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Traffic & Environmental Noise Assessment

For proposed development at

No. 484-488 Bringelly Road, Austral

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1.0 SCOPE OF WORK

The aim of this report is to determine the building materials to be used and the construction methods to be adopted such that the proposed development at No. 484-488 Bringelly Road, Austral (Figure 1 – Site Location) is built to achieve acceptable internal noise levels a per Liverpool City Council Requirements.

Noise intrusion levels are to be within the limits adopted by the Building Code of Australia, NSW Road Noise Policy, AS 3671 'Road Traffic Noise Intrusion – Building Siting and Construction', AS 2107 'Acoustics – Recommended Design Sound Levels and Reverberation Times', Clause 102 of the State Environmental Planning Policy – (Infrastructure) 2007 and Liverpool City Council Requirements, such that all habitable rooms in the proposed development shall be designed to limit internal noise levels. Proposed mechanical plant & equipment is to comply with the NSW Industrial Noise Policy.

The proposed site is located on Bringelly Road in the suburb of Austral (Figure 2 – Bringelly Rd). The architectural plans by Dreamscapes Architects dated the 8th May 2017 are for the proposed construction of four (4) four-storey residential buildings including one (1) level of basement parking (Figure 3 – Proposed Site Plan).

2.0 NOISE SURVEY & INSTRUMENTATION

On the 29th May, 2017, an engineer from this office visited the site at above to carry out environmental noise monitoring (Figure 4 – Noise Reading Location). The unattended environment noise monitoring was conducted for seven (7) days between Thursday the 29th June and Wednesday 5th July, 2017.

All sound pressure levels are rounded to the nearest whole decibel. All measurements were taken in accordance with the Australian Standards AS 1055 "*Acoustics- Description and Measurements of Environmental Noise*".

The noise survey was conducted to determine a conservative reading of the existing day and evening noise levels [15hrs- 7:00 -22:00] $L_{(A90,\ 15\ minutes\ [1hr])}$ and $L_{(Aeq,\ 15\ minutes\ [1\ hr])}$ and to determine a conservative reading of existing night and early morning noise levels [9hrs-22:00-7:00] $L_{(A90,\ 15\ minutes\ [1hr])}$ and $L_{(Aeq,\ 15\ minutes\ [1\ hr])}$.

The measurement procedure and the equipment used for the noise survey are described below. All sound pressure levels are rounded to the nearest whole decibel.

All sound level measurements and analysis carried throughout this report are carried with Svantek 957 Noise and vibration level meter which has the following features:

- Type 1 sound level measurements meeting IEC 61672:2002
- General vibration measurements (acceleration, velocity and displacement) and HVM meeting ISO 8041:2005 standard
- Three parallel independent profiles
- 1/1 and 1/3 octave real time analysis
- Acoustic dose meter function
- FFT real time analysis (1920 lines in up to 22.4 kHz band)
- Reverberation Time measurements (RT 60)
- Advanced Data Logger including spectra logging
- USB Memory Stick providing almost unlimited logging capacity
- Time domain signal recording
- Advanced trigger and alarm functions
- USB 1.1 Host & Client interfaces (real time PC "front end" application supported)
- RS 232 and IrDA interfaces
- Modbus protocol

Machine was calibrated prior to reading. Any results affected by strong wind or rain have been disregarded. The Full Average Statistical Noise Parameters including $\mathbf{L_{(Aeq,\ 15\ minutes)}}$ & $\mathbf{L_{(A90,\ 15\ minutes)}}$ are presented in Figure 5 – Noise Survey. A Summary of those readings is presented in the table below:

Table 2.1- Summary of Noise Readings between 29th June and the 5th July, 2017

At Point A	$\mathbf{L_{(Aeq,\ 15\ minutes)}}$	$\mathbf{L_{(A90,\ 15\ minutes)}}$
Day & Evening Time – 7:00am-10:00pm	58 dB(A)	54 dB(A)
Night & Early Morning Time – 10:00pm-7:00am	53 dB(A)	46 dB(A)

Note* it is expected that traffic volumes along Bringelly Rd will increase an average of 20-30% over the next ten (10) years due to population and development growth in Austral and the surrounding area. Increased noise levels from the higher traffic volumes have been taken into account for this assessment and been reflected in our recommendations.

