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Proposed Commercial Development, 2 Australia Ave, Olympic Park

DA Environmental Noise and Vibration Assessment

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TABLE OF CONTENTS

1 INTRODUCTION

This report has been prepared to accompany an Environmental Assessment for the proposed commercial development at 2 Australia Ave, Sydney Olympic Park. An assessment has been undertaken on the impact of traffic noise, as well as train noise and vibration on the acoustic amenity of the proposed development.

The plant noise emission criteria from the proposed development have been developed based on the requirements of NSW DECCW Industrial Noise Policy.

The assessment has been based on the drawings provided by Capital Corporation with drawing numbers as below.

Table 1 – Architectural Drawings

Drawing No.	Issue
DA1001	03
DA1002	04
DA1003	04
DA1004	04
DA1005	04
DA1006	05
DA1007	04
DA2000	20/10/10
DA2001	20/10/10
DA2003	20/10/10
DA2002	20/10/10
DA2009	20/10/10

2 SITE DESCRIPION

The project site is located at the corner of Australia Ave and Herb Elliott Ave. The northern façade faces Herb Elliott Ave which is the two lane road with bus passby. The eastern façade faces Australia Ave which is four lane road with medium traffic flows while the remaining facades are bounded by the existing commercial buildings.

The Olympic Park railway line is located across Australia Ave. A multi storey under construction building separates the site from rail line. Detailed site map refer to Figure 1 below.

Figure 1 Site Map and Noise/Vibration Measurement Locations

3 EXTERNAL NOISE INTRUSION ASSESSMENT

3.1 TRAFFIC NOISE INTRUSION

3.1.1 Traffic Noise Descriptors

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level.

To accurately determine the effects of traffic 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. These parameters are used to measure how much annoyance would be caused by a particular noise source.

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 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 traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

3.1.2 Traffic Noise Criteria

Recommended internal noise levels for development are set out below. These levels are consistent with the recommended internal noise levels set out in Australia. New Zealand Standard *AS2107 (Recommended Noise Levels and Reverberation Times for Building Interiors)* are achieved.

Table 1 – Internal Noise Level Criteria – Commercial Space

Space	Criteria dB(A) $L_{eq\ (1hr)}$
General Office	45
Private Office	45
Meeting Room	40

3.1.3 Measured Existing Traffic Noise Levels

Traffic noise measurements have been conducted around project site between 8am and 10:30am on 2nd December 2010.

Noise measurements were obtained using a CEL-593 Type 1 Sound Level Analyser, set to A-weighted fast response. The sound level meter was calibrated before and after the measurements using a RION NC-73 Sound Level Calibrator. No significant drift was recorded.

Detailed traffic measurement location and measured traffic noise levels have been presented as below.

Table 2 –Traffic Noise Measurements

Measurement Location	Measured Traffic Noise Level dB(A) L_{eq}
Location 1- Along Australia Ave with microphone approximately 3m from carriage way	64
Location 2- Along Herb Elliot Ave with microphone approximately 5m distance from carriage way	64

Traffic noise intrusion into the proposed development was assessed using the measured external noise levels reported in Section above as a basis. The assessment is based on the architectural drawings listed afore.

Calculations were performed taking into account the orientation of windows area 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.

3.2 EVENT NOISE IMPACT

3.2.1 Internal Noise Criteria

Recommended internal noise levels for development are set out below. These levels are consistent with the recommended internal noise levels set out in Australia. New Zealand Standard *AS2107 (Recommended Noise Levels and Reverberation Times for Building Interiors)* are achieved.

Table 3 -– Internal Noise Level Criteria – Commercial Space

Space	Criteria dB(A) Leq (1hr)
General Office	45
Private Office	45
Meeting Room	40

3.2.2 Measured event NOISE LEVELS

Measured noise levels for various events which this office has been involved with are detailed in the table below. In all cases the measured event and location of the event is detailed. The noise levels detailed below have been used as the basis of the noise impact assessment on the future development.

Table 4 – Measured Events Noise Levels

Event	Location	Noise Level $L_{eq\ (15\ min)}$ dB(A)
Sydney Olympic Park – NRL Grand Final 2009	Olympic Boulevard within 100m of stadium	Up to 72
Music Concert at the SCG in 2007	Neighbouring properties on Moore Park Road within close proximity	Up to 73
Sporting Event (AFL Game) held at the SCG, 2008	Neighbouring properties on Moore Park Road within close proximity	Up to 70

3.3 TRAIN NOISE INTRUSION

3.3.1 Internal Train Noise Criteria

Train noise intrusion into the project site shall comply with the requirements of the Department of Planning's document titled "Development Near Rail Corridors and Busy Roads- Interim Guidelines".

