



# East and Cowper Streets Granville Residential Development Acoustic Planning Report



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#### Document Information

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#### Revision Table

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## Glossary

'A' Weighted	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Daytime (INP)	Between 7.00 a.m. and 6 p.m. as defined in the INP. (See INP)
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale, which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	'A' Weighted sound level in dB.
Evening	Between 6.00 p.m. and 10 p.m. as defined in the INP. (See INP)
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. The human ear responds to sound in the frequency range of 20 Hertz to 20,000 Hz.
INP	New South Wales DEC Industrial Noise Policy, 2000.
Intrusive Noise	Noise emission that when assessed at a noise-sensitive receiver (principally a residential premises boundary) is greater than 5 dB above the background ( $L_{90}$ ) noise level.
$L_{10}$	Noise level exceeded for 10 % of the measurement time. The $L_{10}$ level is commonly referred to as the average maximum noise level.
$L_{90}$	Noise level exceeded for 90 % of the measurement time. The $L_{90}$ level is commonly referred to as the background noise level.
$L_{eq}$	Equivalent Noise Level—Energy averaged noise level over the measurement time.
Night-time (INP)	Between 10.00 p.m. on one day and 7.00 a.m. on the following day as defined in the INP. (See INP).
Rating Background Level (RBL)	Overall single-figure A-weighted background level representing an assessment period (day/evening/night). For the short-term method, the RBL is simply the measured $L_{90,15min}$ noise level. For the long-term method it is the median value of all measured background levels during the relevant assessment period.

R <sub>w</sub>	Weighted Sound Reduction Index—A laboratory measured value of the acoustic separation provided by a single building element (such as a partition). The higher the R <sub>w</sub> the better the noise isolation provided by a building element.
Reverberation Time (RT)	Of a room, for a sound of a given frequency or frequency band, the time that would be required for the reverberantly decaying sound pressure level in the room to decrease by 60 decibels.

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# 1 Introduction

Resonate Acoustics has been engaged by Develotek to undertake a planning stage acoustic assessment of the proposed residential development located at East and Cowper Streets, Granville NSW.

This report covers three main aspects of acoustic study:

1. **Noise intrusion:** from external noise sources - principally from road traffic noise from Parramatta Road into proposed residential spaces.
2. **Noise emission criteria:** for mechanical plant items and other stationary noise sources.
3. **Internal acoustic requirements:** in accordance with the Building Code of Australia/National Construction Code.

The current proposal is of a similar nature to the proposed residential development located at 10-42 East Street Granville for which Resonate Acoustics has prepared a prior planning stage acoustic assessment for Develotek. Given the proximity of the current proposal to the proposed development at East Street and due to the similarity of the noise environment, unattended noise logging data from the prior assessment is reused in this assessment.

The principal activates of this commission are:

## **Noise intrusion**

- Measure and document noise intrusion from the nearby Parramatta Road. Road traffic noise from Parramatta Road is a dominant noise source in the area and as a result, forms the basis of noise intrusion predictions.
- Establish and document noise intrusion criteria in accordance with relevant Standards and regulations.
- Predict noise intrusion from Parramatta Road into internal areas of a typical residential apartment.
- Assess predicted noise levels against the established criteria and provide mitigation recommendations where required.

## **Establish noise emission criteria:**

- Process existing measured background and energy average noise levels.
- Establish noise emission criteria for mechanical plant items and other stationary noise sources.

## **Building Code of Australia/National Construction Code**

- Establish BCA/NCC acoustic requirements for the project

The main body of this report provides a summary of relevant criteria and planning stage acoustic advice. Refer to Section 5 for a summary of advice.

Appendix A provides a full explanation of the methodologies used to establish noise emission criteria in the preparation of this report.

## 2 Project Description

The proposed residential development is located on a site that comprises 14-38 Cowper Street, 21-41 East Street and 5-5a Rowell Street, Granville as shown in Figure 1. The proposal consists of three residential blocks up to 23 storeys high between East and Cowper streets. The development is located adjacent to the 10-42 East Street Develotek site. The site is located equidistant from Parramatta Road and Granville train station.. The current land uses surrounding the development are generally commercial and light industrial.

