peak hour flow (busy)
- 2. Evening non-peak hourly traffic = 90% of PM peak hour flow (busiest)
- 3. Night non-peak hourly traffic = 25% of Midnight peak hour flow (least busy)

We have been advised by GTA consultants that these traffic numbers are worst case scenario assumptions based on the current usage of the Dooleys Lidcombe Catholic Club and have not been based on survey traffic data.

The worst case vehicle movement totals have been calculated by GTA and are presented in Table 2.



**Table 2: Proposed Car Park Activity Summary** 

Time Period	Description
Day	16 cars will enter or exit the proposed car park in the busiest 15 period
(0700-1800hrs)	576 car movements in the new car park during the evening time period
Evening	84 cars will enter or exit the proposed car park in the busiest 15 period
(1800-2200hrs)	1,244 car movements in the new car park during the evening time period
Night	42 cars will enter or exit the proposed car park in the busiest 15 min period
(2400-0700hrs)	507 car movements in the new car park during the night time period

Note: 1 car either entering or exiting the car park is classified as 1 movement for our calculations.

#### 3.0 ENVIRONMENTAL NOISE SURVEY

A noise assessment was carried out in accordance with the NSW Industrial Noise Policy (INP). A survey of baseline noise levels is required at locations that represent the most affected noise sensitive receivers at times when maximum impact is likely to occur.

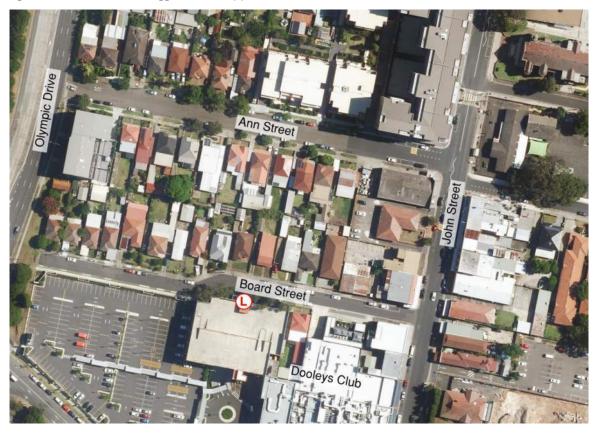
An unattended ARL noise logger was deployed on the roof of the existing Dooleys Car Park, the logger location is marked in Figure 4. Baseline ambient noise levels were measured between 21 November 2015 and 30 November 2015. Ambient noise levels measured at this location were used to establish the existing background noise levels at site.

In order to accurately determine existing ambient noise levels, any data affected by extraneous weather events including rainfall and heavy winds has been excluded in accordance with EPA guidance.

The INP the background noise level is known as the Rating Background Level (RBL). The RBL is calculated for the Day, Evening and Night-time period and shoulder periods, as defined in the INP.



Figure 4: Unattended ARL Logger Location (L)



The measured RBL is outlined in Table 3 below. Results for the entire survey period are summarised in Appendix A.

Table 3: Ambient noise level summary (RBL)

Period	Time Period	RBL, dB L <sub>A90</sub>	dB L <sub>Aeq</sub>
Day	0700-1800hrs	49	59
Evening	1800-2200hrs	49	54
Night	2200hrs-0700hrs	42	55



#### 4.0 ENVIRONMENTAL NOISE CRITERIA

Bouygues Construction have requested an acoustic assessment addressing the expected noise levels from the proposed multi-level carpark.

Noise criteria have been derived for the purpose of operation of the proposed Dooleys multi-level car park based on measured noise levels presented in Table 3. These are summarised in Table 4 below.

**Table 4: INP Criteria** 

Period	Time Period	Intrusiveness Criteria, Amenity Criter	
		dB L <sub>Aeq, 15min</sub>	dB L <sub>Aeq, period</sub>
Residential			
Day	0700-1800hrs	54	60
Evening	1800-2200hrs	54	50
Night	2200-0700hrs	47	45

# 4.1 Sleep disturbance

Noise criteria relating to sleep disturbance from vehicular activity have been derived based on the NGLG and RNP and are summarised in Table 5 with a full derivation in Appendix B.

