MARSHALL DAY Acoustics

34-40 HUGUES STREET, CABRAMATTA
CAR PARK NOISE ASSESSMENT

Rp 001 R02 20181403 | 08 July 2019

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Project: **34-40 HUGUES STREET, CABRAMATTA**

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EXECUTIVE SUMMARY

Marshall Day Acoustics (MDA) has been engaged by Collins and Turner to conduct an assessment of the potential noise impact from the proposed multi-level car park to be constructed at 34-40 Hughes Street, Cabramatta. This assessment is to be submitted to Fairfield Council as part of the Development Application for this project.

The proposed multi-level car park will be constructed in place of the current at grade carpark and will comprise of 3 levels of car parking inclusive of a roof top car park with a total of 219 parking spaces.

This report assesses the operations of the car park against the requirements of the NSW EPA's *Noise Policy for Industry* (NPfI)

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 in traffic report *'MDACP Hughes Street, Traffic Impact Assessment'*, prepared by PTC Consultants, dated 29/11/2018 and the proposed design provided by Collins and Turner, noise emissions from the use of the carpark have been calculated and demonstrates compliance with the NPfI noise level criteria at the nearest residential and commercial receivers.

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1.0 INTRODUCTION

Construction of a multi-level carpark at 34-40 Hughes Street, Cabramatta has been proposed. Marshall Day Acoustics (MDA) has been engaged by Collins and Turner to conduct an assessment of the potential noise impact from the proposed multi-level car park to noise sensitive receivers in the area.

2.0 DEVELOPMENT DESCRIPTION

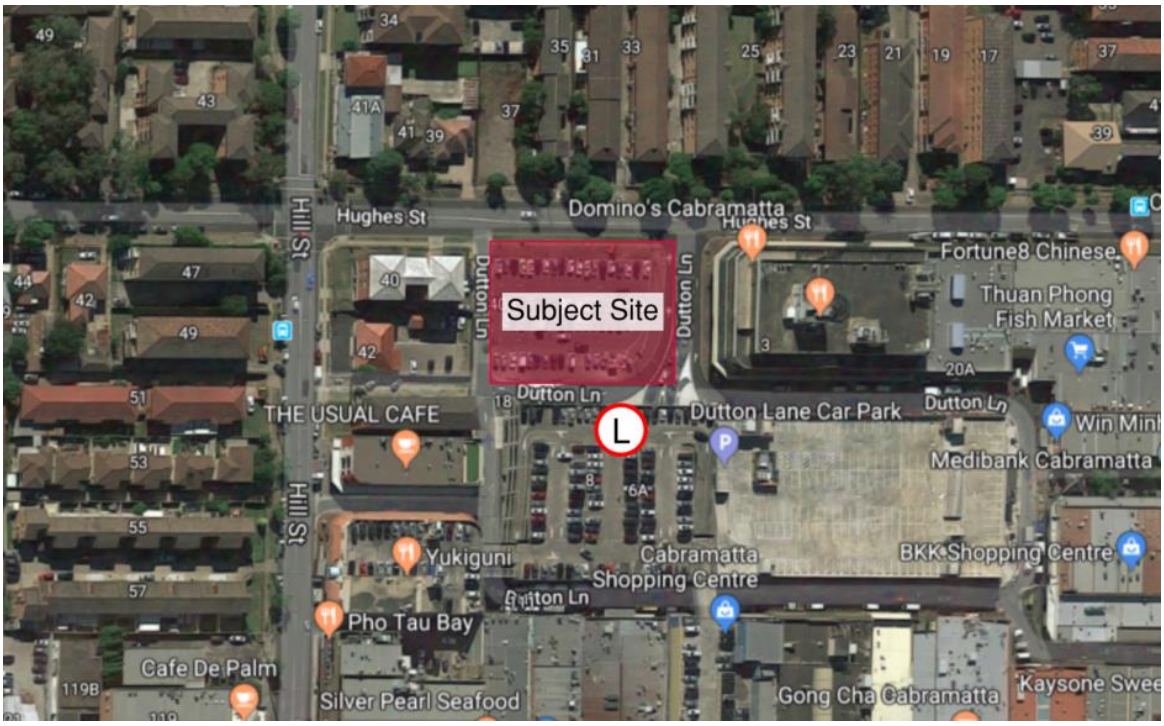
The current site consists of an at grade car park only. The proposed multi-level car park will be constructed in place of the current at grade carpark and will comprise of 3 levels of car parking inclusive of a roof top car park with a total of 219 parking spaces.

2.1 Subject Site

The subject site is located at 34-40 Hughes Street, Cabramatta, NSW. Hughes street and residential dwellings are located to the north of the site. Multi-level commercial building is adjacent to the east. An existing multi-level carpark is located directly to the south and will adjoin the proposed car park. Existing multi-level residential dwellings are located adjacent to the west of the subject site.

