

19-27 Cross Street, Double Bay

Development Application - Acoustic Assessment

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Attention To	Tri-Anta Pty Ltd

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed mixed-use development to be constructed at 19-27 Cross Street, Double Bay.

This document addresses noise impacts associated with the following:

- Traffic noise impacts from Cross Street, Double Bay;
- Traffic noise impacts from Transvaal Avenue, Double Bay and;
- Noise Impacts from Commercial Retail outlets.

ALC have utilised the following documents and regulations in the noise assessment of the development:

- Woollahra Development Control Plan 2015;
- *NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline';*
- Australian and New Zealand AS/NZS 2107:2016 '*Recommended design sound levels and reverberation times for building interiors*' and;
- NSW Department of Environment and Heritage, Environmental Protection Agency document – Industrial Noise Policy for Industry 2017.

This assessment has been conducted using the Luigi Rosselli architectural drawings, see details below.

Table 1 – Architectural Drawing List

Architect	Drawing Title	Date	Revision
Luigi Rosselli Pty Ltd	Site Plan	7/8/2020	1725
	Basement 2		
	Basement 1		
	Ground Floor		
	Level 1		
	Level 2		
	Level 3		
	Level 4		
	Level 5		
	Roof Terrace		
	Roof		
	Section aa		
	Elevation South		
	Elevation East		
	Elevation North		

2 SITE DESCRIPTION

The proposed mixed-use development located at 19-27 Cross Street, Double Bay consists of ground floor retail, 21 residential units across 5 levels and two basement levels.

Acoustic investigation has been carried out by this office in regard to the developments surrounding the site, which has been detailed below:

- Commercial dwellings to the north;
- Commercial dwellings to the east, across Transvaal Avenue;
- Commercial dwellings to the south, across Cross Street and;
- Commercial dwellings to the west, across Cross Street.

Site investigation indicates that Cross street and Transvaal Avenue carry a low to moderate volume of traffic.

The nearest residential noise receivers around the project site include:

- Receiver 1 - Commercial dwelling located at 33 Cross Street, situated to the north-west, commercial receiver is multi-storey;
- Receiver 2 - Commercial dwellings located at 2-16 Transvaal Avenue, situated to the North, commercial receivers are single storey;
- Receiver 3 - Commercial dwellings located at 13-15 Transvaal Avenue, situated to the east, commercial receivers are single and double storey and;
- Receiver 4 – Commercial dwellings located at 2-18 Cross Street situated to the South-west, commercial receivers are single and double story.

A site map, measurement description and surrounding receivers are presented in Figure 1 below.



-  Unattended Noise Monitor
-  Attended Noise Measurement

**Figure 1 – Site Survey and
Monitoring Positions
Sourced from Six Maps**

-  Project Site
-  Residential Receivers

3 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is 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 analysing 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 will depend 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 15 minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 EXISTING ACOUSTIC ENVIRONMENT

The acoustic environment is categorised by moderate background noise levels during the day and evening due to traffic movements along Cross street and Transvaal Avenue along with patrons visiting the surrounding commercial retail outlets. Low background noise levels during the night as most of the volume of traffic has finished for the day and commercial/retail outlet trading hours have finished.

Acoustic monitoring was conducted at the site to establish the background noise levels which will be used as basis for this assessment.

4.1 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

4.1.1 Measurement Equipment

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

4.1.2 Measurement Location

An unattended noise monitor was installed at the rear of the project site. For a detailed location refer to Figure 1.

4.1.3 Measurement Period

Unattended noise monitoring was conducted from Tuesday, 13th February 2018 to Tuesday, 20th February 2018.

4.1.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the table below.

4.1.5 Unattended Noise Measurements

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides the results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in Tables below.

Table 2 – Unattended Noise Monitor – Location 1 – Rating Background Noise Level

Date	Measured Rating Background Noise Level dB(A)L₉₀		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am Next Day)
Tuesday, 13 th February, 2018	-	43	-
Wednesday, 14 th February, 2018	51	45	38
Thursday, 15 th February, 2018	52	45	40
Friday, 16 th February, 2018	56	45	39
Saturday, 17 th February, 2018	51	45	40
Sunday, 18 th February, 2018	48	45	39
Monday, 19 th February, 2018	51	43	40
Tuesday, 20 th February, 2018	56	-	41
Median	51	45	40

4.1.6 Summarised Rating Background Noise Levels

Summarised rating background noise levels for each receiver are presented below.

