ACOUSTIC IMPACT ASSESSMENT

74 Willandra Road, Narraweena, NSW

Project 214 129

5 April 2017

Prepared For:
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CONTENTS

1.0 INTRODUCTION

PKA Acoustic Consulting is commissioned to conduct a noise assessment for the proposed development at 74 Willandra Road, Narraweena. The development will be a boarding house with 28 rooms. The report will be part of DA documentation to be submitted to Warringah Council.

Previously, PKA submitted an acoustic report for the subject development with 17 rooms. The report was accepted by the Council hence some of the data such as ambient noise measurements of that report were used for the new report.

2.0 SUMMARY

This report considers the acoustic issues of the proposed boarding house which is designed to have 28 rooms. An acoustic assessment was conducted in accordance with the acoustic requirements of Warringah Council.

Noise monitoring data from a previous approved acoustic report were used in this assessment.

The following noise issues were addressed in this report:

- Noise emissions from the development to the surrounding sensitive noise receivers
- Traffic noise intrusion into the development
- Mechanical noise (present the criteria)

The assessment concludes that all noise emissions comply with the acoustic requirements of Warringah Council without any mitigations.

3.0 SITE LOCATION

The site is bound by Willandra Road to the east and bushlands on the other sides.

The site location is shown in Figure 3-1. The approximate site boundary is shown in red.

Figure 3-1 Site location (Google Maps)

The nearest noise sensitive receivers are as follows:

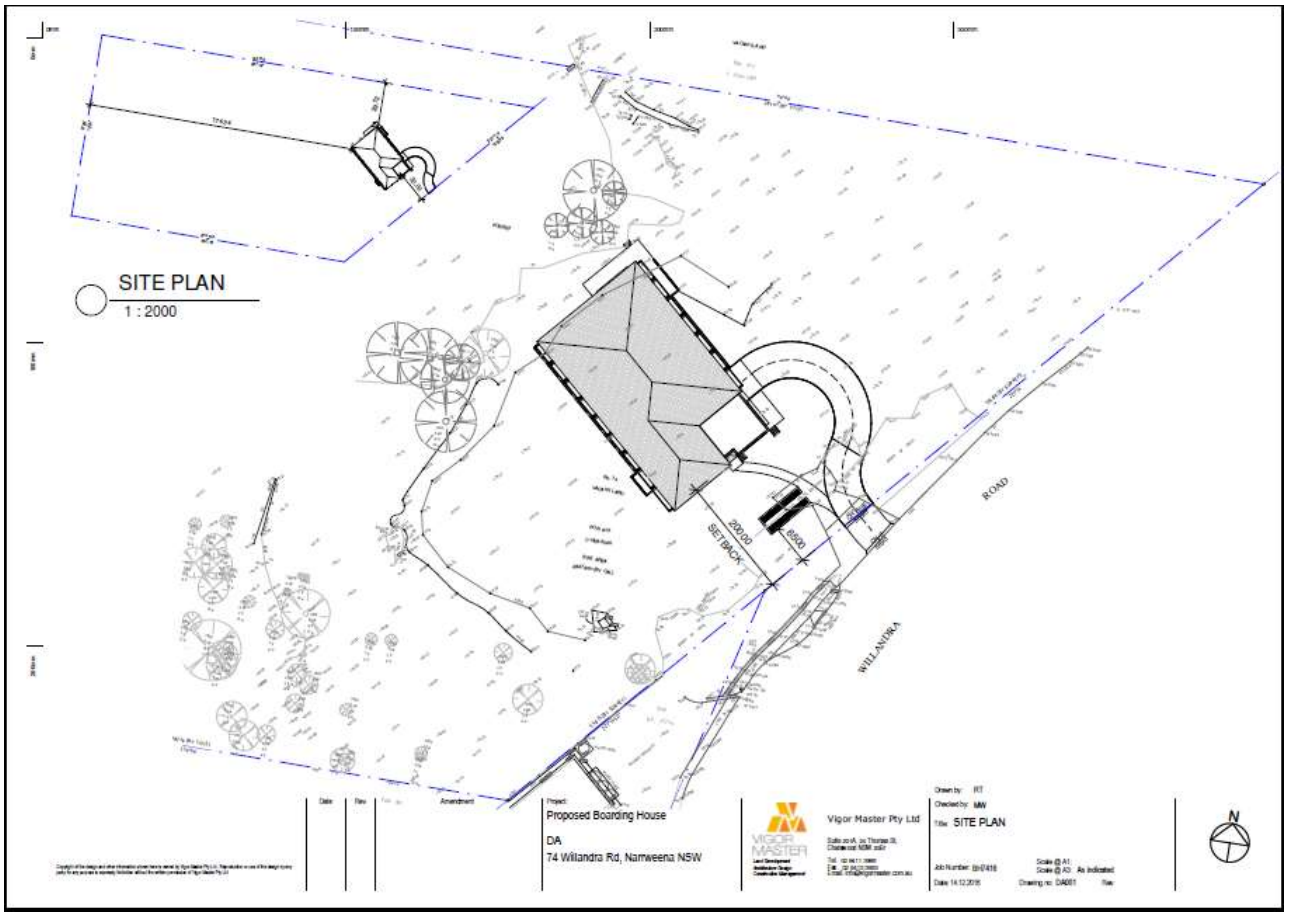
- Residential receivers to the south at 81 Willandra Road approximately 60m from the proposed façade (labelled R1).
- Residential properties across Willandra Road, approx. 25 m from the boundary(R2).
- The nearest non-residential receiver is the Becon Hill Rural Fire Brigade to the west at approximately 100m from the proposed façade.