Table 5 – Internal Train Noise Criteria

Space	Recommended Max $L_{Aeq,1hr}$ dB(A)
Office	40

3.3.2 Train Noise Measurements

Train noise measurements were conducted by this office along the rail line boundary across Australia Ave. Train noise was measured as SEL's. Based on the requirements of the RIC and SRA the following calculated noise levels in Table 4 were determined from the measurement data and Event Train Time Table.

Table 6 - Measured /Predicted External Train Noise Levels

Measurement Location	TIME OF DAY	$L_{Aeq,1hr}$ dB(A)
Rail Line boundary	Day (7am-10pm)	63
	Night (10pm-7am)	62

3.4 ASSESSMENT

Internal noise levels will primarily be as a result of noise transfer through the windows and doors, as these are relatively light building elements that offer less resistance to the transmission of sound. The walls are proposed to be heavy masonry elements that will not require upgrading.

The predicted noise levels through the windows, 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 environmental noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

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

4 RECOMMENDATIONS

The following recommended building structure is required to ensure that external noise intrusion into the project building fully comply with the requirements of Section 3.

4.1 GLAZING

The following tables list the recommended glazing assemblies for this project to achieve the requirements regarding train and traffic noise intrusion. All the windows and external doors listed are required to be fitted with acoustic seals. (Mohair Seals are unacceptable).

The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 7 - Recommended Glazing

facade	Designated Rooms	Recommended Glazing	acoustic seals
North	All	10.38mm Lam	Yes
East	All	10.38mm Lam	Yes
West	All	10mm	Yes
South	All	10mm	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 nominated in Table 8. Note that mohair 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 of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum STC of Installed Window
10mm	33
10.38mm Laminated	35

4.2 ROOF / CEILING

The proposed concrete roof construction will be sufficient to control traffic and train noise intrusion.

4.3 EXTERNAL WALLS

External walls composed of concrete or masonry elements would not require upgrading.

5 TRAIN VIBRATION

Trains induce ground borne vibration that is transmitted through the subsoil. This vibration can be perceptible close to railways.

5.1 OBJECTIVES

NSW Government Department of Planning "Development Near Rail Corridors and Busy Roads"- Interim Guideline recommends that habitable rooms should comply with the criteria in British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings ".

5.1.1 Project criteria

British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" is recommended by NSW Government Department of Planning "Development Near Rail Corridors and Busy Roads"- Interim Guideline for Councils "Consideration of rail noise and vibration in the planning process" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the "Daytime" (6am-10pm). The overall value is then compared to the levels in Table 9. For this project the aim will be for a low probability of adverse comment

Table 9 -– Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in commercial buildings

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Commercial buildings 16hr day	0.4 to 0.8	0.8 to 1.6	1.6 to 3.2

5.2 RAIL TRAFFIC VIBRATION MEASUREMENTS

5.2.1 Measurement Positions

The rail vibration measurements were taken along the proposed eastern façade which is the nearest façade to rail corridor.

5.2.2 Time of Measurements

The manned measurements were carried out from 9am to 10am on 2nd December 2010.

5.2.3 Measurement Equipment

Svan 958 Analyser was used for the vibration measurements. The analyser was connected to four channel input module fitted with a Dytran model 3233A accelerometer.

5.2.4 Measurement results : Vibration Dose Values

The maximum train passby ground vibration acceleration, the typical passby period (gained from both the noise and vibration measurements) and the estimated number of train passbys were used calculate the overall eVDV values for each period of the day. The results are presented in Table 10.

Table 10 - Vibration Dose Values

Testing Location	Time Period	Calculated eVDV $m/s^{1.75}$	Criteria eVDV $m/s^{1.75}$	Complies
Along Eastern facade	Day	0.02	0.4	Yes

6 EXTERNAL NOISE EMISSION

6.1 UNATTENDED BACKGROUND NOISE MEASUREMENTS

An unattended noise monitor was set up at the rear of the site, to record the existing background noise levels. These noise measurements were from the 26th November to 2nd December 2010, with detailed noise data attached in Appendix 1.

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise monitor. The monitor 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. Measurements were taken on A-frequency weighting and fast time weighting.

The measured background noise levels dB(A)L_{90} for day, evening and night time periods are shown in the table below.