The subject site is shown below in Figure 1.

Figure 1: Proposed site and unattended logger location (L) (image courtesy of Google Maps)



2.2 Relevant noise receivers

Details of the nearest noise sensitive receivers are provided below in Table 1 and marked in Figure 2.

Table 1: Noise sensitive receivers

Receiver	Location	Type	Description
1	33-37 Hughes Street	Residential	2 story residential
2	30-32 Hughes Street	Commercial	Multi-level commercial businesses
3	40-44 Hughes Street	Residential	4 story residential

Figure 2: Subject site, noise sensitive receiver locations

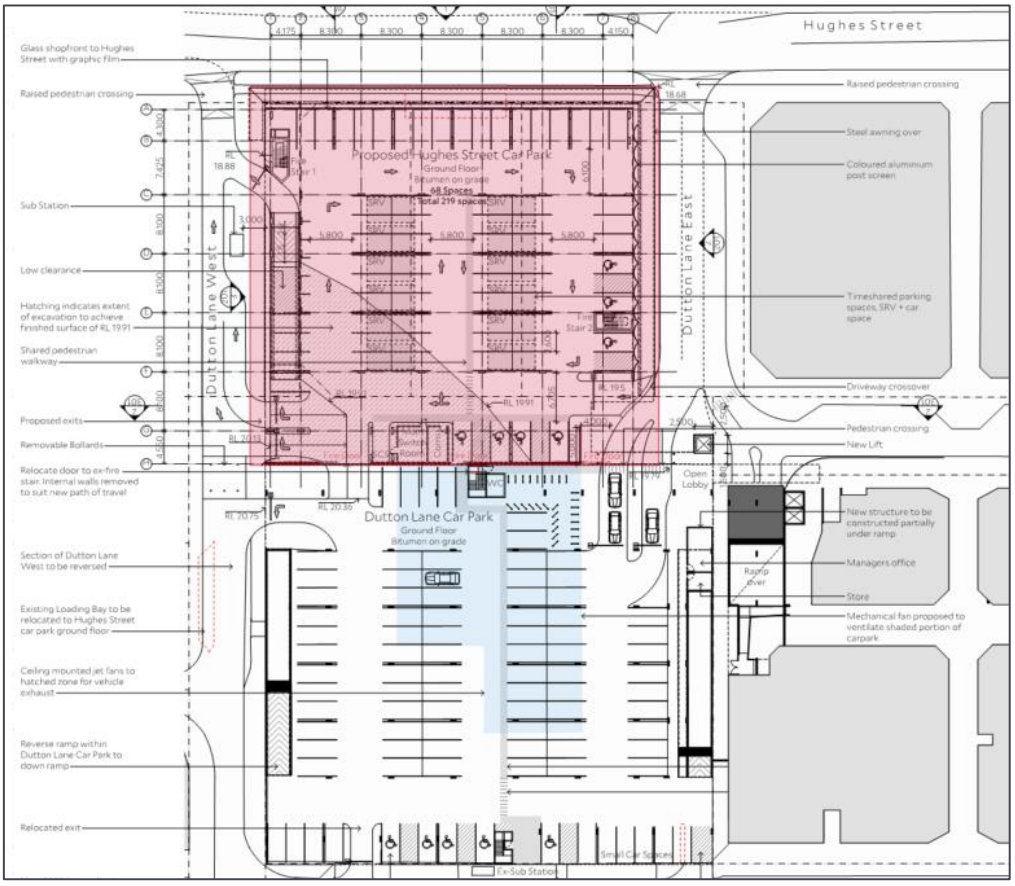
2.3 Proposed Works

The proposed works include the following:

- 3 level parking facility inclusive of roof top (open air) parking, built in place of existing at grade car park
- Total 219 car parking spaces

The proposed site plan is provided in Figure 3.

Figure 3: Proposed site plans



Predicted traffic volume assumptions for the carpark have been provided in traffic report 'MDACP Hughes Street, Traffic Impact Assessment', prepared by PTC Consultants, dated 29/11/2018.

Anticipated traffic volumes have been derived using the Day and Afternoon peak where 'free flow' occurs (one car in, one car out) which equates to 608 cars entering and 638 cars exiting the carpark each hour. Based on the existing traffic flow graphs in the traffic report, the Night peak has been derived by reducing the Day/Evening peak hr volumes by 75%, which equates to 152 cars entering and 160 cars exiting the car park in an hour. We note that these traffic volume derivations should be confirmed by a certified traffic consultant.

For the purpose of our assessment we have assumed that traffic volumes will be spread evenly across the 3 levels of parking.