4.0 DEVELOPMENT DESCRIPTION

The proposed development will comprise of a 2-storey boarding house with 28 rooms, manager's office, living and dining areas and a basement carpark.

The proposed building will be located at a distance of 20 m from the front boundary. The cars will access the building via a two way driveway. The site plan is shown in Figure 4-1.

Figure 4-1: Site plan



5.0 CRITERIA

Part D3 Of Warringah Council DCP 2011 is on noise and requires that noise from combined operation of all mechanical plant and equipment must not generate noise levels that exceed the ambient background noise by more than 5dB(A) when measured in accordance with the NSW Industrial Noise Policy at the receiving boundary of residential and other noise sensitive land uses.

It also states that development near existing noise generating activities, such as industry and roads, is to be designed to mitigate the effect of that noise.

5.1 NSW Industrial Noise Policy (INP)

Noise generated from commercial and industrial premises is generally assessed against the requirements of the *INP*. The policy sets out two separate criteria to ensure environmental noise objectives are met. The first criterion considers intrusive noise and the second is set to ensure the amenity of the land use is protected. The more stringent of these two is adopted for the assessment. This becomes the Project Specific Noise Levels which ensures that the intrusive noise is limited and the amenity is protected.

Intrusiveness Criterion

The intrusiveness of a stationary noise source may be considered acceptable if the average of the maximum A-weighted levels of noise, $L_{Aeq\ 15\ minute}$ from the source do not exceed by more than 5dB the Rating Background Level (RBL) measured in the absence of the source. This applies during all times of the day and night. There also exists an adjustment factor Ki to be applied according to the character of the noise. This includes factors such as tonal, fluctuating, low frequency, impulsive, intermittent etc. qualities of noise.

The RBL is determined in accordance with Section 3 - Determining existing noise levels of the policy.

The intrusiveness criterion is;

$$L_{Aeq}\ 15\ minute + K_i < RBL+5$$

Amenity Criterion

To limit continuing increases in noise levels, the maximum ambient noise level within an area from commercial noise sources should not normally exceed the levels as specified in Section 2.2 of the policy. This protects against impacts such as speech interference and community annoyance. As for the intrusiveness criterion, a modifying factor should be applied to account for the characteristics of the noise source.

The recommended Acceptable Noise Level (ANL) for the amenity criterion is determined in accordance with Table 2.1 and Table 2.2 of the policy.

5.2 State Environmental Planning Policy (Infrastructure) 2007

The developments located next to major roads or train lines are generally assessed against the acoustic requirements of Department of Planning document "*Developments near rail corridors and busy roads- Interim Guidelines".* The acoustic requirements support specific rail and road provisions of the State Environmental Planning Policy (Infrastructure SEPP) 2007 which considers residential sites adjacent to roads with AADTs more than 40,000 and may also be applied for best practice for sites with AADTs exceeding 20,000.

The DoP Interim Guidelines provide noise criteria for the buildings near the major roads and rail corridors as presented in Table 5-1.

Table 5-1 Internal noise levels- DoP guidelines - SEPP clause 102

Internal Space	Time-Period	Internal Noise Level – Windows Closed	Measurement Descriptor
Sleeping areas (bedroom)	Night (10pm to 7am)	35 dB(A)	Leq(9hr) Night
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	Day or Night	40 dB(A)	Leq(15hr) Day or Leq(9hr) Night

Section 3.6.1 of the DoP guidelines sets internal noise criteria for residences with windows closed. It also states 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 meet the ventilation requirements of the Building Code of Australia".

6.0 AMBIENT NOISE LEVELS

PKA previously submitted an acoustic report for this site (PKA report 213 132 dated September 2014). As the acoustic report was accepted by the council, we will use the following noise data from the previous report.

Noise monitoring was conducted in 2013 to measure the ambient & traffic noise. The noise monitor was placed at a location 15 m setback from the front boundary. The measured ambient levels & the INP criteria are presented in the following Table 6-1.

Table 6-1: Ambient noise levels and Noise Goals- Residential type receivers

Receiver Type	Period	Measured noise levels		Acceptable Noise Levels $L_{Aeq\ (period)}$	INP Noise Criteria			Council Criteria (mechanical noise)
		L_{Aeq}	RBL L_{A90}		Amenity $L_{Aeq(period)}$	Intrusiveness $L_{Aeq\ (15minutes)}$	Project Specific Levels	
Residential	Day	57	45	55	55	50	50	50
	Evening	56	36	45	45	41	41	41
	Night	52	30	40	40	35	35	35

Noise from the use should comply with Project Specific Levels above. Noise from mechanical services should comply with the Council criteria above.