The project site is generally bounded by land uses as follows:

- North: Light industrial/commercial businesses and Parramatta Road beyond
- South West: Current: Light industrial/commercial businesses and Granville Railway Station beyond; Proposed: Residential development at 10-42 East Street and Granville Railway Station beyond
- East: Light industrial/commercial businesses
- West: Powell Street and car park and other commercial land uses beyond.

Some residential buildings are interspersed between the existing commercial land uses. Some are located on land proposed to be redeveloped whilst others are not, or not known to be (most notably the residential dwelling at 19 East Street). Criteria for mechanical services noise emission to existing and future residences are established in this report.

The proposed development is shown in the context of the surrounding environment, and acoustically significant site features are identified in Figure 1.

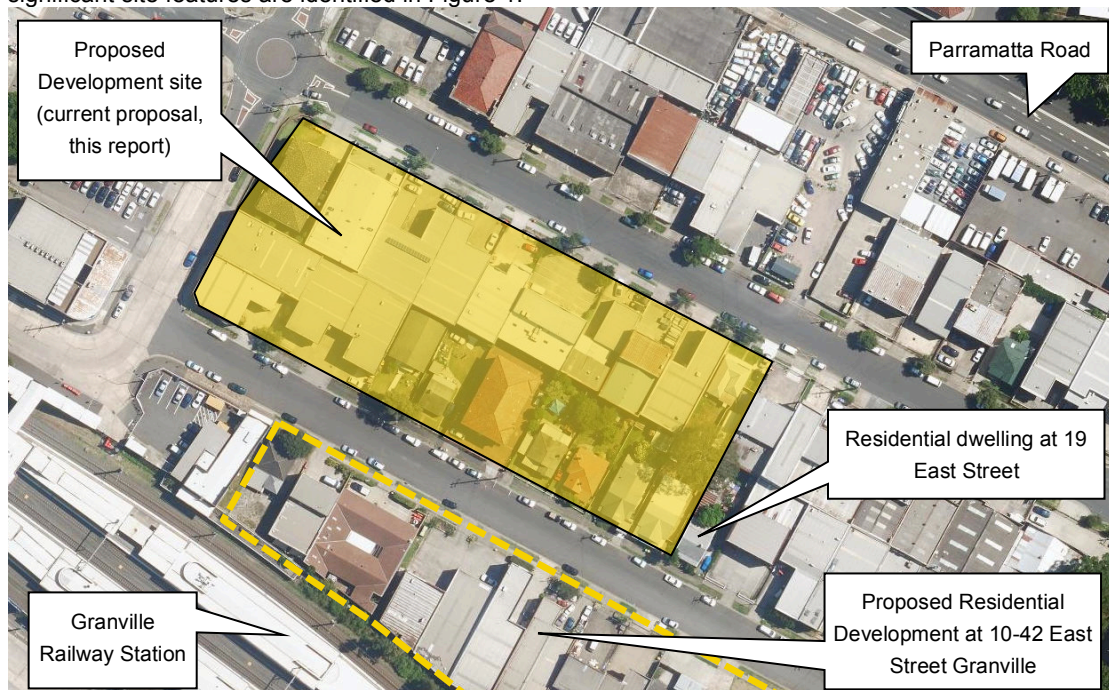


Figure 1 – Proposed development site in context

## 3 Acoustic criteria

### 3.1 Parramatta Development Control Plan (DCP) 2011

Parramatta City Council DCP provides some guidance with regard to acoustic amenity of residential premises. The DCP provides the following in Section 3.3 entitled '*Environmental Amenity*':

#### 3.3.4 Acoustic Amenity

##### Objectives

- O.1 To ensure that the siting and design of buildings minimises noise impacts from abutting busy roads, rail corridors and other noise-generating land uses.
- O.2 To ensure that commercial or industrial development does not unreasonably diminish the amenity of nearby residential uses from noise intrusion.

### 3.2 Noise intrusion

The proposed development is located near to both an active rail corridor and an arterial road with high traffic flows (approximately 48,900 vehicle movements per day AADT<sup>1</sup>). Consequently it is appropriate to establish noise intrusion criteria to safeguard internal residential acoustic amenity. A summary of internal noise level criteria for the building is presented in Table 1:

**Table 1 – Internal noise criteria summary**

Type of occupancy/activity	Recommended design sound level, dB LAeq	Time Period (LAeq 1 hour)
<b>Residential Buildings</b>		
Living areas	40	7 am to 10 pm
Sleeping areas	35	10 pm to 7 am
Work areas	40	7 am to 10 pm
Apartment common areas	50	7 am to 10 pm

These criteria relate to the combined contribution of all steady state and quasi steady-state noise sources, including a room's own mechanical services/air conditioning contribution and external noise intrusion, principally from road traffic noise.