Table 2: Proposed Car Park Traffic Volumes Summary

Time Period	Description
Day (0700-1800hrs)	During the Day peak hour 608 cars will enter and 638 cars will exit the carpark. At this time approximately 320 cars will exit or enter the proposed car park in the busiest 15min period
Evening (1800-2200hrs)	During the Evening peak hour 608 cars will enter and 638 cars will exit the carpark. At this time approximately 320 cars will exit or enter the proposed car park in the busiest 15min period
Night (2200-0700hrs)	During the Night peak hour 152 cars will exit and 160 cars will enter the carpark. At this time approximately 80 cars will exit or enter the proposed car park in the busiest 15min 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 EPA's Noise Policy for Industry (NPfI). A survey of baseline noise levels is required at locations that represent the most affected sensitive receivers at times when maximum impacts is likely to occur.

An unattended ARL noise logger (serial no. ARL 16-707-022) was deployed on the roof level of the adjacent existing Car Park, the logger location (L) is marked in Figure 1. Baseline ambient noise levels were measured between 13 December 2018 through to 21 December 2018. Ambient noise levels measured at this location were used to establish the existing background noise levels at site.

The noise logger was calibrated using a 01dB Stell Acoustic Calibrator before and after the survey period, showing no significant signs of calibration drift.

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

A summary of the measured noise levels is outlined in Table 3. Results for the entire survey period are summarised in Appendix B.

Table 3: Ambient noise level summary

Period	Time Period	RBL, dB L_{A90}	dB L_{Aeq}
Day	0700-1800hrs	54	61
Evening	1800-2200hrs	52	60
Night	2200hrs-0700hrs	50	57

4.0 ENVIRONMENTAL NOISE CRITERIA

Noise criteria have been derived for the purpose of operation of the proposed multi-level Hughes Street car park based on measured noise levels presented in Table 3. These are summarised in Table 4 below with a full derivation found in Appendix C.

Table 4: NPfI Noise Criteria

Period	Time Period	Intrusiveness Criteria, dB $L_{Aeq, 15min}$	Amenity Criteria, dB $L_{Aeq, period}$
Residential			
Day	0700-1800hrs	59	58
Evening	1800-2200hrs	57	48
Night	2200-0700hrs	55	43

4.1 Sleep disturbance

Activities occurring on-site during the night period have the potential to cause sleep disturbance for the nearby residents. These include activities associated with the Development after 2200hrs and before 0700hrs.

The Noise Policy for Industry states that a detailed maximum noise level assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.*

Based on the Night-time RBL of 50dB the site-specific trigger levels for further assessment are $L_{Aeq,15min}$ 55dB and L_{AFmax} 65dB. The Policy does not currently provide details on how to assess sleep disturbance but makes reference to the RNP. 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 50-55dB L_{Amax} are unlikely to cause awakening reactions*
- *One or two noise events per night, with maximum internal noise levels of 65-70dB L_{Amax} are not likely to affect health and wellbeing significantly.*

Based on these findings, noise levels below 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.

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.

The Bavarian Parking calculation method uses a 'typical spectrum' per vehicle which refers to a frequency spectrum for a 'car driving off' which is normalised to the reference level of 63dBA Lw, the full 1/1 octave band spectrum is presented in Table 5 below.

Table 5: Typical spectrum per vehicle – Bavarian calculation method

	dB - Hz									
Source	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**	**A**
Typical Spectrum	46.34	57.94	50.44	54.94	55.04	55.44	52.74	46.54	33.74	63

5.2 Calculated Noise Levels – NPfI 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 noise levels have been calculated for the Day, evening and Night-time assessment periods.

Table 6: NPfI Compliance Assessment

Period	Calculated noise level dB $L_{Aeq, 15mins}$	Intrusiveness criteria, dB $L_{Aeq, 15mins}$	Compliance	Calculated noise level, dB $L_{Aeq, 15mins}$	Amenity criterion, dB $L_{Aeq, 15mins}$	Compliance
Receiver 1						
Day	43	59	✓	43	58	✓
Evening	43	57	✓	43	48	✓
Night	37	55	✓	37	43	✓
Receiver 2						
When in use	-	-	-	47	65	✓
Receiver 3						
Day	45	59	✓	45	58	✓
Evening	45	57	✓	45	48	✓
Night	39	55	✓	39	43	✓

Noise levels have been calculated to the worst affected point, this includes the upper storey windows of receivers adjacent to the carpark.

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 detailed in Table 7 are shown to be below the maximum levels outlined by the EPA.