Table 3 -Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level dB(A)L₉₀
Project Site	Day	51
	Evening	45
	Night	40

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Investigation indicates that the primary external noise sources around site are as follows:

- Traffic noise impacts from Cross Street, Double Bay;
- Traffic noise impacts from Transvaal Avenue, Double Bay and;
- Noise Impacts from Commercial Retail outlets

5.1 NOISE INTRUSION CRITERIA

A traffic noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards;

- Woollahra Development Control Plan 2015;
- NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline' and;
- Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.

5.1.1 Woollahra Development Control Plan 2015

Chapter D5|Double Bay Centres - Part D

5.6.5.2 Acoustic Privacy

Controls

- C1 *"Building siting and layout, particularly with regard to the location of courtyards, terraces and balconies and the like, should minimise the transmission of noise to other buildings and private open space on the site and on adjacent land. The use of openings, screens and blade walls, and the choice of materials, should also be designed to minimise the transmission of noise."*
- C2 *"Minimising the impact of external noise sources on dwellings near noise sources by: a) addressing New South Head Road with recessed balconies, enclosed balconies, kitchens and/or living rooms; and b) locating bedrooms away from noise sources."*
- C3 *"Bedrooms should be located away from noise sources such as goods delivery and early morning garbage collections."*
- C4 *"Restaurants should be designed to minimise the impact of noise associated with late night operation on nearby residents."*
- C5 *"Rear courtyards are only permitted for restaurant use if Council is satisfied that the hours of operation do not have an unreasonable impact on residential amenity."*

Chapter B3|General Residential – Part B

B3.5.4 Acoustic Privacy

Controls

- C1 *"Dwellings are designed to ensure adequate acoustic separation and privacy to the occupants of all dwellings."*
- C2 *"Dwellings located close to high noise sources, such as a busy road or railway line are to:*
- a) be designed to locate habitable rooms and private open space away from the noise source; and*
 - b) include sound attenuation measures, such as acoustic glazing and insulation. Note: Shared walls and floors between dwellings must be designed in accordance with the sound transmission and insulation criteria of the Building Code of Australia."*
- C3 *"Electrical, mechanical, hydraulic and air conditioning equipment is housed so that it does not create an 'offensive noise' as defined in the Protection of the Environment Operations Act 1997 either within or at the boundaries of any property at any time of the day."*

5.1.2 NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline'

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
 - in any bedroom in the building: 35dB(A) at any time 10pm-7am*
 - anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

5.1.3 Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'

Australian Standard AS 2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS 2107-2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 4 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A) L_{eq}
Living Areas	40dB(A) $L_{eq(24Hour)}$
Sleeping Areas	35dB(A) $L_{eq(9Hour)}$
Bathrooms, Ensuites, Laundry	45dB(A) L_{eq}

5.1.4 Summary of Criteria

The governing project criteria is presented in the Table 5 below.

Table 5 – Summary of Internal Noise Level Criteria

Space	Internal Traffic Noise Criteria dB(A)L_{eq}
Bedroom	35dB(A) $L_{eq(9hour)}$
Living Space	40dB(A) $L_{eq(24hour)}$
Bathroom	45dB(A) $L_{eq(When\ in\ use)}$

5.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish traffic and surrounding environmental noise levels impacting the development.

5.2.1 Noise Measurements

5.2.2 Measurement Equipment

Attended short term measurements of traffic noise which were undertaken by this office, to supplement the unattended noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

5.2.3 Measurement Location

Attended Traffic Noise Measurements: These were conducted along Cross Street and Transvaal Avenue, See figure 1 for the measurement locations. All noise measurements had a 180° view of the road and were 3m from the kerb.

5.2.4 Measurement Period

Attended traffic noise measurements were undertaken between the hours of 3:30pm and 5:30pm on Tuesday 20th February 2018.

5.2.5 Measured Traffic Noise Measurements

Attended noise measurements have been summarised below for each location.

Table 6 – Attended Traffic Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)_{Leq} (15Mins)
Cross Street (See Figure 1) 3m from kerb 180° view of the road	3:30pm – 5:30pm Tuesday 20 th February, 2018	62dB(A)
Transvaal Avenue (See Figure 1) 3m from kerb 180° view of the road	3:30pm – 5:30pm Tuesday 20 th February, 2018	54dB(A)

5.3 NOISE INTRUSION ANALYSIS

Traffic noise intrusion into the proposed development was assessed using the measured and predicted noise levels above.