6.1 Traffic Noise Levels

Table 6-2 below presents the measured data for traffic noise levels obtained from the monitor. Values have been rounded to the nearest 0.5 dB. The measurement results are also presented in graphical form in Appendix B.

Table 6-2: Traffic noise levels

Location	$L_{eq\ 15hr}$	$L_{eq\ 9hr}$
	Day (0700-2200)	**Night (2200-0700)**
15 m setback from the boundary	56	52

7.0 ASSESSMENT

7.1 Noise breakout

Noise breakouts from the development will be mainly from the communal spaces such as the living room & dining room. The living room has more potential for noise breakouts as this area is used for gatherings. Gatherings may be in the form of conversations & small birthday parties. There will be no music (live or amplified) in the living room.

To calculate noise impact, we have constructed a noise model. The noise level of human voice was obtained from Handbook of Noise Control, Harris & Crede and is presented in the following Table 7-1.

Table 7-1: Patron Speech Levels – Raised and Normal Voice

Description	dB(A)	Octave Band Centre Frequency (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Log Average Male / Female Speech at 1 m L_{eq}, normal voice level	57	36*	42*	48	54	57	51	47	44	39

Note: For Speech, the values at frequencies 31.5 and 63 Hz shown by * are estimated as data was not available at the reference source. In any event, vocal output at these frequencies typically is not the cause for non-compliance.

We have calculated noise possible emissions from the living area with an open-door scenario. Noise from 28 people in the living space was calculated to the north boundary. It was assumed that only 50% talk at any time. The attenuation effects of distance & directivity were considered in the calculations a summary of results is presented in Table 7-2.

Table 7-2 Noise Emissions from Living Area

Noise level inside living room (28 people)	Noise level at the north boundary	INP criteria	Complies (Yes/No)
69	31	50 Day) 41(evening) 35(night)	Yes

The above calculation results indicate that noise breakout from the living space with the doors open will comply with INP criteria therefore no mitigation measures will be required.

7.2 Traffic Noise intrusion

We have reviewed the current design documentation for the proposed building from the architectural drawings.

The building outer envelope will comprise of the following:

- External Walls: Rendered brickwork with paint finish.
- The Roof: Corrugated colorbond (ironstone), plus suspended ceiling

The acoustic performance of brick wall is at least Rw50 and this will be used in the calculations. The acoustic performance of colorbond roof /ceiling should be calculated as required.

Acoustic glazing is required to reduce traffic noise impact on occupants and will need to reduce noise levels to within the design levels. Based on the above envelope, calculations have been made to design the glazing to reduce the intrusion noise levels to the recommended design levels.

The Guideline also requires that the building be designed such that windows can be left closed where required for acoustic purposes and still comply with the BCA ventilation requirements. We have calculated different instances where windows must remain closed to achieve acceptable noise levels.

A 10 dB(A) reduction is assumed to the inside with external windows and doors open to allow natural ventilation. Generally, if acoustic treatment is required for a window, then that window/space is not suitable for natural ventilation. If standard monolithic glass is adequate (i.e. standard 5mm glass), then natural ventilation can be used for that space.

Using the traffic noise values of Leq (day) 56 dB(A) and Leq (night) 52 dB(A) (see Table 6-2), we have calculated the noise levels on various facades and designed/checked the corresponding building elements. The attenuation effects of distance and directivity were considered in the calculations.

The following Table 7-3 presents the glazing requirements and suitability of each space for natural ventilation.

Table 7-3: Glazing schedule & suitability of spaces for natural ventilation

Level	Space	Facing	Recommendations		Can windows be used for natural ventilation? (Y/N)
			Min R_w Glass + frame	Glazing type (minimum)	
Ground	Living & dining	All directions	25	5 mm single	Yes
Ground	All rooms including Manager room	All directions	25	5 mm single	Yes
1	All rooms	All directions	25	5 mm single	Yes

Notes:

- The above glazing requirements are the minimum to provide the required acoustic performance. Glazing thicknesses can be increased for reasons of safety, fire, etc.
- We have selected the roof as follows:

  Corrugated colorbond roof with ceiling joists or trusses, 165 Gold batts 3.0 cavity infill and 1X 10 mm Gyprock plasterboard CD.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thickness by itself will not necessarily meet the required R_w rating without an appropriate acoustic frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance (in accordance with AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements) meeting the requirements.

All windows and doors with acoustic requirements must be fitted with proper acoustic seals such as Q-LON (or equivalent) around the top & bottom sliders, and must be air tight. Special attention must be given to the sliding doors & windows to have good quality acoustic seals all around them. Any airgap will drastically reduce the intended acoustic performance of the glazing. It should be noted that Mohair seals are not considered to be acoustic seals.

The entire frame to the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

All above calculations assume that the bedrooms are carpeted and living rooms will have hard surfaces. The acoustic requirements for the bedrooms will increase where hard floor finishes are provided in lieu of carpet.

The outer entry doors should have acoustic performance Rw 28. This can be achieved using 35 mm solid core doors and periphery acoustic seals.

All habitable spaces in the above Table are identified as “suitable” for natural ventilation. They can leave the windows open to use natural ventilation, if they so desire.