3.0 ACOUSTICAL STUDY (AS/NZS 2107:2000)

The above standard has formulated the criteria for developments situated in urban areas. The levels have been derived from relevant Australian Standards, the measurements and analysis of noise conditions in other similar developments and standards established in completed projects.

As traffic noise levels are not constant, a Leq noise level descriptor is used when assessing this type of noise source. The Leq is the mean energy level of noise being measured and has been found to accurately describe the level of annoyance caused by traffic noise.
It is usual practice, when we find it necessary to recommend internal sound levels in buildings to refer to Australian/New Zealand Standard AS/NZS 2107:2000 "Acoustics – Recommended Design Sound Levels and Reverberations times for Building Interiors".

This standard provides recommended noise levels for steady state such as noise from building services and quasi-steady state sounds, such as traffic and industrial noise. The noise levels recommended in AS/NZS 2107:2000 take into account the function of the area and apply to the sound level measured within the space unoccupied although ready for occupancy.

The standard recommends the following noise levels for residential buildings.

AUSTRALIAN STANDARD AS/NZS 2107:2000 RECOMMENDED DESIGN NOISE LEVELS, LAeq

Type of occupancy	Recommended Design Sound Level	
Activity	Satisfactory	Maximum
Houses in areas with negligible transportation		
Sleeping Areas	25	35
Houses and Apartments near minor roads		
Living Areas	30	40
Sleeping Areas	30	35
Work Areas	35	40
Apartment common areas (e.g. foyer, lift lobby)	45	55
Houses and Apartments near major roads		
Living Areas	35	45
Sleeping Areas	30	40
Work Areas	35	45
Apartment common areas (e.g. foyer, lift lobby)	45	55

4.0 ACOUSTICAL STUDY (AS 3671-1989) & Clause 102 of the SEPP – (Infrastructure) 2007

Australian Standard 3671 "Traffic noise intrusion building siting and construction" is used to determine the type of building materials required to satisfactorily attenuate traffic noise so that internal traffic noise levels recommended in Australian Standard 2107-2000 "Recommended design sound levels and reverberations for building interiors" and Clause 102 of the State Environmental Planning Policy – (Infrastructure) 2007, can be achieved.

By taking in to consideration that the proposed development is considered to be "sensitive to traffic noise or vehicle emissions", it must be "appropriately located and designed, or include measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development" arising from Bringelly Rd.

Under Clause 102, where the development is for residential use and is located in or adjacent to a relevant road corridor, a consent authority must not grant consent unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

- in any bedroom in the building – 35dB(A) at any time between 10.00p.m. and 7.00a.m.
- anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40dB(A) at any time.

Maximum design sound level is defined as the level of noise that has been found to be acceptable by most people for the environment in question and also to be not intrusive. In this assessment, satisfactory design sound levels were used where practically possible.

In accordance with Section 3.4.2.6 of AS 3671 the traffic noise attenuation (TNAc) required for each building component (walls, windows, ceiling,…etc) is determined from the following equation:

$$TNAc = TNR + 10 \log 10 [(Sc / Sf) x (3/h) x 2T60 x C] \quad \text{……..……..4.1}$$

Where *TNAc* = the traffic noise attenuation required of the component, in decibels.
TNR = the traffic noise reduction, determined in Clause 3.3;
Sc/Sf = area ratio of the component
h = ceiling height of room, in metres
T60 = reverberation time of room, in seconds
C = number of components.

The tables provided in the relative Australian standards for selecting building materials **(**walls, windows, ceiling etc) are expressed in terms of their Rw (weighted sound reduction index) or STC. Section 3.4.3.1 defines the relation between Rw and TNAc calculated in [4.1] as follows:

$$Rw \text{ (or } STC) \approx TNAc + 6 \quad \text{……..….4.2}$$

This formula approximate all allowances made for the spectral composition of the noise.

5.0 SLEEP AROUSAL

Section 5.4 of the NSW Road Noise Policy mentions the Environment Protection Authority NSW 1999 guideline which aims at limiting the level of sleep disturbance due to environmental noise. It states that the $L_{A1,\ 1\ minute}$ level of any noise should not exceed the ambient L_{AF90} noise level by more than 15dB. This guideline takes into account the emergence of noise events, but does not directly limit the number of such events or their highest level, which are also found to affect sleep disturbance.

