

MANAGING DIRECTORS

MATTHEW PALAVIDIS
VICTOR FATTORETTO

DIRECTORS

MATTHEW SHIELDS
BEN WHITE



Leichhardt Park Child Care Centre

Noise Emission & Aircraft Noise Intrusion Assessment

SYDNEY

A: 9 Sarah St Mascot NSW 2020

T: (02) 8339 8000

F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA

LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au

ABN: 11 068 954 343

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1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to prepare a noise emission and aircraft noise intrusion assessment for the proposed child care facility to be located at Leichhardt Park.

Aircraft noise intrusions into the proposed development have been assessed in accordance with the requirements of AS 2021 – 2000 "Aircraft Noise Intrusion – Building Siting and Construction".

Noise emissions will be assessed with reference to relevant Council guidelines, the Association of Australian Acoustic Consultant's Technical Guideline for Child Care Centre Noise Assessment, and the requirements of the EPA Industrial Noise Policy. Where necessary, building and/or management controls will be recommended in order to reduce noise emissions to acceptable levels.

This report is prepared based on the concept architectural drawing under the project name of *Proposed Child Care Centre Leichhardt Park*, drawing number 103 131 SK04, issue B, dated January 2014 and provided by Dillon & Savage Architects.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The proposed subject site is to be located at Leichhardt Park, Leichhardt.

The proposed child care centre will be a single storey facility with a capacity of approximately 60 children aged up to 5 years. The facility will contain three outdoor play areas, four indoor play areas, kitchen and dining areas, staff and meeting rooms, and cot rooms.

Two of the outdoor play areas are located on the northern boundary of the site nearest to the adjacent public car park. The combined capacity of these two outdoor play areas is 36 children. The third outdoor play area is located towards the southern boundary of the site and has a capacity of 24 children.

The proposed hours of operation for the facility are 7am to 6pm, Monday to Friday.

Noise sensitive receivers in the vicinity of the site are as follows:

- Receiver 1: Single storey residential dwelling at 66 Mary Street.

An aerial photo of the site, noise monitor location and nearby residences is presented below.

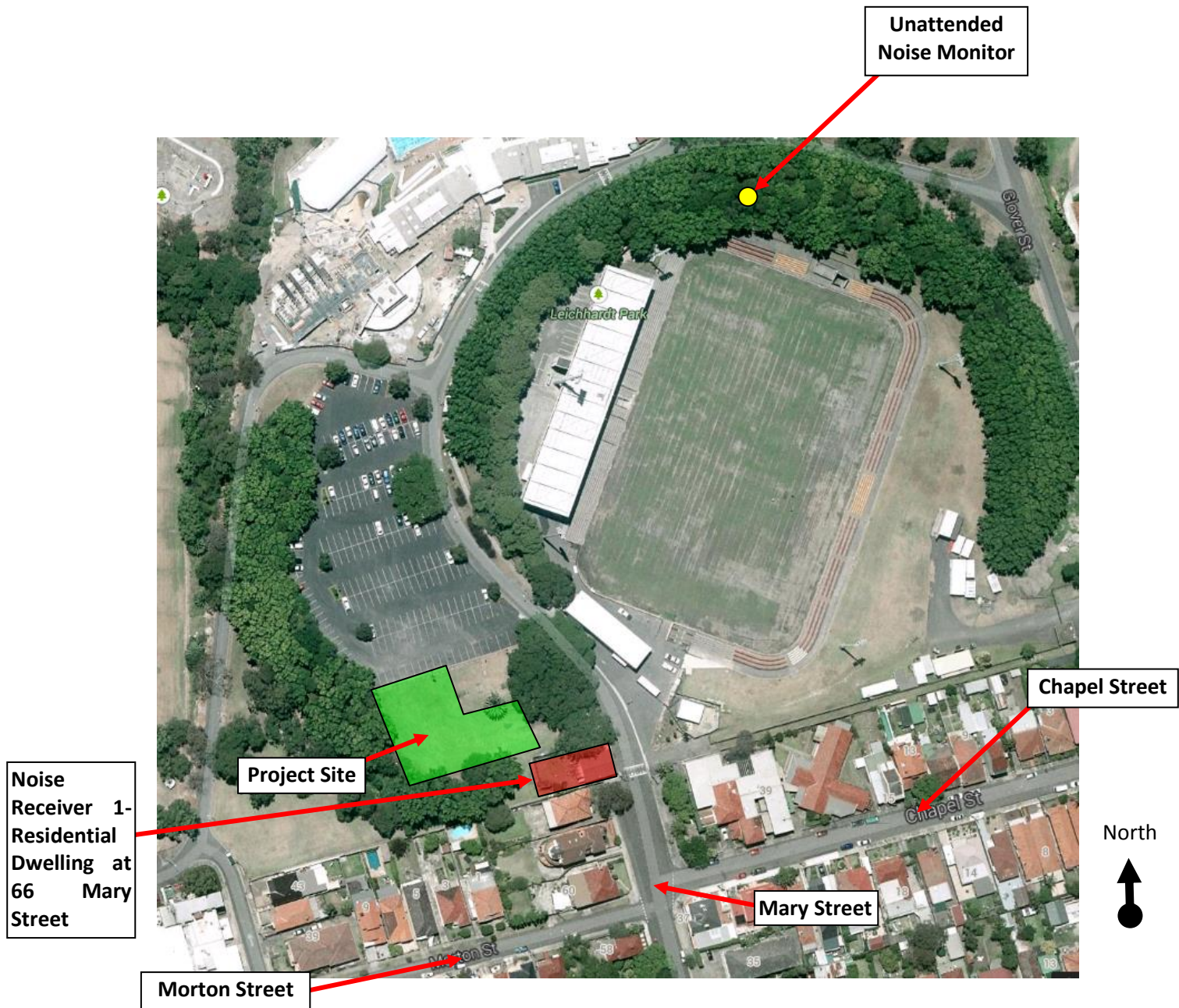


Figure 1: Site Map and Noise Measurement Locations

3 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 traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 ASSESSMENT OF AIRCRAFT NOISE

4.1 SITE EVALUATION

The acceptability of aircraft noise exposure is assessed using Australian Standard AS 2021-2000 "Aircraft Noise Intrusion - Building Siting and Construction".

The standard sets criteria for allowable levels of aircraft noise exposure depending on the proposed land use for the site being assessed.

The acceptability of a site in terms of aircraft noise exposure is assessed using the Australian Noise Exposure Forecast System (ANEF). Three basic parameters influence perception of aircraft noise: the frequency of aircraft movements overhead, the noise level and duration of individual aircraft movements, and the time of the day in which they occur. ANEF was developed to provide a rating system that reflects actual human response to these factors so that the noise exposure of a particular location can be readily assessed.

The proposed site is located between the ANEF 20 and ANEF 25 contours, based on the Sydney Airport 2033 ANEF contour map. Therefore, the proposed site must be assessed to ensure that internal noise levels are limited to those recommended in AS2021.

4.2 INTERNAL NOISE CRITERIA FOR RESIDENTIAL LEVELS

AS2021 states that a full evaluation of internal noise levels should be carried out for locations with an aircraft noise exposure close to or exceeding ANEF 20. This full evaluation requires an examination of likely levels of internal noise from aircraft flyovers.

AS2021 stipulates the internal noise levels listed in the table below for residential buildings. These levels will be used to assess aircraft noise intrusion into the residential levels of the development.