7.3 Noise from mechanical services

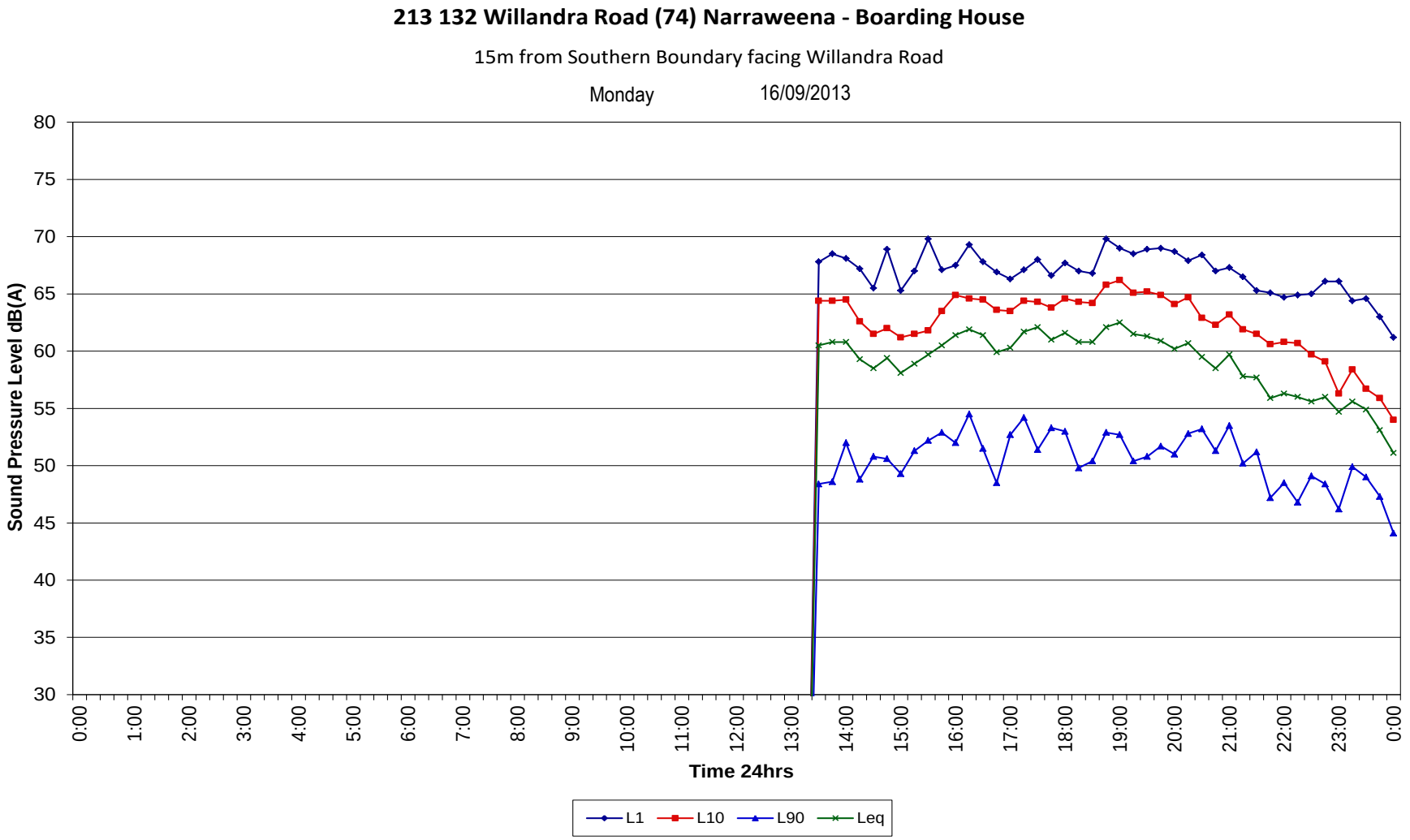
Noise from mechanical services should comply with the Council criteria as shown in Table 6-1. At this stage the design and selection of the plant is not finalised therefore the possible noise impact from the mechanical plant cannot be assessed. However, the plant should be selected such that the total mechanical noise does not exceed the above criteria at the boundary of the noise receivers.

