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# **Surry Hills Shopping Village Redevelopment Project**

## **Noise Impact Assessment**

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## 1 INTRODUCTION

Acoustic Logic Consultancy Pty Ltd has been engaged to conduct an acoustic assessment for the purpose of assessing the potential impacts on the acoustic amenity of the proposed Surry Hills Shopping Centre Village development, Surry Hills for both external and internal noise sources as part of the Planning Application submission. The noise sources investigated are as follows:

- Environmental noise impact on the future site, including surrounding traffic noise from surrounding roadways.
- Noise emissions associated with traffic generated from the site.
- Noise emissions from the site including mechanical plant noise to surrounding receivers.
- Noise emissions associate with the propose carpark and loading dock to surrounding receivers.

Environmental noise will be covered first as it will potentially impact the future development. Unattended and attended noise monitoring was conducted in order to determine the existing traffic noise levels around the perimeter of the site.

The final part of the report will address noise generated from the development to surrounding properties including building services and the proposed activities on the site. Detailed design of the mechanical plant will be provided as part of the CC submission for each stage of the project. This study will set the goal assessment criteria applicable to the project based on the Environmental Protection Authority (EPA) requirements, the City of Sydney Council's DCP and relevant statutory/regulatory requirements.

## 1.1 SITE DESCRIPTION

Figure 1 below illustrates the location of the proposed Surry Hills Shopping Centre Village development site and the location of noise monitoring and measurements.

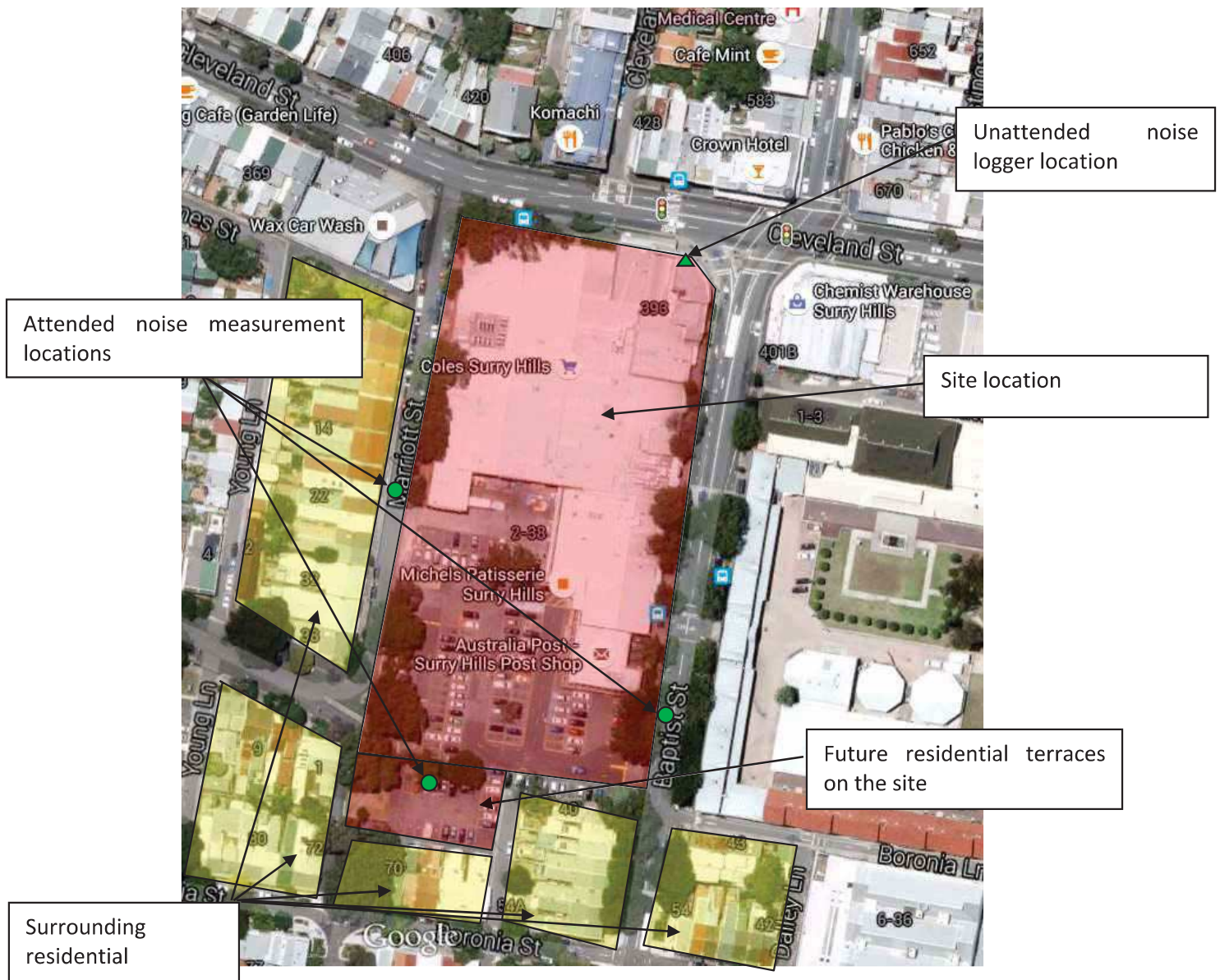


Figure 3 – Site Location and Measurement Positions





Figure 2 – Proposed Development

The existing environmental noise sources affecting the site are as follows:

- The development is affected by environmental noise predominantly from traffic noise from Cleveland Street to the north of the site which carries high volumes of traffic, Baptist Street to the east which carries medium traffic volumes as well as other surrounding roadways.

The environmental noise source outlined above has varying degrees of impact upon the proposed development which will be outlined in this report.

## 2 EXISTING ACOUSTIC ENVIRONMENT

Environmental noise impacting the site is a result of traffic noise from the surrounding perimeter roadways and other surrounding land existing land uses.

### 2.1 TOPOGRAPHY

The topography of the site and surrounding land of the proposed development is generally flat, the acoustic assessment has taken this topography into account.

## 3 ACOUSTIC SURVEY

As part of this assessment an acoustic survey of the proposed Surry Hills Shopping Village development site has been conducted.

The acoustic survey included attended and unattended noise logging which is detailed in this section of the report.

### 3.1 ENVIRONMENTAL NOISE LEVELS

Environmental noise constantly varies in level, due to fluctuations in local noise sources including road traffic. Accordingly, a 15 minute measurement interval is normally utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In the case of environmental noise three principle measurement parameters are used, namely  $L_{10}$ ,  $L_{90}$  and  $L_{eq}$ .

The  $L_{10}$  and  $L_{90}$  measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The  $L_{10}$  parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the  $L_{90}$  level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The  $L_{90}$  parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source depends on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the  $L_{90}$  level.

The  $L_{eq}$  parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period.  $L_{eq}$  is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of industrial noise.

### **3.2 ATTENDED NOISE MEASUREMENTS**

Attended noise level measurements conducted as part of this assessment are detailed in this section of the report. All noise levels undertaken as part of this assessment were conducted in conjunction with the requirements of AS1055.

#### **3.2.1 Measurement Equipment**

Attended measurements were undertaken using a Norsonic 140 sound level analyser, set to A-weighted fast response. The sound level analyser was calibrated before and after the measurements, no significant drift was noted.

#### **3.2.2 Measurement Period**

Noise measurements was conducted at the locations detailed in Figure 3 in Section 2 above during the following period:

1. Peak afternoon conditions between 4.30pm and 6pm and between 11pm and Midnight on the 14<sup>th</sup> of August, 2015.

### **3.3 UNATTENDED NOISE MONITORING**

Unattended noise monitoring conducted as part of this assessment is detailed in this section of the report. The results of unattended noise logging are included in Appendix A.

#### **3.3.1 Unattended Monitoring Period**

Unattended noise monitoring was conducted at the site during the period of 7<sup>th</sup> to 14<sup>th</sup> of August 2015 in order to measure the existing background and environmental noise levels at the site.

The noise level monitors were located at the following locations:

1. Location 1 –level 1 of the site on the corner of Cleveland Street and Baptist Street as detailed in Figure 1 above.
2. Note that noise monitoring could not be conducted to the rear of the site due to security, as a logger was stolen during the measurement period. As a result attended noise levels were conducted to the rear of the site to ascertain existing background noise levels at the site.

### **3.3.2 Monitoring Equipment**

Unattended noise measurements were obtained using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noise monitors were calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode. Periods of adverse weather conditions during the measurement period have not be used in this assessment.

### 3.4 RESULTS OF THE ACOUSTIC SURVEY

An acoustic survey was undertaken at the proposed Surry Hills Shopping Village site in order to determine the existing acoustic environment. The unattended monitor results will be used to determine the variation between day, evening and night time noise levels. Attended measurements will be compared with the unattended monitoring data during the same measurement period so that relative differences between the attended and unattended locations can be formed thereby providing a comprehensive study of existing noise levels around the proposed site.

#### 3.4.1 Meteorological conditions during monitor period

Section 3.4 of the NSW Environment Protection Authority (EPA) Industrial Noise Policy document outlines the following with regards to meteorological impacts on noise monitoring;

*“Noise monitoring should not be conducted (or the data should be excluded) when average wind speeds (over 15-minute periods or shorter) at microphone height are greater than 5 m/s, or when rainfall occurs.”*

However, the same section of this policy also outlines that;

*“Exceptions to this rule are allowed, provided the proponent is able to show that the wind-induced noise on the microphone, and sound levels due to rain, are at least 10 dB below the noise levels (that is, background and/or ambient) under investigation.”*

Weather conditions during the monitoring period have been assessed and the periods of inclement weather are highlighted in Appendix 1. The periods of inclement weather have been excluded from the monitoring data in calculation of noise levels.

Exceedances of the 5m/s average wind speed limit was noted on different days of the monitoring period, with these periods also excluded from the monitoring data in calculation of the rating background noise levels (RBL's).

Additionally, it should be noted that the subject site is located around the site is a built-up area with multi-storey buildings, flat terrain and considerable less flora fauna in comparison to Observatory Hill, which is an elevated terrain, not obstructed by surrounding structures and will be primarily affected by noise generated by wind blowing through leaves.

### 3.4.2 Existing Background Noise Levels

Background noise levels during day time are dominated by general vehicular traffic movements. The NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP) details specific steps in determining the background noise level for assessment of the day, evening and night time periods. Table 1 summarises the background determined at the monitoring location, based on the guidelines set out in the INP and the results of unattended noise monitoring.

**Table 1 – Measured Ambient Noise Levels**

| Location                 | Description                      | Day Noise Level<br>7am to 6pm<br>(dB(A)L <sub>90</sub> ) | Evening Noise<br>Level 6pm to<br>10pm (dB(A)L <sub>90</sub> ) | Night Noise Level<br>10pm to 7am<br>(dB(A)L <sub>90</sub> ) |
|--------------------------|----------------------------------|----------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|
| Noise Logger<br>Location | Background L <sub>90,15min</sub> | 62                                                       | 56                                                            | 50                                                          |

In addition to the background levels obtained at the unattended monitoring position presented above, attended noise monitoring was conducted at 2 locations around the perimeter of the subject site as detailed in Figure 1 of Section 1 above. The results of the attended noise measurements are presented in Table 2 below.

