

Road Traffic Noise Assessment

548-552 Pacific Highway
St Leonards
NSW 2065

July 2016

Report No. nss22478 – Final

Prepared at the request of:-

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1. INTRODUCTION

Noise and Sound Services was requested by MD&A Architects of 26 Sydney Street, Marrickville, NSW 2204 to carry out a road traffic noise assessment at 548-552 Pacific Highway, St Leonards, NSW 2065. Currently on the site are commercial premises. It is proposed to demolish those premises and construct a 15 storey hotel with four levels of underground parking, a hotel lobby area, 221 bedrooms and a rooftop area.

The purpose of the survey is to assess road traffic noise levels and advise on the sound insulation requirements from external noise in line with the State Environmental Planning Policy (Infrastructure) 2007 Clause 102 - Impact of Road Noise or Vibration on Non-road Development and the Australian Standards AS 3671 and AS 2107 – 2000 '*Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors*'.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The proposed development at 548-552 Pacific Highway, St Leonards, NSW 2065 is close to an arterial road being the Pacific Highway. The site is located on the Southern side of the Pacific Highway between the intersection of Christie Street and the Pacific Highway to the East and Lithgow Street and the Pacific Highway to the West. The day time traffic flows are predominantly private motor and commercial vehicles averaging approximately 2800 vehicles per hour. There is also occasional 'heavy' traffic (circa 4%). Currently on the site are commercial premises. The closest proposed site position to the rail line is approximately 60 metres.

2.2 Development Description

It is proposed to construct a 15 storey hotel with four levels of underground car parking. The nearest façade on the proposed development site is to be located approximately 4 metres from the Pacific Highway. Full details are given in drawings provided by '*MD&A Architects*', 26 Sydney Street, Marrickville, NSW 2204, project: PROPOSED HOTEL, 548-552 Pacific Highway, St Leonards, NSW 2065, Drawings No: DA-01–37.

3. CRITERIA

3.1 Australian Standards AS 3671 and AS 2107

The Australian Standard AS 3671-1989 '*Acoustics - Road traffic noise intrusion - building siting and construction*' refers to guideline limits in Australian Standard AS 2107. Australian Standard AS 2107 – 2000 '*Acoustic – Recommended Design Sound Levels and Reverberation Times for Building Interiors*' provides recommended design sound levels for different areas of occupancy in buildings. This includes recommended internal design sound levels from continuous road traffic noise for hotels and motels as shown in Table 1 below.

TABLE 1 - RECOMMENDED DESIGN SOUND LEVEL FOR RESIDENTIAL BUILDINGS. FROM AS 2107 (2000).

Type of Occupancy	Recommended Design Sound Level (L_{Aeq}) dBA	
	Satisfactory	Maximum
Hotels and Motels		
Bars and Lounges	45	50
Conferences areas		
Without sound reinforcement up to 50 persons	35	40
From 50 to 250 persons	30	35
With sound reinforcement	35	45
Dining rooms	40	45
Enclosed Car Parks	55	65
Foyers and reception areas	45	50
Kitchen, laundry and maintenance areas	45	55
Sleeping areas		
hotels and motels near minor roads	30	35
hotels and motels near major roads	35	40
Washrooms and toilets	45	55

3.2 Site Specific Noise Goals

Site-specific internal road traffic noise goals ($L_{Aeq, \text{period}}$) in line with the State Environmental Planning Policy (Infrastructure) 2007 and Australian Standard AS 2107 are set at 35 dBA for sleeping areas and 45 dBA for bathrooms and lobby/foyer areas.

4. NOISE MEASUREMENT RESULTS

4.1 Instrumentation – Noise

The instrumentation used during the noise source survey consisted of a Brüel and Kjær sound level meter model 2250 (serial no. 2446904). This meter conforms to Australian Standard AS IEC 61672.1-2004 : '*Electroacoustics - Sound level meters – Specifications*' as a class 1 precision sound level meter and has an accuracy suitable for both field and laboratory use. The calibration of the meter was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231 (serial no. 2445349). No significant system drift occurred over the measurement period.

The sound level meter and calibrator were checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with conformance certificates within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

4.2 Instrumentation – Vibration

The instrumentation used for the vibration survey consisted of an ACO Type 3233 vibration meter (serial no. 030333). This meter utilises a tri-axial vibration pickup transducer which has a band width of 1 Hz to 200 Hz and is suitable for both field and laboratory use. The vibration meter was checked, adjusted and aligned to conform to the ACO factory specifications.

4.3 Measurement Procedure – Noise

The acoustical measurements were carried out in accordance with Australian Standards AS 1055. '*Acoustics –Description and Measurement of Environmental Noise*', (1997) and AS 2702 '*Acoustics –Methods for the Measurement of Road Traffic Noise*', (1984) as required by Australian Standard AS 3671 '*Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction*' (1989).