Table 11 - Measured Traffic Noise Levels

Location	Time	L_{90} dB(A)
Unattended noise monitor on site	Day (7am to 6pm)	52
	Evening (6pm to 10pm)	49
	Night (10pm to 7am)	46

6.2 REQUIREMENTS

Noise emissions from plant and equipment comply with the '*provisions of the Protection of the Environment Operations Act 1997,* DECCW's Industrial Noise Policy and Noise Control Manual

6.2.1 Noise emission limits

The NSW DECCW Industrial Noise Policy provides guidelines for assessing noise impacts from industrial developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The DECCW Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the DECCW in its Environmental Noise Control Manual states that noise controls should be applied with the General intent to protect residences from sleep arousal.

6.2.2 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 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.

6.2.3 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 DECCW'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 12 provides the recommended ambient noise levels for the urban 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 12 - DECCW Recommended Acceptable Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of day	Recommended Acceptable Noise Level dB(A) L_{eq}
Residential	urban	Day	60
		Evening	55
		Night	45

If the existing amenity noise levels due to industrial noise are close to or above the recommended acceptable noise levels then operation of the site shall be designed to a lower level than the acceptable noise level.

If the existing amenity levels from industrial noise and other transportation noise sources are more than 2 dB(A) above the acceptable levels, and there is no prospect of these levels reducing in the future, then the amenity criterion is set at 10 dB(A) below the existing level. In practice, this prevents any audible increase in the existing noise level.

6.2.4 Protection of the Environment Operations Act Regulation

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be herd within a habitable room in any other residential premises (regardless of weather any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or

(b) before 7 am or after 10 pm on any other day.

6.2.5 Noise Assessment Objectives

Based on the DECCW's Industrial Noise Table 13 provides a summary of the assessment criteria applicable to the subject premises at the neighbouring potentially affected residential properties based on noise monitoring conducted for the subject site. The intrusiveness and amenity criteria for this project have been determined using the DECCW guidelines and the noise monitoring results.

Table 13 - Noise Objectives for Residential Receivers

Time of day	Measured Background Noise Level L_{90} dB (A)	Amenity Criteria L_{eq} dB (A)	Intrusiveness Criteria Background + 5 dB(A) L_{eq}dB (A)	DECCW Criteria for Residential Condensers	Noise Objective L_{eq} dB (A)	Sleep Disturbance Objective L_1 dB (A)
Day	52	60	57	N/A	57	N/A
Evening	49	55	54	N/A	54	N/A
Night	46	45	51	Inaudible within neighbouring premises	45	61

7 CONCLUSION

Potential environmental noise impacts onto the proposed commercial development at 2 Australia Ave, Olympic Park has been assessed. The following noise sources have been assessed:

- Traffic noise.
- Train noise
- Event activities noise.
- Plant
- Train vibration

It is concluded that:

- Provided acoustic treatment in Section 4 of this report the internal noise levels shall fully comply with the requirements of AS2107-2000 and NSW Development Near Rail Corridors and Busy Roads- Interim Guidelines.
- External noise emission criteria have been setup in Section 6 based on the requirements of NSW DECCW Industrial Noise Policy.
- Train vibration measurements indicated that trains induce ground borne vibration fully comply with the requirements of British Standard BS 6472:1992 “Evaluation of Human Exposure to Vibration in Buildings which is recommended by NSW SEPP.