**Table 2 – Measured Attended Environmental Noise Levels**

| Location                        | Time Period           | Measured Noise level<br>dB(A) L <sub>eq</sub> (15 min) | Measured Noise level<br>dB(A) L <sub>90</sub> (15 min) |
|---------------------------------|-----------------------|--------------------------------------------------------|--------------------------------------------------------|
| Location 1 – Baptist<br>Street  | Peak Afternoon Period | 66                                                     | 52                                                     |
|                                 | Night Time            | 58                                                     | 46                                                     |
| Location 2 – Boronia<br>Street  | Peak Afternoon Period | 63                                                     | 49                                                     |
|                                 | Night Time            | 58                                                     | 43                                                     |
| Location 3 – Marriott<br>Street | Peak Afternoon Period | 62                                                     | 46                                                     |
|                                 | Night Time            | 55                                                     | 42                                                     |

### 3.4.3 Measured Background Noise Spectrum

As part of the noise survey background noise measurement was also conducted on site to determine the existing background noise spectrum. Background noise level measurements were conducted at the site as detailed in Figure 1 above in 1/3 octaves which are presented below.

**Table 3 – Background Noise Spectrum Baptist Street**

| Location       | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|------|
| Baptist Street | Daytime<br>(7am – 6pm)  | 59     | 59   | 54    | 54    | 46    | 46   | 45   | 35   | 33   | 52   |
|                | Evening<br>(6pm – 10pm) | 53     | 53   | 46    | 46    | 41    | 41   | 39   | 31   | 26   | 46   |
|                | Night<br>(10pm – 12am)  | 53     | 53   | 46    | 46    | 41    | 41   | 39   | 31   | 26   | 46   |

**Table 4 – Background Noise Spectrum Boronia Street**

| Location       | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|------|
| Boronia Street | Daytime<br>(7am – 6pm)  | 56     | 56   | 49    | 49    | 44    | 44   | 42   | 34   | 29   | 49   |
|                | Evening<br>(6pm – 10pm) | 49     | 49   | 42    | 42    | 37    | 39   | 37   | 28   | 25   | 43   |
|                | Night<br>(10pm – 12am)  | 49     | 49   | 42    | 42    | 37    | 39   | 37   | 28   | 25   | 43   |

**Table 5 – Background Noise Spectrum Marriott Street**

| Location        | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|-----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|------|
| Marriott Street | Daytime<br>(7am – 6pm)  | 52     | 52   | 48    | 47    | 42    | 40   | 38   | 32   | 27   | 46   |
|                 | Evening<br>(6pm – 10pm) | 46     | 46   | 42    | 42    | 36    | 38   | 36   | 28   | 22   | 42   |
|                 | Night<br>(10pm – 12am)  | 46     | 46   | 42    | 42    | 36    | 38   | 36   | 28   | 22   | 42   |

## 4 EXTERNAL NOISE INTRUSIONS

The predominant noise source affecting the site is traffic noise from vehicle movements on surrounding roadways

### 4.1 ENVIRONMENTAL NOISE INTRUSIONS ASSESSMENT CRITERIA

Environmental noise impact into the proposed development has been assessed in conjunction with the City of Sydney council DCP and the NSW SEPP (including Developments Near Busy Roads and Railway Corridors) as detailed in this section of the report.

#### 4.1.1 Sydney Development Control Plan 2012

Section 4.2 of the Sydney DCP 2012 relates to objectives and provisions for residential flat developments. Part 4.2.3.11 of this section of DCP 2012 outlines the following acoustic controls for new developments affected by traffic noise:

*(7) The repeatable maximum  $L_{Aeq(1hour)}$  for residential buildings and serviced apartments must not exceed the following levels:*

*(a) for closed windows and doors:*

- i) 35dB for bedrooms (10pm-7am); and*
- ii) 45dB for main living areas (24 hours).*

*(b) for open windows and doors:*

- i) 45dB for bedrooms (10pm-7am); and*
- ii) 55dB for main living areas (24 hours).*

*(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum  $L_{Aeq(1hour)}$  level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:*

- (a) 38dB for bedrooms (10pm-7am); and*
- (b) 48dB for main living areas (24 hours).*

#### 4.1.2 NSW SEPP Requirements

As Cleveland carries more than 40,000 Annual Average Daily Traffic numbers (AADT) an assessment in conjunction with the SEPP (Infrastructure) or State Environmental Planning Policy (Infrastructure) 2007 Condition 102, which states:

*“(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*

*(a) a building for residential use,*

*(b) a place of public worship,*

*(c) a hospital,*

*(d) an educational establishment or child care centre.*

*(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*

*(3) If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*

*(a) in any bedroom in the building--35 dB(A) at any time between 10 pm and 7 am,*

*(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway)--40 dB(A) at any time”.*

Note that the noise level criteria detailed above are based on the requirements of the EPA’s ‘Developments Near Rail Corridors and Busy Roads’ policy.

#### 4.1.3 Project Internal Noise Criteria

Pursuant to these requirements, internal traffic noise criteria are presented in the table below based on all relevant standard above.

**Table 6 - Internal Traffic Noise Criteria**

| Space/Activity Type    | Noise Level                                                          |
|------------------------|----------------------------------------------------------------------|
| Living Area (24 hours) | 40 dB(A) $L_{eq}$ (15 hour)<br>45 dB(A) $L_{eq}$ (1 hour) 24hr       |
| Bedroom (10pm-7am)     | 40 dB(A) $L_{eq}$ (15 hour)<br>35 dB(A) $L_{eq}$ (1 hour) night time |
| Commercial Areas       | 45 dB(A) $L_{eq}$ (15 hour)*                                         |
| Retail Areas           | 50 dB(A) $L_{eq}$ (15 hour)*                                         |

\*Note: Based on the Australian Standard AS2107:2000

#### 4.1.4 Environmental Noise Measurements

Noise level recorded at the site which have been used as the basis of this report are detailed in Section 3 of this report.

#### 4.1.5 Methodology of Traffic Noise Intrusion Assessment

External noise intrusions will primarily be as a result of noise transfer through the roof, windows and doors, as these are relatively light building elements, which offer less resistance to the transmission of sound. Noise transfer through masonry external walls will not be significant and need not be considered further.

The constructions necessary to attenuate traffic noise impacts to levels complying with those detailed in section 4.1 above, are set out in section 4.2. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to aircraft noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

## 4.2 RECOMMENDED TREATMENTS

The treatments set out in this section will ensure compliance with the noise objectives for both external noise sources (aircraft and traffic) likely to impact the potential development.

Calculations take into account the size and orientation of windows, barrier effects (from terrace areas), facade transmission losses and room sound absorption characteristics.

### 4.2.1 Recommended Glazing

The recommended glazing assemblies are presented below. In all cases, the selected glazing type reduces internal noise levels to within the nominated criterion for the various space types.

The proposed glazing thickness will satisfy all acoustic requirements. Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

**Table 7 – Recommended Glazing Constructions**

| Level                              | Façade                  | Room Type         | Glazing           | Seals |
|------------------------------------|-------------------------|-------------------|-------------------|-------|
| Commercial Levels                  | Facing Cleveland Street | Commercial/Retail | 10.38mm laminated | Yes   |
|                                    | All other facades       | Commercial/Retail | 6.38mm laminated  | Yes   |
| Residential Levels<br>(All Levels) | Facing Cleveland Street | Bedroom           | 12.38mm laminated | Yes   |
|                                    |                         | Living Rooms      | 10.38mm laminated | Yes   |
|                                    | Facing Baptist Street   | Bedroom           | 10.38mm laminated | Yes   |
|                                    |                         | Living Rooms      | 6.38mm laminated  | Yes   |
|                                    | All other facades       | Bedroom           | 6.38mm laminated  | Yes   |
|                                    |                         | Living Rooms      | 6.38mm laminated  | Yes   |

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table above. All external windows and doors listed are required to be fitted with Q-Ion type acoustic seals. Note that mohair of fin type seals will not be acceptable for the windows requiring acoustic seals.

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

**Table 8 - Minimum STC or  $R_w$  of Glazing (with Acoustic Seals)**

| <b>Glazing Assembly</b> | <b>Acoustic Seals</b> | <b>Minimum STC of Installed Window</b> |
|-------------------------|-----------------------|----------------------------------------|
| 12.38mm Laminated       | Yes                   | 36                                     |
| 10.38mm Laminated       | Yes                   | 35                                     |
| 6.38mm Laminated        | Yes                   | 30                                     |

#### **4.2.2 Roof / Ceiling**

The proposed roof ceiling constructions will be acoustically acceptable without additional acoustic treatments.

#### **4.2.3 External Walls**

The proposed external wall constructions will be acoustically acceptable without additional acoustic treatments.

#### **4.2.4 Ventilation and Air Conditioning**

As internal noise levels within the external openings open to 5% of the floor area for ventilation will not comply with the noise level criteria of 45dB for living areas (10pm-7am); and 35dB for bedrooms based on the City of Sydney DCP and an alternative outside air source or air conditioning will be required to be provided to the residential areas of the development.

## 5 NOISE EMISSION LIMITS – NOISE GENERATED ON THE SITE

The NSW Environmental Protection Authority (EPA) Industrial Noise Policy (INP) and the City of Sydney Council DCP provides guidelines for assessing noise impacts from development sites. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The EPA's Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA in its Environmental Noise Control Manual states that noise controls should be applied with the general intent to protect residences from sleep arousal.

For land use developments with the potential to create additional traffic on local roads the development should comply with the requirements detailed in the Environmental Criteria for Road Traffic Noise (ECRTN).

The relevant noise level criteria for noise emission generated on the site are detailed in this of the report.

All relevant criteria have been developed based on the unattended noise logging and attended noise measurements conducted at the site and detailed in Section 3 of this report. The noise level measurement locations were conducted at positions which did not include noise from the existing site. The obtained noise levels did not include noise from an industrial noise source and therefore the modifying factors of the EPA are not required to be applied to the noise emission assessment.

### 5.1.1 City of Sydney Standard Conditions

The City of the Sydney Council standard conditions include the following;

#### **NOISE - GENERAL**

*(a) The emission of noise associated with the use of the premises including the cumulative operation of any mechanical plant and equipment, and air conditioning shall comply with the following:*

*(i) The  $L_{Aeq, 15 \text{ minute}}$  noise level emitted from the use must not exceed the project specific noise level for that receiver as determined in accordance with the NSW EPA Industrial Noise Policy. Noise must be measured in accordance with the Industrial Noise Policy and relevant requirements of Australian Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.*

*(ii) Project specific noise levels shall be determined by establishing the existing environmental noise levels, in complete accordance with the assessment  $L_{A90, 15 \text{ minute}}$  / rating  $L_{A90, 15 \text{ minute}}$  process to be in accordance with the requirements for noise monitoring listed in the NSW EPA Industrial Noise Policy and relevant requirements of Australian Standard AS1055-1997 Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.*

*(iii) Modifying factors in Table 4.1 of the NSW EPA Industrial Noise Policy are applicable.*

*(b) An  $L_{Aeq,15 \text{ minute}}$  noise level emitted from the use must not exceed the  $L_{A90, 15 \text{ minute}}$  noise level by more than 3dB in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) when assessed inside any habitable room of any affected residence or noise sensitive commercial premises provided that;*

*(i) Where the  $L_{A90, 15 \text{ minute}}$  noise level is below the threshold of hearing,  $T_f$  at any Octave Band Centre Frequency as defined in Table 1 of International Standard ISO 226 : 2003- Normal Equal-Loudness-Level Contours then the value of  $T_f$  corresponding to that Octave Band Centre Frequency shall be used instead.*

*(ii) The  $L_{Aeq,15 \text{ minute}}$  noise level and the  $L_{A90,15 \text{ minute}}$  noise level shall both be measured with all external doors and windows of the affected residence closed;*

*(iii) The relevant background noise level ( $L_{A90, 15 \text{ minute}}$ ) is taken to mean the day, evening or night rating background noise level determined in complete accordance with the methodology outlined in the NSW EPA Industrial Noise Policy and Australian Standard AS1055.1997 Acoustics – Description and measurement of environmental noise.*

*(iv) Background noise shall be established in the absence of all noise emitted from the use but with the ventilation equipment normally servicing the affected residence operating. Background noise measurements are to be representative of the environmental noise levels at the affected location.*

(v) Modifying factors in Table 4.1 of the NSW EPA Industrial Noise Policy are applicable. Internal Noise measurements are not to be corrected for duration.