Freefield noise measurements were carried out near the vicinity of the proposed development site, approximately 2 metres from the Pacific Highway. Measurements were also carried out behind the site at Christie Lane. The measurements were carried out on Wednesday 6th July 2016 (see Appendix A below for full results). The 'A' frequency weighting and 'fast' time weighting were used exclusively. The weather was sunny at 15 degrees Celsius with negligible wind. The time of the measurements was selected as representing a time when the traffic flows are considered to be high whilst maintaining free flow, i.e. without congestion. As such, noise levels are considered to be a worst-

case scenario. Night time levels (from 10:00 pm to 7:00 am) are lower than the day time levels and hence meeting the criteria during the day time will also ensure that the night time criterion is met.

4.4 Measurement Procedure – Vibration

Sample ground borne vibration measurements were taken on site on Monday 6th July 2016.

4.5 Measurement Results – Noise

The day time energy average external road traffic noise level ($L_{Aeq, 1 \text{ hour}}$) was **72 dBA** 2 metres from the Pacific Highway and **59 dBA** at Christie Lane. Full measurement results are shown in Appendix A.

4.6 Measurement Results - Vibration

The vibration magnitudes at the proposed site were less than 0.05 mm/s. This is below the level of perception (0.5 mm/s) for whole body vibration. Therefore no further action is required for road traffic vibration.

5. DISCUSSION AND CALCULATIONS

This section of the report discusses the measurement results at the site of the proposed hotel development and details formula used to predict external and internal noise levels for the proposed 221 hotel bedrooms.

5.1 External Noise Levels

The free field measurement external road traffic noise level ($L_{Aeq, 1 \text{ hour}}$) at the subject site was found to be 72 dBA at the measurement location of 2 metres from the Pacific Highway. The nearest façade of the hotel to be facing the Pacific Highway is at a distance of approximately 4 metres. The distances of other hotel rooms which comprise the development, from the measurement position, have been taken into account. The noise level at the nearest façade is calculated to be **69 dBA** (from $69 = 72 - 10 \log_{10} (4/2)$). A noise level of **59 dBA** will be used for the hotel rooms which face Christie Lane.

5.2 Internal Noise Levels

In addition to distance attenuation, the internal noise level (L_{p2}) in various rooms of the proposed development is found from the formula:

$$L_{p2} = L_{p1} - R_w + 10 \log_{10} (S/A) - K + 6 \text{ dBA}$$

Where: L_{p1} is the external noise level;
 R_w is the weighted sound reduction index of the partition;
 S is the area of the partition (window or glazed door);
 A is the room acoustic absorption; and
 K is an angle of view correction.

By applying this formula the selection of the weighted sound reduction index (R_w) for the windows and glazed doors in the external façades for the proposed hotel bedrooms can be found. The glazed areas are normally the weakest acoustic partition in the room façades.

6. RECOMMENDATIONS

This section provides the minimum construction requirements to meet the internal noise goals.

6.1 External Wall Construction

The external walls of the building must have a minimum R_w of approximately 52 dB, which is standard for:-

- brick veneer consisting of 110 mm thick exterior face brick, with 90 mm deep timber stud or 92 mm metal stud, at least 40 mm clearance between the masonry and stud frame and 10 mm thick plasterboard internal wall constructions; or
- double brick of 2 leaves of 110 mm brickwork separated by at least a 50 mm gap

6.2 Roof / Ceiling Construction

The roof/ceiling of the hotel must have a minimum R_w of 48 dB, which is standard for a concrete slab at least 120 mm thick or a pitched sheet metal, concrete tiled roof with sarking and one layer of 13 mm thick plasterboard ceiling fixed to the ceiling joists and R2 (or greater) thermal insulation in the roof cavity. The plasterboard walls and ceiling should be well sealed. The joint between the wall and ceiling can be sealed, for example, with a resilient layer such as mastic and covered with a plasterboard cornice or the joint can be sealed with tape and cornice cement.

6.3 Minimum Glazing Thickness and R_w Ratings

To meet the internal design goals, as given in Section 3.3 above, the glazing in the proposed hotel rooms will require the glass thicknesses specified in Table 2 below to give the recommended R_w ratings.