Calculations were undertaken taking into account the orientation of windows, barrier effects (*where applicable*), the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

5.4 RECOMMENDED CONSTRUCTIONS

5.4.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-Ion type acoustic seals. **(Mohair Seals are unacceptable)**.

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.

The recommended constructions are listed in the table below.

Table 8 – Recommended Glazing Construction

Façade (All Levels)	Space	Recommended Construction	Acoustic Seals
North	Living Room	6mm Float	Yes
	Bedroom	6mm Float	
South (Cross Street)	Living Room	6.38mm Laminated	
	Bedroom	6.38mm Laminated	
East (Transvaal Avenue)	Living Room	6mm Float	
	Bedroom	6mm Float	
West (Intercontinental Hotel)	Living Room	6mm Float	
	Bedroom	6mm Float	

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 9 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
6mm Float	29
6.38mm Laminated	31

5.4.2 External Roof/Ceiling

External roof construction will be constructed from concrete and masonry elements, this proposed structure will not require any further acoustic upgrading. In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

5.4.3 External Walls

External wall construction will be constructed from concrete and masonry elements, this proposed structure will not require any further acoustic upgrading. In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

5.4.4 Entry Doors

External opening entry doors shall have glazing thicknesses equal to those recommended in section 5.4.1 Recommended Glazing Construction, and are to have Raven RP10 to the top and sides, and Raven RP38 to the underside of the door.

5.4.5 Mechanical Ventilation

With respect to natural ventilation of the dwelling, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

- *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

All facades will satisfy the requirements above with windows/doors open.

6 NOISE EMISSION ASSESSMENT

The noise emissions from the project site shall comply with the requirements of the following;

- Woollahra Development Control Plan 2015 and;
- NSW EPA Industrial Noise Policy for Industry 2017.

6.1 NOISE CRITERIA

6.1.1 Woollahra Development Control Plan 2015

B3.7 External Areas

Controls:

C9. "Mechanical plant equipment are suitably enclosed or screened to minimise noise impacts to adjoining properties."

"Note: Noise emissions from mechanical plant equipment must not exceed the background noise levels when measured at the boundary of the development site. The provisions of the Protection of the Environment Operations Act 1997 apply."

6.1.2 NSW EPA Industrial Noise Policy for Industry 2017

The NSW EPA Noise Policy for Industry 2017, has two criteria which need to be satisfied; namely the Intrusiveness noise level criteria and the Project amenity noise level criteria. The project noise trigger level is then established based on the lower of the intrusiveness and project amenity levels.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.1.2.1 Intrusiveness Noise Level Criteria

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

Background noise levels adopted are presented in Section 4.1.6. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 10 – Intrusiveness Noise Level Criteria

Location	Period/Time	Intrusiveness Noise Level Criteria dB(A) $L_{eq}(15min)$
Nearby Residences	Day (7am-6pm)	56
	Evening (6pm-10pm)	50
	Night (10pm-7am)	45

6.1.2.2 Project Amenity Noise Level Criteria

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

The NSW EPA Industrial noise policy sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 3 categories to distinguish different residential areas. They are rural, suburban, urban. This site is categorised by urban receivers.

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.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

The project amenity noise level is calculated by taking the recommended amenity noise level (as presented in table 2.2 of the policy), subtracting 5dB(A) and then adding 3dB(A) to convert from $L_{Aeq, period}$ to a $L_{Aeq, 15 minute}$ descriptor. The project amenity noise level criteria are presented in the table below.

Table 11 – Project Amenity Noise Level Criteria

Location	Period/Time	Project Amenity Noise Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences – Urban Receiver	Day (7am-6pm)	58
	Evening(6pm-10pm)	48
	Night(10pm-7am)	43
Commercial	When in use	63

6.1.2.3 Project Noise Trigger Level

The project noise trigger level (as outlined in section 2.1 of the policy) is the lower of the intrusiveness and project amenity noise levels. The project noise trigger levels are presented in the table below.

Table 12 – Project Noise Trigger Level Criteria

Location	Period/Time	Project Noise Trigger Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences	Day (7am-6pm)	56
	Evening(6pm-10pm)	48
	Night(10pm-7am)	43
Commercial	When in use	63

6.1.3 Sleep Arousal Criteria

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (such as cars driving by) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the NSW EPA Noise Policy for Industry. As recommended in the policy, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An assessment should be conducted to determine if noise levels at a residential location during the night time period (10pm-7am) exceed:
 - $L_{Aeq, 15min}$ 40dB(A) or the prevailing RBL (rating background noise level) plus 5 dB, whichever is greater, and/or
 - L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater.