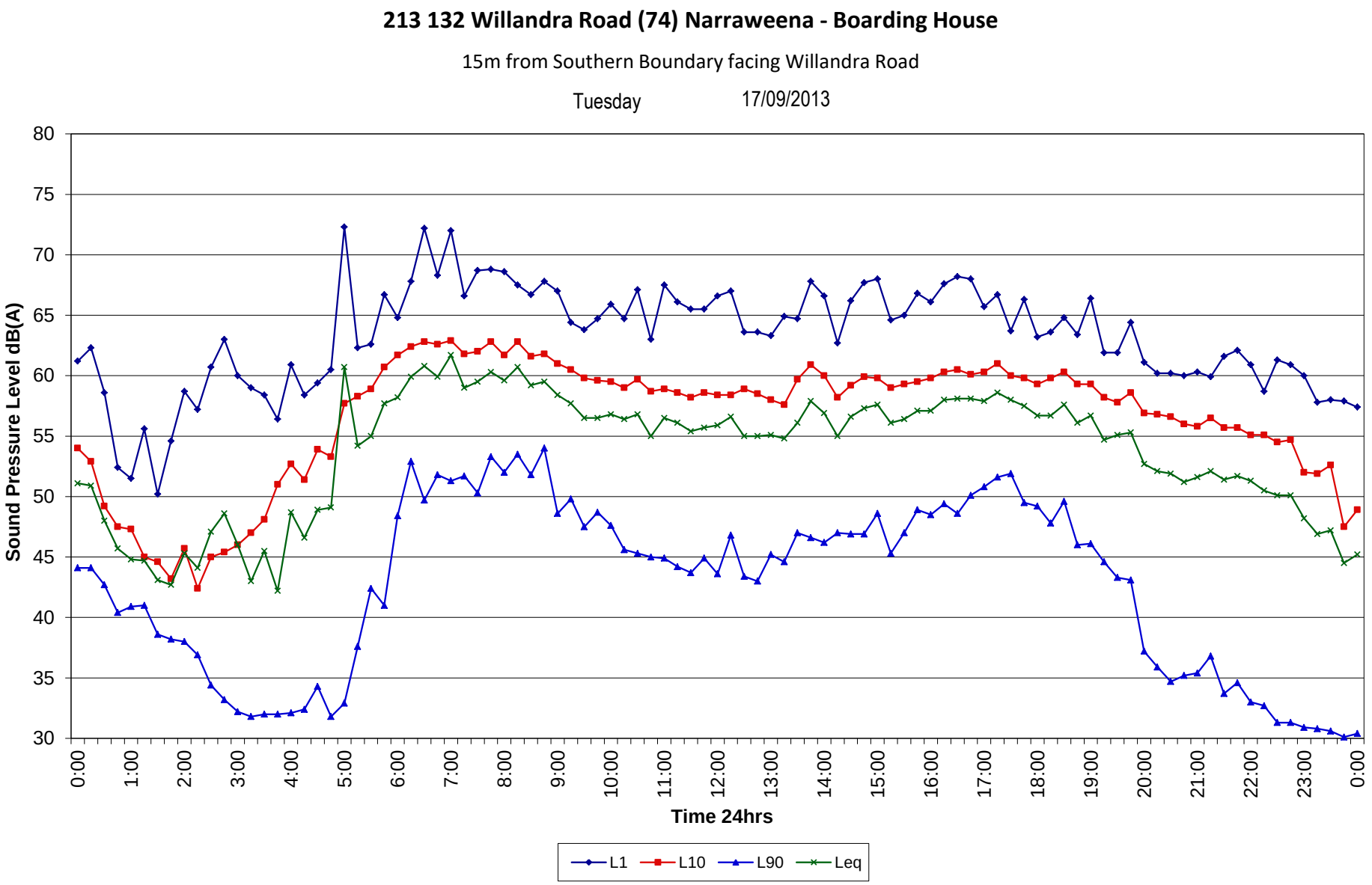
APPENDIX A: DRAWINGS USED TO PREPARE REPORT

The following drawings were drawn by Vigor Master and were used in the assessment.

No.	Rev.	Title	Date
DA001	-	Site plan	14.12.2016
DA101	-	Basement	14.12.2016
DA102	-	Ground floor	14.12.2016
DA103	-	First floor	14.12.2016
DA104	-	Roof	14.12.2016
DA201	-	Southeast elevation	14.12.2016
DA203	-	Southwest	14.12.2016
DA204	-	Northeast elevation	14.12.2016
DA301	-	Section 1	14.12.2016
DA302	-	Section 2	14.12.2016
DA401	-	Schedule of external finishes	14.12.2016