**TABLE 2 - MINIMUM GLAZING THICKNESS AND R_w RATINGS
548-552 PACIFIC HIGHWAY, ST LEONARDS, NSW 2065.**

Room	Estimated Size of Glazing (mm)	Recommended Glazing Minimum Thickness	Required Minimum R_w or STC (dB)
Ground Floor			
Lobby (facing Pacific Highway)	5220x4500 4530x4500 2646x4500 1001x4500 963x4500	6.38mm laminated awning/fixed window with Qlon seals 8.38mm laminated hinged door with Qlon seals	30
Lobby (facing Christie Lane)	2x2170x2400	4mm float awning/fixed window with standard seals 6.38mm laminated hinged door with Qlon seals	22
Rooms on Levels 1, 2 3 and 4			
01	2371x2850	6.38mm laminated awning/fixed window with Qlon seals	33
02 and 03	3603x2850	10.38mm laminated awning/fixed window with Qlon seals	34
04	3604x2850	10.38mm laminated awning/fixed window with Qlon seals	34
05	3118x2850	6.38mm laminated awning/fixed window with Qlon seals	33
06	4334x2100	4mm float awning/fixed window with standard seals	25
07	1910x2100	4mm float awning/fixed window with standard seals	22
08	3240x2100	4mm float awning/fixed window with standard seals	25
09	3570x2100	4mm float awning/fixed window with standard seals	25

Continued....

**TABLE 2 - MINIMUM GLAZING THICKNESS AND R_w RATINGS
548-552 PACIFIC HIGHWAY, ST LEONARDS, NSW 2065.**

Room	Estimated Size of Glazing (mm)	Recommended Glazing Minimum Thickness	Required Minimum R_w or STC (dB)
Rooms on Levels 1, 2 3 and 4 (Continued)			
10 Bathroom	4864x2100	4mm float awning/fixed window with standard seals	25
	1500x2100	4mm float awning/fixed window with standard seals	20
11 and 16	2100x2850	4mm float awning/fixed window with standard seals	22
12	3004x2850	4mm float awning/fixed window with standard seals	24
13, 14 and 15	3100x2850	4mm float awning/fixed window with standard seals	24
17 Bathroom	5430x2100	4mm float awning/fixed window with standard seals	25
	1500x2100	4mm float awning/fixed window with standard seals	20
Rooms on Levels 5, 6, 7, 8, 9, 10, 11, 12 and 13			
01 Bathroom	3090x2850	6.38mm laminated awning/fixed window with Qlon seals	33
	3500x2100	4mm float awning/fixed window with standard seals	26
	600x2100	4mm float awning/fixed window with standard seals	24
02 and 03	3103x2850	10.38mm laminated awning/fixed window with Qlon seals	34
04	3085x2850	10.38mm laminated awning/fixed window with Qlon seals	34
05	3105x2850	10.38mm laminated awning/fixed window with Qlon seals	34

Continued....

**TABLE 2 - MINIMUM GLAZING THICKNESS AND R_w RATINGS
548-552 PACIFIC HIGHWAY, ST LEONARDS, NSW 2065.**

Room	Estimated Size of Glazing (mm)	Recommended Glazing Minimum Thickness	Required Minimum R _w or STC (dB)
Rooms on Levels 5, 6, 7, 8, 9, 10, 11, 12 and 13 (Continued)			
06 Bathroom	3003x2850	6.38mm laminated awning/fixed window with Qlon seals	33
	3294x2100	4mm float awning/fixed window with standard seals	23
	600x2100	4mm float awning/fixed window with standard seals	20
07 Bathroom	4864x2100	4mm float awning/fixed window with standard seals	25
	600x2100	4mm float awning/fixed window with standard seals	20
08 and 13	3100x2850	4mm float awning/fixed window with standard seals	24
09	3004x2850	4mm float awning/fixed window with standard seals	24
10, 11 and 12	3100x2850	4mm float awning/fixed window with standard seals	24
14 Bathroom	5430x2100	4mm float awning/fixed window with standard seals	28
	600x2100	4mm float awning/fixed window with standard seals	24
Corridors	1810x2100 1340x2100	4mm float awning/fixed window with standard seals	20
Level 14			
Corridor	1200x2100	4mm float awning/fixed window with standard seals	20
Showers	2x1200x2100	4mm float awning/fixed window with standard seals	20

Notes:-

- All other glazing to be a minimum of 4 mm thick float glass for habitable rooms with a minimum R_w or STC rating of 22 dB;
- R_w = Weighted Sound Reduction Index, covers a frequency range from 100 Hz to 3.15 kHz;
- STC = Sound Transmission Class, covers a frequency range from 120 Hz to 4 kHz;
- Glazing systems recommended are minimum requirements for acoustic purposes. In some cases thicker glass may be required for safety or other reasons.

6.4 Entry Doors

The external entry doors and the entry door to each hotel room, should be at least 35 mm thick and of solid-core construction. The doors should also be fitted with acoustic seals (e.g. 'Lorient' IS7025 and IS8011si or 'Raven' RP47 frame and RP38 bottom seals) to give a certified R_w rating of at least 32 dB.