The policy does not explicitly state where noise impacts should be assessed within the residential location. For the purposes of this assessment, noise impacts will be assessed at the location immediately outside a resident's bedroom window. If the noise events are compliant with this criteria, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The criteria is set out below.

Table 13 – Sleep Arousal Criteria

Location	Background Noise Level (10pm-7am)	Sleep Arousal Criteria dB(A)
Nearby Residents	40dB(A) L_{90}	45dB(A) $L_{eq(15min)}$ 55dB(A) L_{Max}

- Step 2 - If there are noise events that could exceed the step 1 criteria, then a more detailed assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the EPA Noise Policy for Industry, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

For the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
- *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

6.2 NOISE EMISSION ASSESSMENT

6.2.1 Mechanical Plant Noise

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services to the closest residential receivers should comply with the requirements of section 6.1.

6.2.2 Retail/Hospitality Tenancies on Ground Floor

There is currently no operator or fit out plan available at this stage. A separate DA report is recommended once the detailed operation/floor plans are ready.

7 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed mixed-use development to be constructed at 19-27 Cross Street, Double Bay.

Provided that the treatments set out in section 5 of this report are employed, internal noise levels shall comply with the requirements below:

- Woollahra Development Control Plan 2015;
- *NSW Department of Planning and Environment's Document – 'Developments near Rail Corridors or Busy Roads – Interim Guideline' and;*
- *Australian and New Zealand AS/NZS 2107:2016 'Recommended design sound levels and reverberation times for building interiors'.*

External noise emissions criteria have been setup in this report to satisfy the requirements from the following documents;

- Woollahra Development Control Plan 2015 and;
- NSW EPA Noise Policy for Industry 2017.

Detailed acoustic control measures for the plant servicing the proposed development will be determined at CC stage.