APPENDIX B: GRAPHICAL NOISE DATA




213 132 Willandra Road (74) Narraweena - Boarding House
15m from Southern Boundary facing Willandra Road
Tuesday
17/09/2013
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
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10:00
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15:00
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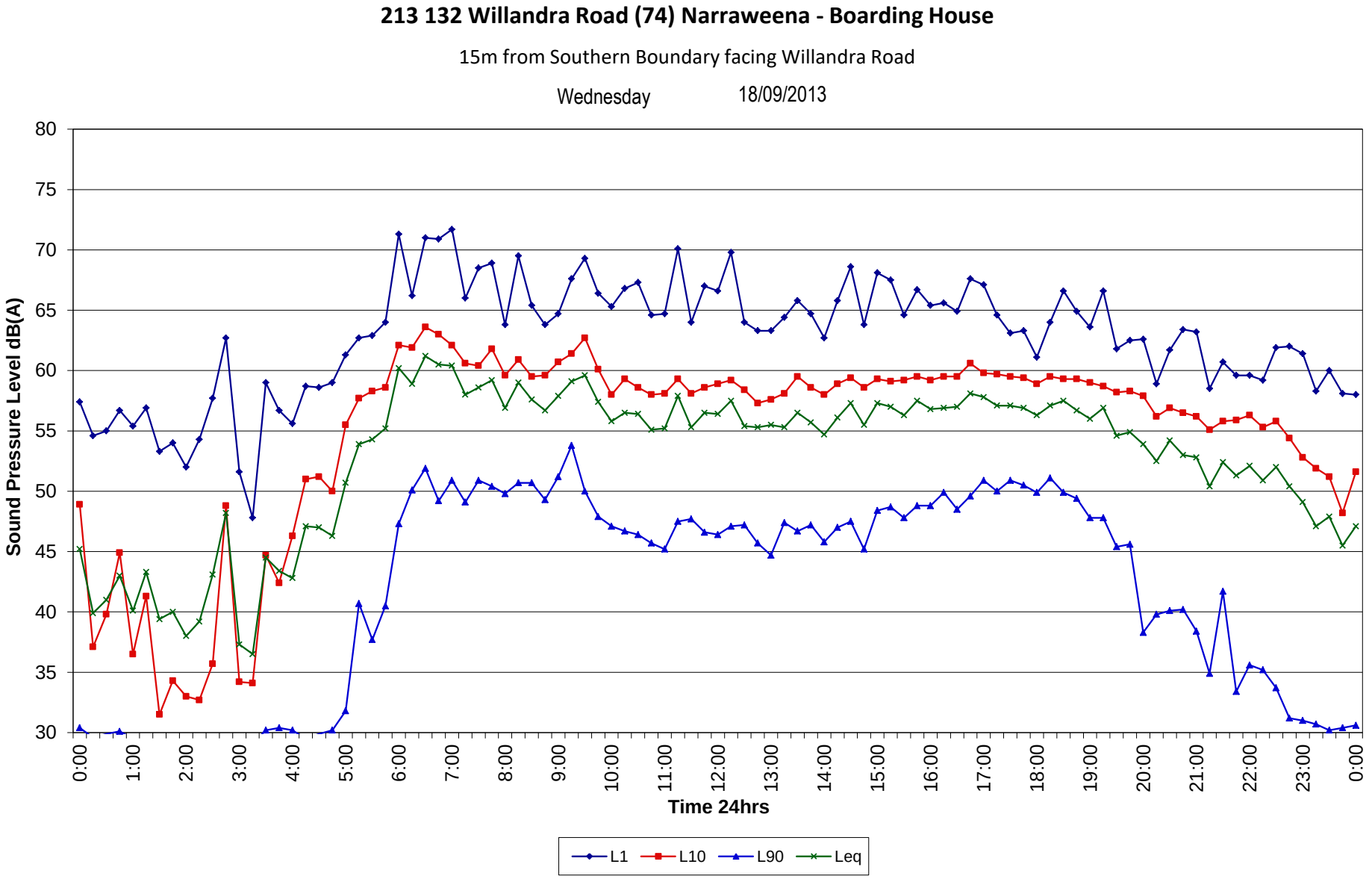
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