Table 1 - Aircraft Noise Levels Inside Residential Buildings

ACTIVITY	INDOOR DESIGN SOUND LEVEL FROM AIRCRAFT FLYOVER, dB(A)
Sleeping areas	50 dB(A)
Other habitable spaces (including Play Areas)	55 dB(A)
Bathrooms, toilets, laundries	60 dB(A)

4.3 EXTERNAL AIRCRAFT NOISE LEVELS

Aircraft noise levels at the site were determined using AS 2021. The Standard gives aircraft noise levels for aircraft landing and taking off for locations near airports. The location of the runways was obtained from the Sydney Airport ANEF 2033.

Based on the distance from the site to the runways, the flight path and the site elevation, AS 2021 predicts that the loudest typical aircraft movement will be from a 747-400 aircraft taking off from the Main Runway. The noise level at the site as indicated by the standard is 84 dB(A). This noise level will be used to predict the resultant internal noise levels.

4.4 EVALUATION OF NOISE INTRUSION

Internal noise levels will primarily be as a result of noise transfer through the roof, windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound.

The predicted noise levels through the roof, walls, windows and doors are discussed below. 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.

4.5 RECOMMENDED CONSTRUCTIONS

The following constructions are recommended to comply with the noise objectives stated in Table 1.

4.5.1 Glazed Windows and Doors

The window glazing proposed for this project is listed below. The windows will be satisfactory provided they meet the criteria listed below.

The proposed glazing thickness will satisfy all acoustic requirements of AS2021. 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 2 - Recommended Glazing Construction

Room	Element	Glazing Thickness	Acoustic seals
Playroom 4 & Staff Program Room	Glazing	12.38mm laminated	Yes
Playrooms 1, 2 & 3	Glazing	10.38mm laminated	Yes
Cot Rooms	Glazing	10.38mm laminated	Yes
Dining/Craft Area	Glazing	10.38mm laminated	Yes
Staff Lunchroom, Administration, Director, Meeting	Glazing	10.38mm laminated	Yes
Wash Rooms	Glazing	6.38mm laminated	Yes

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in Table 3 in all areas. Where nominated, this will require the use of acoustic seals around the full perimeter of operable frames and the frame will need to be sealed into the building opening using a flexible sealant. Note that mohair seals in windows and doors are not acceptable where acoustic seals are required. The proposed suppliers should provide evidence that the window systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum STC requirements listed in Table 3, and that they will be constructed and installed in a manner equal to the test samples.

Table 3 - Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
12.38mm laminated	Yes	37
10.38mm laminated	Yes	35

4.5.2 External Walls

The recommended wall constructions for sections of the development where light weight wall construction has been proposed are outlined in the table below. All walls require cavity insulation equal to 75mm thick, 11kg/m³ glass wool.

Table 4 –Wall Requirements

Room	External Lining	Stud Width (mm)	Internal Lining
Staff Program Room	2x6mm fibrous cement	≥70mm	2 x 16mm plasterboard
Administration	1x6mm fibrous cement	≥70mm	2 x 16mm plasterboard
Playrooms	1x6mm fibrous cement	≥70mm	1 x 13mm plasterboard
Dining/Craft Area & Foyer	1x6mm fibrous cement	≥70mm	1 x 13mm plasterboard
Washrooms	1x6mm fibrous cement	≥70mm	1 x 13mm plasterboard

Walls that are to be of a masonry construction should be a minimum 110mm brick veneer + 70mm stud + 1x10mm plasterboard, with cavity insulation equal to 75mm thick, 11kg/m³ glass wool.

4.5.3 External Doors

It is recommended that full perimeter acoustic seals are used for the external entry doors into all playrooms, the foyer/parent area, and the dining/craft area. The doors shall be a minimum of 40mm solid core timber, with Raven RP10 to the top and sides and Raven RP38 to the underside of the doors.

Glazed doors are to have glazing thicknesses equal to or greater than those recommended in table 2, with Raven RP10 to the top and sides and Raven RP38 to the underside of the doors.

4.5.4 Roof / Ceiling Construction

The recommended roof/ceiling construction is shown in Figure 1 below. Penetrations in all ceilings (such as for light fittings etc.) must be acoustically treated and sealed gap free with a flexible sealant.

The recommended roof/ceiling construction is shown in Figure 1.

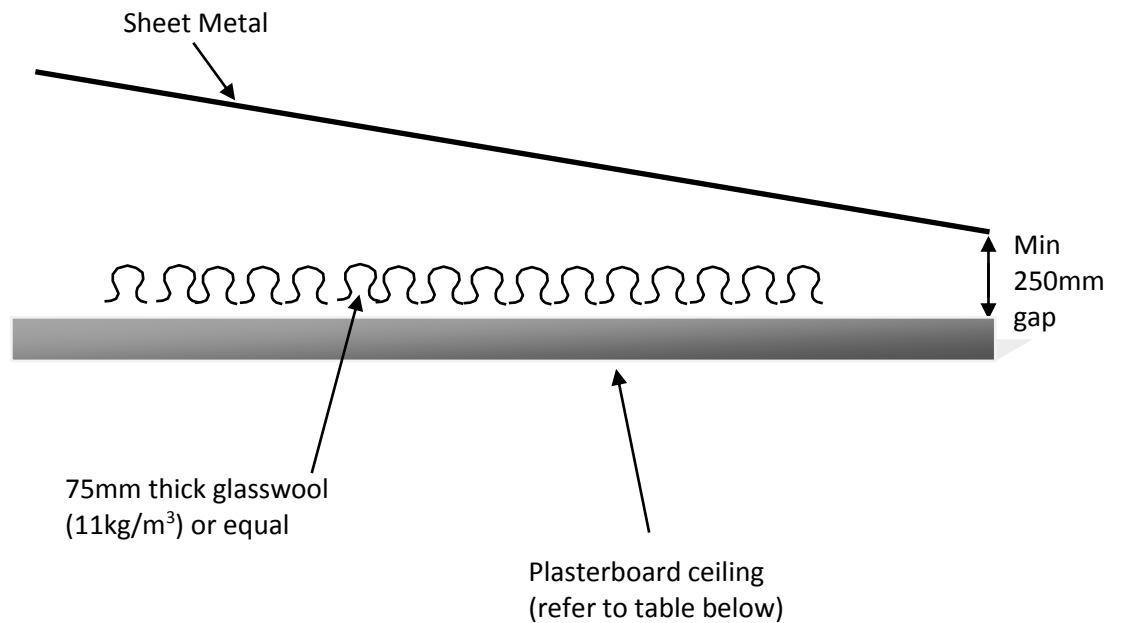


Figure 2 – Roof / Ceiling Construction

Table 5 – Ceiling Plasterboards

Room	External Lining	Cavity Width (mm)	Internal Lining
Playrooms	0.5mm metal deck	≥250mm	2 x 16mm plasterboard
Foyer/Parent Area	0.5mm metal deck	≥250mm	2 x 16mm plasterboard
Dining/Craft Area	0.5mm metal deck	≥250mm	2 x 13mm plasterboard
Cot Rooms	0.5mm metal deck	≥250mm	2 x 13mm plasterboard
Staff Program Room	0.5mm metal deck	≥250mm	2 x 10mm plasterboard
Administration	0.5mm metal deck	≥250mm	1 x 16mm plasterboard
Washrooms	0.5mm metal deck	≥250mm	1 x 16mm plasterboard
Meeting & Director Room	0.5mm metal deck	≥250mm	1 x 13mm plasterboard

4.5.5 Plasterboard Corner Details

The recommended plasterboard ceiling/wall corner construction options over the rooms are shown in the figure 2.