Table 5: Sleep disturbance assessment

Assessment	Time of day	Time period	Criteria, dB
Screening Test	Night	2200-0700hrs	57dB L <sub>A1(60sec)</sub> (external)
RNP	Night	2200-0700hrs	50-55 L <sub>Amax</sub> (internal)
			Equivalent to 60-65dB L <sub>Amax</sub> (external)

### 5.0 RESULTS AND DISCUSSION

# 5.1 Calculation methodology

Carpark activities have been modelled with Bavarian Parking Area Noise study 2007 (Bayerisches Landesamt fur Umwelt) methodology. The study incorporates various selectable acoustic parameters  $K_{PA}$  and  $K_I$ . Values for  $K_{PA}$  and  $K_I$  have been taken from the study and incorporated into the modelling. Values of +3dB  $K_{PA}$  and +4dB  $K_I$  (+7dB total) have been applied for the correction factors. These values are based on noise levels from restaurant carparks.

#### 5.2 Calculated Noise Levels – INP Assessment

Based on the above traffic volumes, the anticipated noise levels from the proposed carpark have been calculated and are detailed in Table 6. For the purpose of this assessment only the evening and night-time periods have been assessed on the assumption that peak traffic periods for the Club occur during the Evening period compliance for the Evening and Night period is also expected to result in compliance during the Day period.



**Table 6: INP Compliance Assessment** 

Period	Calculated noise level dB L <sub>Aeq, 15mins</sub>	Intrusiveness criteria, dB L <sub>Aeq, 15mins</sub>	Compliance	Calculated noise level, dB L <sub>Aeq, period</sub>	Amenity criterion, dB L <sub>Aeq, period</sub>	Compliance
Receiver 1						
Evening	39	54	✓	37	50	✓
Night	36	47	✓	30	45	✓
Receiver 2						
Evening	50	54	✓	49	50	✓
Night	47	47	✓	41	45	✓
Receiver 3						
Evening	49	54	✓	48	50	✓
Night	46	47	✓	41	45	✓
Receiver 4						
Evening	39	54	✓	37	50	✓
Night	36	47	✓	30	45	✓
Receiver 5						
Evening	36	54	✓	34	50	✓
Night	29	47	✓	27	45	✓
Receiver 6						
Evening	44	54	✓	43	50	✓
Night	41	47	✓	35	45	✓
Receiver 7						
Evening	52	54	✓	50	50	✓
Night	45	47	✓	43	45	✓

Levels have been calculated to the worst affected point, this includes the upper storey windows of receivers adjacent to the carpark and looking down onto the carpark. Receiver 4 has been treated as a 2 storey property for the purpose of this assessment.

# Sleep Disturbance Assessment

To assess the potential for sleep disturbance, we have predicted maximum noise levels from vehicular access and car parking activity at the façade of the nearest affected receivers. The calculated noise levels are detailed in Table 7.



Table 7: Calculated L<sub>Amax</sub> noise levels

	Predicted maximum noise level, dB L <sub>Amax</sub>						
Noise source	Receiver 1	Receiver 2	Receiver 3	Receiver 4	Receiver 5	Receiver 6	Receiver 7
Car normal <sup>1</sup> operation	50	46	46	50	50	49	62

<sup>&</sup>lt;sup>1</sup> includes car engine start, door closing, and driving away

### 6.0 DISCUSSION

As seen in Table 6 the calculated noise levels from the proposed multi-level carpark are compliant with the EPA NSW Industrial Noise Policy.

As outlined in Table 7, there is generally compliance with guidelines for sleep arousal noise levels, with the exception of Location 7. At Location 7 maximum noise levels of 62dB are predicted externally at the front façade of 1 Board Street. This is above the "screening test" level of 57dB and as such the guidance within the EPA's Road Noise Policy has been referred to.

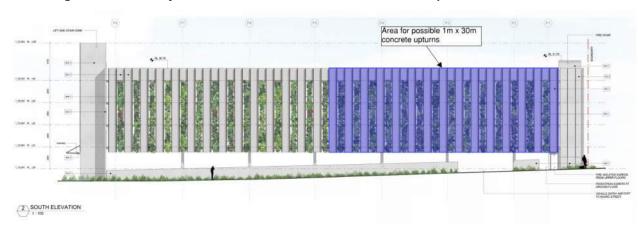
The RNP indicates that "maximum internal noise levels below 50-55dBA are unlikely to awake people from sleep". Based on this a noise level of  $60-65dB L_{Amax}$  outside an open bedroom window would be unlikely to cause awakening reactions (assuming that the facade of the residential building provides 10dB attenuation, which would be typical of a facade with partially open windows). The predicted level of 62dB falls within this range. We also note that existing road traffic passing along Board Street will already be at a similar or higher level to vehicle noise associated with the proposed carpark.

