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Noise Impact Assessment
Mixed Use Development
Toronto, NSW

Prepared for:

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EXECUTIVE SUMMARY

A Noise Impact Assessment (NIA) for a proposed mixed use development at 118 Cary Street, Toronto, NSW has been conducted.

The site is impacted by high traffic noise levels from Cary Street. The assessment has found that glazing upgrades to some windows exposed to Cary Street will be required as detailed in Section 3.1. The upgrades involve the installation of 6.5mm laminated single glazing or equivalent to achieve Rw 31.

A theoretical assessment has found that, the communal outdoor area and carpark entry (roller doors) will comply with the relevant noise impact criteria. External mechanical plant will comply with the noise emission criteria, subject to final acoustic assessment of plant type and location.

Based on the results of this assessment, it is our professional opinion that adoption of the recommendations within this report will result in compliance with noise conditions as may be imposed by Council in a development consent.

1.0 INTRODUCTION

1.1 The Proposal

Mark Lawler Architecture (MLA) has commissioned Spectrum Acoustics to prepare a Noise Impact Assessment (NIA) for a proposed mixed use development at 118 Cary Street, Toronto NSW. This study was commissioned to accompany a Development Application to Lake Macquarie City Council.

1.2 Project Description

Under the proposal there would be two basement parking levels, a ground floor level containing commercial tenancies and residential Units constructed over four levels with a roof top garden. The site fronts a major arterial road, Cary Street, and being a noise sensitive development an assessment of traffic noise impacts in required. The assessment is based on the requirements of the Department of Planning guideline “Development near Rail Corridors and Busy Roads – Interim Guideline” (2008).

This assessment also considers potential noise impacts on surrounding residences from the carpark, mechanical plant and communal outdoor area.

1.3 Description of Terms

Table 1 contains the definitions of commonly used acoustical terms and is presented as an aid to understanding this report.

Table 1: Definition of acoustical terms

Term	Definition
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
STL	Sound Transmission Loss. The ability of a partition to attenuate sound, in dB.
Lw	Sound Power Level radiated by a noise source per unit time re 1pW.
Leq	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period.
L1	Average Peak Noise Level - the level exceeded for 1% of the monitoring period.
L10	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L90	Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area.

2.0 NOISE ASSESSMENT

2.1 Ambient Noise Levels

Ambient noise levels were measured near the site at 91 Cary Street from 5-8 August 2017 using an ARL 215 environmental noise logger. The measurements were conducted in accordance with relevant EPA guidelines and AS 1055-1997 "Acoustics – Description and Measurement of Environmental Noise". The noise logger used complies with the requirements of AS 1259.2-1990 "Acoustics – Sound Level Meters", and has current NATA calibration certification.

The logger was programmed to continuously register environmental noise levels over the 15 minute intervals, with internal software calculating and storing Ln percentile noise levels for each sampling period. Calibration of the logger was performed as part of the instrument's initialisation procedures, with calibration results being within the allowable $\pm$ 0.5 dB(A) range.

The logger was located on the verandah of the residence at 91 Cary Street as shown in **Figure 1**.

Figure 1: Site location and logger location

Ambient L_{Aeq} and background (L_{A90}) noise levels obtained from the loggers are summarised below in **Table 2** and shown graphically in **Appendix A**. Table 1 includes the background (L90) levels, the Leq over the full day (11 hour, 7am-6pm), evening (4 hour, 6pm-10pm) and night (9 hour, 10pm-7am) periods as well as the 90th percentile (P90) of the measured $L_{Aeq(15minute)}$ levels.