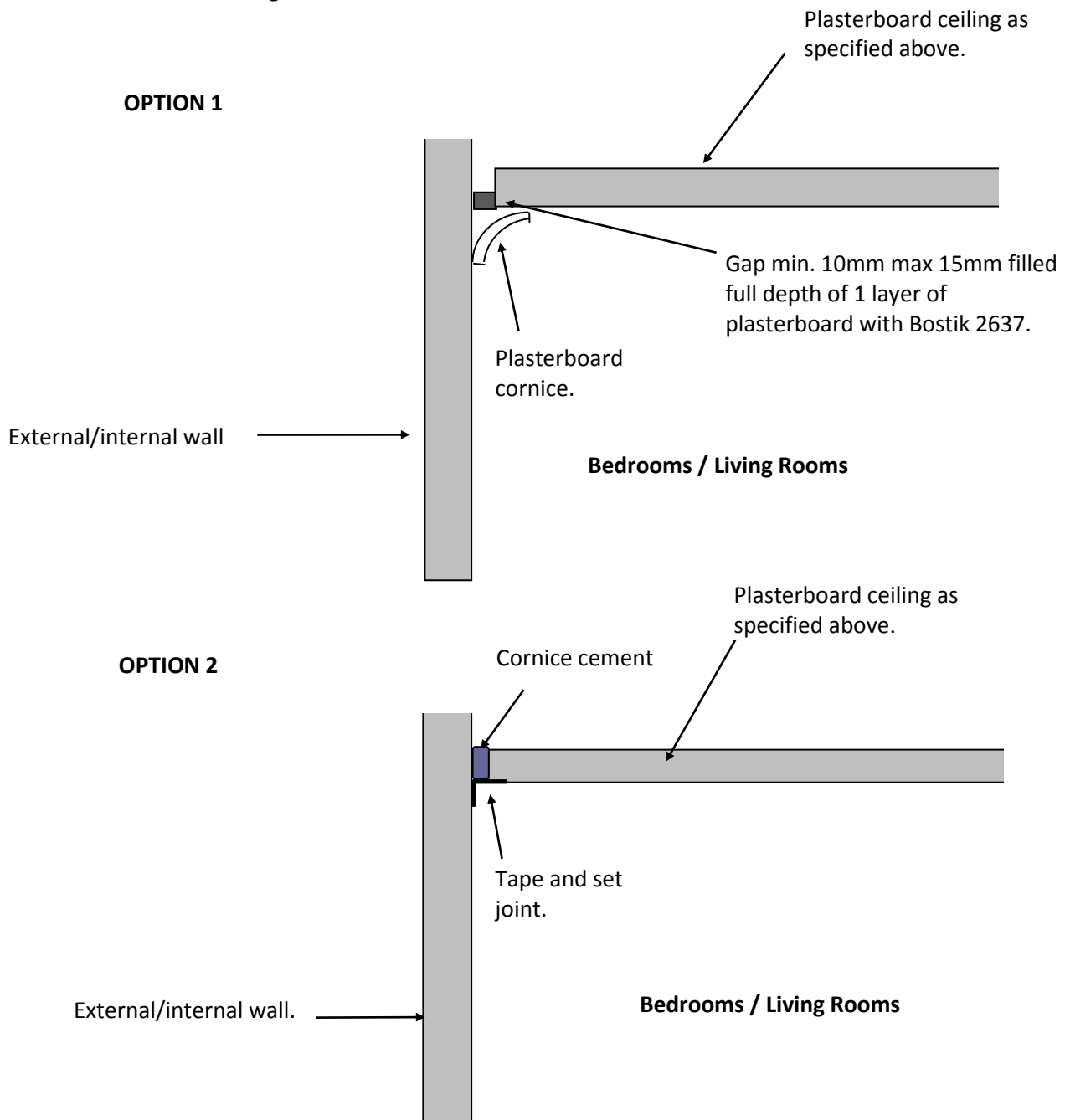


Figure 2 – Plasterboard Corner Options

4.5.6 Ventilation and Air Conditioning

AS2021-2000 requires the installation of ventilation or air conditioning systems where aircraft noise exposure exceeds ANEF 20. As internal noise levels cannot be achieved with windows open it is required that an alternative outside air supply system or air conditioning be installed in accordance with AS 1668.2 requirements. Any mechanical ventilation system that is installed should be acoustically designed such that the acoustic performance of the recommended constructions are not reduced by any duct or pipe penetrating the wall/ceiling/roof. Noise emitted to the property boundaries by any ventilation system shall comply with Council requirements.

5 NOISE EMISSION ASSESSMENT

5.1 BACKGROUND NOISE MONITORING

Unattended measurements were made using a noise logger in order to determine the existing background noise levels to be used for noise emission assessment.

5.1.1 Measurement Location

Measurements were taken by a noise monitor installed in the Leichhardt Park Oval near the proposed child care facility location (see aerial photograph).

Background noise levels at this point will be indicative of the background levels that will be present at the nearby residential receivers.

5.1.2 Measurement Equipment

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The logger was 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.

5.1.3 Monitoring Period

Unmanned noise monitoring was carried out between 20th and 27th February 2014.

5.1.4 Measured Noise Levels

Appendix A provides the results of the unattended noise monitoring. Background noise levels during the times in which it is proposed to use the child care centre are presented below.

Table 6 – Measured Background Noise Levels

LOCATION	PERIOD/TIME	BACKGROUND NOISE LEVEL dB(A)L ₉₀
Leichhardt Park Oval	Day (7am-6pm)	43

5.2 NOISE EMISSION GOALS

This section of the report outlines the noise emission goals that are to be met during the operation of the proposed child care facility.

5.2.1 Leichhardt Municipal Council DCP 2013

Section C36(d) of Part C (Section 4) in the Leichhardt Municipal Council DCP 2013 states:

“Noise attenuation measures, including physical measures such as fencing, and operational measures such as a Plan of Management, to ensure that noise generated from the child care centre will not result in an ‘offensive noise’ (as defined in the Protection of the Environment Operations Act 1997) at any surrounding residential premises.”

We note that the POEO Act does not provide a numerical/specific guideline as to what constitutes offensive noise. In the absence of this, the following acoustic guidelines will be used for this assessment:

- Association of Australian Acoustic Consultants Technical Guideline for Child Care Centre Noise Assessment for noise emissions from the play areas.
- NSW EPA Industrial Noise Policy for plant noise emissions.

5.2.2 Play Areas - Association of Australian Acoustic Consultants Technical Guideline for Child Care Centre Noise Assessment

The AAAC adopts a “background+10dB(A)” noise emission goal for the use of outdoor spaces of child care centres.

This more lenient goal is in recognition that:

- Noise from children playing is not typically considered as intrusive as industrial noise (or other noise sources typically required to comply with a “background+5dB(A)” criteria), and should therefore not be held to the same criteria;
- There are very limited building controls that can practically be implemented for control of noise from outdoor areas; and
- The outdoor play areas are used only for limited periods of the day, at times when nearby properties are typically less noise sensitive.