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

Yours faithfully,

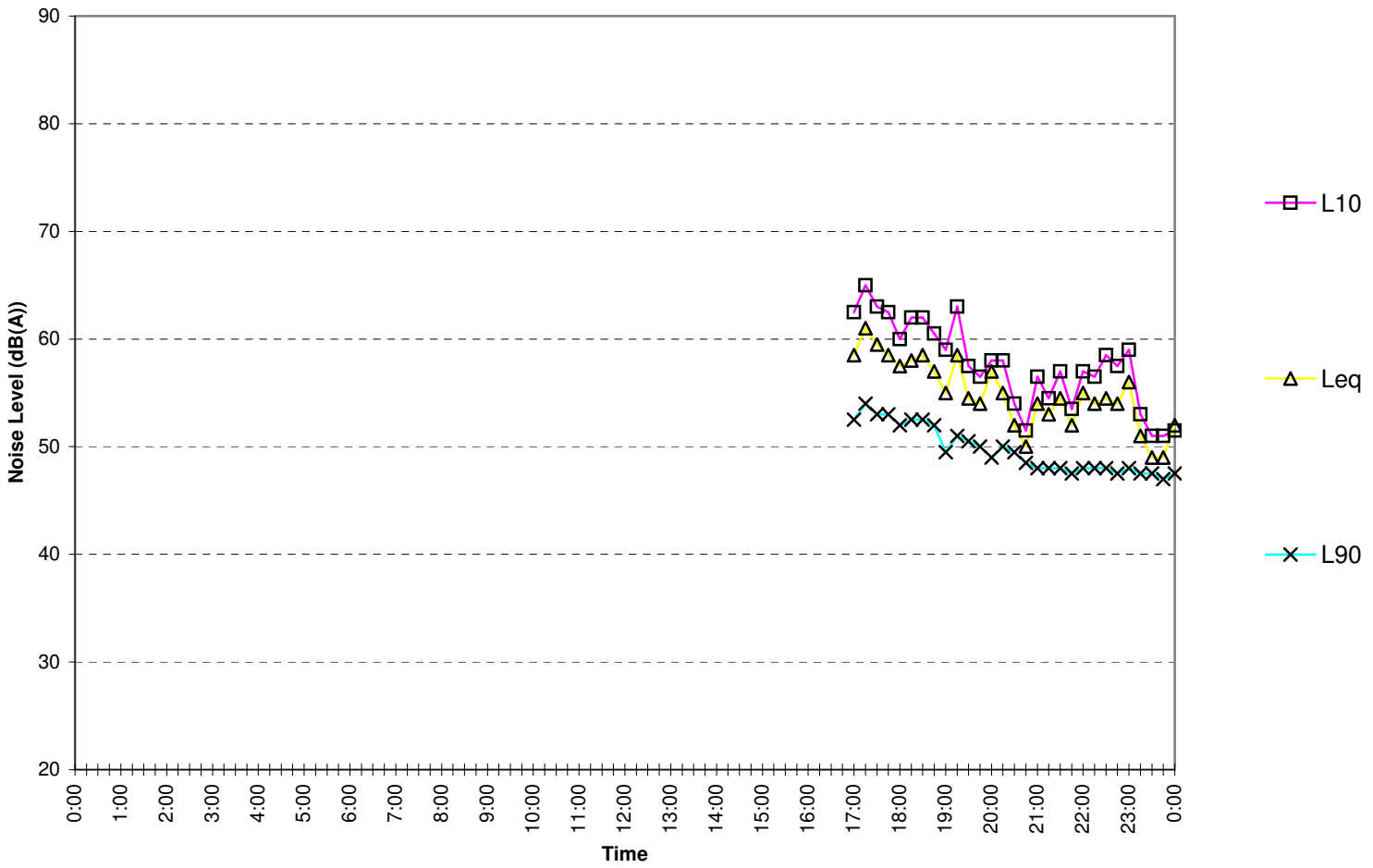
Acoustic Logic Consultancy Pty Ltd
George Wei