Where two sources contribute, it is common to reduce each criterion by 3 dB so that the combined total noise equals the criterion.

<sup>1</sup> Roads and Maritime Services vehicle counter station ID 49025 '*Parramatta Road between Alfred and Kemp Streets, Granville*'.



### 3.3 Mechanical services noise emission

In this assessment, we have determined mechanical services noise emission criteria in accordance with the procedures set out in the NSW Industrial Noise Policy (INP).

The intrusive noise criterion applied by the INP is based on 'background plus 5 dB(A)'.

The INP also provides criteria to protect the amenity of an area based upon the prevailing level of industrial noise, and other considerations. Application of the amenity criteria may result in a more stringent criterion than the intrusive criterion.

The mechanical services noise emission criteria relate to noise emission to existing residential premises assumed to be retained (e.g. 19 East Street Granville) and can be applied to noise emission to future (proposed) nearby residential development.

Based upon an unattended noise survey summarised in Appendix A, the project specific mechanical services noise criteria are provided in Table 2.

**Table 2 – Mechanical services noise emission criteria – residential receivers**

Location	Noise Emission Criteria (dB LAeq)		
	Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
Nearby residential premises (10-42 East Street)	48	44	42

- (1) The noise emission criterion at nearby commercial receivers is 65 dB(A) when in use.
- (2) These criteria apply to the combined contributions of all residential blocks. The individual contribution of one block should be below the applicable criterion at the existing nearby residential premises to account for additional contribution from the other blocks (the margin would be determined once the final block configuration is decided)
- (3) The criteria in Table 2 also apply at the boundary of residential premises within the proposed development, i.e. the contribution of industrial type noise from a block's own services to itself, and from one block to another.

Refer to Appendix A for further information on the derivation of the noise emission criteria.

### 3.4 Internal acoustic separation

The proposed residential units at 21-41 East, 14-38 Cowper and 5-51 Rowell Streets are classified as Class 2/3 under the BCA/NCC. Class 2/3 buildings must achieve the objectives in Part F5 of the BCA *Sound Transmission and Insulation*. The acoustic requirements applicable to this development are outlined in Table 3.

**Table 3 - BCA requirements for Class 2 and 3 buildings**

Building element	Description	Impact noise requirements	Airborne noise criteria	Verification criteria
Floors	Separating sole-occupancy units and separating sole-occupancy units and a plant room, lift shaft, stairway, public corridor, public lobby or the like.	$L_{n,w} + C_l \leq 62$	$R_w + C_{tr} \geq 50$	Impact: $L_{n,T,w} + C_l \leq 62$ Airborne: $D_{nT,w} + C_{tr} \geq 45$
Walls	Separating sole occupancy units	—	$R_w + C_{tr} \geq 50$	$D_{nT,w} + C_{tr} \geq 45$
	Separating a habitable room of a sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen in an adjacent sole occupancy unit	Discontinuous construction <sup>1</sup>	$R_w + C_{tr} \geq 50$	$D_{nT,w} + C_{tr} \geq 45$
	Separating a sole occupancy unit and a stairway, public corridor, public lobby or the like <sup>2</sup>	—	$R_w \geq 50$	$D_{nT,w} \geq 45$
	Separating a sole occupancy unit and a plant room and lift shaft	Discontinuous construction <sup>1</sup>	$R_w \geq 50$	$D_{nT,w} \geq 45$
	A door between a sole occupancy unit and a stairway, public corridor, lobby or the like.	—	$R_w \geq 30$	$D_{nT,w} \geq 25$
Services	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a habitable room (other than a kitchen)	—	$R_w + C_{tr} \geq 40$	-

Building element	Description	Impact noise requirements	Airborne noise criteria	Verification criteria
	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a kitchen or any other room.	—	$R_w + C_{tr} \geq 25$	-
Pumps	The point of connection between the service pipes in a building and any circulating or other pump.	A flexible coupling at the connection	—	—

- (1) Discontinuous construction is defined such that walls are to have a minimum 20 mm gap between separate leaves. Cavity masonry walls are to have resilient wall ties or no wall ties. For other walls there are to be no mechanical linkages between wall leaves except at the wall periphery. A staggered stud wall is not deemed to be discontinuous.