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

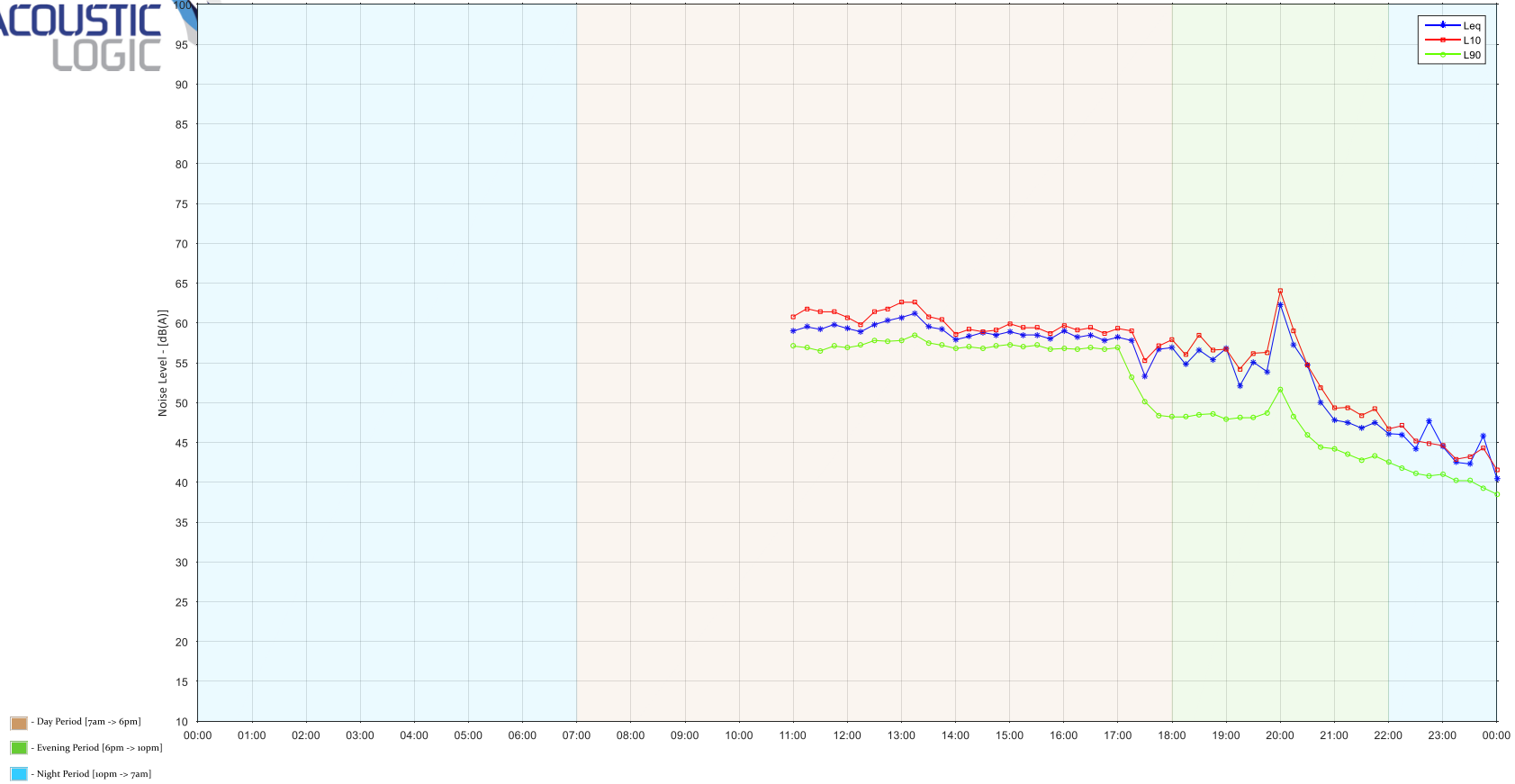
Yours faithfully,



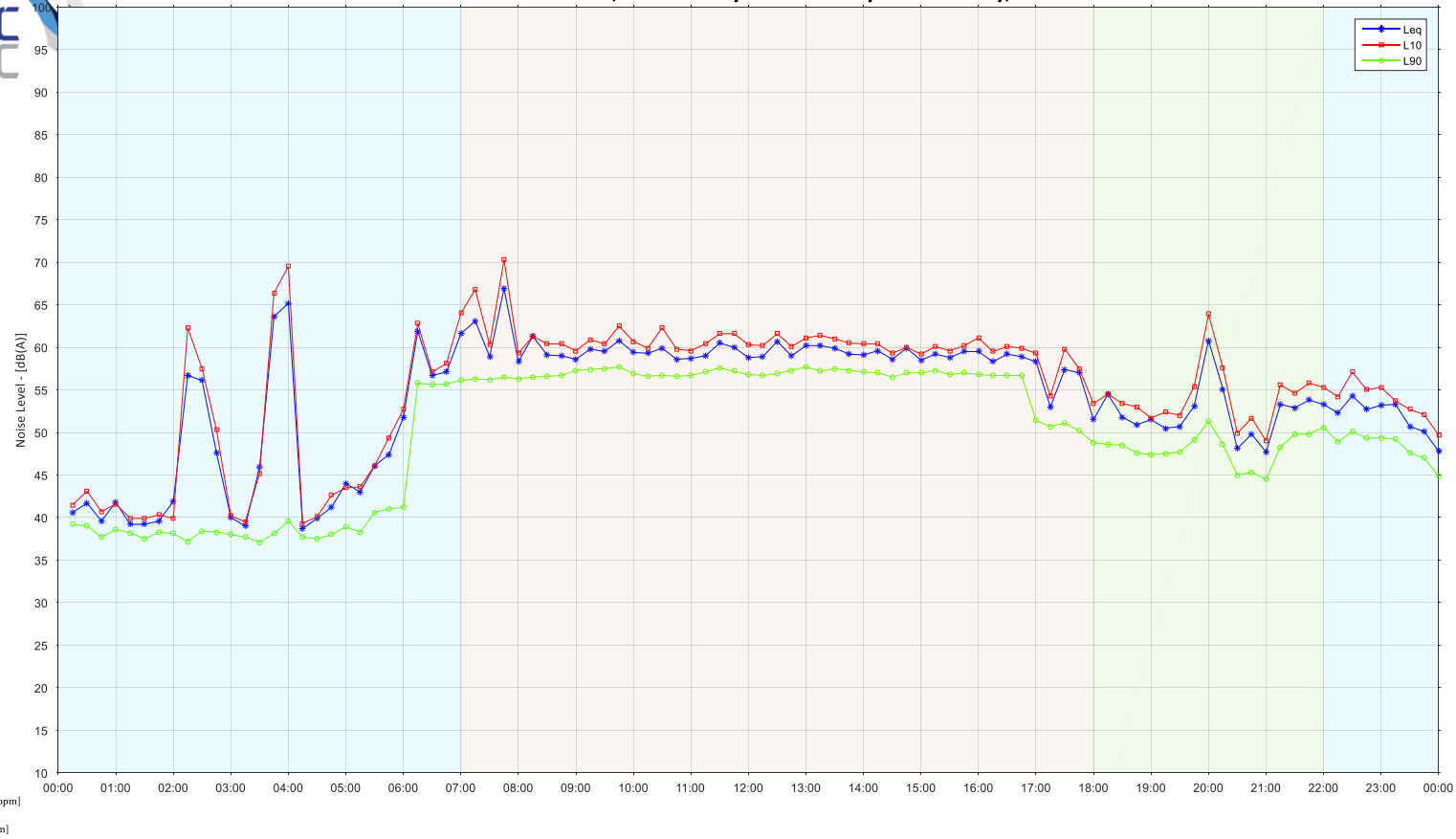
Acoustic Logic Consultancy Pty Ltd
George Kinezos