Senior Acoustic Engineer

Appendix Unattended Background Noise Monitoring Results

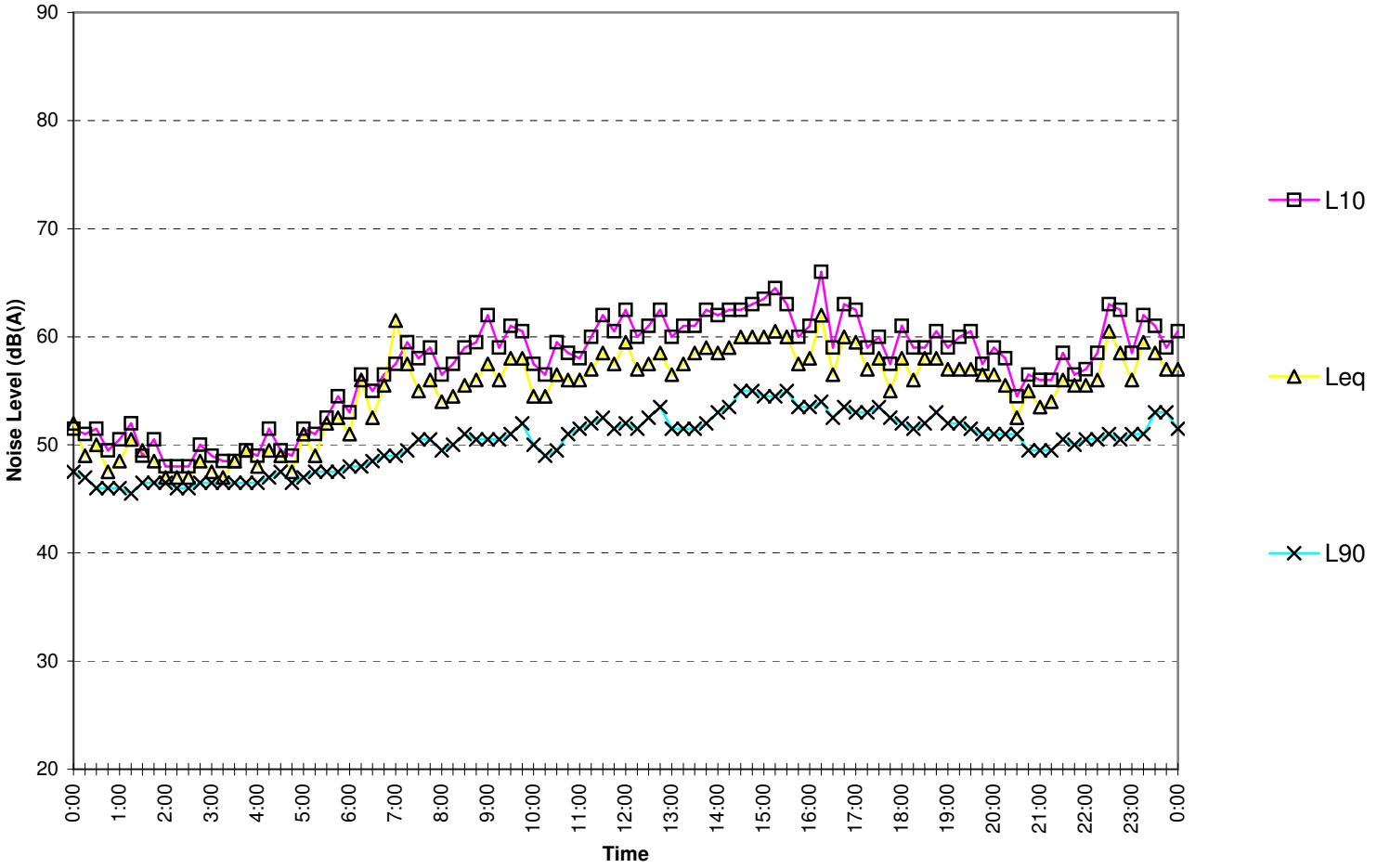
2 Australia Ave