A wall that is required to have sound insulation is to continue to the underside of the floor or roof above. Alternatively, the ceiling adjacent the walls must be acoustically treated such that the sound isolation provided by the wall is not degraded.

The internal tenancy wall and floor constructions have not been specified at this stage. Generally, compliance with the requirements above must be demonstrated in order to obtain a Construction Certificate and therefore it is not necessary for the constructions to be determined nor assessed at this stage.

It is our experience that a typical compliant inter-tenancy wall is 220 to 250 mm thick, dependant upon the construction type/materials.

## 4 Assessment

### 4.1 Road traffic noise intrusion

Based on the results of unattended and attended noise surveys (refer Appendix A), typical daytime and night-time incident road traffic noise levels for northern façades facing Parramatta Road have been determined. A combination of unattended and attended measurements and observations on site have determined that the north façade facing Parramatta Road is the most potentially noise affected.

For reference, the overall road traffic noise levels (shown in detail in Appendix A) are:

- 61 dB LAeq (1 hour) daytime and
- 56 dB LAeq (1 hour) night-time

#### Glazing

These typical noise levels have been used to calculate required glazing types to ensure internal noise levels in residential spaces are compliant with the internal noise level criteria presented in Section 3.2.

In order to undertake these calculations, the following assumptions have been made in the absence of detailed architectural drawings:

- Living spaces are approximately 20 m<sup>2</sup>, bedrooms are approximately 14 m<sup>2</sup>.
- Living spaces and bedrooms have an approximate mid-frequency reverberation time of approximately 0.5 seconds (requires a carpeted floor finish)
- Living rooms typically include up to 6.75 m<sup>2</sup> glazing
- Bedrooms typically include up to 2.25 m<sup>2</sup> glazing
- It is recommended that external noise intrusion should be designed to 3 dB(A) below the relevant internal noise criterion to allow a contribution from other steady-state noise sources (e.g.: air conditioning).

Based on the foregoing, the recommended glazing for road traffic noise affected residential spaces is:

- Bedrooms: 6 mm float glass with acoustic seals (Minimum Rw 31)
- Living areas: 6 mm float glass with acoustic seals (Minimum Rw 31)

These are suggested glazing types for residential spaces facing Parramatta Road. Residential spaces on other facades may require lesser glazing on the basis of noise control. Thermal or other considerations may dictate glazing requirements of a higher standard than those stated above and the final glazing selection should be coordinated with the needs of other disciplines.

These suggested glazing types may change for atypical room sizes or for glazed areas that are substantially different and if rooms are not carpeted as assumed.

### **Ventilation**

It is commonly accepted that a window that is open to provide ventilation to a room provides 10 dB(A) noise reduction from outside to inside.

On this basis, internal noise levels in residential spaces on the Parramatta Road facing facade when windows are open for ventilation will be:

- 51 dB LAeq (1 hour) daytime and
- 46 dB LAeq (1 hour) night-time

These exceed their respective internal design sound levels by 11 dB(A) for daytime and night time. Consequently windows must be closed to ensure internal noise criteria can be satisfied.

It is therefore recommended that an alternative means of ventilation be provided for residential spaces on road traffic noise affected facades. An alternative means of ventilation may take the form of:

- Air conditioning with an outside/fresh air component (not a conventional 'split' system).
- Mechanical ventilation drawn from a 'quiet' side of the building and/or with an acoustically attenuated intake path.
- Proprietary acoustically treated ventilation intakes such as 'SilenceAir', with air drawn through by the operation of the apartment's own toilet exhaust fan or another fan to a mechanical engineer's design.
- An open window on a 'quiet' side of the building (should single-sided ventilation be possible).

It is recommended that acoustical modelling is undertaken at the detailed design stage once development approval is granted to optimise glazing selections and the ventilation strategy.

## **4.2 Mechanical services noise emission**

Mechanical services plant has not been selected at this stage of the project and therefore no numerical assessment can be made. A full assessment of mechanical plant noise emission is recommended once the location and specification of units has been determined.