The AAAC guidelines recommend a “background +10dB(A)” criteria for periods of 2 hours per day, and “Background + 5dB(A)” for other periods, or other noise sources at the site (vehicle, plant noise, noise from internal areas).

These criterion have also been adopted by the Land and Environment Court in a number of decisions, including *Mesabo Pty Limited v Mosman Municipal Council* [2004] NSWLEC 492.

Therefore, for this assessment, we propose that:

- Outdoor play areas be permitted to generate a noise level of 10dB(A) L_{eq} above the background noise level for up to 2 hours per day.
- Should the outdoor play areas be in use for more than 2 hours per day, noise emissions from these should not exceed background levels by more than 5dB(A) L_{eq} .

A summary is presented below:

Table 7 - Noise Emission Objectives (Child Care Centre)

Location	Time of day	Background Level dB(A) L_{90}	Noise Emission Objective	
			Outdoor Play Areas (2 hours per day) dB(A) L_{eq} (15min)	Outside of 2 hour period dB(A) L_{eq} (15min)
Nearby residential buildings to the south-east of the child care facility	7am-6pm	43	53	48

5.2.3 Plant Noise - NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This 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.
- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all “industrial” noise sources such as mechanical plant 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.

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

5.2.3.1 Intrusiveness Criterion

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 6.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 8 – Intrusiveness Noise Emission Goals

Location	Period/Time	Intrusiveness Noise Emission Goal dB(A) $L_{eq}(15min)$
Nearby Residences	Day (7am-6pm)	48

5.2.3.2 Amenity Criterion

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 2.1 on page 16 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by suburban 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;

Table 9 – Amenity Noise Emission Goals

Location	Period/Time	Amenity Noise Emission Goal dB(A) $L_{eq}(\text{Period})$
Nearby Residences – Suburban Receiver	Day (7am-6pm)	55

5.3 ASSUMPTIONS USED IN ASSESSMENT

Noise levels generated by children at play have been measured by this office in other child care centres. The sound power levels determined from these measurements are then used in order to predict the likely noise emissions from the site.

Noise emissions from the proposed child care centre are based on the following assumptions:

- The average sound power level of a single child from different age groups is outlined in the table below. The assessment assumes that one in two children are generating noise at any given time. This level has been calculated based on measurements made by Acoustic Logic at other similar child care centres.

Table 10 – Average Sound Power Level of Individual Children of Different Age Groups

Age Group	Average Sound Power Level dB(A)_{Leq}
0-2 years	74
2-3 years	76
3-6 years	78

- The two worst case scenarios used to model noise emissions from the proposed child care centre to receiver one are listed below:
 - Scenario 1: Outdoor Play Area 0-2, and playrooms 3 and 4 operating at full capacity;
 - Scenario 2: All three Outdoor Play Areas operating at full capacity;
- The operating capacities of these play areas (based on information provided to this office) are:
 - Outdoor play areas 2-3 and 3-5 combined: 36 children;
 - Outdoor play area 0-2: 24 children;
 - Playroom 3: 12 children;
 - Playroom 4: 12 children.
- The noise emission assessment assumes that the children are evenly distributed throughout the play areas.

5.4 PREDICTED NOISE LEVELS

5.4.1 Noise from Both Outdoor Play Areas

This section of the report presents the predicted noise emissions from the proposed childcare centre at the nearest residential receivers for the two scenarios presented in 5.3. These scenarios are:

- Scenario 1: Outdoor Play Area 0-2, and playrooms 3 and 4 operating at full capacity;
- Scenario 2: All three Outdoor Play Areas operating at full capacity;

Noise emissions are predicted at the property boundary of 66 Mary Street, the closest residential receiver to the proposed child care facility.

Predicted noise levels are as follows. Predicted noise levels factor in distance attenuation and barrier effects. In addition, all predictions are based on the assumption that the acoustic treatments in section 5.5 are adopted.

Table 11 – Predicted Noise Levels at Nearby Residences

Residential Property	Assessment Location	Scenario	Predicted Noise Level dB(A) _{Leq(15min)}	Allowable Noise Level dB(A) _{Leq(15min)}	Complies
66 Mary Street (Receiver 1)	Property Boundary	Scenario 1	44	48	Yes
		Scenario 2	45	48	Yes

We note that predicted noise emission comply with both a “background+10dB(A)” and the more stringent “background+5dB(A)” assessment.

Given that compliance with “background + 5dB(A)” noise emission goal is achieved, there is no need to limit the use of active play in outdoor areas to only 2 hours per day.

5.5 RECOMMENDED TREATMENTS

In order to control noise emissions to acceptable levels, the following treatments and management controls are required:

- Construction of a minimum 1.8m high, imperforate fence (no holes – e.g. lapped and capped timber or Colorbond) along the perimeter of the outdoor play area 0-2 as shown below.

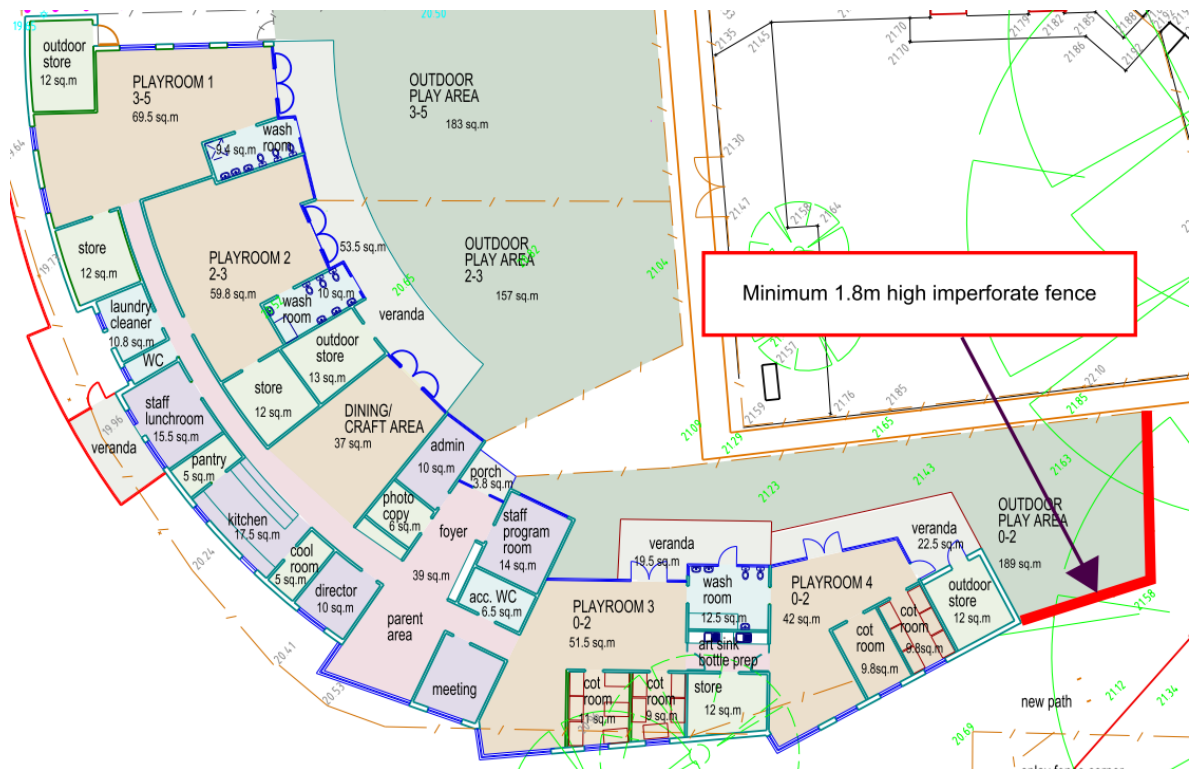


Figure 3 – Recommended Fence

- During periods of active play in playrooms 3 and 4, we recommend that the south facing windows of these rooms remain closed.
- Noise from any new mechanical services (air-conditioners, kitchen exhaust fan or similar) should comply with the acoustic requirements of the EPA Industrial Noise Policy (Intrusiveness and Amenity criteria). Detailed review of new plant items should be undertaken at Construction Certificate stage, once plant items are selected and locations determined. Compliance with EPA guidelines will be achievable with standard acoustic treatments.