Table 2: Measured ambient noise levels

Location	Day	Evening	Night
91 Cary Street	55 dB(A) L90	46 dB(A) L90	36 dB(A) L90
	64 dB(A) Leq (11hr)	63 dB(A) Leq (4hr)	57 dB(A) Leq (9hr)
	67 dB(A) Leq (P90)	65 dB(A) Leq (P90)	60 dB(A) Leq (P90)

2.2 Noise criteria

2.2.1 Traffic noise impacts

Internal traffic noise criteria for residential units are given in Section 3.5 of the Interim Guideline are:

- In any bedroom in the building: **35 dB(A),L_{eq}** at any time 10pm – 7am, and
- Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): **40dB(A),L_{eq}** at any time.

These criteria originated from the Rail Infrastructure Corporation (RIC) publication "Consideration of Rail Noise and Vibration in the Planning Process" (2003) where it is explicit that the criteria apply with windows and doors closed. The criteria correspond to those in AS/NZS 2107, where the noise is considered to be "quasi-continuous" in nature.

2.2.2 Noise emissions

The proposal is not industrial in nature, but Council usually applies the "background + 5 dB" criterion for assessment of noise impacts. The measured night time background noise level (RBL) was 36 dB(A),L_{90} which implies an intrusiveness criterion of 41 dB(A),$L_{eq(15min)}$ in accordance with the NSW Industrial Noise Policy (INP) for assessment of noise impacts from mechanical plant on existing residences in the area.

2.2.3 Sleep disturbance

It is possible that residents of the development could use the proposed communal outdoor area at night, as this area would contain a barbecue and seating. These impacts may disturb sleep at neighbouring residences, and the EPA prefers these impacts to be assessed against a "sleep disturbance" criterion of Background (L90) + 15 dB, giving an assessment criterion of 51 dB(A),Lmax.

2.3 Assessment Methodology

Figure 2 is a reproduction of Figure B2 from the Interim Guideline (2008) showing a typical situation of a dwelling adjacent to a busy road and calculated internal noise levels relative to external noise levels using the UK Calculation of Road Traffic Noise (CoRTN) methodology. Figure 2 shows a traffic noise level of 68 dB(A) at windows W1 and W2 directly facing the road. Windows W3 and W4 are on facades perpendicular to the road, thereby being shielded from 50% of the traffic noise by the building structure, and noise levels are 2-3 dB below the traffic noise level at W1 and W2. Window W5 is approximately twice the distance from the road as W4 and experiences an external traffic noise level 4 dB below the level at W4.

Figure 2 also gives the traffic noise loss for three constriction scenarios labelled A, B and C. The following specifications for these construction scenarios are reproduced from the Guideline. The specification for walls includes insulation in the wall cavity, however brick veneer achieves Rw >45 without insulation, which will not reduce the overall noise insulation of the room as a whole, since windows are the acoustically weakest elements. Any recommendations regarding the following construction specifications assume no insulation in facade walls.