Applying the above thus the sleep disturbance criteria for the above project is $L_{A1,\ 1\ minute}$ and should not be exceeded by [L_{A90} =46 dB(A) plus 15]= 61 dB(A).

There are other studies on sleep disturbance like the one carried the enHealth Council (2004) and the guidelines published by the World Health Organisation (1999) were reviewed and analysed in terms of the guidance on noise exposure and sleep disturbance. The enHealth report states that:

‘ as a rule for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value not exceed approximately 45 dB(A) $L_{A,(Max)}$ more than 10 or 15 times per night’.

6.0 EXTERNAL RECOMMENDATIONS

Building Component	Rw Rating Achieved
Windows & Sliding Doors in Living/Dining/Kitchen & Bedroom Areas of Units ***facing Bringelly Rd*** are to be 6mm laminated type with full perimeter Schlegel Q-Lon acoustic seals (Ph: 8707-2000). (1)	30-32
Windows & Sliding Doors in Living/Dining/Kitchen & Bedroom Areas of all other Units are to be minimum 4mm float and to be in accordance with AS 2047 (Windows in Buildings).	28-30
Windows in all other areas (Bathrooms/Laundries/Staircase etc) are unrestricted and to be in accordance with AS 2047 (Windows in Buildings).	-
External Walls are to be Double skin cavity brick walls minimum 270/250 mm, conventional brick veneer construction or any other method of wall construction with a minimum Rw of 44.	44
Roof is to be Minimum 150mm Concrete Roof AND/OR Galvanised Steel Roofing (0.5mm), on 10mm gypsum plaster board ceiling with minimum 100mm gaps & 75mm thick, R2.0 Bradford Insulation in cavity.(2).	40-50

NB: This report is to be read in conjunction with the BASIX certificate and any other related building specification.
(1). All gaps between window & door frames and the masonry walls are to be sealed using acoustic foam Hilti CP620 or similar. Glass wool batts can be applied prior to the application of the foam to seal larger gaps. (2). All gaps are to be acoustically sealed.

7.0 PROPOSED MECHANICAL PLANT & CAR PARK MECHANICAL VENTILATION

A range of mechanical plant, equipment and ventilation will be included in the proposed development at No. 484-488 Bringelly Rd, Austral. Noise emitted by the use of the proposed mechanical plant is assessed by the NSW Industrial Noise Policy.

The proposed level of basement parking is located below ground level and that makes providing natural ventilation not possible and a mechanical extract system should be used. The mechanical ventilation system needs to achieve six air changes per hour for exhaust fume extract and ten air changes per hour for smoke clearance.

A garage roller door may also be located at the entry of the Car Park. Predicted noise levels from the operation of garage roller doors have been estimated according to typical rollers doors installed at other developments. The average time duration for a garage roller door to fully open or close is approximately 30 seconds.

7.1 NSW INDUSTRIAL NOISE POLICY (2000)

The NSW Industrial Noise Policy that came into force in January 2000 replaced chapters 19, 20, 21 & 82 of the ENCM (Environmental Noise Control Manual). The new policy seeks to promote environmental well-being through preventing and minimizing noise by providing a frame work and process for deriving noise limits conditions for consent and licenses.

The Industrial Noise Policy recommends two separate noise criteria's to be considered for the assessment of the proposed development, the Intrusive Noise Criteria and the Amenity Noise Criteria, which are further explained below.

The assessment criteria listed in this report will be the lowest of the intrusive or amenity criteria for each time period in order to protect residential receivers from intrusive noise and a loss of acoustic amenity.

7.1.1 INTRUSIVE NOISE CRITERIA

Section 2.2.1 of the Noise Guide for Local Government states that a noise source is generally considered to be intrusive if the noise from the source when measured over a 15 minute period exceeds the background noise by more than 5 dB(A).

Similarly, The Industrial Noise Policy in section 2.1 summarizes the intrusive criteria as below:

$$L_{Aeq,\ 15\ minute} \leq \text{rating background level plus } 5$$

According to Section 2.1 of the NSW Industrial Noise Policy (2000) states that 'the intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) measured over a 15 minute period, does not exceed the Rating Background Level (RBL) measured in the absence of the source by more than 5 dB.'