Potential noise control measures to avoid sleep disturbance at 1 Board Street would be to construct 1 metre high concrete upturns along the eastern half of the southern façade for each parking level inclusive of the roof level parking area. A graphical explanation of the area for these potential noise control measures is shown in Figure 5.

An alternative potential noise control measure would be to mandate that all car parking spaces along the southern edge of the carpark are to be 'rear to curb' only (with the rear of the cars facing south across all parking levels). This would ensure keeping engine noise at the furthest possible distance from the resident.

Is should be noted that the above predictions assume that the front (northern) windows of 1 Board Street include a bedroom(s). If there are no bedroom windows on the front (northern) façade of the house the above treatments are unlikely to be required.

Figure 5: Southern Façade Noise control measures: 1m x 30m concrete upturns





### **GLOSSARY OF TERMINOLOGY**

**Ambient** The ambient noise level is the noise level measured in the absence of the

intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a

new noise source.

dB <u>Decibel</u>

The unit of sound level.

Expressed as a logarithmic ratio of sound pressure P relative to a reference

pressure of Pr=20  $\mu$ Pa i.e. dB = 20 x log(P/Pr)

dBA The unit of sound level which has its frequency characteristics modified by a

filter (A-weighted) so as to more closely approximate the frequency bias of

the human ear.

**A-weighting** The process by which noise levels are corrected to account for the non-

linear frequency response of the human ear.

L<sub>Aeq (t)</sub> The equivalent continuous (time-averaged) A-weighted sound level. This is

commonly referred to as the average noise level.

The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period

of 15 minutes and (2200-0700) would represent a measurement time

between 10 pm and 7 am.

L<sub>A90</sub> The A-weighted noise level equalled or exceeded for 90% of the

measurement period. This is commonly referred to as the background noise

level.

**L**<sub>Amax</sub> The A-weighted maximum noise level. The highest noise level which occurs

during the measurement period.

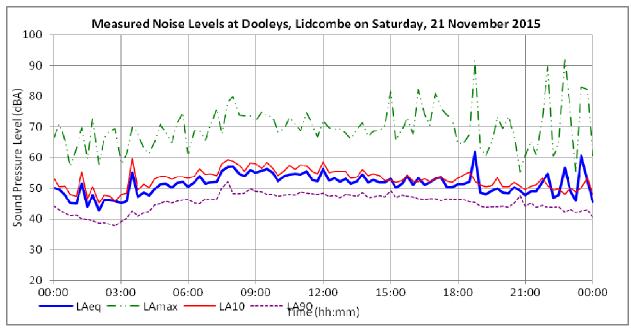
L<sub>A01</sub> The A-weighted noise level which is equalled or exceeded for 1% of the

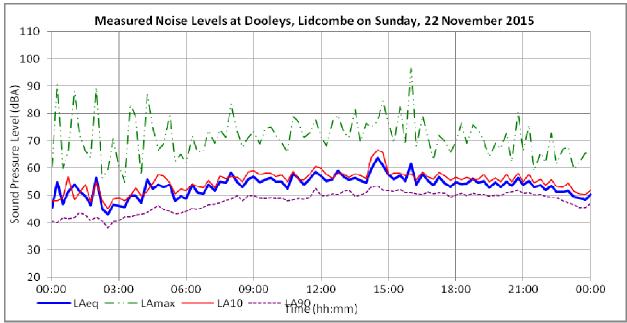
measurement period. This is sometimes referred to as the typical maximum

noise level.