Friday November 26,2010



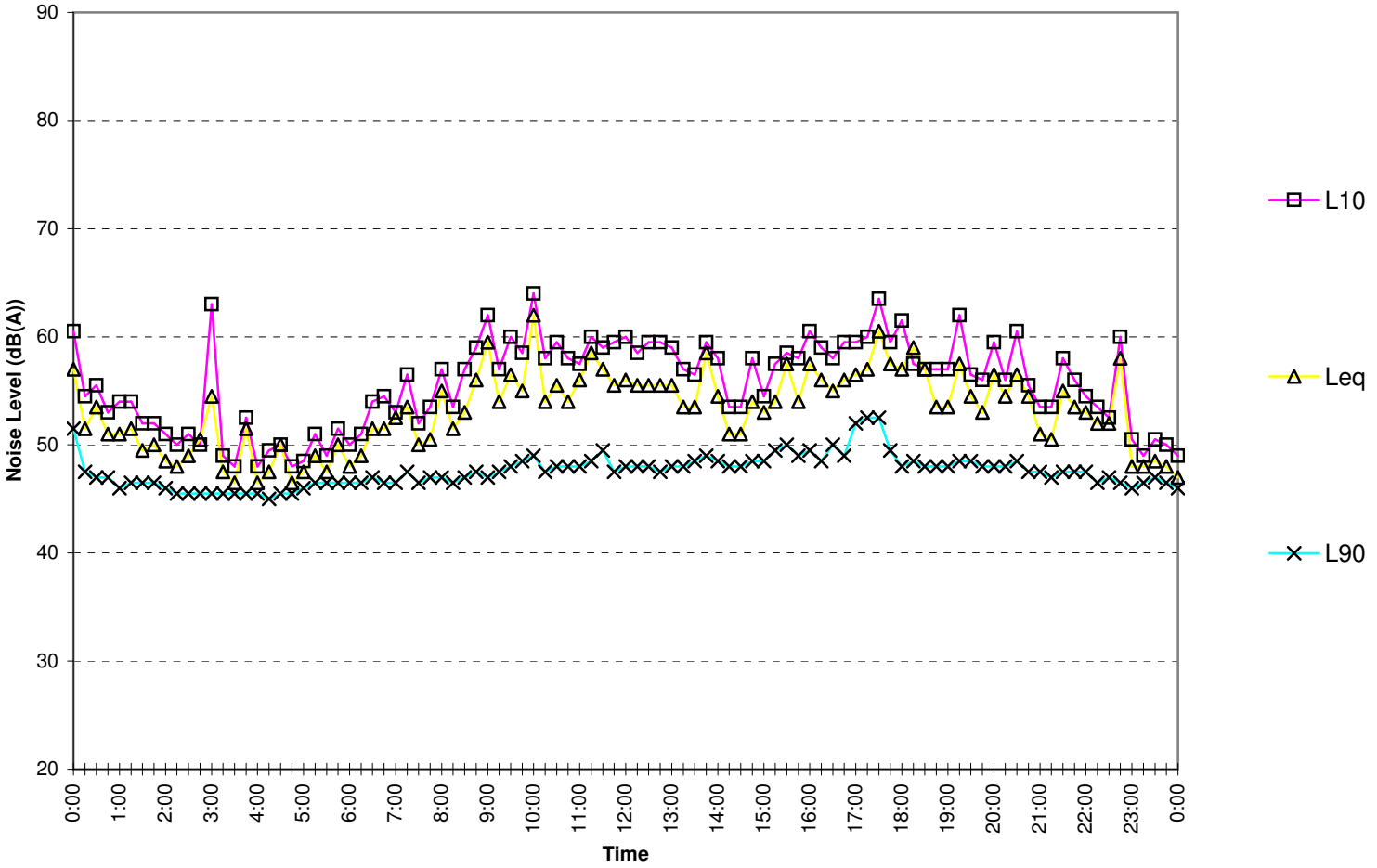
2 Australia Ave

Saturday November 27,2010



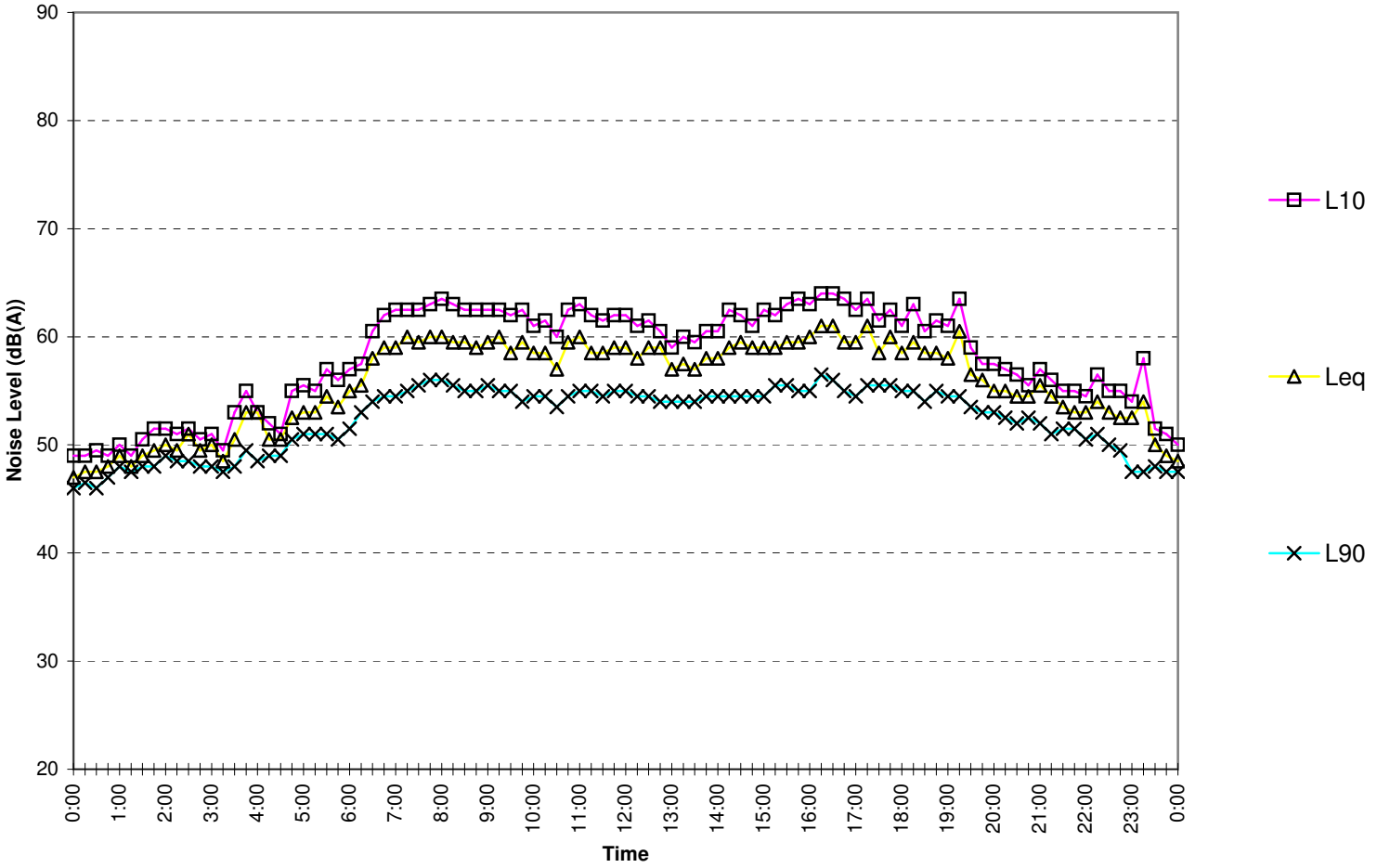