The resulting noise level criteria from the operation of the mechanical equipment on the site are detailed in the following sections based on the EPA, INP.

## **5.2 EPA INTRUSIVENESS CRITERION**

The EPA guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the  $L_{eq}$  descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

## **5.3 EPA AMENITY CRITERION**

The EPA guideline is intended to limit the absolute noise level from all industrial noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Table 5 of the INP provides the recommended ambient noise levels for the suburban residential receivers for the day, evening and night periods. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and

- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

**Table 9 – EPA Recommended Amenity Noise Levels**

| Type of Receiver     | Time of day | Recommended Acceptable Noise Level dB(A) $L_{eq}$ |
|----------------------|-------------|---------------------------------------------------|
| Residential          | Day         | 55                                                |
|                      | Evening     | 45                                                |
|                      | Night       | 40                                                |
| Commercial Receivers | When in use | 65                                                |

## 5.4 SLEEP AROUSAL

To minimise the potential for sleep arousal the  $L_1$  (1 minute) noise level of any specific noise source does not exceed the background noise level ( $L_{90}$ ) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. The  $L_1$  noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Where the typical repeatable existing  $L_1$  levels exceed the above requirement then the existing  $L_1$  levels form the basis for, sleep disturbance criteria.

## 5.5 SUMMARY OF ASSESSMENT CRITERIA FOR PROPOSED SITE

The EPA's INP intrusiveness, amenity and sleep arousal criteria for this project have been determined using these guidelines and the noise monitoring results. These are summarised below. We note that the formulation of the assessment criteria has been based on the lowest ambient levels determined from all monitoring and measurement data obtained at the site.

### 5.5.1 Day Time Period

The following table sets out the measured  $L_{eq}$  amenity and  $L_{90}$  background noise levels, and the assessment criteria based on the suburban criteria. The day period applies between 7am and 6pm Monday to Saturday; and 8am to 6pm Sundays and public holidays.

**Table 10 – Measured  $L_{eq}$  &  $L_{90}$  Noise Levels and Criteria - Daytime**

| Location         | Measured $L_{eq}$ Noise Level dB(A) | Measured $L_{90}$ Noise Level dB(A) | Amenity Criterion dB(A) $L_{eq}$ | Intrusiveness Criterion dB(A) $L_{eq}$ |
|------------------|-------------------------------------|-------------------------------------|----------------------------------|----------------------------------------|
| Cleveland Street | 74                                  | 62                                  | 55                               | 67                                     |
| Baptist Street   | 66                                  | 52                                  | 55                               | 57                                     |
| Boronia Street   | 63                                  | 49                                  | 55                               | 54                                     |
| Marriott Street  | 62                                  | 46                                  | 55                               | 51                                     |

### 5.5.2 Evening Period

The following table sets out the measured  $L_{Aeq}$  and  $L_{90}$  background noise levels, and the assessment criteria based on the suburban criteria. The evening period applies between 6pm and 10pm.

**Table 11 –Measured Leq & L90 Noise Levels and Criteria - Evening Period**

| Location         | Measured Leq<br>Noise Level dB(A) | Measured L90<br>Noise Level dB(A) | Amenity Criterion<br>dB(A) $L_{eq}$ | Intrusiveness<br>Criterion<br>dB(A) $L_{eq}$ |
|------------------|-----------------------------------|-----------------------------------|-------------------------------------|----------------------------------------------|
| Cleveland Street | 72                                | 56                                | 45                                  | 61                                           |
| Baptist Street   | 58                                | 46                                | 45                                  | 51                                           |
| Boronia Street   | 58                                | 43                                | 45                                  | 48                                           |
| Marriott Street  | 55                                | 42                                | 45                                  | 47                                           |

### 5.5.3 Night Time Period

The night period (that is, between 10pm and 7am) is the period where noise emissions can have the most significant effect on residential amenity. In addition to the quasi-steady state criteria the  $L_1$  noise emission level should not exceed the background noise level by more than 15 dB(A) to prevent sleep arousal from intermittent events. The night time period applies between 10pm and 7am.

**Table 12 –Measured Leq & L90 Noise Levels and Criteria - Night Time Period**

| Location         | Measured Leq<br>Noise Level<br>dB(A) | Measured L90<br>Noise Level<br>dB(A) | Amenity<br>Criterion<br>dB(A) $L_{eq}$ | Intrusiveness<br>Criterion<br>dB(A) $L_{eq}$ | Night time<br>Sleep<br>Disturbance<br>dB(A) $L_1$ (1 Min) |
|------------------|--------------------------------------|--------------------------------------|----------------------------------------|----------------------------------------------|-----------------------------------------------------------|
| Cleveland Street | 64                                   | 50                                   | 40                                     | 55                                           | 65                                                        |
| Baptist Street   | 58                                   | 46                                   | 40                                     | 51                                           | 61                                                        |
| Boronia Street   | 58                                   | 43                                   | 40                                     | 48                                           | 58                                                        |
| Marriott Street  | 55                                   | 42                                   | 40                                     | 47                                           | 57                                                        |

## 5.6 RESULTING NOISE LEVEL CRITERIA

The criteria for the various monitoring locations have been considered and assessed for the surrounding receivers. Table 7 below details the noise level criterion for properties surrounding the proposed development. In all cases, if a discrepancy in attended and unattended noise levels were obtained at two nearby locations within a residential grouping the more conservative noise level criterion has been adopted.

**Table 13 – Noise Objectives for Surrounding Receivers**

| Location         | Day time Noise<br>Objective dB(A)<br>$L_{eq}$ | Evening Noise<br>Objective dB(A)<br>$L_{eq}$ | Night time Noise<br>Objective dB(A)<br>$L_{eq}$ | Noise Objective for<br>Intermittent<br>Activities dB(A) $L_1$ (1<br>Min)<br>(Background + 15<br>dB(A)) |
|------------------|-----------------------------------------------|----------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Cleveland Street | 55                                            | 45                                           | 40                                              | 65                                                                                                     |
| Baptist Street   | 55                                            | 45                                           | 40                                              | 61                                                                                                     |
| Boronia Street   | 54                                            | 45                                           | 40                                              | 58                                                                                                     |
| Marriott Street  | 51                                            | 45                                           | 40                                              | 57                                                                                                     |

\*Note: Noise level criteria above includes noise levels impacting the future residential receivers proposed within the development as result of the operation of the proposed facilities within the development.

**Table 14 – Background Noise Critical Baptist Street**

| Location       | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|------|
| Baptist Street | Daytime<br>(7am – 6pm)  | 62     | 62   | 57    | 57    | 49    | 49   | 48   | 38   | 36   | 55   |
|                | Evening<br>(6pm – 10pm) | 55     | 55   | 49    | 49    | 44    | 44   | 42   | 34   | 29   | 49   |
|                | Night<br>(10pm – 12am)  | 56     | 56   | 49    | 49    | 44    | 44   | 42   | 34   | 29   | 49   |

**Table 15 – Background Noise Spectrum Boronia Street**

| Location       | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt |
|----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|------|
| Boronia Street | Daytime<br>(7am – 6pm)  | 59     | 59   | 52    | 52    | 47    | 47   | 45   | 37   | 32   | 52   |
|                | Evening<br>(6pm – 10pm) | 52     | 52   | 45    | 45    | 40    | 42   | 40   | 31   | 28   | 46   |
|                | Night<br>(10pm – 12am)  | 52     | 52   | 45    | 45    | 40    | 42   | 40   | 31   | 28   | 46   |

**Table 16 – Background Noise Spectrum Marriott Street**

| Location        | Time Period             | 31.5Hz | 63Hz | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz | A-wt      |
|-----------------|-------------------------|--------|------|-------|-------|-------|------|------|------|------|-----------|
| Marriott Street | Daytime<br>(7am – 6pm)  | 55     | 55   | 51    | 50    | 45    | 43   | 41   | 35   | 30   | <b>49</b> |
|                 | Evening<br>(6pm – 10pm) | 49     | 49   | 45    | 45    | 39    | 41   | 39   | 31   | 25   | <b>45</b> |
|                 | Night<br>(10pm – 12am)  | 49     | 49   | 45    | 45    | 39    | 41   | 39   | 31   | 25   | <b>45</b> |

## 5.7 ASSESSMENT CRITERIA – ADDITIONAL TRAFFIC GENERATION

For land use developments with the potential to create additional traffic on local roads the development should comply with the requirements detailed in the EPA ECRTN. Criteria applicable to the development are detailed below. If existing noise levels exceed those in Table 8 a 2 dB increase in noise is allowed.

The proposed development includes the use of a carpark located to the south west of the site and future roadways within the development site which will be assessed against the criteria detailed in the table below.

**Table 17 - Criteria for Traffic Noise for New Developments**

| Time of day         | Criteria for Acceptable Traffic Noise Level<br>dB(A)                 |
|---------------------|----------------------------------------------------------------------|
| Day (7am to 10pm)   | 60 $L_{Aeq(1hr)}$ – Collector Road<br>55 $L_{Aeq(1hr)}$ – Local Road |
| Night (10pm to 7am) | 55 $L_{Aeq(1hr)}$ – Collector Road<br>50 $L_{Aeq(1hr)}$ – Local Road |

Attended and unattended traffic noise levels measurements were conducted at a number of locations surrounding the development including locations as detailed in the table below. The resulting noise levels have been used to generate the resulting noise level criterion for additional traffic movements which been used in this assessment.

**Table 18 - Criteria for Traffic Generation**

| Location         | Criteria for Acceptable Traffic Noise Level dB(A) $L_{eq}$ (1hr) |                     |
|------------------|------------------------------------------------------------------|---------------------|
|                  | Day (7am to 10pm)                                                | Night (10pm to 7am) |
| Cleveland Street | 76                                                               | 66                  |
| Baptist Street   | 68                                                               | 60                  |
| Boronia Street   | 65                                                               | 60                  |
| Marriott Street  | 64                                                               | 57                  |

## 6 ADDITIONAL TRAFFIC NOISE GENERATION ASSESSMENT

The proposed development includes carpark spaces as follows:

- Basement 1 – 202 Car Spaces for retail/commercial use with access off Baptist Street.
- Basement 1 – Includes the loading dock with access off Baptist Street.
- Basement 2 – 160 Car Spaces for residential use only with access to the south of the site.

The proposed basement carparking is detailed in the figures below.



## 6.1 ADDITIONAL TRAFFIC NOISE ON LOCAL STREETS

Potential noise impacts from traffic movements generated by the development on public roads have been assessed for residents surrounding the site and future tenancies within the development, including the potential for noise impact generated from the proposed additional roadways on the perimeter of the site from the proposed retail and commercial component of the development. The assessment is based on the maximum traffic flow periods using FHWA and CORTN traffic noise prediction models and noise level measurements conducted at the site and presented in this report.

Traffic noise generated by the proposed development was assessed using current and predicted traffic numbers based on the potentially worst case condition of half the carpark replenishing itself in any 1 hour day or evening period.

The predicted worst case noise increases on each of the streets surrounding the development are summarised in the following table.

The calculated potential noise from additional traffic movements from the site are displayed in the table below at the potentially worst affected residential receivers located on Liverpool Road, Norton Street and Knox Street.