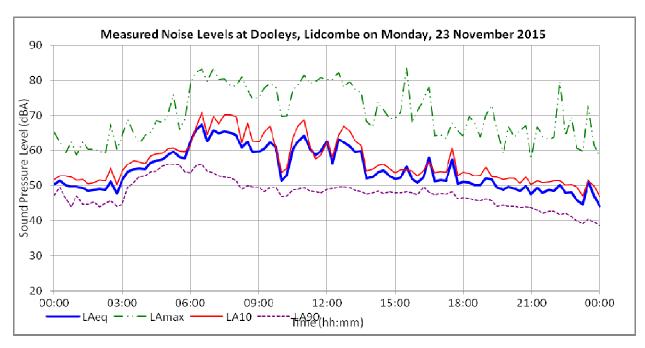


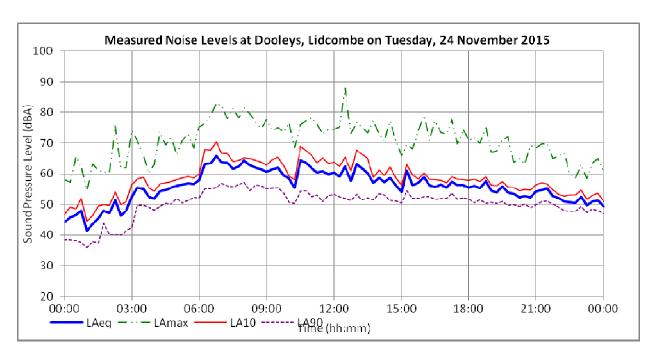
# APPENDIX A NOISE LOGGING DATA



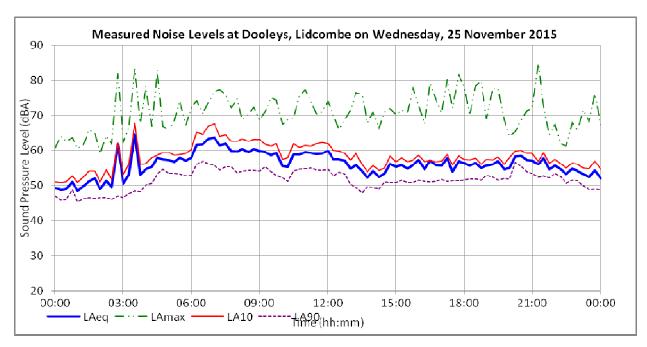


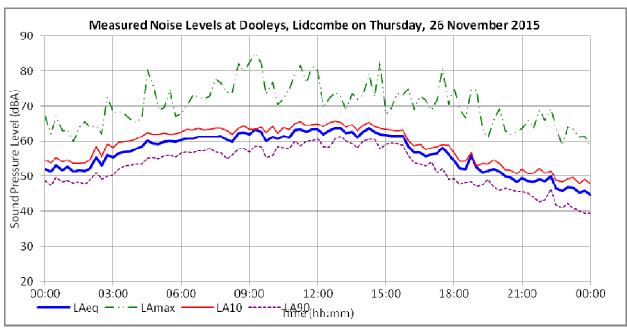




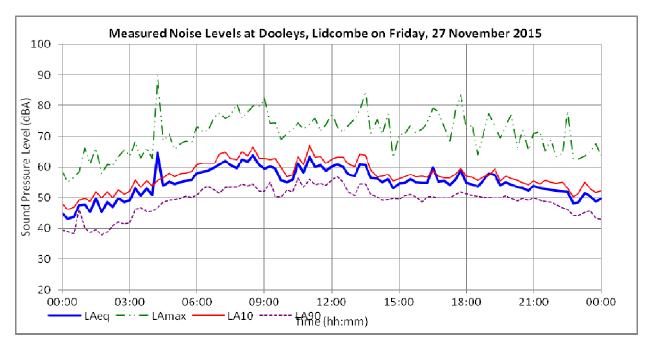


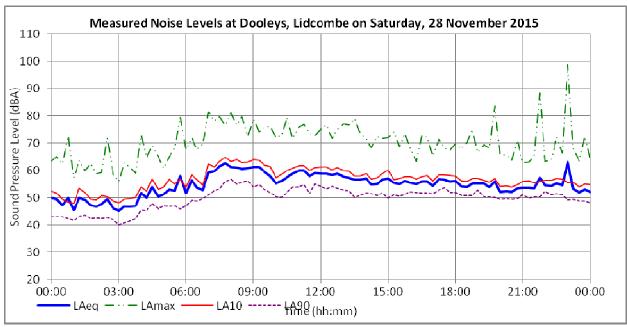




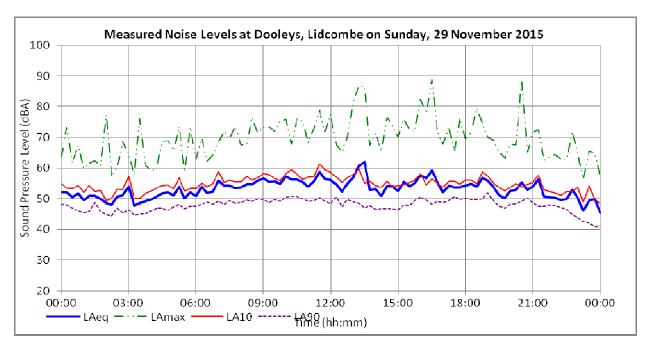


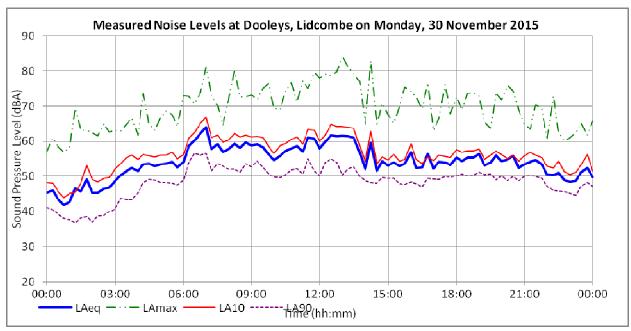




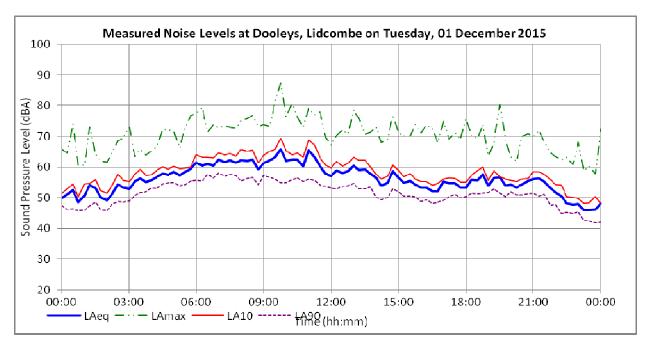


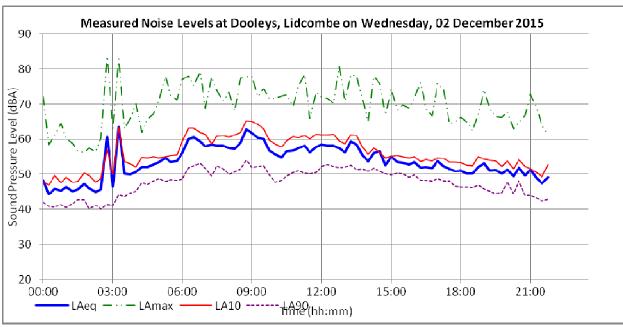














#### APPENDIX B ENVIRONMENTAL NOISE CRITERIA

### **B1** NSW Industrial Noise Policy

In NSW, the EPA INP is the guideline for assessing noise emissions from industrial and commercial facilities including vehicle movements on site.

The INP sets out a procedure where a development can be assessed against a series of noise level criteria. In the INP, these criteria are called the *project specific noise levels* and are derived from an analysis of the ambient noise environment and zoning information with the background level described as the Rating Background Level (RBL).

Unattended logging was conducted to determine background noise levels in the vicinity of the Dooleys Club in accordance with the NSW Industrial Noise Policy (INP) at a location identified in Figure 4 over the period of 21<sup>th</sup> November 2015 to 30 November 2015. Logger was located at Level 3 Dooleys Club carpark.

Unattended logging was conducted with an ARL EL-316 Type 1, calibrated before and after deployment and found to be within acceptable drift. Data has been excluded for periods of rain and high wind conditions as per Section 3.4 of the NSW INP.