6 CONCLUSION

This report presents our acoustic assessment for the proposed child care facility to be located at Leichhardt Park, Leichhardt.

Noise intrusion from aircraft onto the future users of the facility have been assessed in accordance with Australian Standard AS2021:2000. Provided that the acoustic treatments in section 4.5 are adhered to, the internal noise levels of the child care facility will comply with the criteria.

A noise emission assessment of the proposed child care facility to the nearest residential receivers has also been conducted in accordance with the requirements of the Leichhardt Municipal Council DCP, the Association of Australian Acoustic Consultant's Technical Guideline for Child Care Centre Noise Assessment, and the EPA Industrial Noise Policy. Provided that the acoustic treatments set out in section 5.5 of this report are adopted, noise emissions will comply with the nominated criteria.

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

Yours faithfully,

A handwritten signature in black ink, appearing to read 'Justin Leong', with a horizontal line underneath.

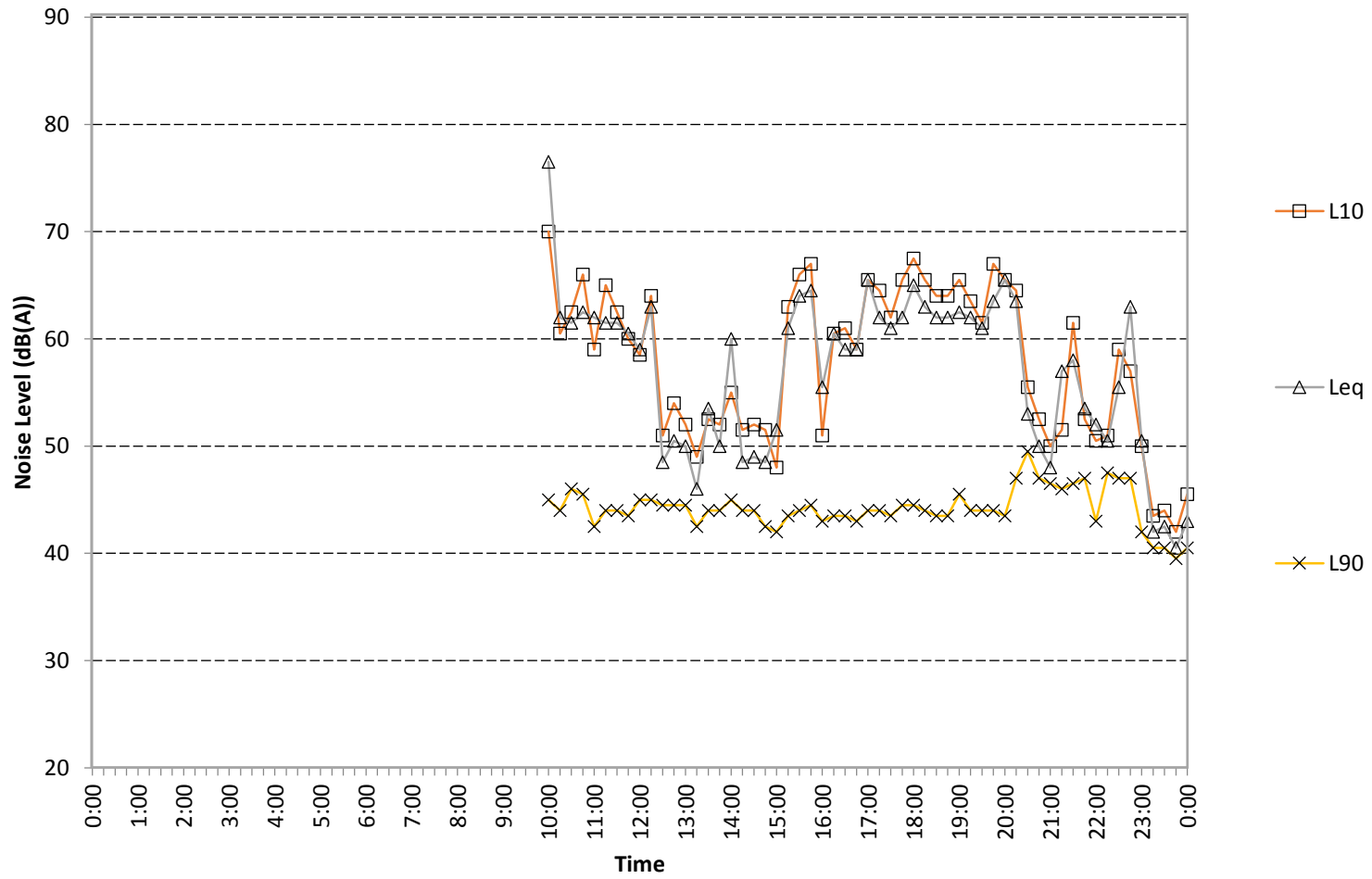
Acoustic Logic Consultancy Pty Ltd
Justin Leong