APPENDIX 1 – UNATTENDED MONITORING DATA – FRONT OF PROJECT SITE

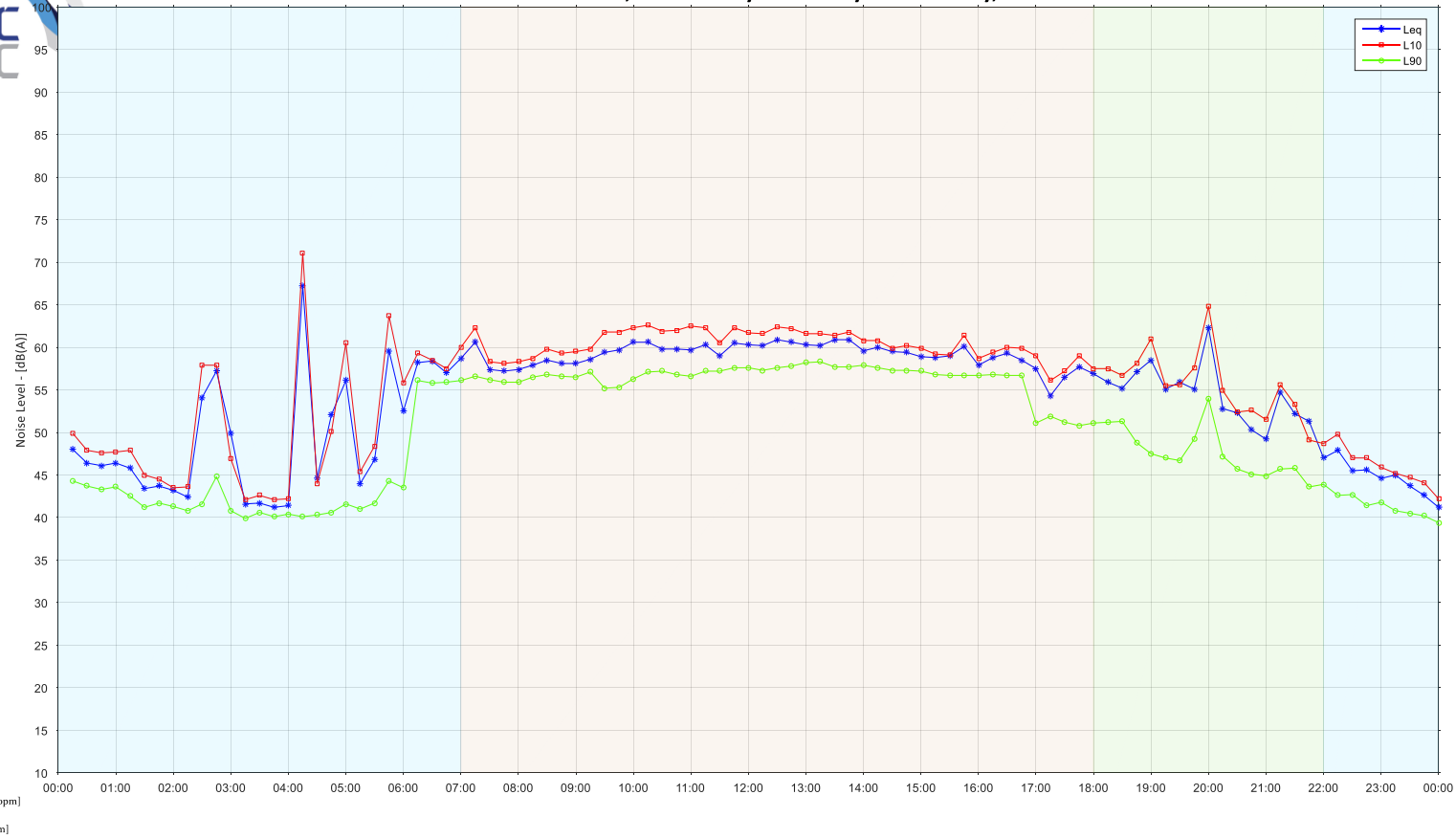
19-27 Cross Street, Double Bay: Tuesday 13 February, 2018