6.5 Ventilation

An acoustically insulated building must be kept virtually air tight to exclude external noise. Therefore for the windows requiring laminated glazing in Table 2 above, and to achieve the required R_w ratings, the windows must be kept closed. Hence there is a requirement for mechanical ventilation or air-conditioning to provide fresh air to control odours. Specific ventilation requirements are outside of our scope of expertise, however requirements for indoor-air quality are given in Australian Standard AS 1668.2 -2002, "*The use of ventilation and air-conditioning in buildings - Ventilation design for indoor air contaminant control*". Internal noise levels from mechanical ventilation or air-conditioning should not exceed 35 dBA for bedroom areas and 40 dBA for all other habitable areas. External noise levels from mechanical ventilation or air-conditioning should not exceed 5 dB over the lowest existing background noise level (L_{A90}) when in day time use and when measured at the neighbouring boundary. Night time noise levels must meet the requirements of the Protection of the Environment Operations (Noise Control) Regulation 2008.

7. SUMMARY AND CONCLUSIONS

Noise and vibration from road traffic movements using the Pacific Highway has been measured in the vicinity of 548-552 Pacific Highway, St Leonards, NSW 2065. The measurements have been used to predict internal noise levels for the proposed 221 hotel room development. No exceedences of the internal noise or vibration levels are predicted. This is providing that the recommendation details shown in Section 6 above are fully complied with. Mechanical ventilation (e.g. internal wall-mounted air ventilators) or air conditioning is required.

Status	Date	Prepared by:
Draft	18 th July 2016	Robbie Cain
Status	Date	Checked by:
Draft	21 st July 2016	Ken Scannell MSc MAAS MIOA
Status	Date	Issued by:
Final	19 th August 2016	Mark Scannell BA Planning

Important Note. All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and **must be** checked with the supplier or suitably qualified specialist before purchase.

APPENDIX A – MEASURED SOUND PRESSURE LEVELS

Environmental noise levels can vary considerably with time; therefore it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the L_{AF10} noise level is the level exceeded for 10% of the time, and is approximately the average maximum noise level. The L_{AF90} level is the level that is exceeded for 90% of the time, and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the 'background' noise level. The L_{Aeq} level represents the average noise energy during the measurement period.

The measurement procedure and the equipment used for the noise survey are given in section 4 of this report. The measurement results are shown in Table A1 and A2 below. All sound pressure levels in Tables A1 and A2 below are rounded to the nearest whole decibel.

TABLE A1 – 448-552 PACIFIC HIGHWAY, ST LEONARDS, NSW 2065, 6th July 2016 – 2 METRES FROM THE PACIFIC HIGHWAY.

Time		Sound Pressure Level (dBA)					
Start	Finish	L_{Aeq}	L_{AF1}	L_{AF10}	L_{AF50}	L_{AF90}	L_{AF99}
11:25	11:40	73	81	76	71	64	58
11:40	11:55	72	80	75	69	63	60
11:55	12:10	72	80	75	70	60	60
12:10	12:25	73	82	75	71	61	61
12:25	12:40	72	82	75	70	62	60

TABLE A2 – 448-552 PACIFIC HIGHWAY, ST LEONARDS, NSW 2065, 6th July 2016 – CHRISTIE LANE.

Time		Sound Pressure Level (dBA)					
Start	Finish	L_{Aeq}	L_{AF1}	L_{AF10}	L_{AF50}	L_{AF90}	L_{AF99}
12:30	12:45	57	64	76	56	54	53
12:45	13:00	58	66	75	56	54	53
13:00	13:15	62	71	75	56	54	53
13:15	13:30	58	65	75	56	54	53
12:30	13:30	59	71	75	56	54	53

APPENDIX B - EXAMPLE MATERIAL SUPPLIERS

Acoustic Glazing Suppliers

Windows

'Trend Windows & Doors Pty Ltd' telephone (02) 9840 2000.

www.trendwindows.com.au

'Wideline Pty Ltd' telephone (02) 8304 6400.

www.windowline.com.au

'Vantage Windows' telephone 1300 026 189

<http://www.awsaustralia.com.au>

'Christoffel Pty Ltd' telephone (02) 9627 4811

www.christoffel.com.au/contact.htm

'Sound Barrier Systems Pty. Ltd' telephone (02) 9540 4333

www.soundbarrier.com.au

Acoustic Absorbent Material

Pyrotek - telephone 13 17 44. www.pyroteknc.com

Tontine Website: www.spec-net.com.au/tontine/acoustic/acousorb.htm

Acoustic Door Seals

Kilargo - telephone 1300 858 010 www.kilargo.com.au

Raven – telephone 1800 888 123 www.raven.com.au

Internal Wall-Mounted Air Ventilators

Acoustica – telephone 1300 722 825 www.acoustica.com.au

Sonair – telephone 1300 858 674 www.edmonds.com.au