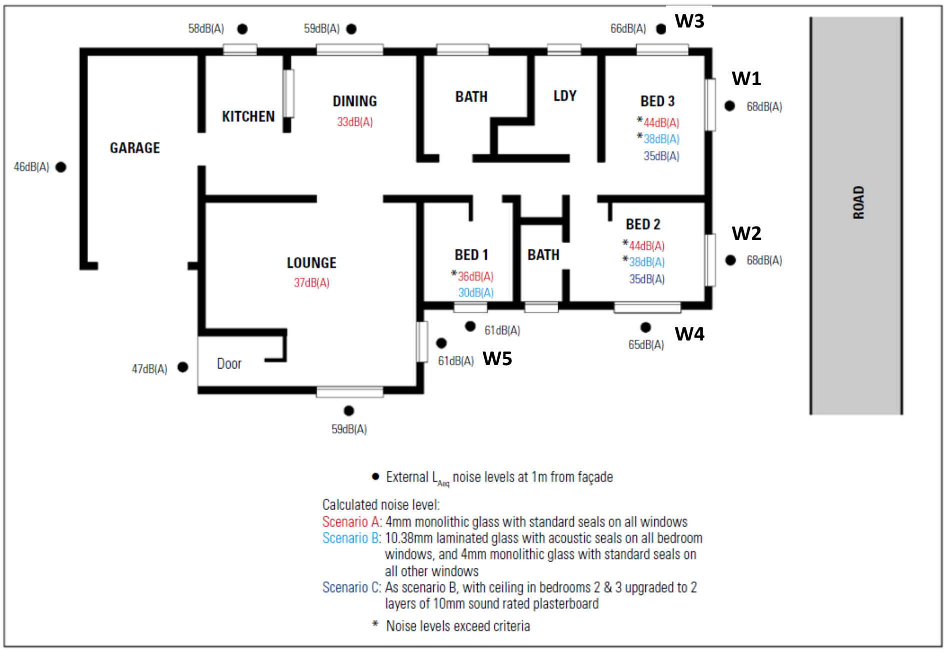


Figure 2: Traffic noise reduction for various construction types.

Specification A

Windows	standard 4mm monolithic glass with standard weather seals on all windows	(Rw 25)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Specification B

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Specification C

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	as per Specification B, except the single layer of standard plasterboard ceiling is replaced with a double-layer of 10mm sound-rated plasterboard ceiling	(Rw 52)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Table 3 summarises the traffic noise reduction provided by each construction scenario for the cases in Figure 2 where a room contains either one or two windows.

Table 3: Traffic Noise reduction levels

Construction scenario	Noise reduction (2 windows)	Noise reduction (1 window)
Scenario A	23	25
Scenario B	29	31
Scenario C	32	34 (estimated)

Between the minimum 23 dB reduction for Scenario A and minimum 29 dB reduction for Scenario B lies what will be called Scenario A/B in which 23-28 dB traffic noise reduction is required[1]. This will be achieved with the same construction as scenario B except using 6.5mm Vlam Hush (or equivalent) in lieu of the 10.38mm glazing (8.5mm Vlam Hush provides the same acoustic rating as 10.38mm). This conservative measure is based on adopting the 23 dB noise reduction for 4mm glass, whether there are one or two windows in the room.

3.0 RESULTS AND RECOMMENDATIONS

3.1 Traffic Noise Impacts

Figure 3 shows measured daytime and night time traffic noise levels applied at the northern half of the facade of the first residential floor facing Cary Street, which is considered typical of the full facade and higher floors.

[1] The value of 23dB has been included in the Scenario A/B category as a measure of conservatism.

Figure 3: Traffic noise levels at residential facade.

Based upon the facade traffic noise levels in Figure 3, the following minimum glazing will be required:

- Living rooms (A) – 6.5mm Vlam Hush or equivalent;
- Bedrooms (B) – 6.5mm Vlam Hush or equivalent;
- Living rooms (C) – 6.5mm Vlam Hush or equivalent;
- Bedrooms (D) – 4mm float or equivalent.

Glazing suppliers are required to certify that windows (A) – (C) achieve a weighted sound reduction index of Rw 31. The above requirements are mirror-symmetrical for the southern half of the podium level and apply to the residential floors above.

3.2 Noise Emissions

3.2.1 Mechanical Plant

For a typical domestic A/C condenser unit with sound power level 65 dB(A), a minimum setback distance of 7m is required to achieve the criterion. The nearest residential receivers are at significantly greater distance from the site and no impacts are anticipated. Similarly, the carpark exhaust fans are likely to be located at carpark level and could easily be placed so as to no pose any noise impact potential at off-site receivers. The fan outlets should be appropriately placed or acoustically treated to limit noise levels to the night time criterion at residence within the development. Compliance with noise criteria for external A/C units is generally achievable and the final mechanical plant specification should be reviewed by an acoustical consultant and certified as part of the construction certification process.

3.2.2 Communal Area

Figure 4 shows the eastern end of the proposed communal outdoor area. Such areas often contain a barbecue and tables which in this case would be located approximately 65m from the nearest residential in Arnott Avenue boundary.