2 Australia Ave

Sunday November 28,2010



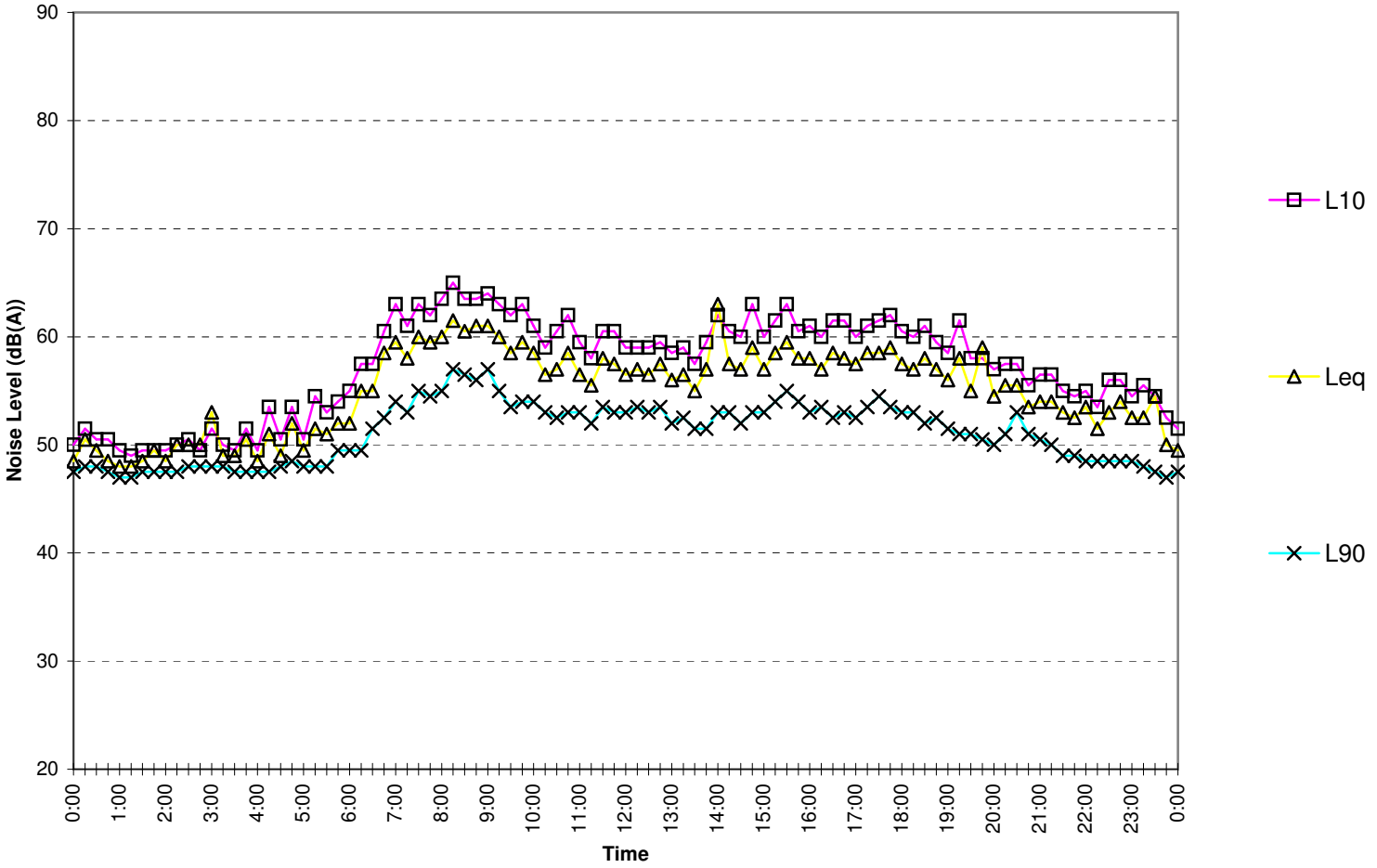
2 Australia Ave

Monday November 29,2010



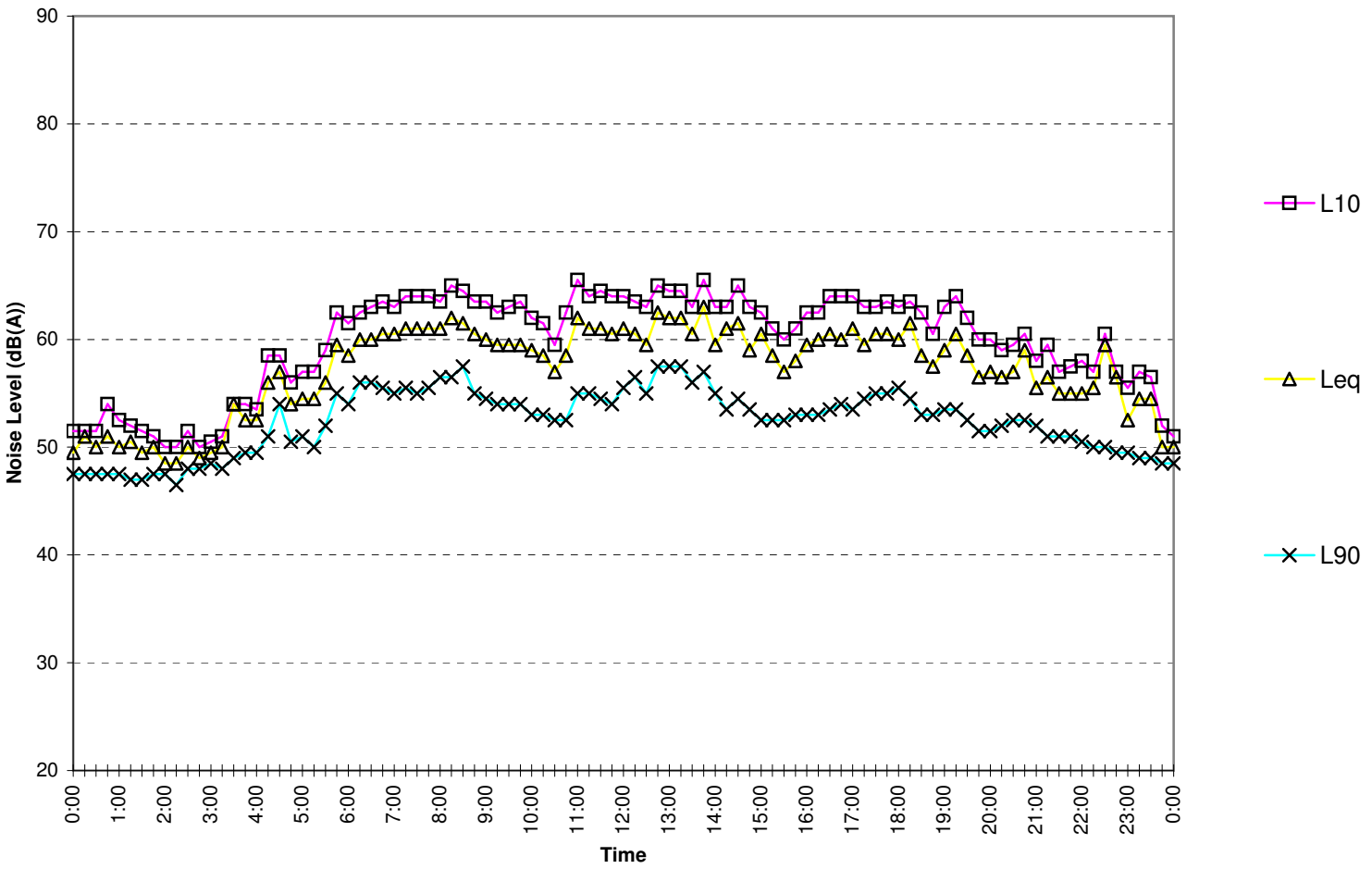
2 Australia Ave

Tuesday November 30,2010



2 Australia Ave

Wednesday December 1,2010



2 Australia Ave

Thursday December 2,2010