**Table 19 – Calculated Noise Associated with Traffic Generation**

| Roadway        | Time Period         | Current Traffic Noise Levels | Criteria for Acceptable Traffic Noise Level<br>dB(A) $L_{eq}$ (1hr) | Calculated Future Traffic Noise<br>$L_{eq}$ (1 hr) | Compliance |
|----------------|---------------------|------------------------------|---------------------------------------------------------------------|----------------------------------------------------|------------|
| Baptist Street | Day (7am to 10pm)   | 66                           | 68                                                                  | Approximately 66.8 dB(A)                           | Yes        |
|                | Night (10pm to 7am) | 58                           | 60                                                                  | Approximately 59 dB(A)                             | Yes        |

Note: All calculations were conducted using FHWA and CORTN traffic modelling.

The investigation into noise associated with additional traffic movements revealed that any increased traffic flows will cause either no noise increase to existing roadways or compliance with INP criteria for increased traffic volumes on surrounding roadways and would not adversely impact on the acoustic amenity of surrounding residential receivers.

## **7 MECHANICAL PLANT TREATMENTS**

A detailed mechanical noise assessment will be conducted once plant selections and services drawings have been finalised as part of the construction documentation to ensure noise levels comply with the criteria detailed in this report. Details will be provided as part of the CC submission of the project.

Based on experience with similar development acoustic treatments are both possible and practical using acoustic treatments such as lining of ductwork, acoustic silences, variable speed controllers, time switches, acoustic screens etc. General requirements for a number of potential plant items on the site are expanded on below.

### **7.1 CHILLERS / AIR HANDLING UNITS**

Units can be located on roof tops with an acoustic screen or in basement areas, with acoustic treatment to intake and exhaust as necessary.

These units would predominantly operate during the day, with the potential to operate with extended hours. Acoustic treatment to these units may be required to ameliorate noise impact to the surrounding residents and to comply with the criteria specified in this report and verified at CC stage.

### **7.2 SUPPLY / EXHAUST FANS**

Supply and exhaust fans may be located within the underground plant rooms or in rooftop plant areas. These units typically emit high noise levels and require acoustic treatment such as silencers and internal lined ductwork. Silencer requirements would be determined once fan selections have been completed at CC stage.

### **7.3 CONDENSER UNITS**

Condensing units typically emit relatively low noise levels and with careful selection, it is possible that no further acoustic treatment would be necessary.

### **7.4 MINOR PLANT**

Other minor plant items, such as bathroom or kitchen exhaust fans, will be required. These items typically emit relatively low noise levels and may require minimal acoustic treatment of a standard nature, such as internally lining of ductwork.

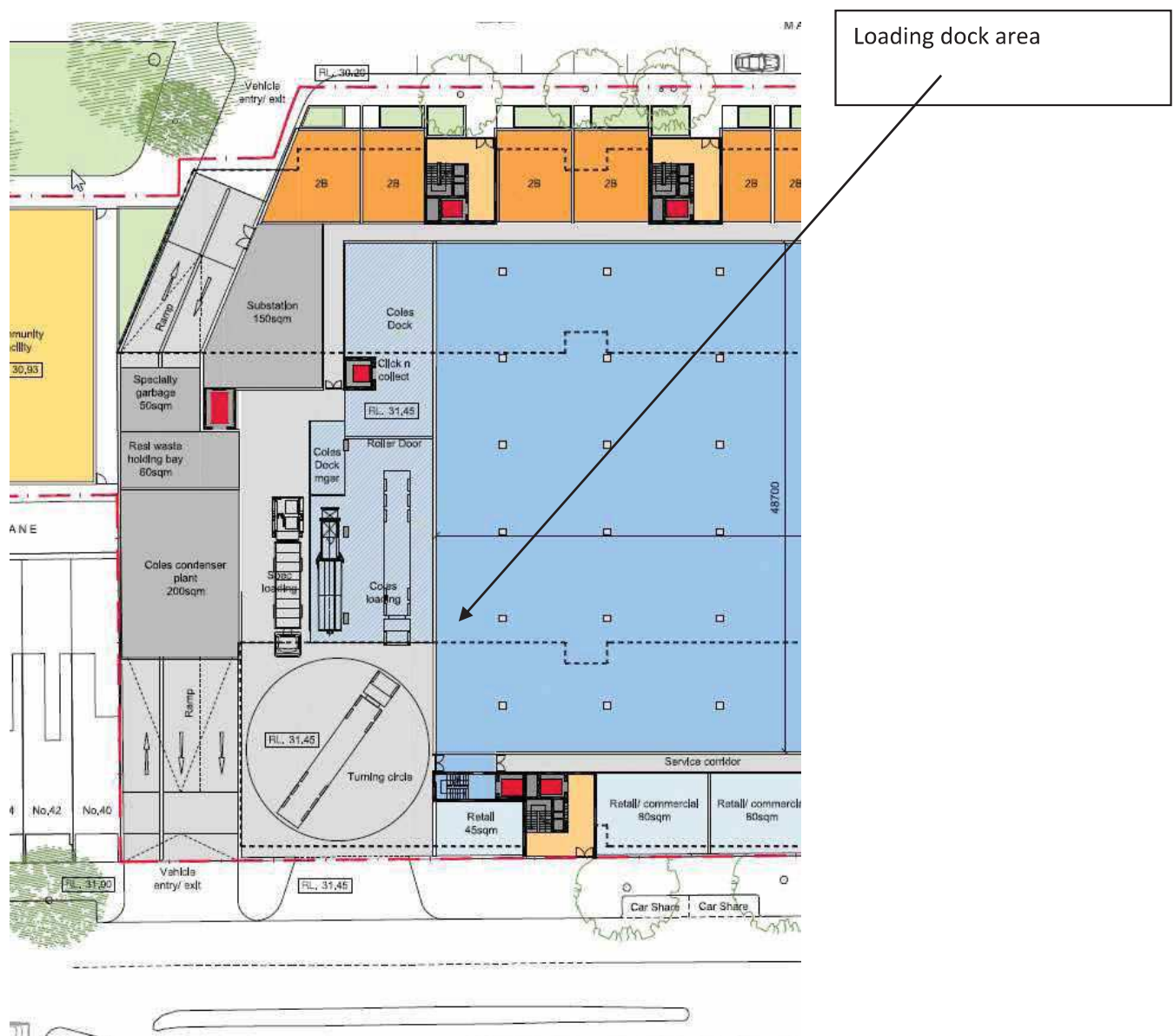
## 8 ASSESSMENT OF LOADING DOCK ACTIVITIES

This section of the report presents the assessment of noise associated with the operation of the loading docks associated with the Surry Hills Shopping Village. The assessment was conducted in conjunction with the EPA and City of Sydney Council DCP criteria as presented in this report.

Loading dock will be open to receive deliveries between the hours of the day and evening including the following:

- 10pm to 7am Monday and Friday and
- 10pm to 8am on Sunday and Saturday

The loading dock and is located within the development as detailed in the figure below.



## 8.1 POTENTIAL LOADING DOCK NOISE SOURCES

The potentially significant loading dock noise sources are listed in Table 20 below long with noise emission levels. The emission levels in Table 20 have been obtained from noise monitoring carried out at similar warehouse and retail loading dock facilities. Noise measurements were obtained using a Norsonics SA 110 sound level meter, set to fast response. The sound level meter was calibrated before and after the measurements using a Rion NC-73 calibrator. No significant drift was recorded.

**Table 20 - Noise Source Emission Levels**

| Noise Source                 | Sound Emission Level dB(A)<br>at 7m | Type of Noise Source |
|------------------------------|-------------------------------------|----------------------|
| Small Truck Reversing alarm  | 75 <sup>(1)</sup>                   | Quasi-Steady, tonal  |
| Trucks Manoeuvring/Reversing | 75                                  | Quasi-Steady         |
| Truck Air Brakes             | 89                                  | Transient            |
| Truck Door Closing           | 75                                  | Transient            |
| Truck Starting               | 72                                  | Transient            |

(1) A 5 dB(A) penalty has been applied to this source to account for the tonal characteristic of noise produced.

## 8.2 PREDICTED NOISE LEVELS AT MOST AFFECTED RECEIVERS

Noise levels at the residences were predicted based on the noise emission levels in Table 20, which are typical for this type of development.

Table 21 summaries the predicted noise levels at the nearest residence on Liverpool Road to the north of the proposed loading dock and within the proposed development. The noise levels below assume the acoustic treatments detailed in this report are adopted. Based on the location of the loading dock there are no residence which will have a direct line of sight to the area.

**Table 21 – Assessment of Loading Dock Noise Emissions**

| Location/Activity                                                 | Receiver                                          | Predicted Noise Level<br>at Residence<br>$L_{eq,15min}$  | Allowable Noise<br>Level at Residence<br>$L_{eq,15min}$ |
|-------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------|
| Truck Loading/Unloading <sup>(1)</sup><br>Within the Loading Dock | Worst affected<br>residence on Baptist<br>Street  | < 40 dB(A) Day<br>< 40 dB(A) Evening<br>< 40 dB(A) Night | 54 dB(A) Day<br>45 dB(A) Evening<br>40 dB(A) Night*     |
| Truck<br>Loading/Unloading(1)<br>Within the Loading Dock          | Worst affected<br>residence on<br>Marriott Street | < 40 dB(A) Day<br>< 40 dB(A) Evening<br>< 40 dB(A) Night | 51 dB(A) Day<br>45 dB(A) Evening<br>40 dB(A) Night*     |

1 - These activities include activities such as the delivery truck being idle in the dock, movement of pallet trucks, operation of compactors, etc.

**Table 22 – Assessment of Loading Dock Noise Emissions**

| <b>Location/Activity</b>                                             | <b>Receiver</b>                                   | <b>Predicted Noise Level<br/>at Residence<br/>L<sub>1</sub></b> | <b>Allowable Noise<br/>Level at Residence<br/>L<sub>1</sub></b> |
|----------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| Truck Loading/Unloading <sup>(1)</sup><br>Within the Loading Dock    | Worst affected<br>residence on Baptist<br>Street  | < 55 dB(A) Night                                                | 58                                                              |
| Truck<br>Loading/Unloading <sup>(1)</sup><br>Within the Loading Dock | Worst affected<br>residence on<br>Marriott Street | < 55 dB(A) Night                                                | 57                                                              |

1 - These activities include activities such as the delivery truck being idle in the dock, movement of pallet trucks, operation of compactors, etc.

### **8.3 RECOMMENDED LOADING DOCK DEVELOPMENT CONTROLS**

It is recommended that the following management and physical controls be implemented into the design and operation of the proposed loading dock associated with the Surry Hills Shopping Village Mall project:

1. The loading dock is fully enclosed with all openings for services acoustically treated with lined metal ductwork or the like.
2. A solid roller/panel door to the loading dock should be installed which is closed during periods when trucks are being loaded and unloaded.
3. Trucks are not to be stacked on the street waiting to access the loading dock. Communication is required prior between trucks and loading dock operator to ensure trucks can be received without delay.
4. Bail and/or garbage compactors are to be used only within the building fabric or during day time hours.
5. Neoprene rubber buffers should be installed on the vertical face of the loading dock where vehicles park to absorb impacts.
6. A detailed assessment of noise emissions from plant and equipment associated with the loading dock is required to be conducted prior to installation in conjunction with Local council requirements.
7. Vehicle engines should be switched off during loading and unloading within the dock.

## 9 CONCLUSION

This report provides the results of Environmental Noise Study for the proposed Surry Hills Shopping Village development. Noise at the site has been measured and noise goals have been set in accordance with the requirements of the relevant statutory/regulatory authorities including City of Sydney Council and the Environmental Protection Authority.

Determination of noise assessment criteria based on the EPA's Industrial Noise Policy and ECRTN have been determined based on both unattended and attended noise monitoring conducted at the proposed development.

Additionally in principal treatments have been provided to ensure internal noise levels from surrounding noise sources (namely surrounding roadway) comply with the relevant Australian Standards.

Based on the assessment detailed in this report the proposed development will comply with all relevant noise and vibration criteria.

We trust this information is satisfactory. Please contact us should you have any further queries.