Due to likelihood of other residential development in the immediate vicinity, it is recommended that cumulative mechanical services noise impacts be considered. Once method of controlling cumulative noise impacts at existing residential dwellings to be retained is to design to a margin (for example 3 dB) below the criteria provided in Table 2 for each of the respective time periods.

In-principle methods of controlling mechanical services noise emission, to be considered at the design stage are:

- Selecting the quietest plant for a given task
- Judicious location and orientation
- Use larger fans at a slower speed rather than smaller fans at a higher speed
- Using variable speed drives to lower fan speed in response to lower duty/load requirements
- Use of barriers, both incidental and purpose designed
- Internally lined ducts and bends, external duct and equipment wrapping, silencers.

## 5 Summary

A summary of key points from our assessment and analysis is presented in this section.

### 5.1 External noise intrusion

Glazing types have been suggested to control road traffic noise intrusion to achieve compliant internal noise levels. It is likely that the 6 mm float glass and acoustic seals will be appropriate to control road traffic noise intrusion.

It has also been suggested that an alternative means of ventilation should be considered for residential spaces, as windows must be closed in order to control noise intrusion. Refer to section 4.1 for details.

### 5.2 Mechanical services noise emission

Mechanical services noise from equipment servicing the proposed development shall be designed to comply with the criteria summarised in Section 3.3.

It is important to note that mechanical services design should take into account the future likely contribution of nearby proposed developments and their associated mechanical services noise contribution.

In-principle noise controls have been recommended.

### 5.3 Building Code of Australia

Table 3 shall be referred to during the detailed design phase in order to ensure compliance with the Building Code of Australia internal acoustic separation requirements.

## Appendix A – Noise surveys

### Unattended noise logging – background noise

Unattended noise measurements ('logging') have been conducted during the period Thursday 28<sup>th</sup> May to Thursday 4<sup>th</sup> June 2015. Logging was conducted on Cowper Street at a representative location.

Additionally logged results data has been used from a previous logging exercise conducted for a Develotek development at 10-42 East Street. Measurements at this location were conducted between the period Tuesday 5<sup>th</sup> August to Wednesday 13<sup>th</sup> August 2014.

The logging location identified as 'Background noise logging location' in Figure 2 is of relevance to the establishment of (industrial) noise emission criteria.

The location identified as 'Road Traffic Noise Logging Location' is used to establish road traffic noise levels incident upon the nearest noise-affected residential facades.



**Figure 2 – Unattended noise logging locations**



## Equipment

The equipment used for the unattended noise measurements is as follows:

- Road traffic noise logging: Rion NL-21 noise logger (serial number: 00409176).
- Background noise logging: Rion NL-32 noise logger (serial number: 00451254).

The noise loggers were configured to record all relevant noise indices including background noise ( $L_{A90}$ ) and equivalent continuous noise levels ( $L_{Aeq}$ ). Samples were accumulated at 15-minute intervals. The time response of the loggers was set to 'fast'.

## Data processing – noise emission

In order to determine mechanical services noise emission criteria, data from the 'background' logger was processed according to the procedures and time periods in the NSW Industrial Noise Policy (INP) time periods as follows:

- INP Daytime: 07:00 to 18:00
- INP Evening: 18:00 to 22:00
- INP Night-time: 22:00 to 07:00

It is necessary to establish a representative noise level for each of these time periods. We have used the procedures in the NSW INP to derive a representative background noise level (a Rating Background Level or RBL) for the daytime, evening and night-time periods. An RBL is the median of the lowest 10<sup>th</sup> percentile of the background  $L_{A90}$  samples in each daytime, evening and night-time measurement period.

The ambient noise environment on the East Street side of the site is considered to be mostly urban hum, being a mix of many industrial-type noise sources with some limited rail and road traffic noise contribution. Noise levels during defined time periods are presented in Table 4.