Section 3.1 of the above policy defines the background level as $L_{A90,15\ minutes}$ which is the Noise exceeded 90% percent of a time period over which annoyance reactions may occur (taken to be 15 minutes). The RBL is defined as the overall single-figure $L_{A90,15\ minutes}$ background level representing each assessment period (day/evening/night) over the whole monitoring period.

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level.

Background noise levels were carried out on the southern boundary of the site in order to determine background noise levels. Results were as follows with the allowable intrusive noise emission criterion shown:

Table 5.1.1 – Intrusive Noise Criteria

Time of Day	$L_{(Aeq, 15\ minutes)}$	$L_{(A90, 15\ minutes)}$
Day (7am-6pm)	59	54
Evening (6pm-10pm)	56	51
Night (10pm-7am)	53	46

7.1.2 AMENITY NOISE CRITERIA

In the Industrial Noise Policy it is stated that "To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed acceptable noise levels for the area".

Relevant parts of the recommended noise levels from industrial noise sources shown in Table 2.1 of the "NSW Industrial Noise Policy", are shown below:

Table 5.1.2 - Recommended Noise Levels from Industrial Noise Sources

Type of Receiver	Indicate Noise Amenity Area	Time of the Day	Recommended L_{Aeq} Noise Level, dB(A)	
			Acceptable	Recommended Maximum
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50

7.1.3 RECOMMENDATIONS

We have assumed that mechanical services plant including the carpark ventilation and security roller door may operate as required up to 24 hours each day.

Noise criteria of the exhaust fan, medium condensing unit, and car park security roller door sound power levels are presented in the table below:

Table 5.1.3.1 – Typical Mechanical Plant Leq Sound Power Levels

FREQUENCY [Hz]	63	125	250	500	1000	2000	4000	8000	dBA
Typical Car park Exhaust fan	80	82	84	87	86	83	78	71	90
Typical Condensing Unit	71	69	67	61	58	54	47	44	64
Leq, 15 mins Car-Park security roller door.	62	57	60	60	68	63	62	57	77

In order for the operation of the car park & building mechanical plant and equipment to meet the noise criteria listed in Section 5.1 of this report, we recommend the following:

Table 5.1.3.2 - Mechanical Plant Recommendations

MECHANICAL PLANT	RECOMMENDATIONS
Car Park Supply air	• Install a silencer Min 2D (E29/90)[1] or Equivalent.
Car Park Exhaust Fan	• Provide silencer before and after Fan. • Silencer Min 2D (E29/90)[1] or Equivalent. • Lagged duct with min 38mm 32 kg/m^3 acoustic insulation a minimum 10 metres into the car park
Ducting in Commercial Tenancies	• Lagged duct with min 38mm 32 kg/m^3 acoustic insulation

Note:

1. All silencers should be placed 1 to 2 duct diameter distance away from the fans. Specifications of silencers/acoustic louvers are provided in Table below

Table 5.1.3.3 - Silencer specifications

Insertion Loss of Recommended Silencers [dB]								
FREQUENCY [Hz]	63	125	250	500	1000	2000	4000	8000
Attenuator/Silencer	6	11	18	31	36	27	24	17

Alternative attenuator/silencer or acoustic louvers can be considered provided that the insertion loss values are equal or greater than the values specified in the Table above.

We recommend that further acoustic assessment is carried when the development application has been approved and Mechanical Plans have been prepared for our review and assessment.

8.0 DISCUSSION & CONCLUSION

The construction of the proposed development at No. 484-488 Bringelly Road, Austral if carried out as recommended in the plans and specifications and including the acoustic recommendations in this report, will meet the required noise reduction levels as required in Clause 102 of the State Environmental Planning Policy – (Infrastructure) 2007, NSW Road Noise Policy, Australian Standards AS 3671 'Traffic Noise Intrusion Building Siting and Construction', AS 2107 'Acoustics – Recommended Design Sound Levels and Reverberation Times' and Liverpool City Council Conditions/Requirements.

All proposed Mechanical Plant & Equipment will comply with the noise criteria of the NSW Industrial Noise Policy provided recommendations made in this report are adhered to.