Report prepared by,

A handwritten signature in black ink that reads "B.G. White." The signature is written in a cursive, slightly slanted style.

ACOUSTIC LOGIC CONSULTANCY PTY LTD  
Ben White

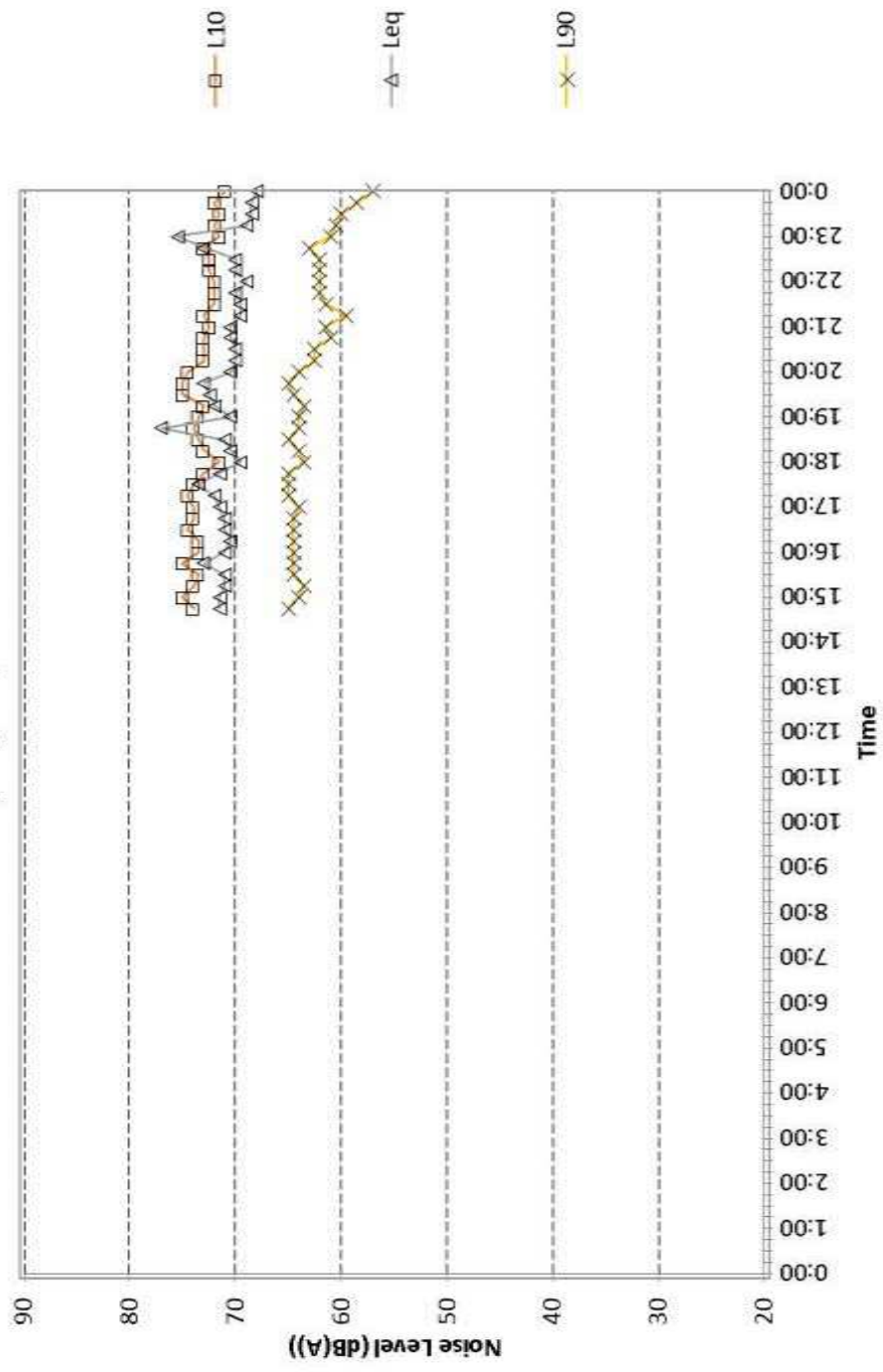
## Appendix A – Noise Logging Results



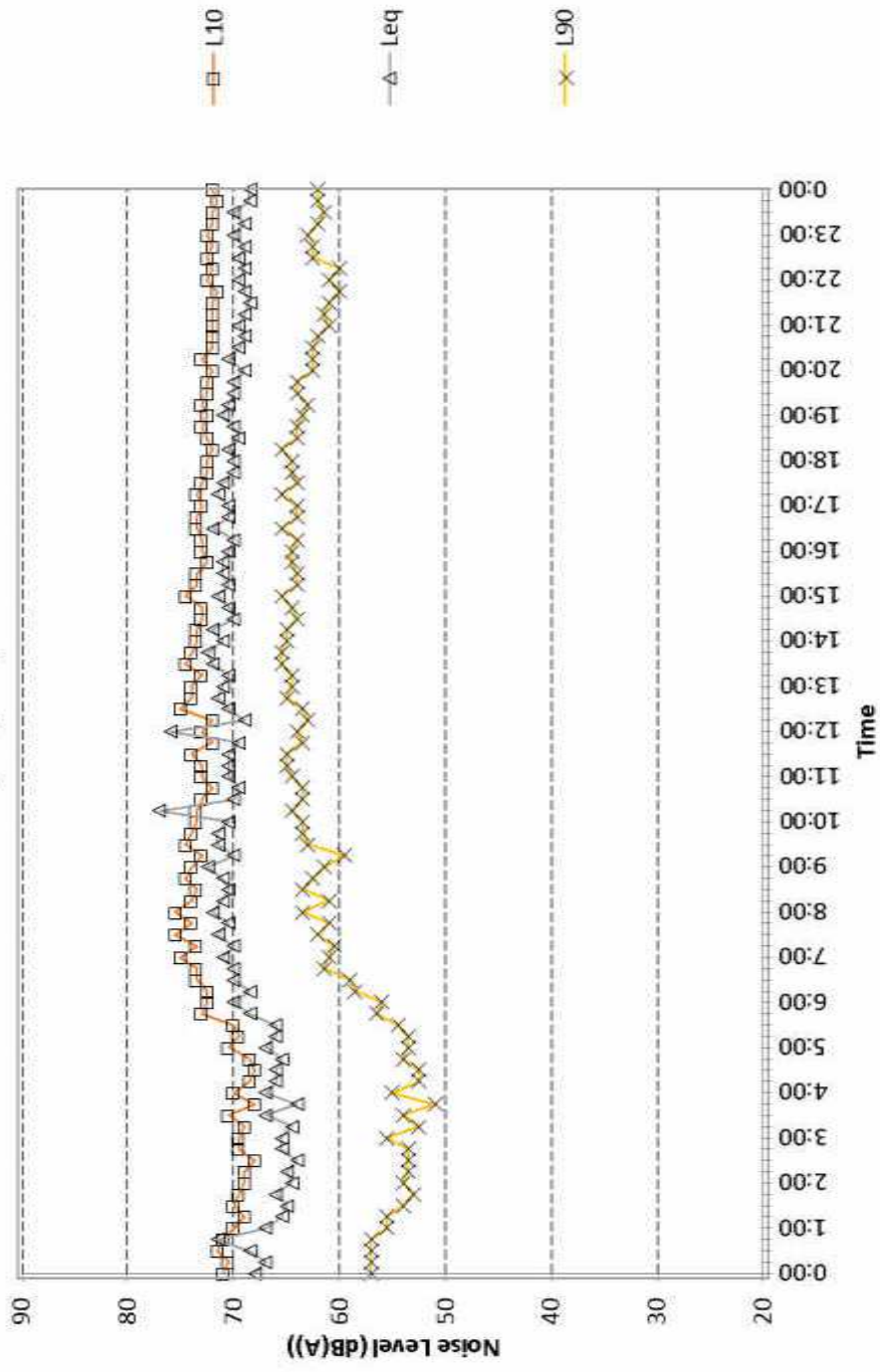
Periods of inclement weather not used within the assessment