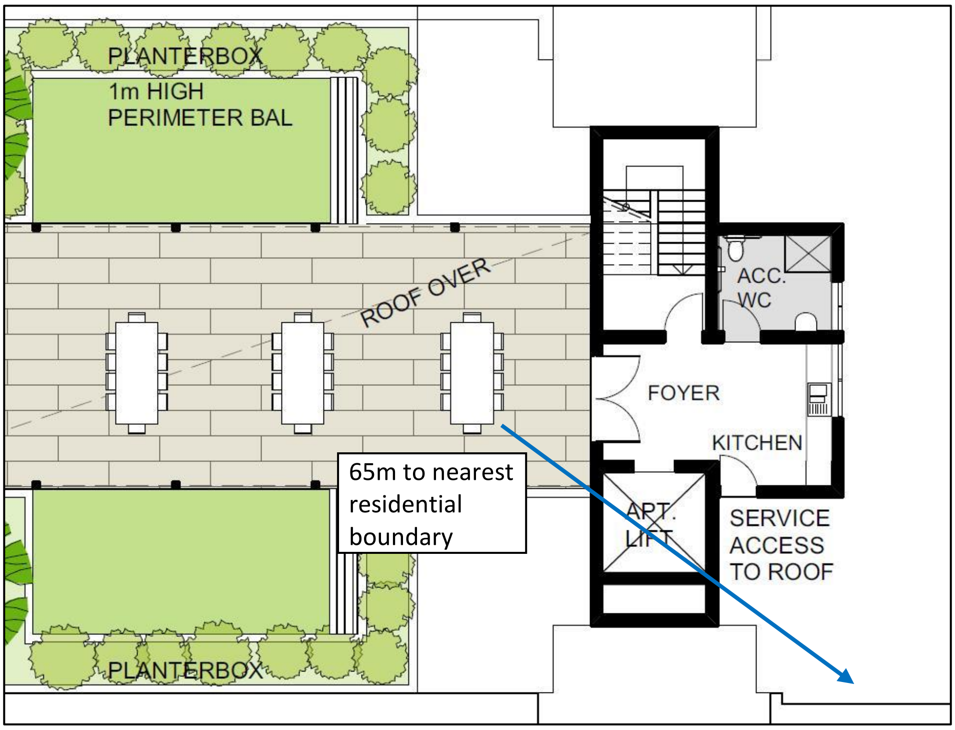


Figure 4: Communal open space.

The maximum sound power level of raised speech is typically 80 dB(A), averaging 70 dB(A),$L_{eq(15minute)}$ for a small group of people. Noise loss for a distance of 65m is 44 dB. The received levels at the nearest Arnott Avenue residential boundary are 36 dB(A),Lmax and 26 dB(A),Leq(15min) which are well below the adopted intrusiveness criterion of 41 dB(A) and the sleep disturbance criterion of 51 dB(A),L_{max}.