Table 7: Sleep disturbance assessment

	Predicted maximum noise level, dB L_{Amax}		
Noise Source	**Receiver 1**	**Receiver 2**	**Receiver 3**
Car normal[1] operation	58	(Commercial)	61

[1] includes car engine start, door closing, and driving away

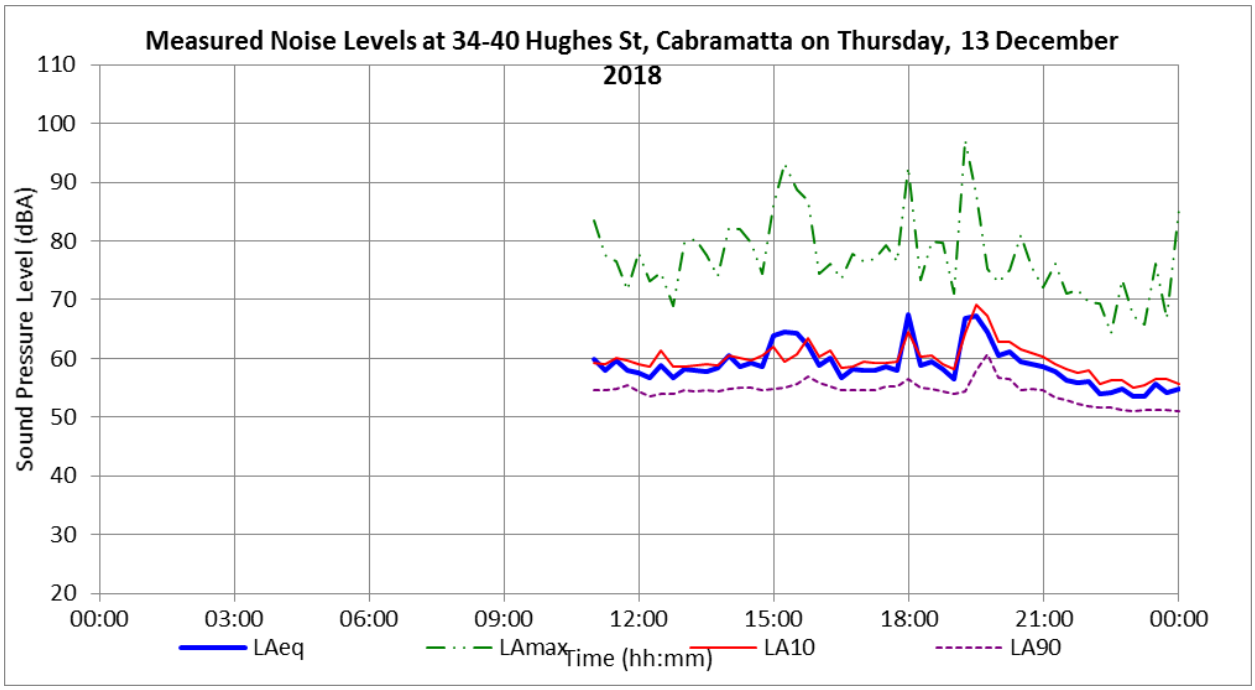
6.0 CONCLUSION

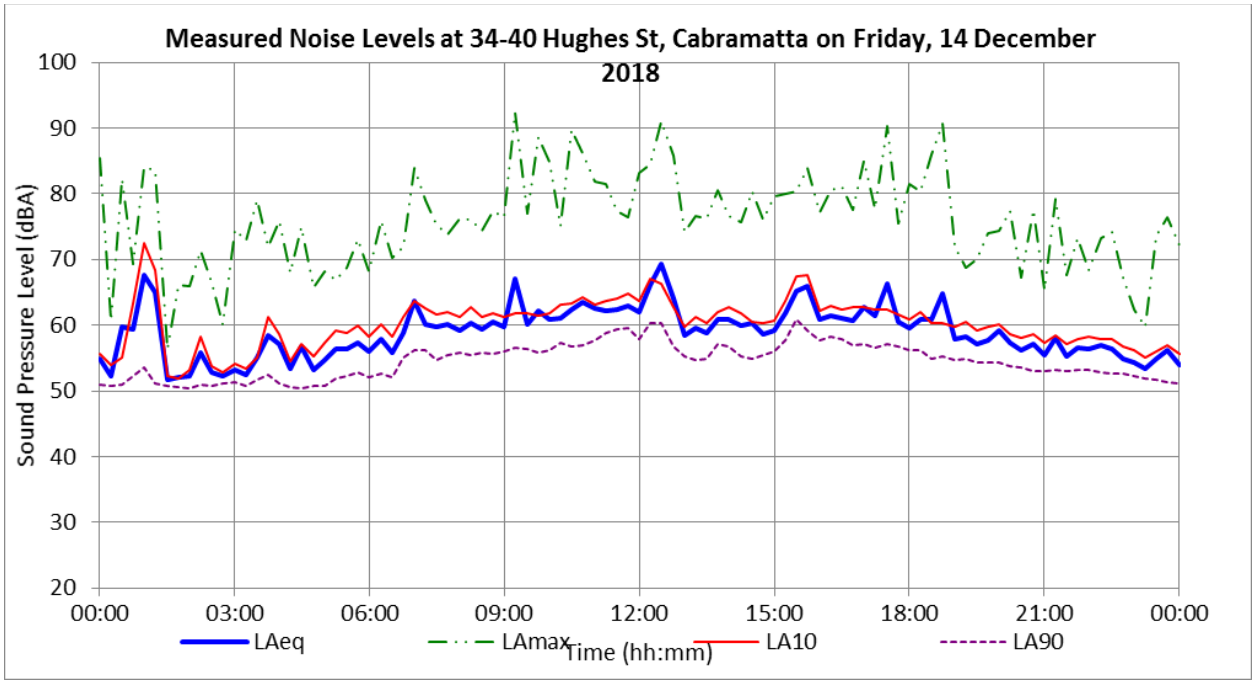
As outlined in Table 6 and Table 7, noise emissions from the operation of the proposed car park have been calculated to the nearest noise sensitive receivers. Based on the traffic volumes provided in traffic report *'MDACP Hughes Street, Traffic Impact Assessment'*, prepared by PTC Consultants, dated 29/11/2018 and the proposed design provided by Collins and Turner, noise emissions from the use of the carpark have been calculated and demonstrates compliance with the NPfI noise level criteria at the nearest residential and commercial receivers without the need for additional noise controls.