# Surry Hills Shopping Village

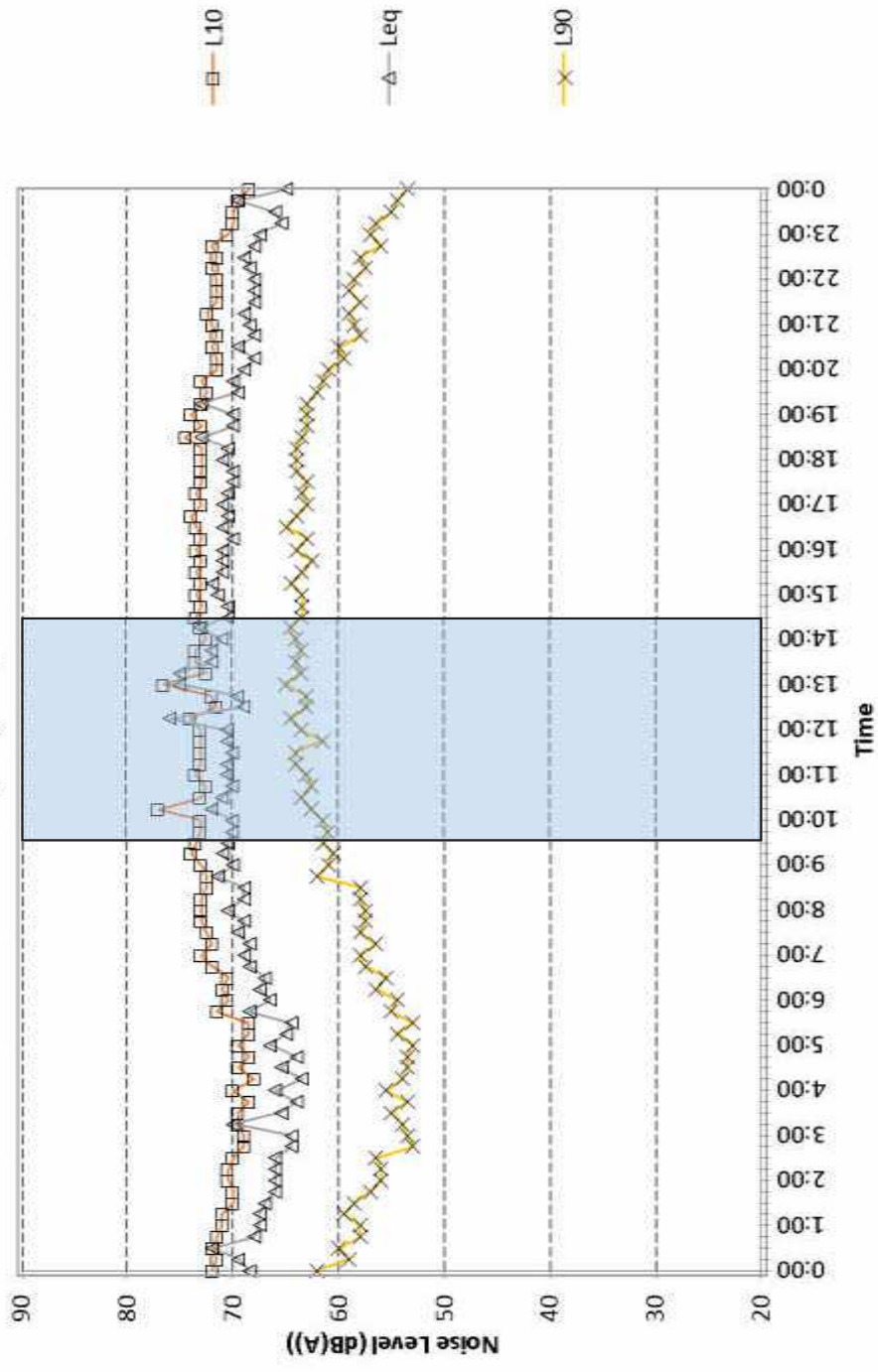
Friday August 7, 2015



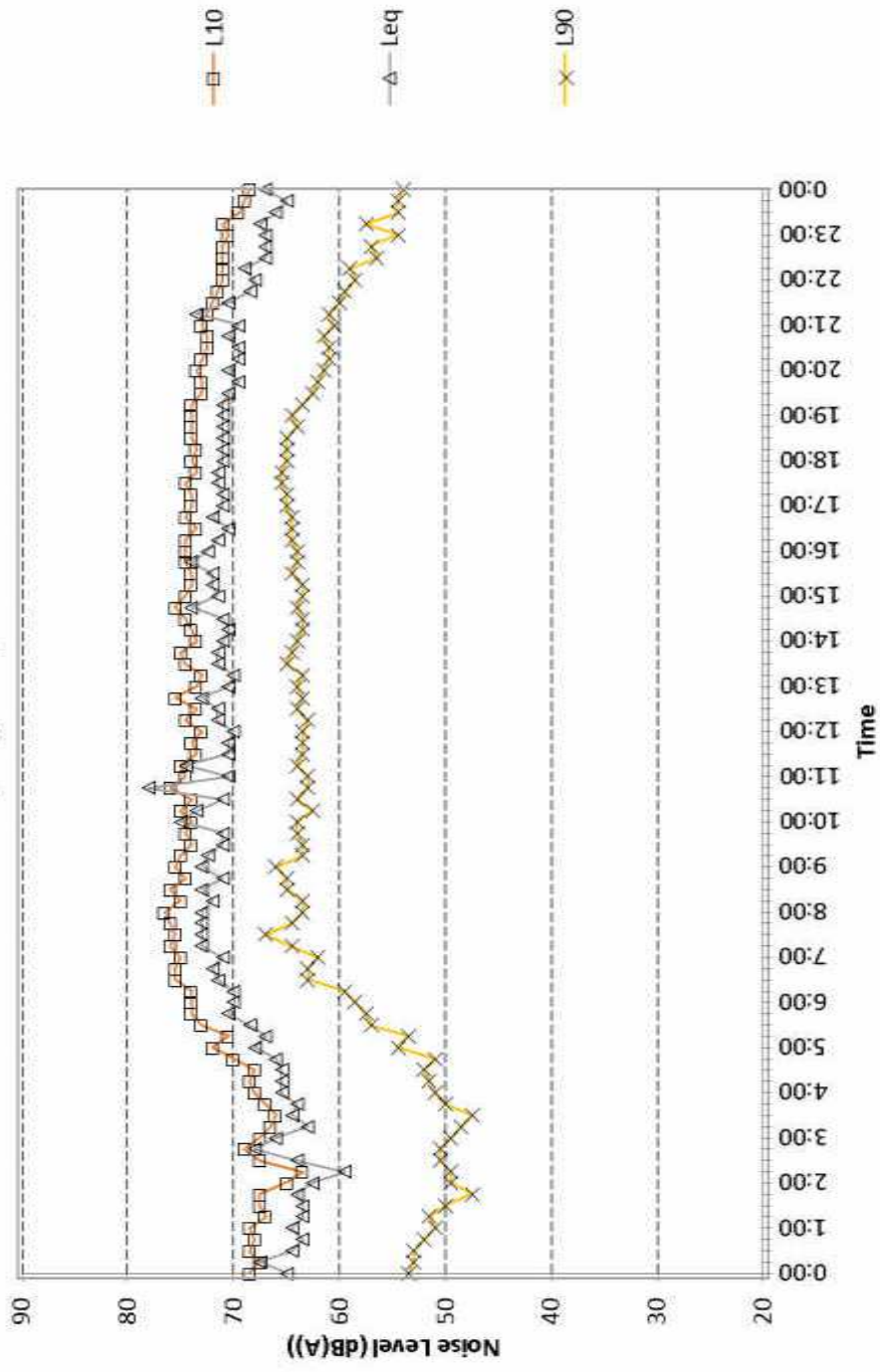
# **Surry Hills Shopping Village** **Saturday August 8, 2015**



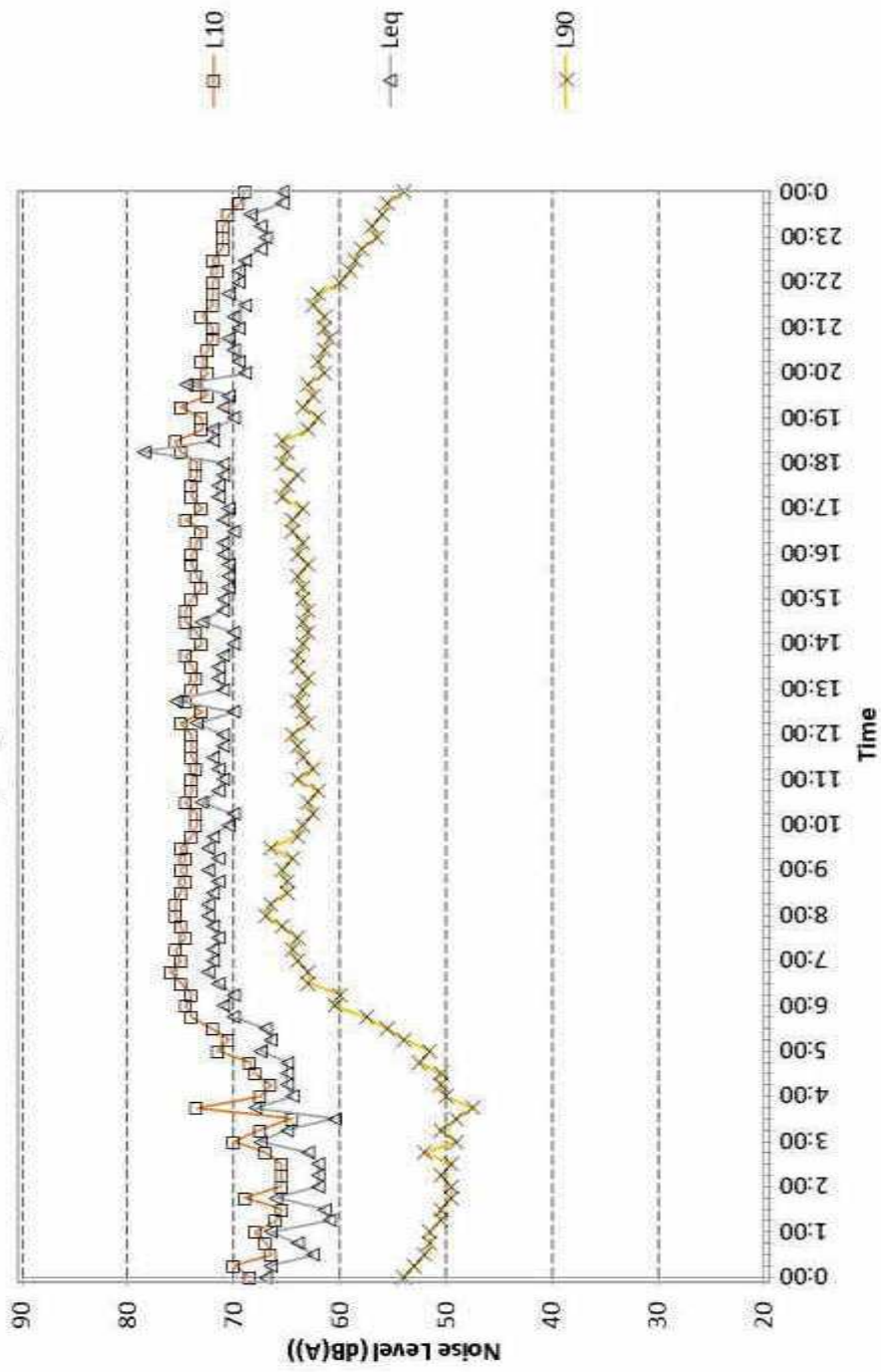
**Surry Hills Shopping Village**  
 Sunday August 9, 2015



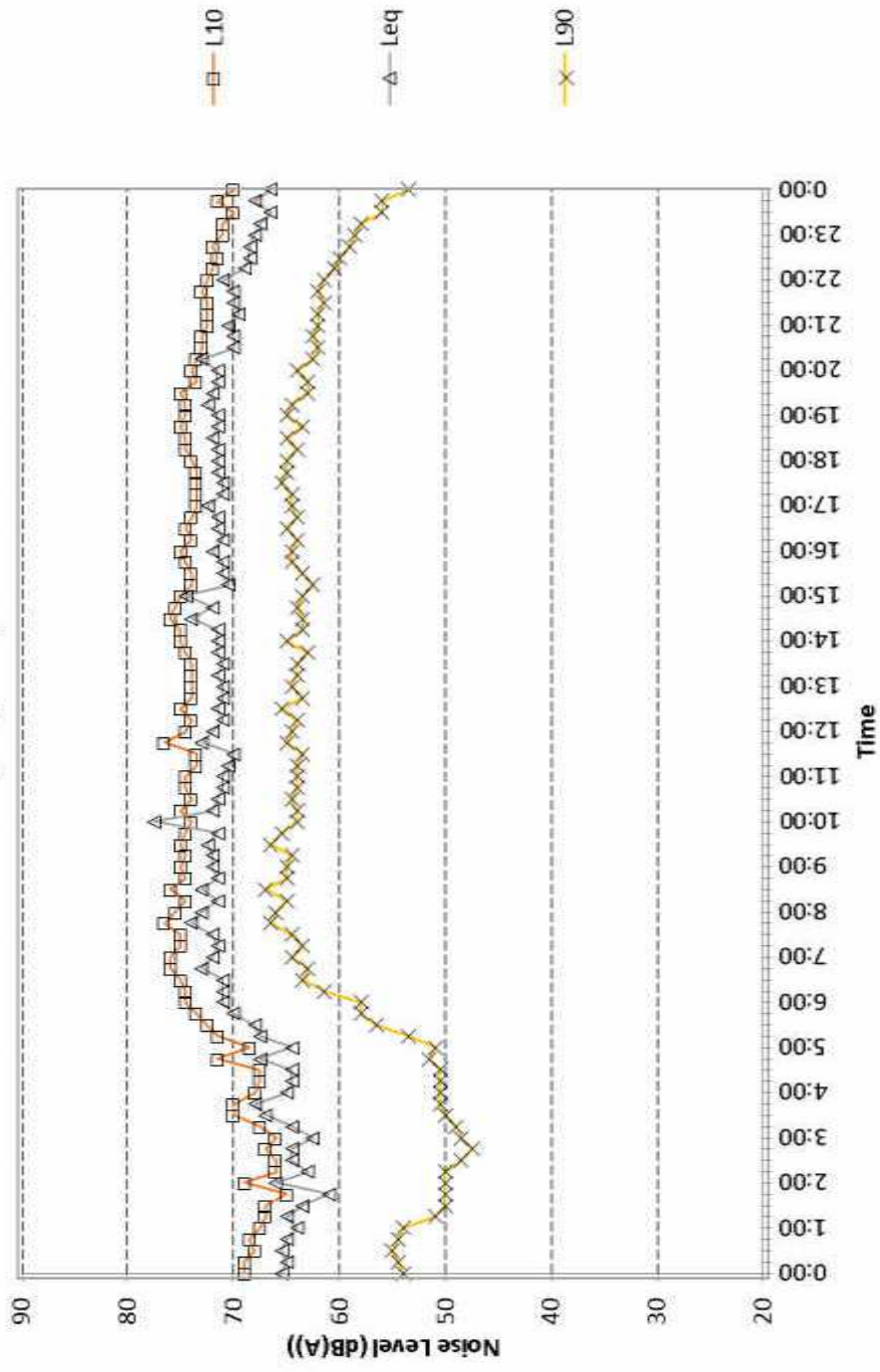
**Surry Hills Shopping Village**  
Monday August 10, 2015