213 132 Willandra Road (74) Narraweena - Boarding House
15m from Southern Boundary facing Willandra Road
Wednesday 18/09/2013
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
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17:00
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20:00
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22:00
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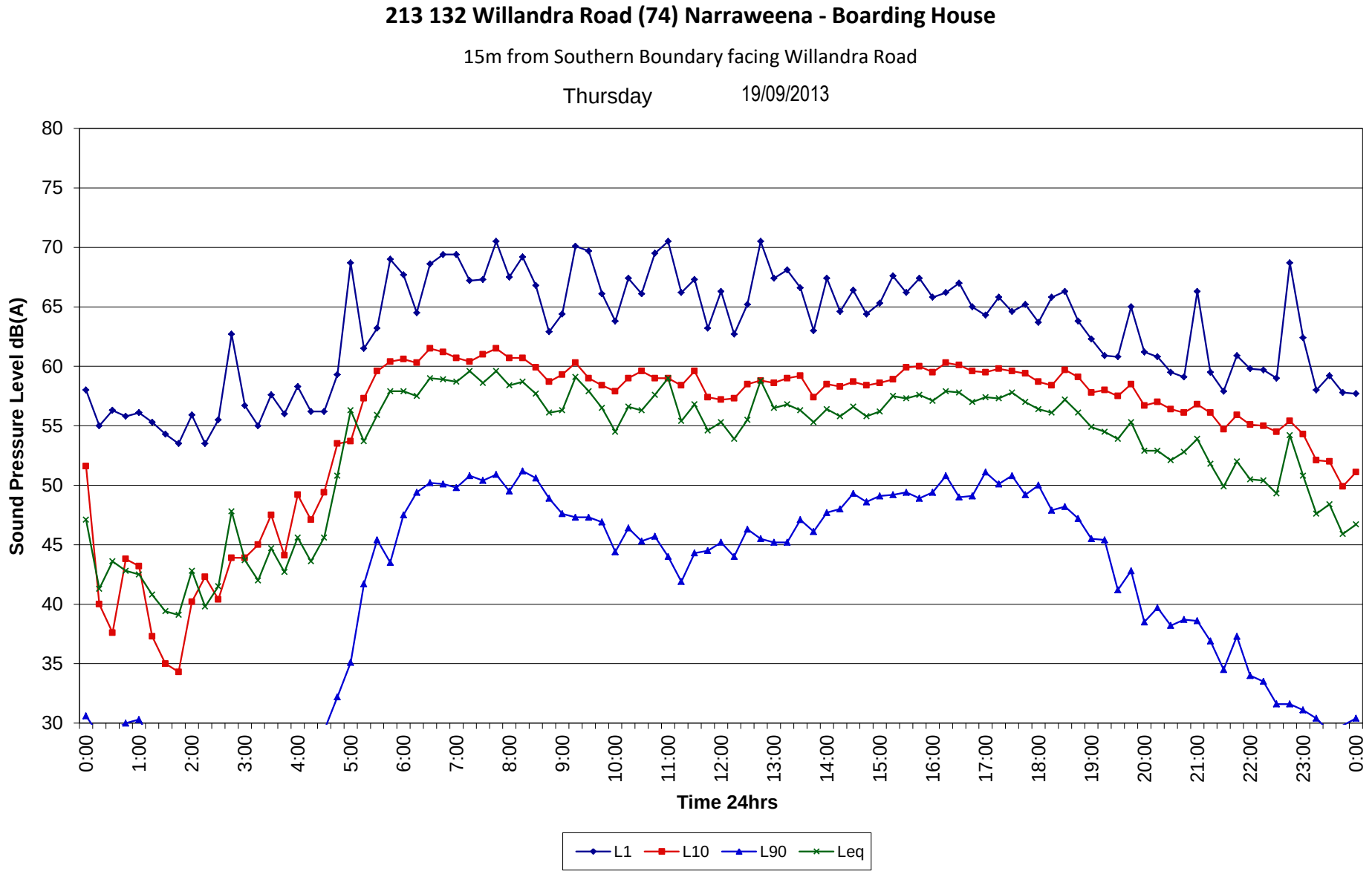
Time 24hrs
L1
L10
L90
Leq