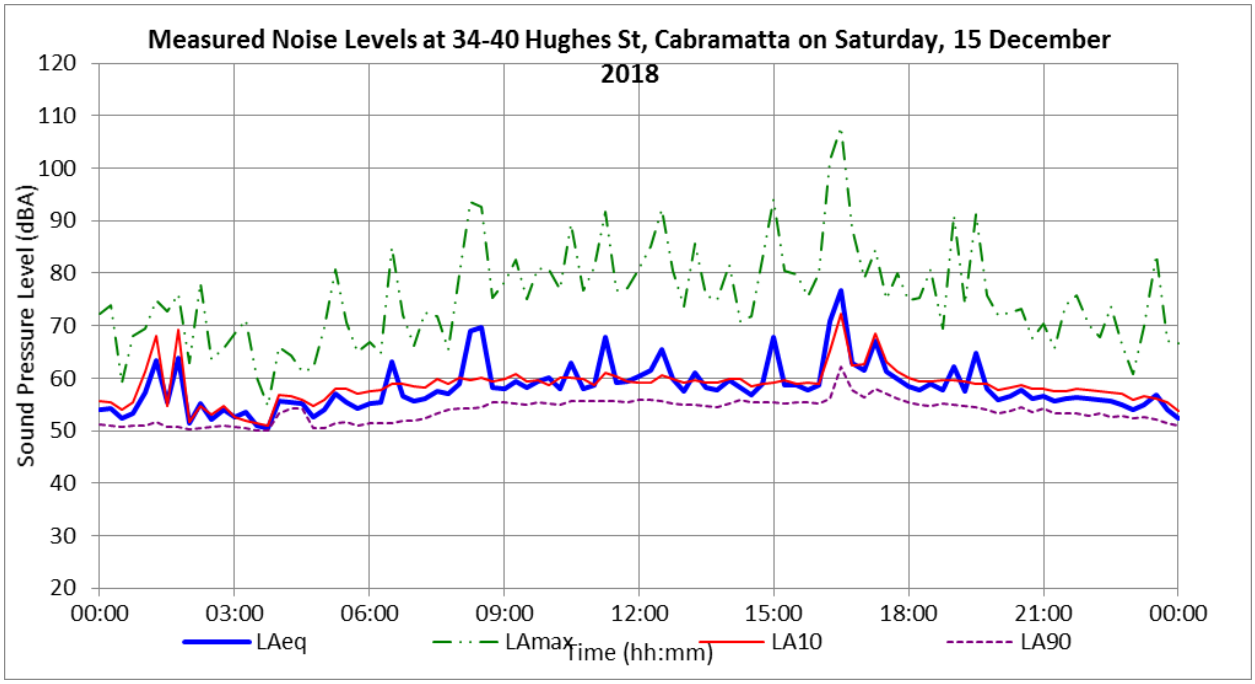
APPENDIX A GLOSSARY OF TERMINOLOGY

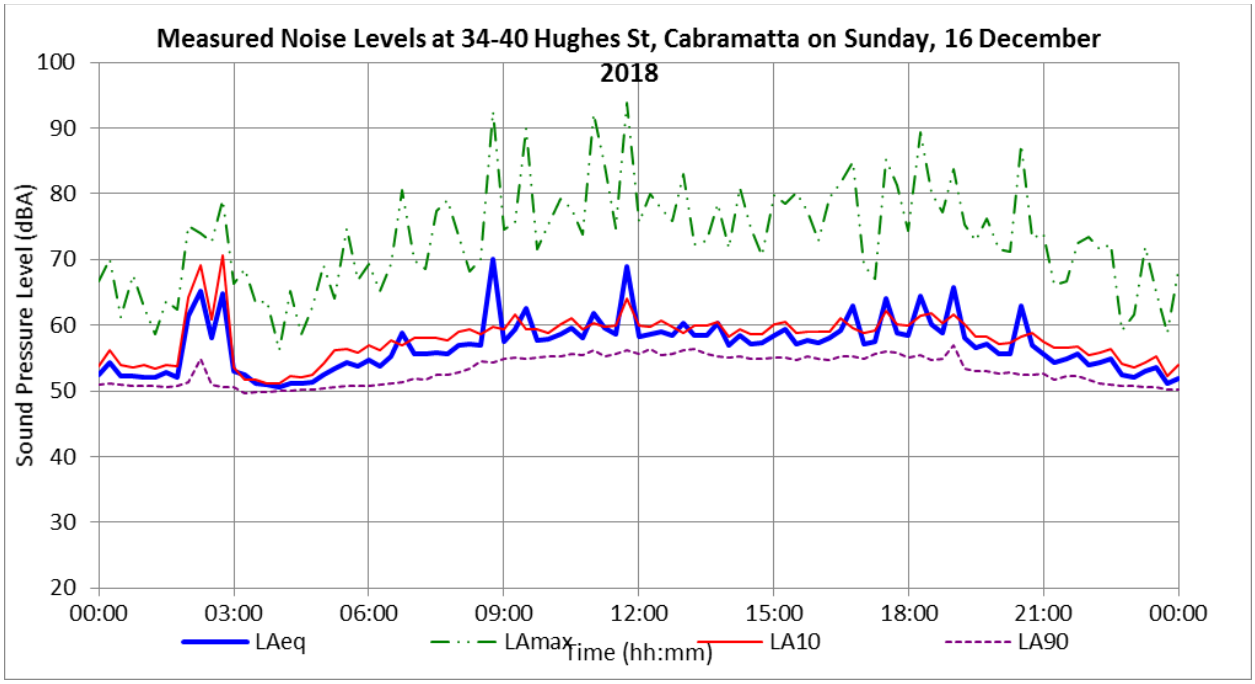
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 μPa 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.
$L_{Aeq\ (t)}$	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_{A90}	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_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{A01}	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.