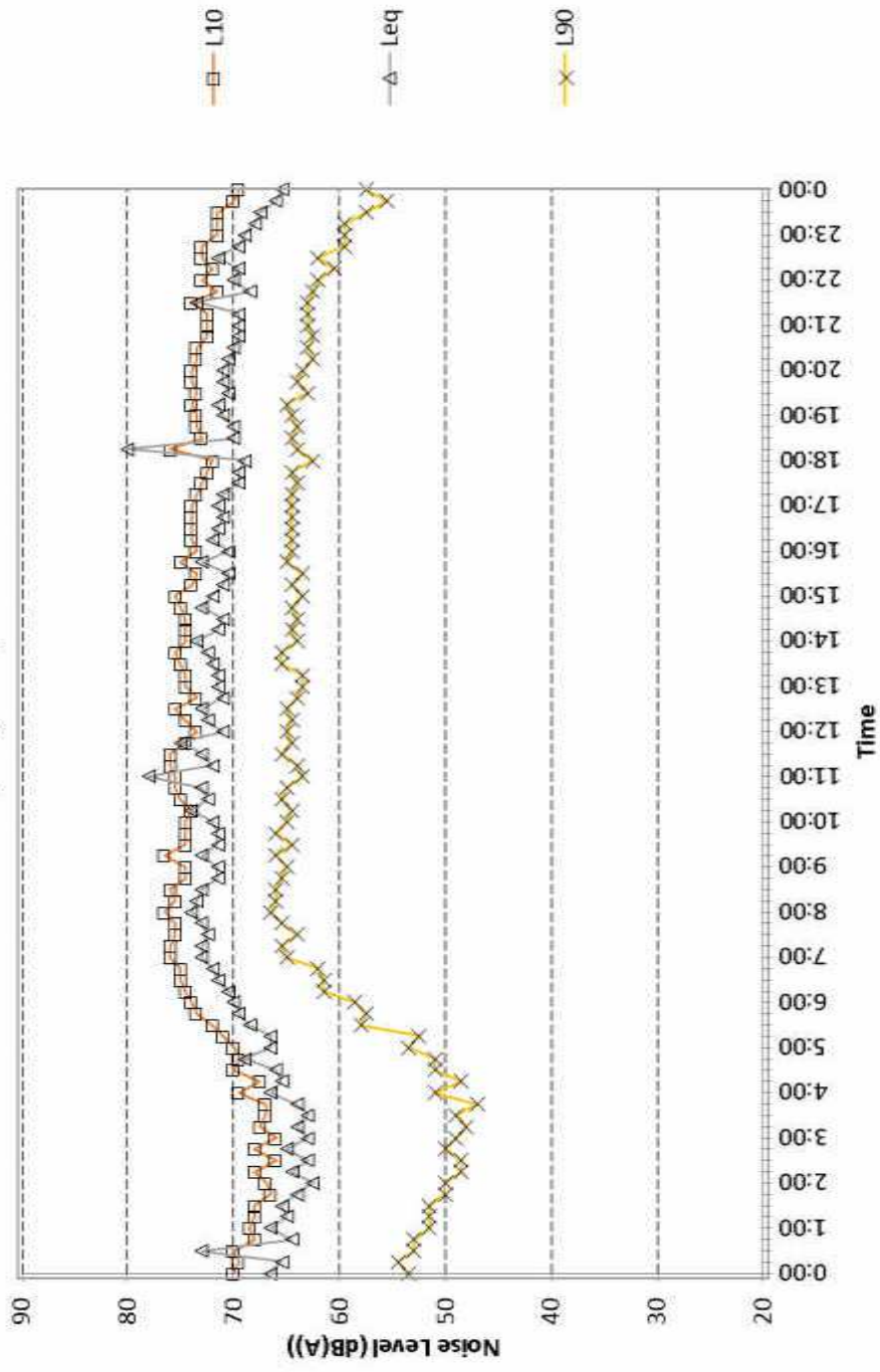
# **Surry Hills Shopping Village** Tuesday August 11, 2015



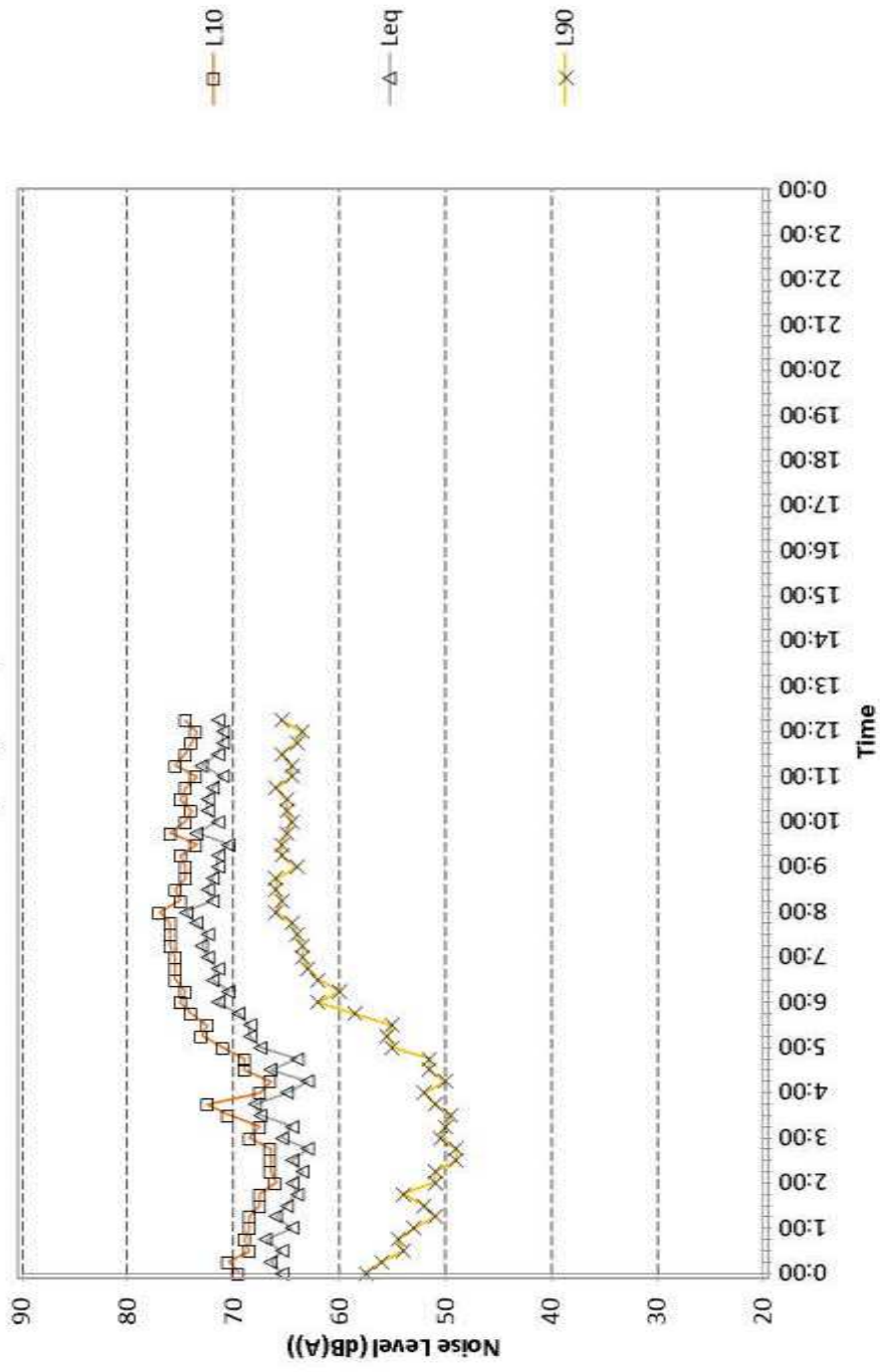
**Surry Hills Shopping Village**  
**Wednesday August 12, 2015**



# **Surry Hills Shopping Village** **Thursday August 13, 2015**



**Surry Hills Shopping Village**  
Friday August 14, 2015





## **Appendix I1: Acoustic Letter**

**MANAGING DIRECTORS**

MATTHEW PALAVIDIS  
VICTOR FATTORETTO

**DIRECTORS**

MATTHEW SHIELDS  
BEN WHITE



20151042.2/1710A/R3/BW

17/10/2016

Surry Hills Project Pty Ltd as Trustee for Surry Hills  
Trust

## **Surry Hills Shopping Village Redevelopment Project - Review of Council Comments**

This letter confirms that an acoustic review of the comments received from Council on 5<sup>th</sup> September 2016 regarding the proposed design of the Surry Hill Shopping Village redevelopment project has been undertaken, including following:

### **1. Noise levels impacting the building façade fronting Cleveland Street, Baptist and Marriott Streets.**

The proposed apartment design aims to maximise the acoustic amenity to future residents including apartments which face Cleveland Street. All apartments in the building facing Cleveland Street have been designed with an opening facing away from the major noise source on Cleveland Street. This will ensure occupants have the option to use operable windows for fresh air into the apartments in an orientation facing away from Cleveland Street or keep the windows closed to reduced internal noise levels.

The apartment design layouts have been undertaken in consideration of the surrounding noise sources affecting the site and the requirements of the Apartment Design Guide (ADG) including the recommended design principals detailed in Sections 4J1 and 4J2, and Sections 4.2.3.11 of the City of the Sydney Council DCP 2012.

As part of the assessment of the site a noise model (Soundplan model) has been completed for the building fronting Cleveland Street and portions of the proposed residential buildings C and E. The Soundplan model has assessed the impact of noise from the main source surrounding the site with the resulting model detailed in Figure 1 below.

---

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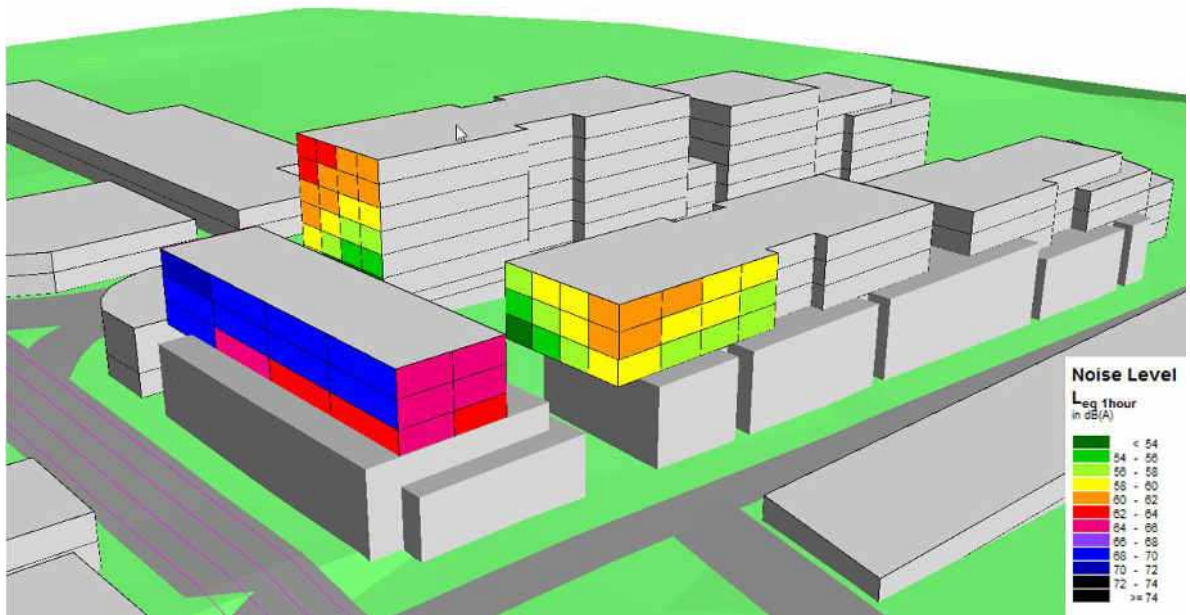