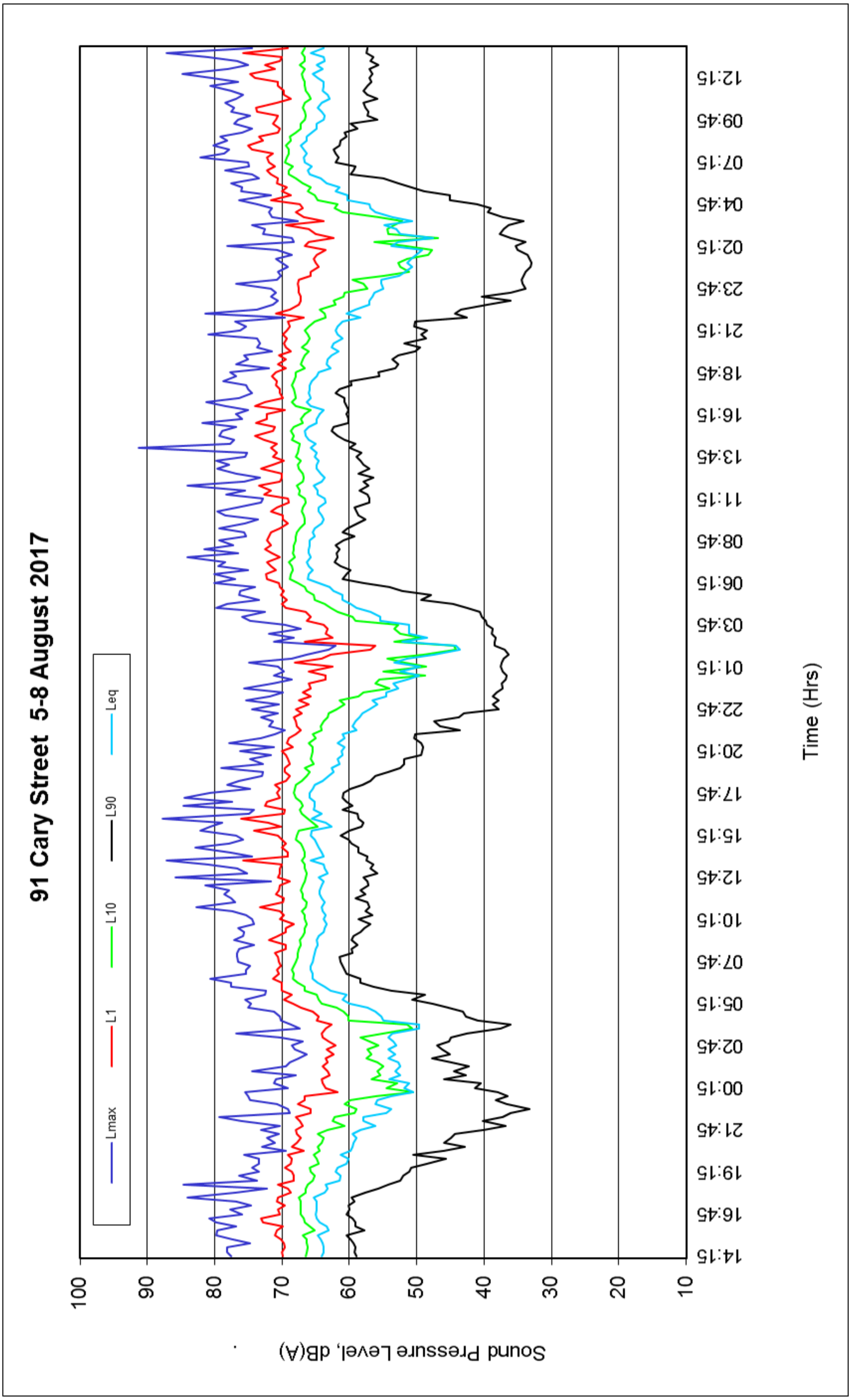
3.2.3 Roller door

Vehicular entry to the site will be via roller doors at the north east corner of the site of Arnott Avenue. The roller doors will be set back approximately 10 m from the north eastern site boundary and a further 12m to the nearest residential boundary. Maximum noise impacts from an automatic roller door are typically assessed as up to 75 dB(A),Lmax for a door in good condition.

Taking into account distance loss for 22m to the residence opposite the site on Arnott Avenue, the predicted Lmax level of 40 dB(A) is well below the sleep disturbance criterion of 51 dB(A),L_{max}. The impacts will be even less, as the sleep disturbance criterion applies at 1m from a bedroom window and the residence is set back considerably from the boundary.

APPENDIX A

NOISE LOGGER DATA


91 Cary Street 5-8 August 2017
Lmax
L1
L10
L90
Leq
Sound Pressure Level, dB(A)
Time (Hrs)
100
90
80
70
60
50
40
30
20
10
14:15
16:45
19:15
21:45
00:15
02:45
05:15
07:45
10:15
12:45
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