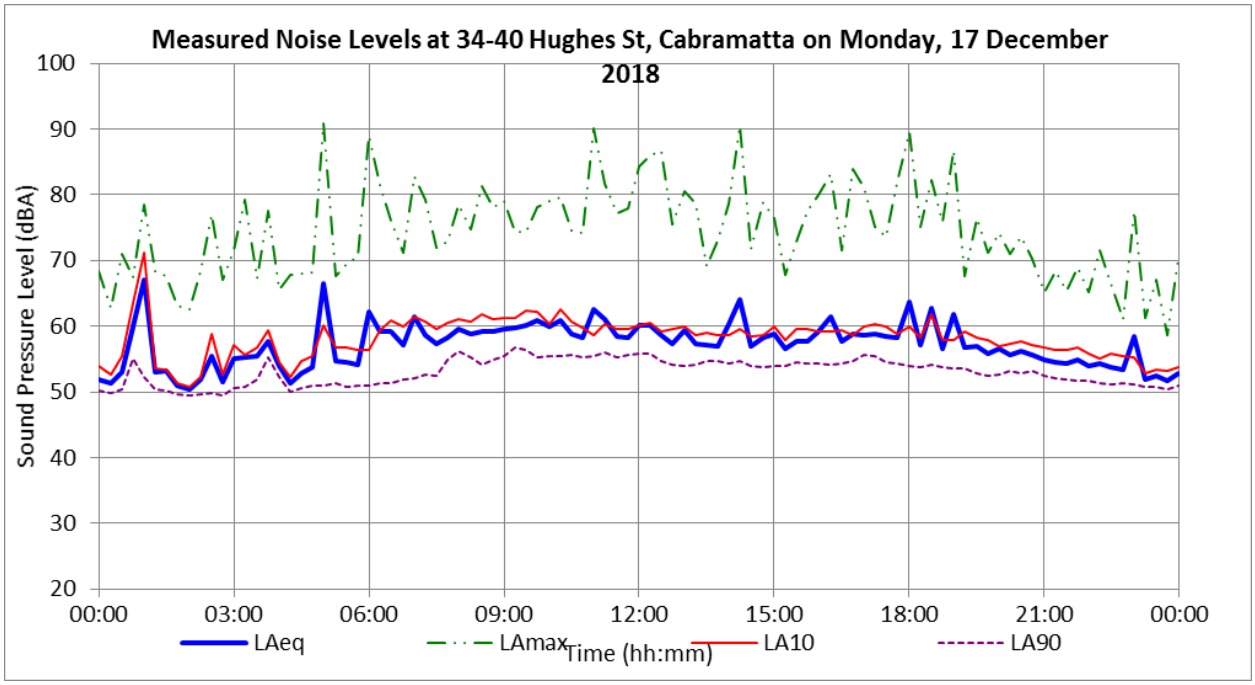
APPENDIX B NOISE LOGGING DATA

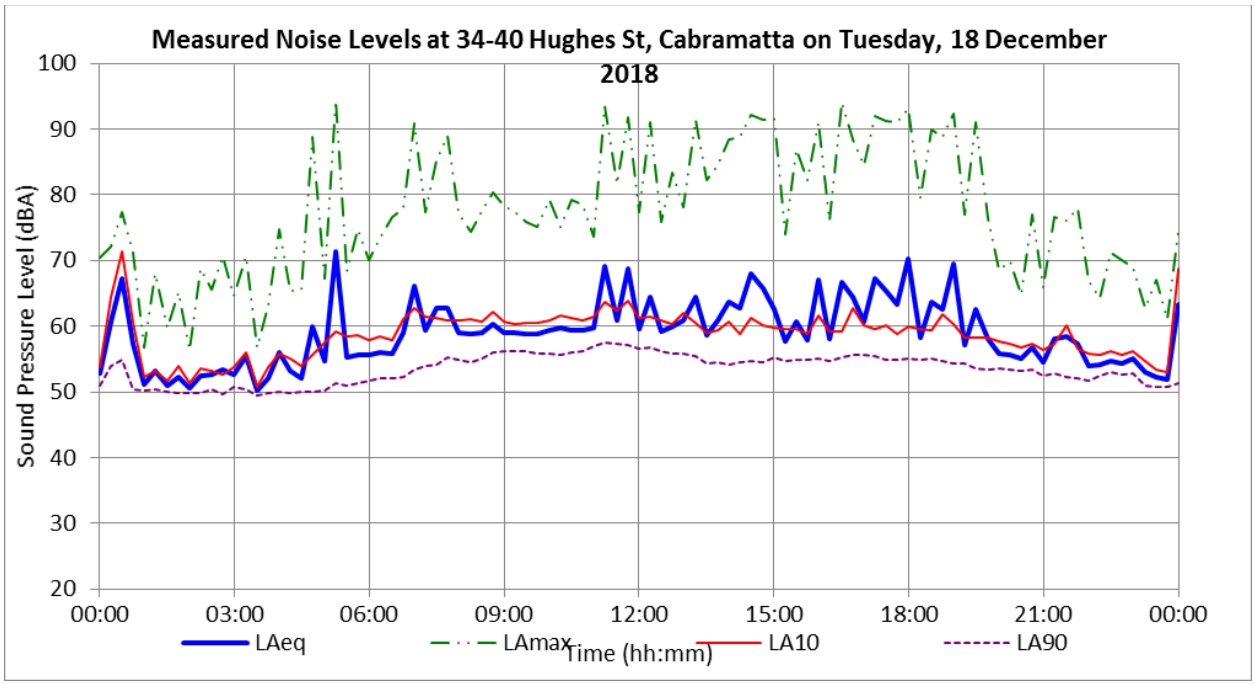


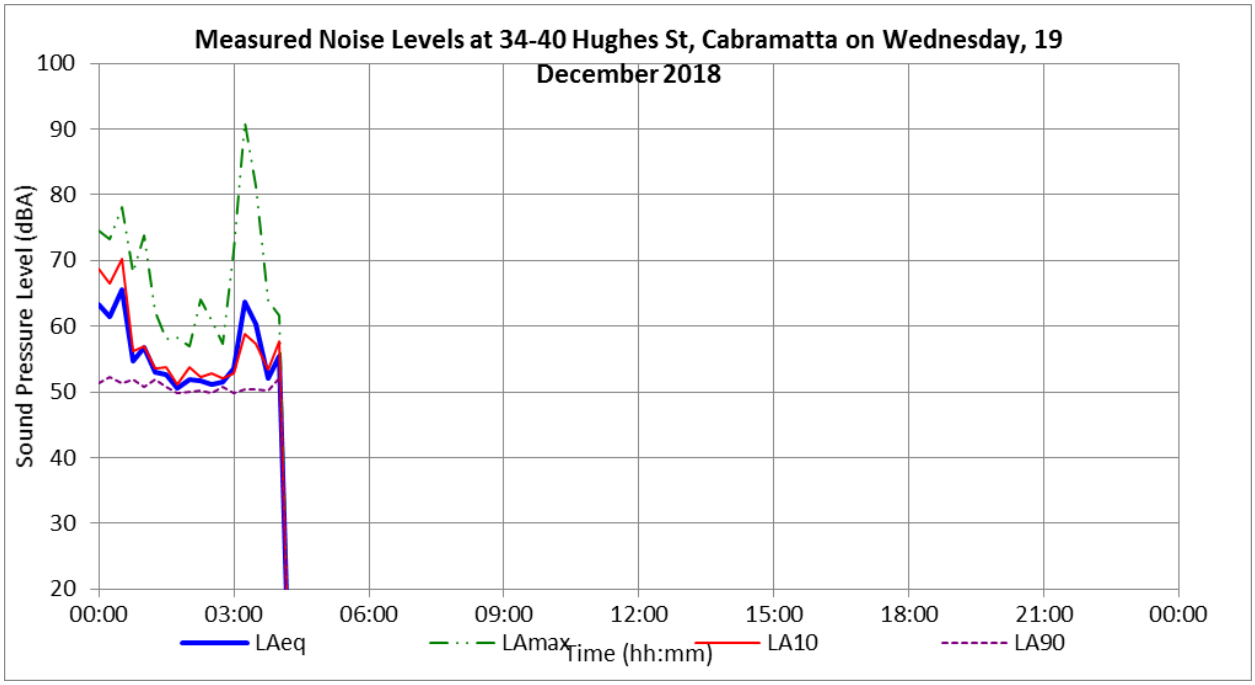



Measured Noise Levels at 34-40 Hughes St, Cabramatta on Saturday, 15 December 2018
Sound Pressure Level (dBA)
120
110
100
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at 34-40 Hughes St, Cabramatta on Sunday, 16 December 2018
Sound Pressure Level (dBA)
100
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at 34-40 Hughes St, Cabramatta on Monday, 17 December 2018
Sound Pressure Level (dBA)
100
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at 34-40 Hughes St, Cabramatta on Tuesday, 18 December 2018
Sound Pressure Level (dBA)
100
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)


Measured Noise Levels at 34-40 Hughes St, Cabramatta on Wednesday, 19 December 2018
Sound Pressure Level (dBA)
100
90
80
70
60
50
40
30
20
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
LAeq
LAmax
LA10
LA90
Time (hh:mm)

APPENDIX C ENVIRONMENTAL NOISE CRITERIA

C1 NSW Noise Policy for Industry

In NSW, the NPfI is the guideline for assessing noise emissions from industrial facilities and other developments with noise sources that may be considered to be industrial in nature.