**Table 4 – Measured noise levels at background noise logging location**

Location	Noise Level (dB re 20 $\mu$ Pa) during Period		
	INP Daytime 07:00 – 18:00	INP Evening 18:00 – 22:00	INP Night-time 22:00 – 07:00
$L_{A90}$ / RBL / Background noise level	43	45	42
Measured $L_{Aeq}$ / Energy Average Total Noise Level	56	54	52



## Noise logging weather conditions

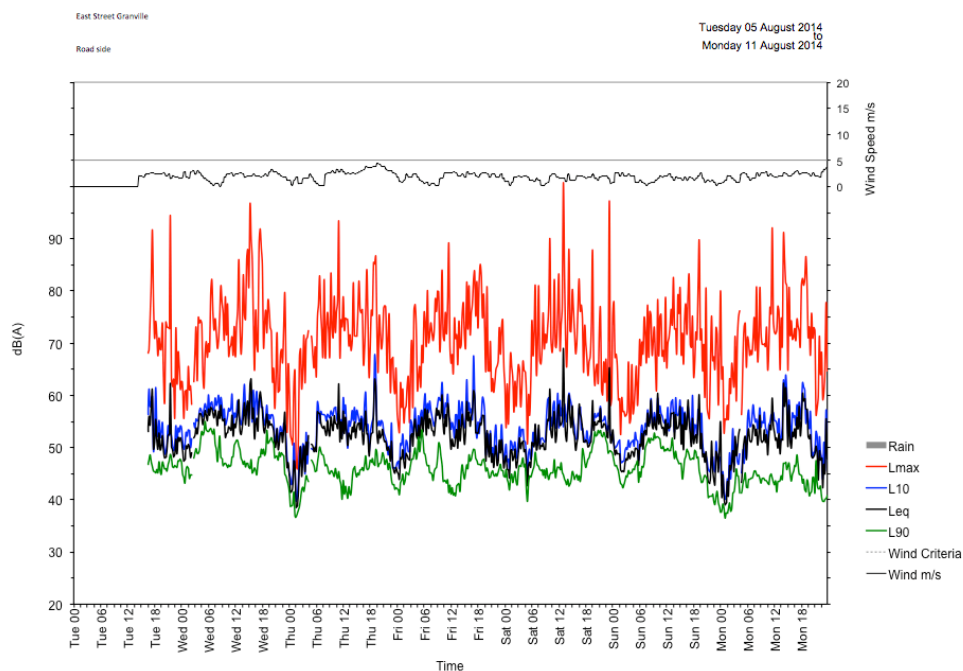
In order to provide an indication that noise data was obtained during suitable meteorological conditions, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) Automatic Weather Station (AWS) 066062 at Sydney Observatory Hill.

Noise data has been excluded from the processed results if:

- 1) Rain was observed during a measurement period and/or
- 2) Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground, and these values are halved for the purpose of estimating wind speed at 1.5 m above ground.

## Background noise logging - graphed results

For reference, a weekly chart showing the graphed noise logging results from the background noise logger is shown in Figure 3.



**Figure 3 – Graphed noise logging data – Background noise logger**

## Derivation of noise emission criteria

In consideration of the above, project specific criteria have been established in accordance with the NSW INP.

Criteria for continuously operational mechanical services and other stationary noise sources at the proposed development site are shown in bold in Table 5.

For the purpose of determining amenity criteria at this site, the nearby residentially zoned land is considered to be located in an 'urban' noise environment as defined in the NSW INP.

**Table 5 – INP Noise emission criteria – residential receivers**

Location	Noise Level (dB re 20 µPa) during Period		
Residential receivers, e.g.: East Street Granville	INP Daytime 07:00 – 18:00	INP Evening 18:00 – 22:00	INP Night-time 22:00 – 07:00
Rating Background Level (RBL)	43	45	42
Intrusive criterion (RBL + 5 dB)	48	50	47
Amenity Criterion (Urban)	58	44	42
<b>INP Project specific criteria</b>	<b>48</b>	<b>44</b>	<b>42</b>

The amenity criteria presented in Table 5 take into account the Modification Factors presented in Table 2.2 of the INP, existing measured energy average noise levels presented in Table 4 above and our impressions of the site during multiple site visits.

## Unattended noise logging – Road traffic noise

The location identified as 'Road Traffic Noise Logging Location' in Figure 2 has been used to establish road traffic noise levels incident upon the noise-affected residential facades facing Parramatta Road.

The measured data has been processed to determine energy average noise levels during each of the following periods:

- Daytime (7 am to 10 pm),
- Night-time (10 pm to 7 am) and
- The highest one hour in each of these periods

These time periods are consistent with usual practice in NSW. Refer to Table 1 for results.