APPENDIX A

NOISE MONITOR MEASUREMENTS

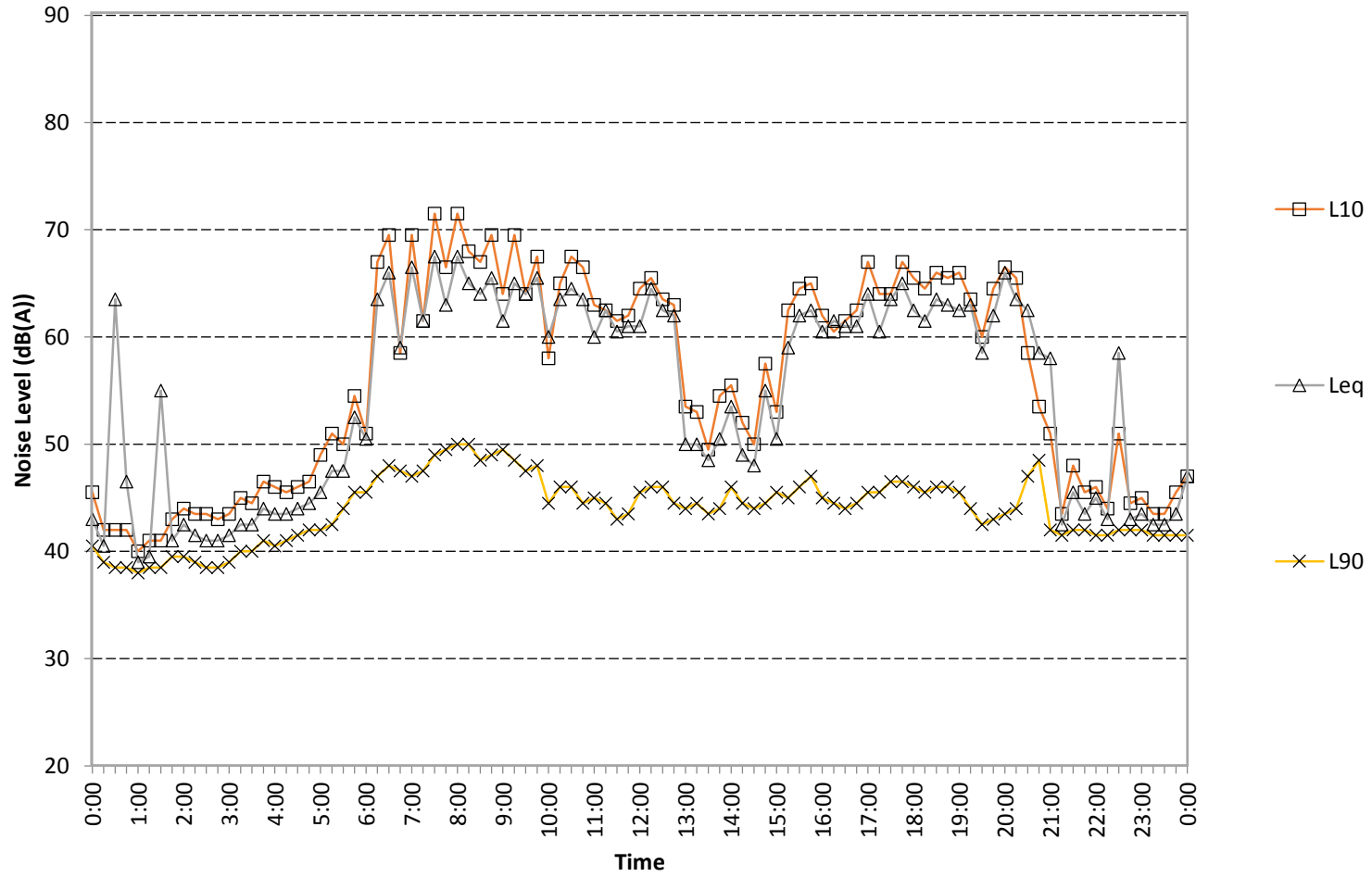
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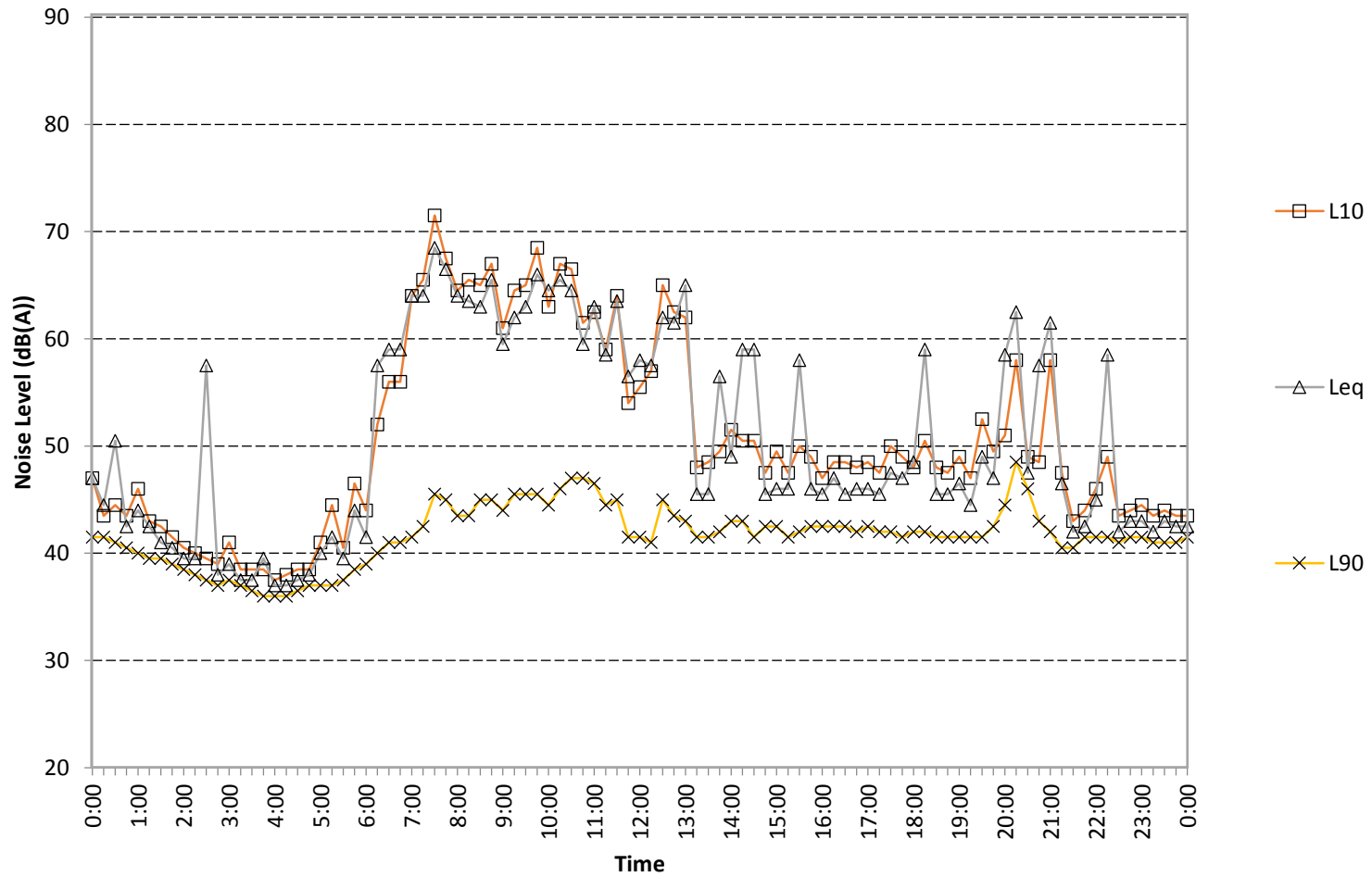
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Friday February 21, 2014