Should you require further explanations, please do not hesitate to contact us.

Yours Sincerely,

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9.0 APPENDIX

Figure 1 - Site Location

Figure 2 - Existing Bringelly Rd

Figure 3 - Proposed Site Plan

Figure 4 - Noise Reading Location

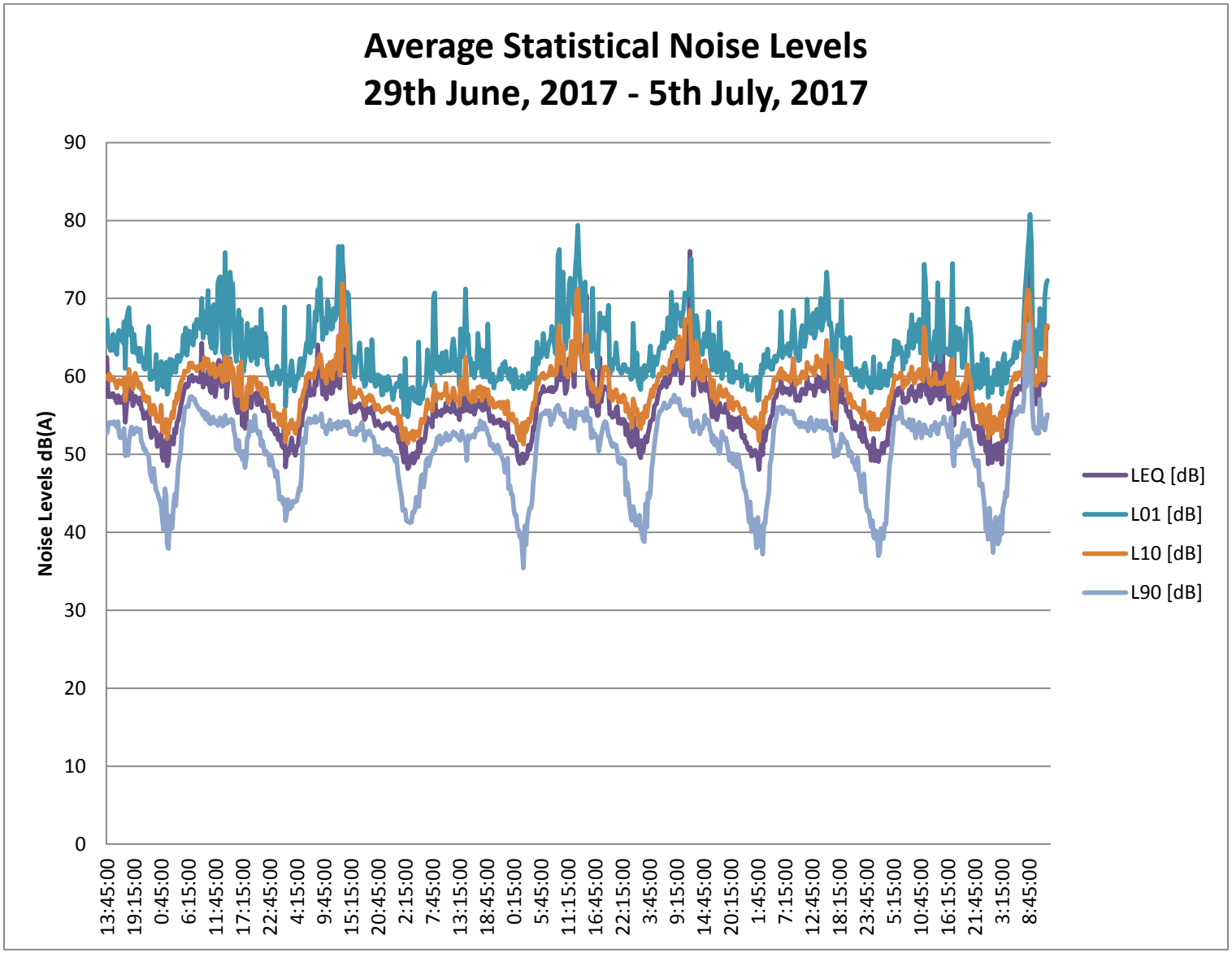

Figure 5 - Noise Survey