**Table 6 – Measured noise levels – Road traffic noise logging location**

Location	Energy-average noise level (L <sub>Aeq</sub> ) (dB re 20 µPa)			
	Daytime (15 hour) 07:00 – 22:00	Daytime (1 hour) 07:00 – 22:00	Night-time (9 hour) 22:00 – 07:00	Night-time (1 hour) 22:00 – 07:00
14-38 Cowper Street North (road) facade	60	61	53	56

- (1) For the purposes of our assessment, the higher (more stringent) noise levels occurring during the noisiest one hour L<sub>Aeq</sub> (1 hour) periods for both day and night have been used.

## Road traffic noise measurements - spectra

In order to perform road traffic noise intrusion calculations, road traffic noise spectra considered representative of those at the East and Cowper Street development site have been applied to the overall dB(A) sound pressure levels obtained during the unattended noise survey.

Results, scaled to the night-time road traffic noise level of 56 dB L<sub>Aeq</sub> (1 hour) are presented in Table 7.

**Table 7 – Road traffic noise spectra scaled to 56 dB(A)**

Measurement	Sound pressure level (dB L <sub>Aeq</sub> ) at Octave Band Centre Frequency (Hz)							dB(A)
	63	125	250	500	1000	2000	4000	
Night-time L <sub>Aeq</sub> (1hour) road traffic noise	37	41	45	48	52	50	42	56

### Road traffic noise logging - graphed results

For reference, a weekly chart showing the graphed noise logging results from the road traffic noise logger is shown in Figure 4.

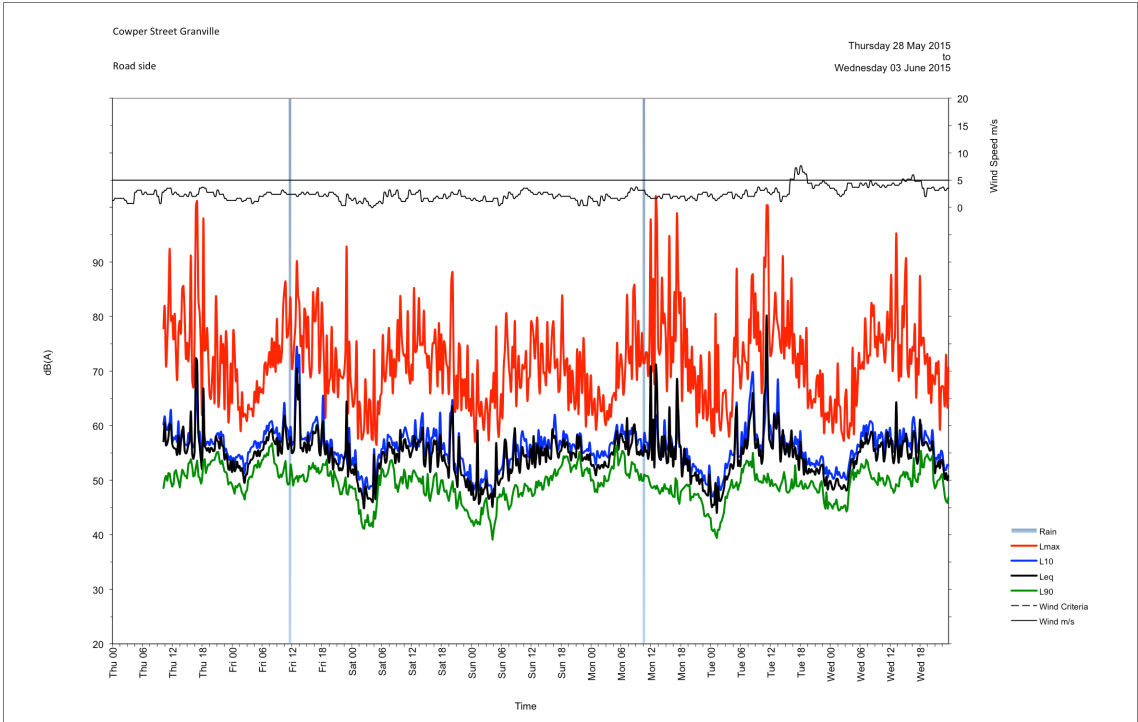


Figure 4 – Graphed noise logging data – road traffic noise logger