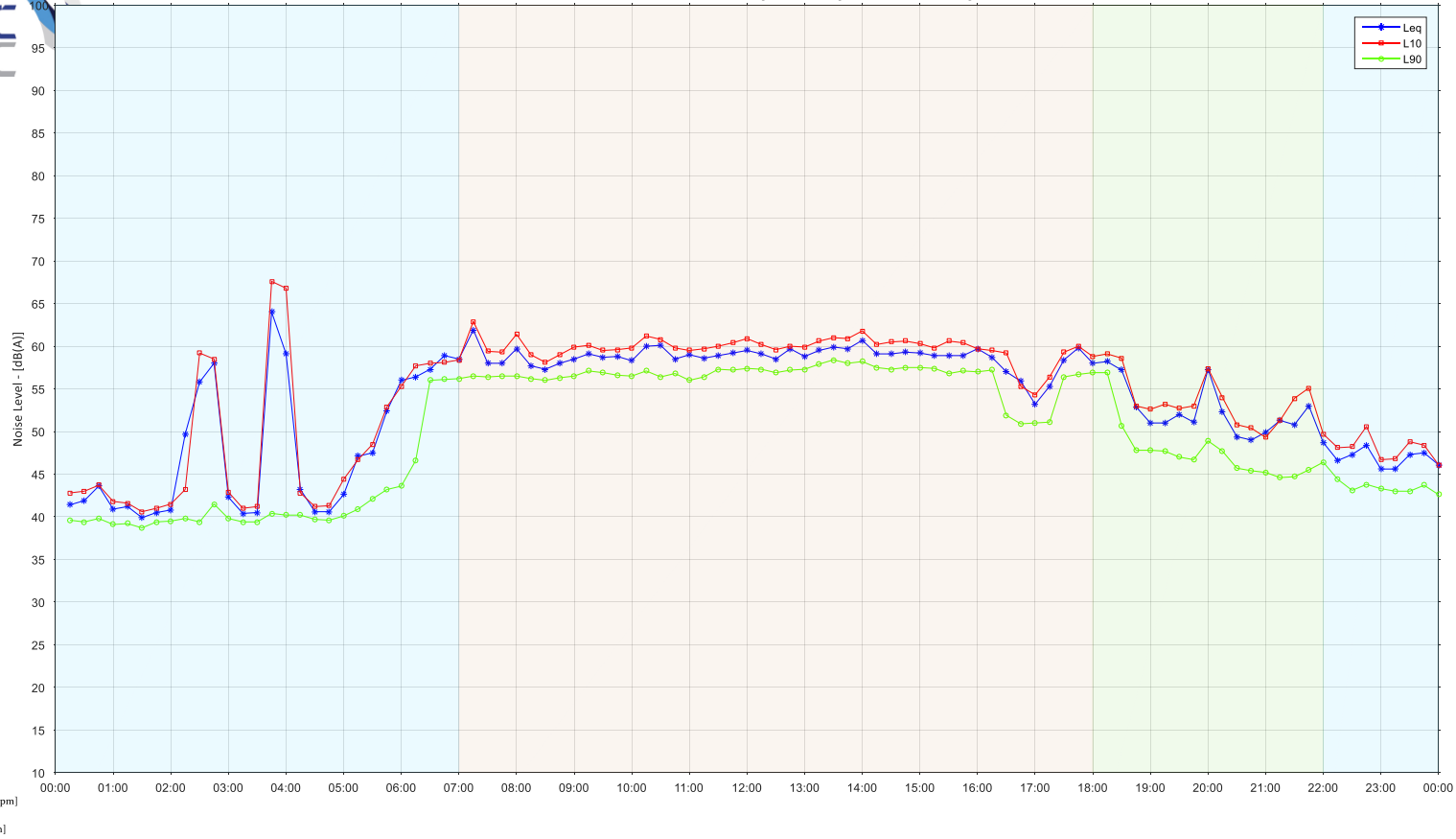
19-27 Cross Street, Double Bay: Wednesday 14 February, 2018