Figure 1 – Results of Soundplan Modelling of Cleveland Street

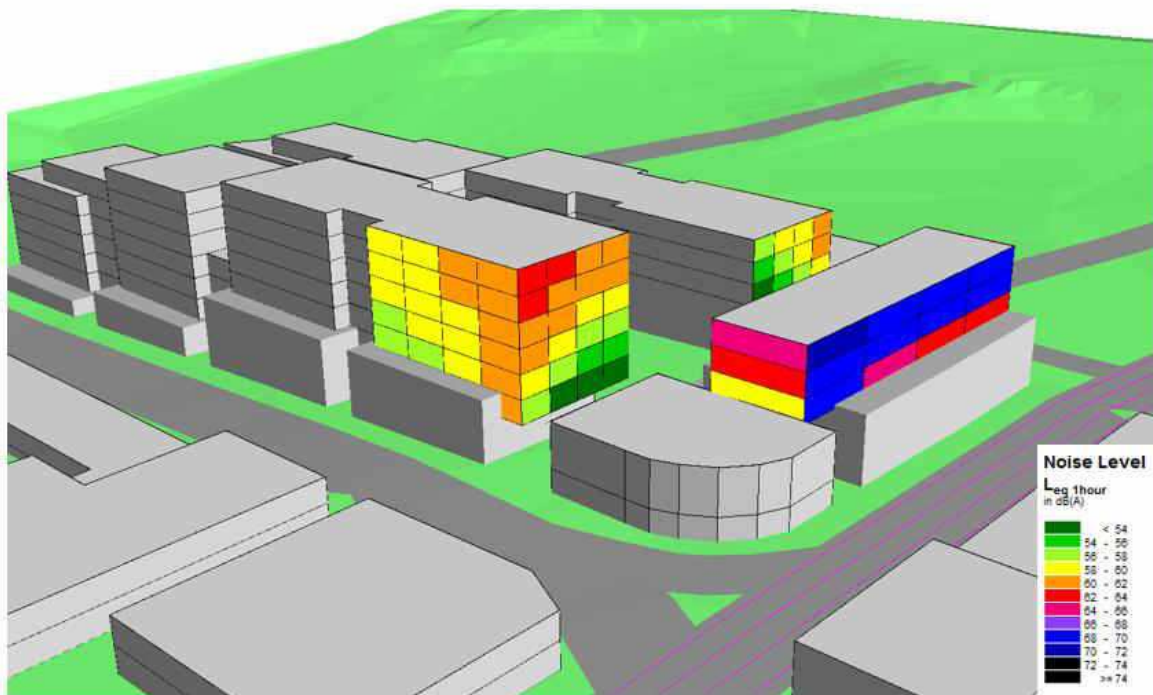


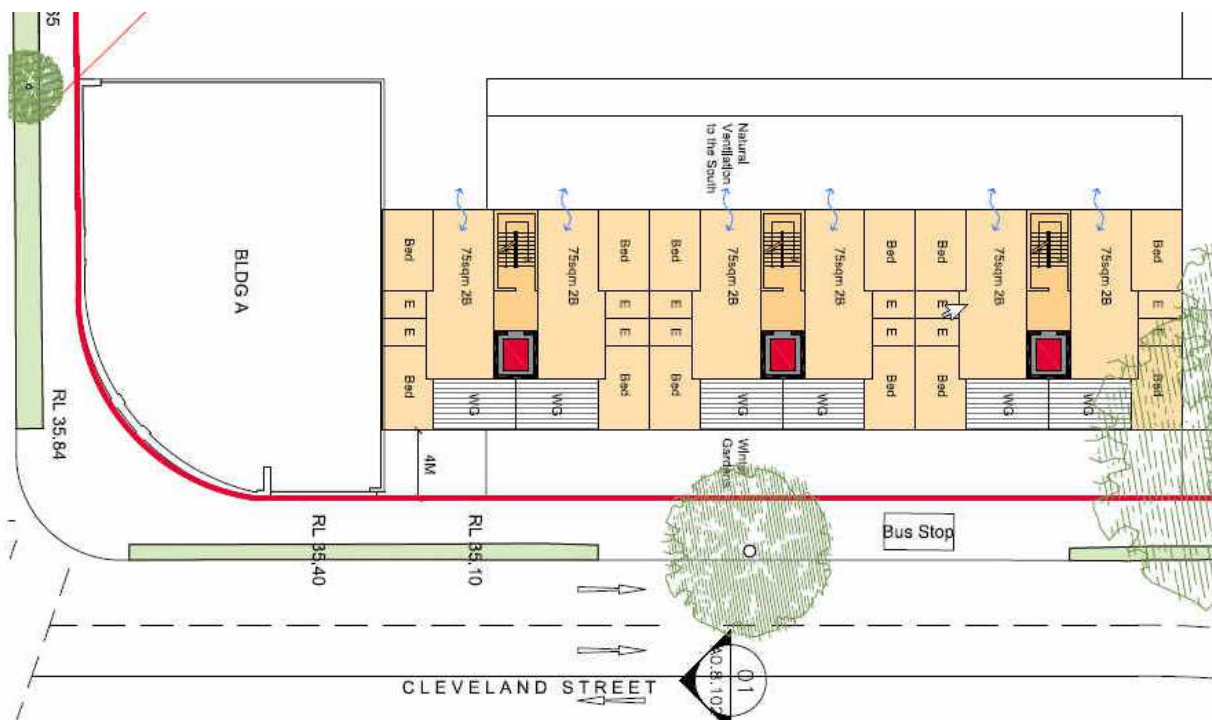
Figure 2 – Results of Soundplan Modelling of Baptist Street

Based on the results of the acoustic modelling conducted at the site, and detailed above, the apartments with orientations facing Cleveland Street will not strictly comply with the requirements of internal noise levels with windows open as detailed in Section 4.2.3.11, (7), (b) of the City of Sydney Council DCP.

To address the non-compliance, the apartments layouts have been considered to respond to provisions of the Apartment Design Guild (ADG) maximising the acoustic amenity for future residents.

Figure 2 below details the proposed layout of apartments within Building B facing Cleveland Street including façade orientations facing away from Cleveland Street.

The proposed apartment layouts provide an acceptable solution for the natural ventilation of apartments, whilst maintaining acoustic amenity.



**Figure 2- Apartment lay out Building B**

Apartments along the northern façade of buildings C & E have been designed to ensure the floor layouts will achieve a maximum level of acoustic amenity for residents within these buildings, as required by the provisions of the ADG.

## 2. Condenser Plant

The proposed condenser area located to the south of the site is proposed to house the Coles plant and equipment.

It is acoustically possible and plausible to locate the plant at the proposed location and design suitable acoustic treatments to ensure noise levels will comply with relevant City of Sydney Council and EPA criteria.

The treatments may include locating air inlets and outlets at locations which face away from the neighbouring residential properties at 40 Baptist Street by utilising an air pathway over the loading dock and carpark entry way and exhausting to the internal courtyard area of the future development.

Acoustic treatments such as lined ducting, silencers and the like will be required and detailed based on the selected plant and equipment and details of treatments provided as part of the CC submission for the project.

The proposed treatments to the plant and equipment are detailed in the Figure 4 below.

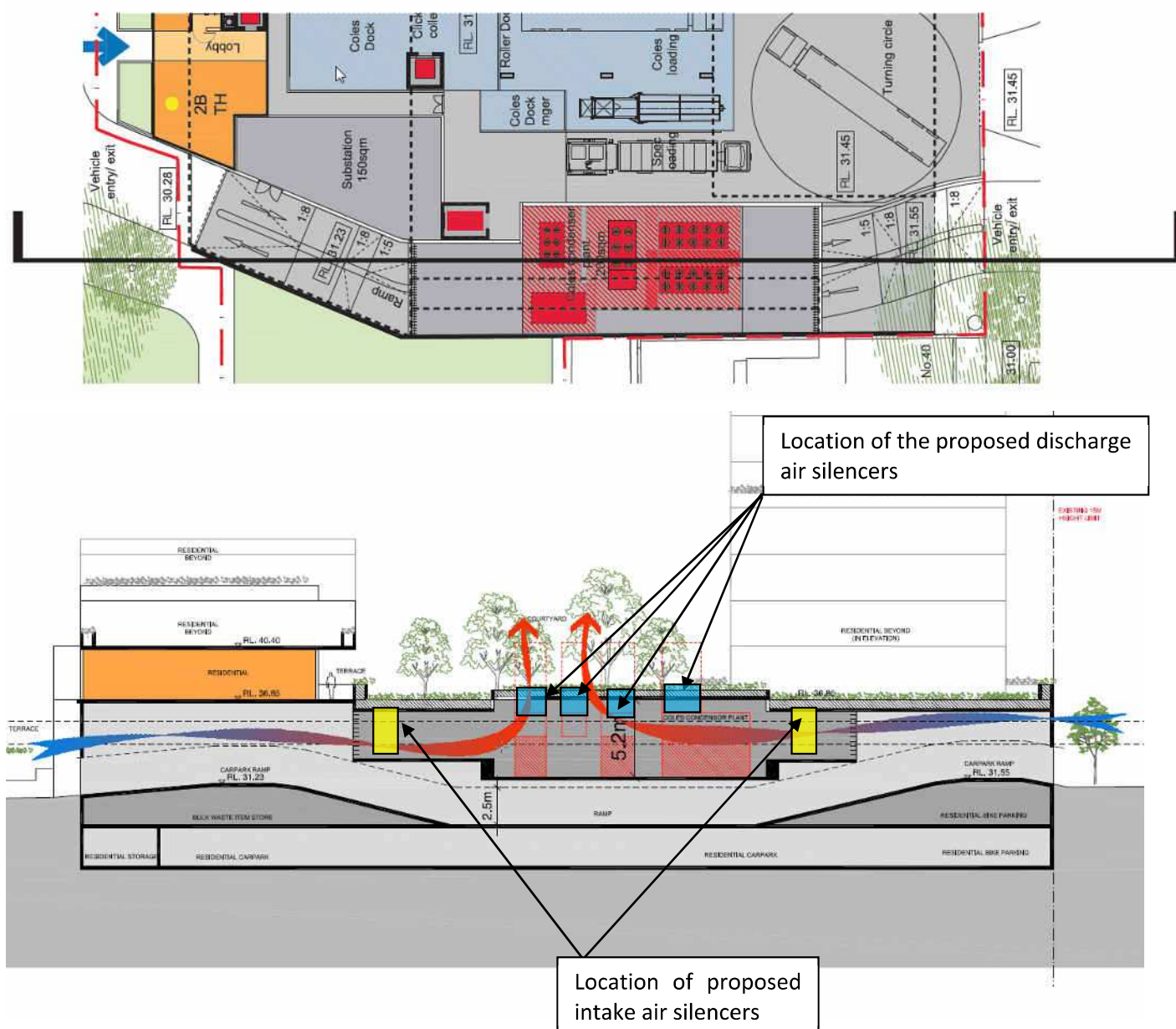


Figure 4 – Proposed Condenser Acoustic Treatments

We trust this information is satisfactory. Please contact us should you have any further queries.  
Yours faithfully,

A handwritten signature in dark ink that reads "B.G. White." The signature is written in a cursive, slightly slanted style.

Acoustic Logic Consultancy Pty Ltd  
Ben White