To establish the representative RBL, the logger located at Level 3 of the Dooleys Club carpark was deemed to be representative of surrounding residences, without direct exposure to Olympic Drive. Observed noise sources at the logger location were;

- (dominant) road traffic from nearby Olympic Drive
- Passenger and freight train pass-by to nearby Lidcombe station
- (daytime) Occasional construction noise from building site, corner John Street and Board Street
- General urban hum

A summary of the background noise level measurements is shown in Table 8.

Table 8: Industrial Noise Policy time periods and ambient noise levels

Receiver	Period	Time of day	RBL L <sub>90</sub> dBA	L <sub>eq</sub> dBA
Residences	Day	0700-1800hrs	49	59
	Evening	1800-2200hrs	49	54
	Night	2400-0700hrs	42	55

Note 1: Periods correspond to;

Day: 7:00am to 6:00pm Monday to Saturday; or 08:00am to 6:00pm on Sundays and public holidays

Evening: 6:00pm to 10:00pm

Night: remaining periods



#### Intrusiveness criteria

The intrusiveness noise assessment is based on knowledge of the background noise level at the receiver location. The intrusiveness criterion is the background noise level at the nearest noise sensitive location plus 5 dB. Therefore the noise emissions from the premises are considered to be intrusive if the A-weighted source noise level ( $L_{Aeq, 15mins}$ ) is greater than the background noise level ( $L_{A90}$ ) plus 5 dB.

Based upon noise logging conducted, noise limits for intrusiveness have been derived in accordance with the INP and are presented in Table 9 below.

Table 9: Derived Intrusiveness criteria

Time of Day	Rating Background Level, L <sub>90</sub> dBA	Intrusiveness Criteria (RBL + 5 dB) L <sub>eq 15 min</sub> dBA
Day	49	54
Evening	49	54
Night	42	47

### Amenity criteria

The Amenity Criteria are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the Amenity Criteria is to correct the acceptable noise levels set for the appropriate amenity area with the baseline noise monitoring. Based on defining characteristics outlined by the INP, nearby receivers have been defined as an Urban.

The Acceptable and Recommended Maximum noise levels applicable for the residential receivers are detailed in Table 10 below.

Table 10: Recommended Amenity L<sub>Aeq</sub> noise levels

Period	Recommended Noise Level L <sub>eq</sub> dBA			
	Acceptable	Recommended Maximum		
Day	60	65		
Evening	50	55		
Night	45	50		

Source: Table 2.1 NSW DECCW Industrial Noise Policy

### B2 Sleep disturbance criteria

Noise Guide for Local Government

In its NGLG, the NSW EPA provides the following criteria as an example of a "screening test" to determine the potential for sleep arousal:

• The  $L_1$  level of any specific noise source should not exceed the background noise level ( $L_{90}$ ) by more than 15dBA when measured outside a bedroom window.

 $L_1$  is defined as the noise level that is exceeded for 1% of the measurement time and is similar to, but numerically lower than  $L_{max}$ . The EPA has stated that it will accept analysis based on either  $L_1$  or  $L_{max}$  descriptors.

In this instance, the screening criterion for sleep disturbance becomes  $57dB L_{Amax}$  at the facade of the nearest affected residential receivers.



INP

In the INP application notes dated 4 May 2006, the EPA have recognised that the above criteria are "not ideal". However, the EPA "will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not, a more detailed analysis is required."

The EPA recommends that detailed analysis is carried out to address the extent to which sleep disturbance may occur. The use of the RNP (formerly the ECRTN) by the EPA is recommended to review the extent of possible impacts.

The RNP suggests that potential sleep arousal from traffic should be assessed. The RNP has compared a number of sleep disturbance criteria and concluded the following:

- Maximum internal noise levels below 50-55dBA are unlikely to awake people from sleep
- One or two noise events per night, with maximum internal noise levels of 65-70dBA, are not likely to affect health and well-being significantly.

Based on these findings, a noise level of  $60-65dB \ L_{Amax}$  outside an open bedroom window would be unlikely to cause awakening reactions (assuming that the facade of the residential building provides 10dB attenuation, which would be typical of a facade with partially open windows). Furthermore, one or two events with a noise level of  $75-80dB \ L_{Amax}$  outside an open bedroom window would be unlikely to affect health and well-being significantly.



# APPENDIX H MARK-UP OF INTERNAL PARTITIONS