The NPfI sets out a procedure where a noise source can be evaluated against a series of noise assessment levels. In the NPfI, these project specific noise levels are derived from an analysis of the ambient noise environment and zoning information.

The background noise levels for this project are summarised in Table 8 below. In the NPfI, the background noise level is called the Rating Background Level (RBL).

Table 8: NPfI time periods and measured Rating Background Levels

Period	Time of day	RBL $L_{A90, 15min}$ dB	$L_{Aeq, 15min}$ dB
Day	0700-1800hrs	54	61
Evening	1800-2000hrs	52	60
Night	2200-0700hrs	50	57

Intrusiveness noise levels

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

Based upon the data for summarised in Table 8, the Intrusiveness Noise Levels have been calculated in accordance with the NPfI and are presented in Table 9.

Table 9: Derived Intrusiveness Noise Levels

Period	RB, $L_{A90, 15min}$ dB	Intrusiveness Noise Level (RBL + 5 dB), $L_{Aeq, 15 min}$ dB
Day	45	59
Evening	40	57
Night	35	55

Amenity noise levels

The Amenity Noise Levels are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the amenity level is to correct the acceptable noise levels set for the appropriate amenity area with the baseline noise monitoring.

A review of the noise levels measured indicates that the residential noise environment is typical of a Urban area with mostly traffic related noise sources. Further modification is undertaken to account for standardisation of the assessment time periods (as detailed in Section 2.2 of the NPfI). The resultant levels and the relevant modifications are detailed in Table 10 below.

Table 10: Derived Amenity Noise Levels

Receiver	Period	Recommended Amenity Noise Level $L_{Aeq, Period}$ dB	Modified Amenity Noise Level L_{Aeq}, 15min dB
Residential (Urban)	Day	60	58
	Evening	50	48
	Night	45	43
Commercial	When in use	65	65

Source: Table 2.2 NSW Noise Policy for Industry

Determination of Project Noise Trigger Levels

The final process in determining the operational noise limits for the development is to derive the Project Noise Trigger Levels. The Project Noise Trigger Levels are levels that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The Project Noise Trigger Levels are derived by selecting the more stringent of either the Intrusiveness or Amenity noise levels. For residential receivers each assessment time period is evaluated individually. For commercial receivers, only the Amenity noise level applies. The Project Noise Trigger Levels applicable to the Subject site are shown in Table 11.

Table 11: Project Noise Trigger Levels

Receiver	Period	Project Noise Trigger Level, $L_{Aeq, 15min}$, dB
Residential	Day	58
	Evening	48
	Night	43
Commercial	When in use	65

The NPfI Project Trigger Noise Levels are applicable at the property boundary of the nearest affected receivers.