19-27 Cross Street, Double Bay: Thursday 15 February, 2018



19-27 Cross Street, Double Bay: Friday 16 February, 2018



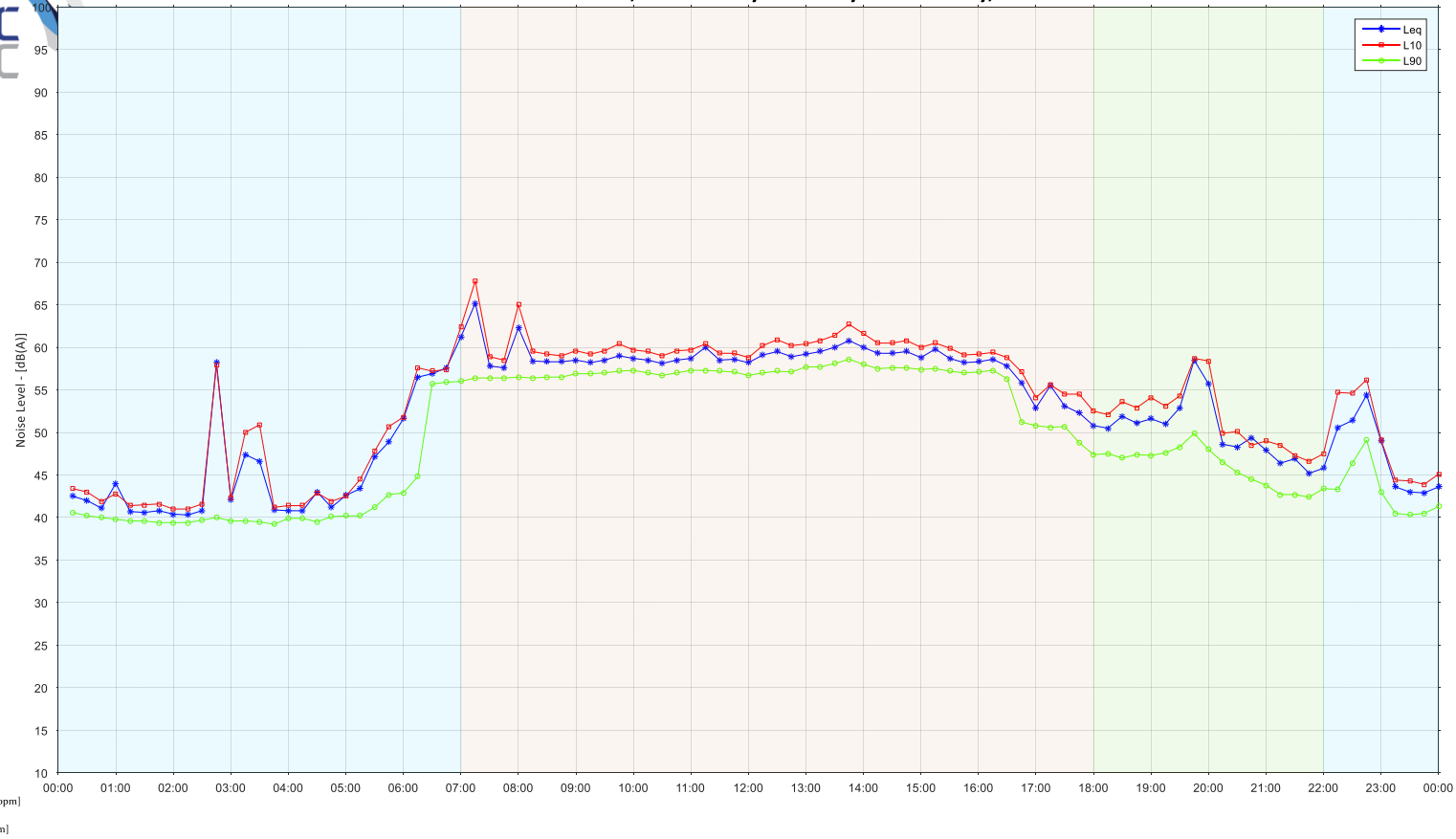
19-27 Cross Street, Double Bay: Saturday 17 February, 2018



19-27 Cross Street, Double Bay: Sunday 18 February, 2018



19-27 Cross Street, Double Bay: Monday 19 February, 2018



19-27 Cross Street, Double Bay: Tuesday 20 February, 2018