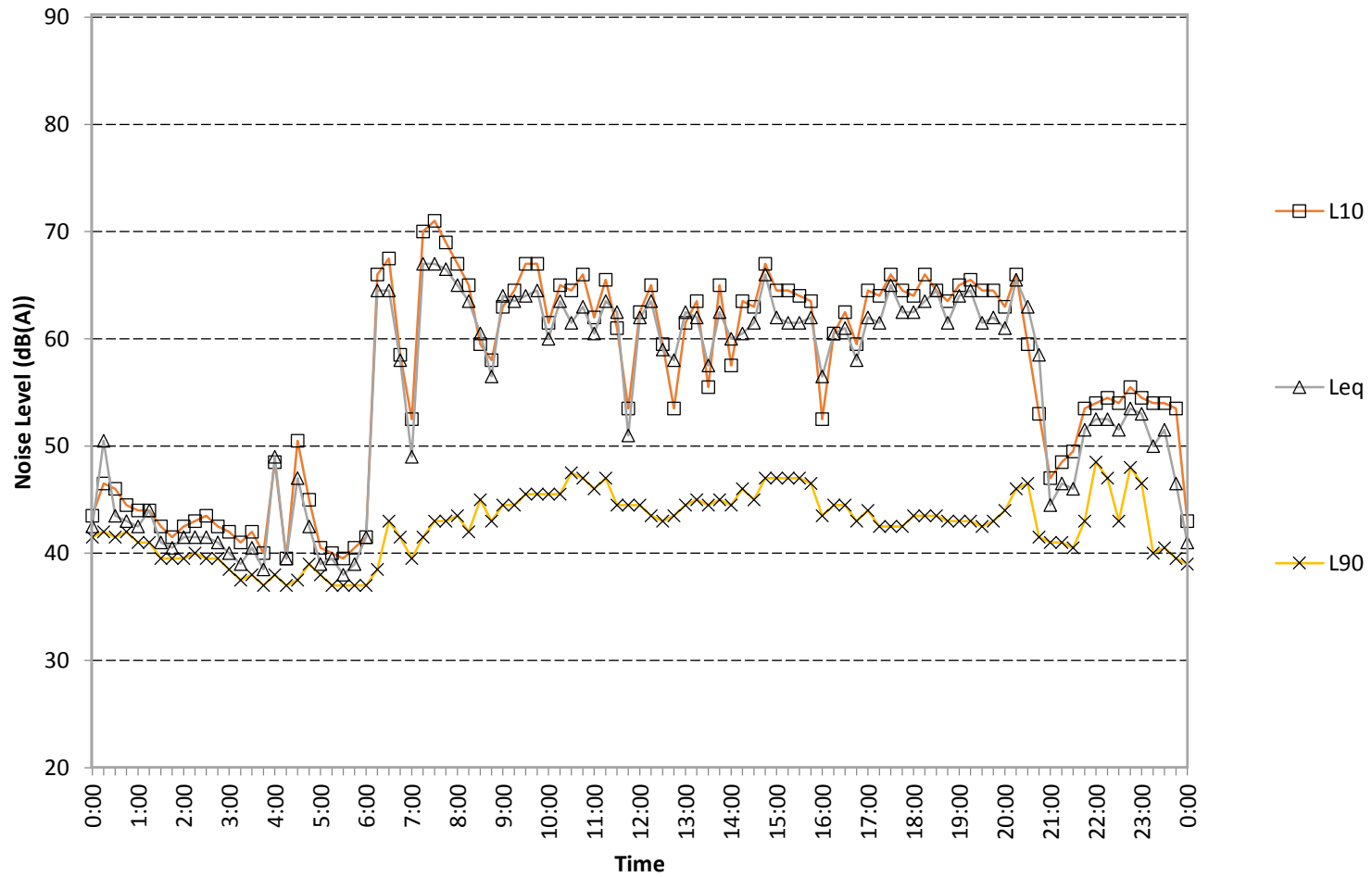
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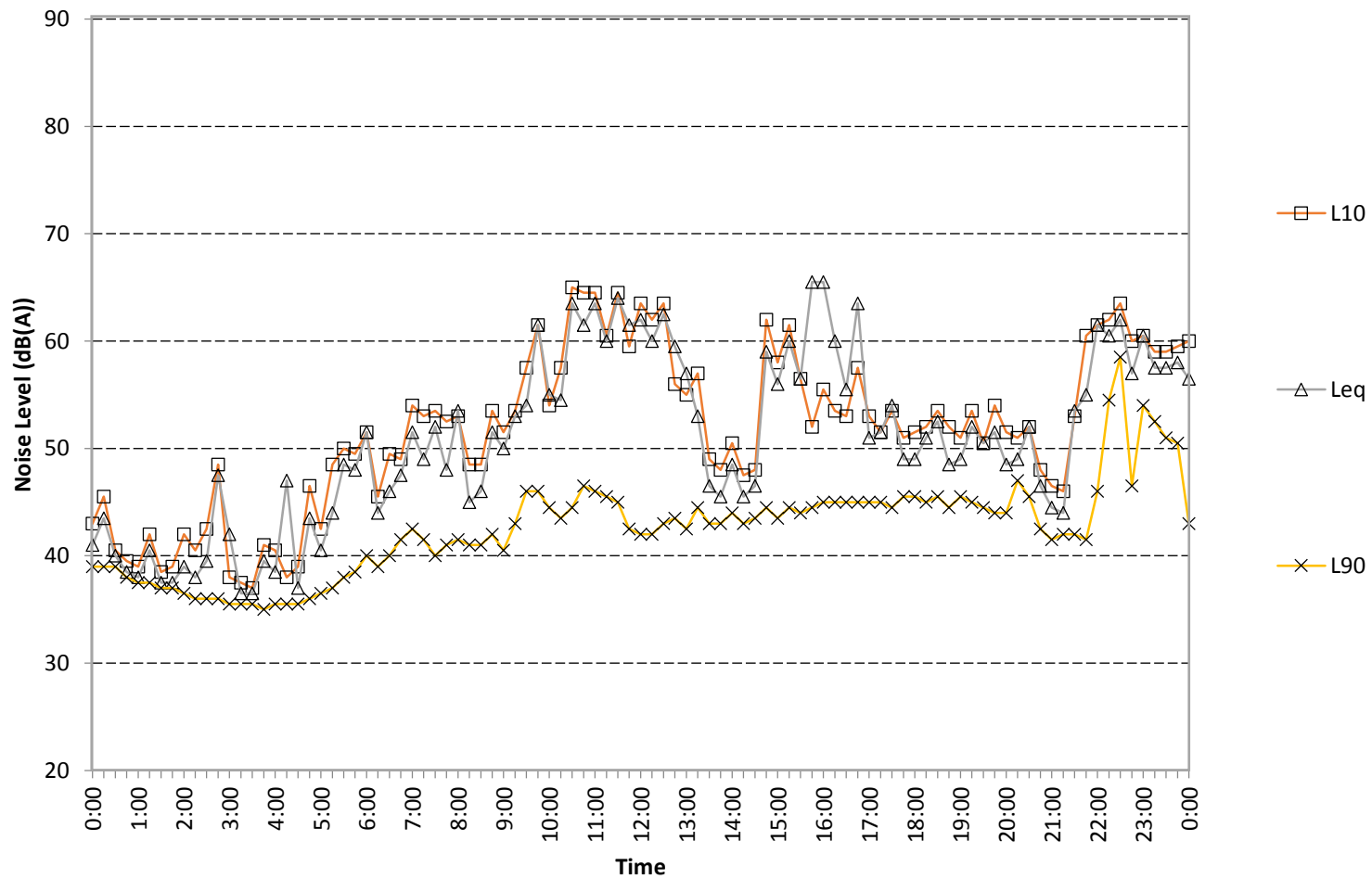
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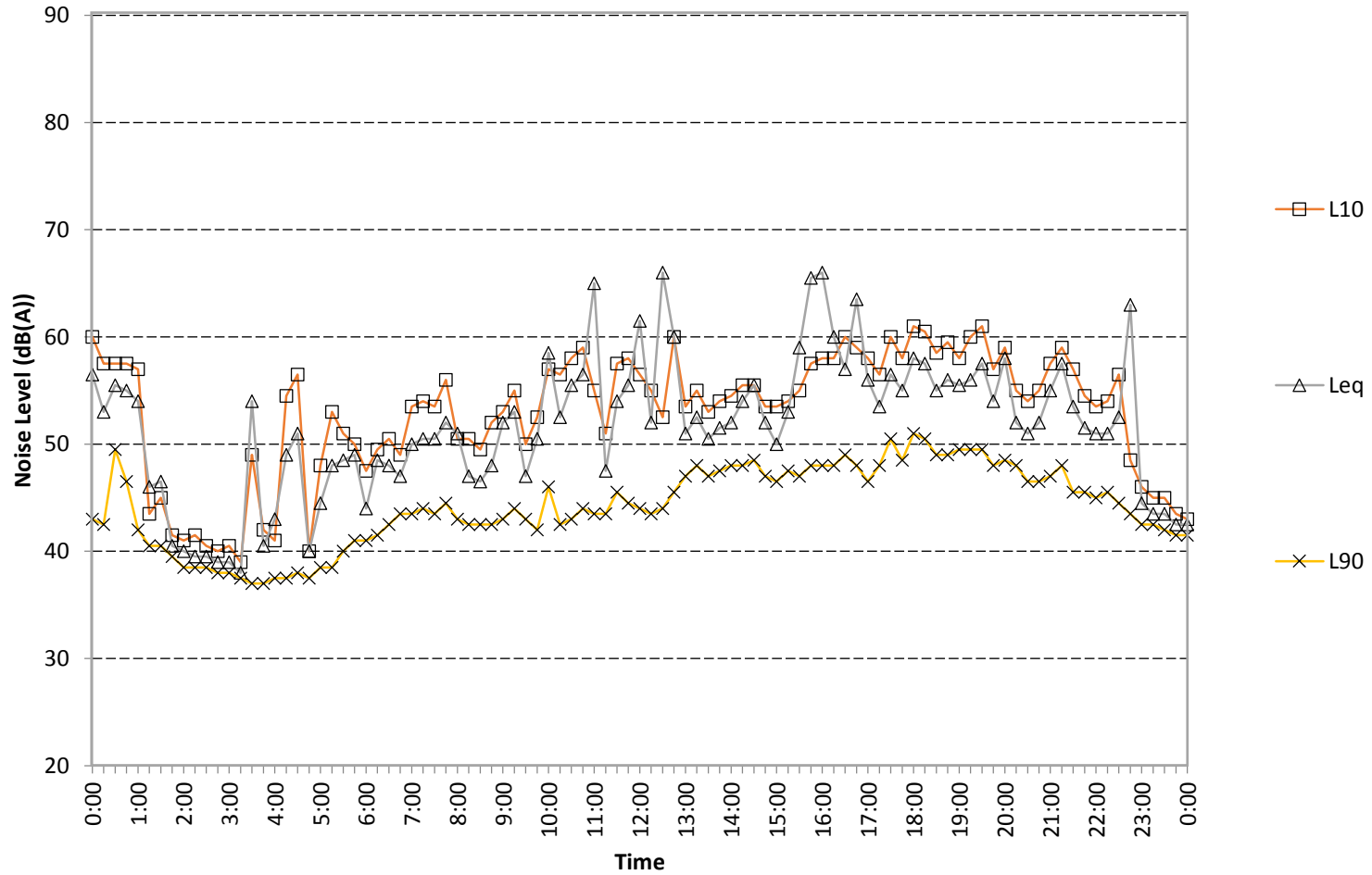
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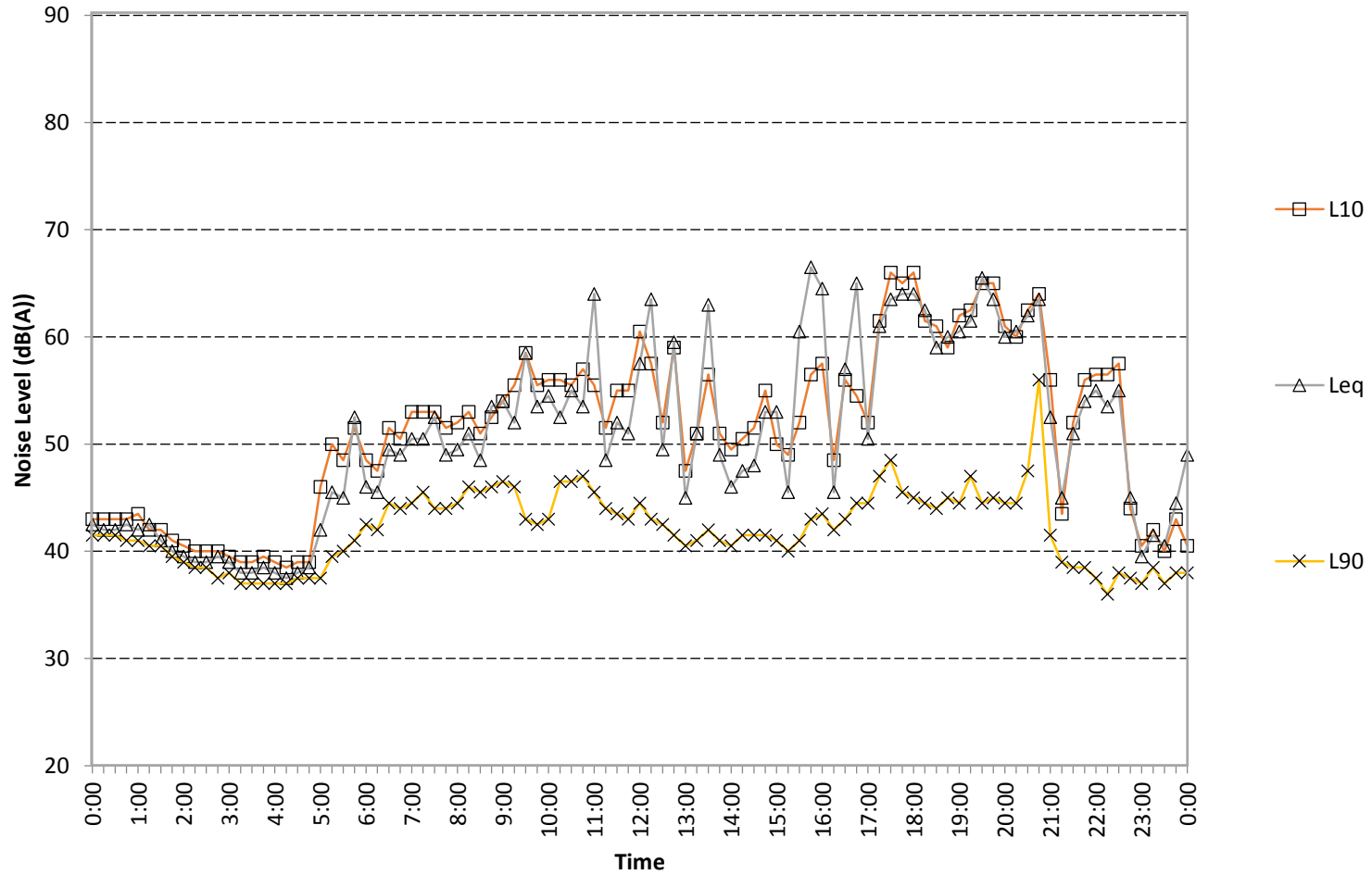
Leichhardt

Tuesday February 25, 2014



Leichhardt

Wednesday February 26, 2014



Leichhardt

Thursday February 27, 2014