213 132 Willandra Road (74) Narraweena - Boarding House
15m from Southern Boundary facing Willandra Road
Thursday
19/09/2013
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
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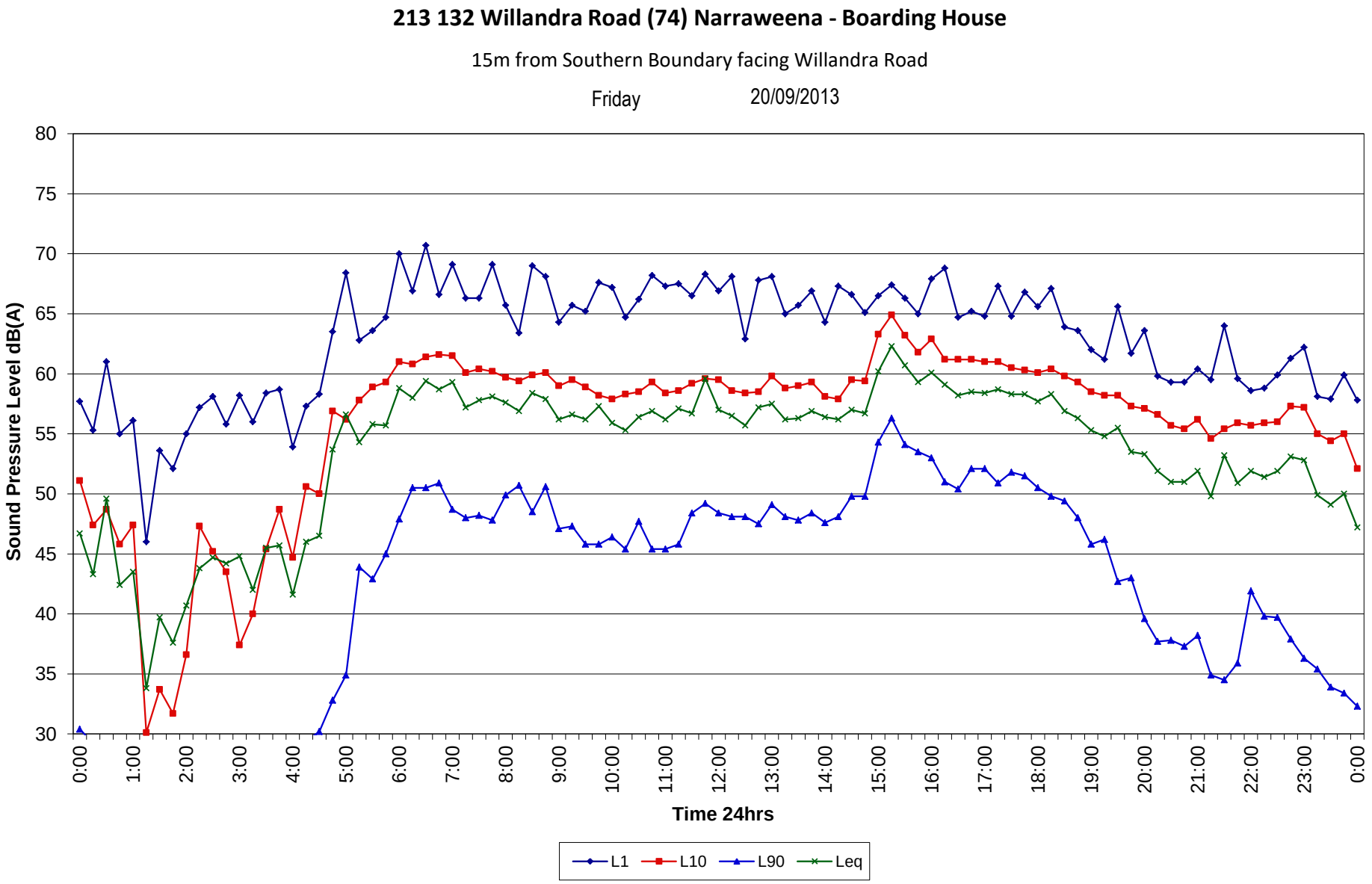
Time 24hrs
L1
L10
L90
Leq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15m from Southern Boundary facing Willandra Road
Friday
20/09/2013
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
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Time 24hrs
L1
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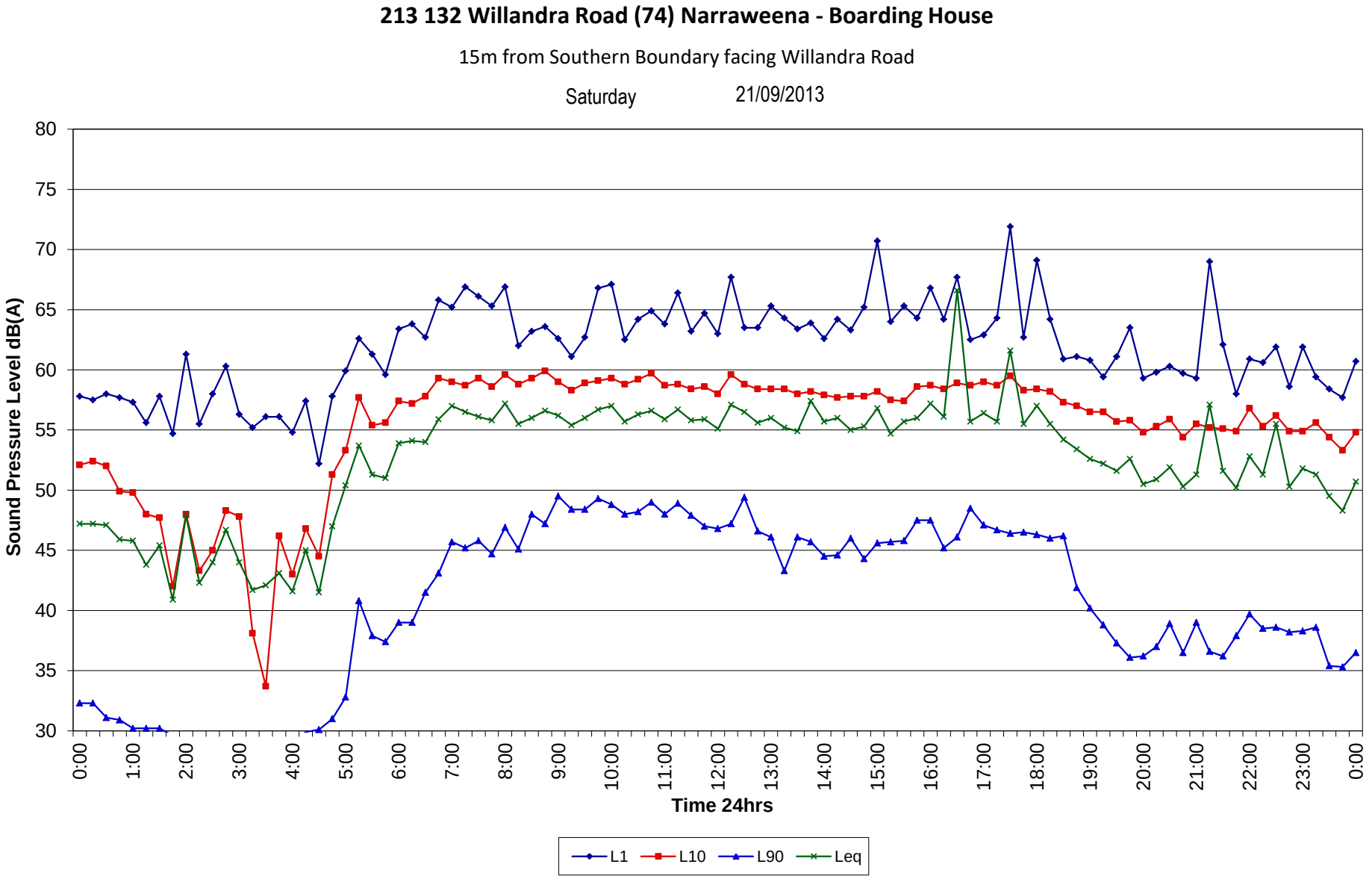
Leq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15m from Southern Boundary facing Willandra Road
Saturday
21/09/2013
Sound Pressure Level dB(A)
80
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Time 24hrs
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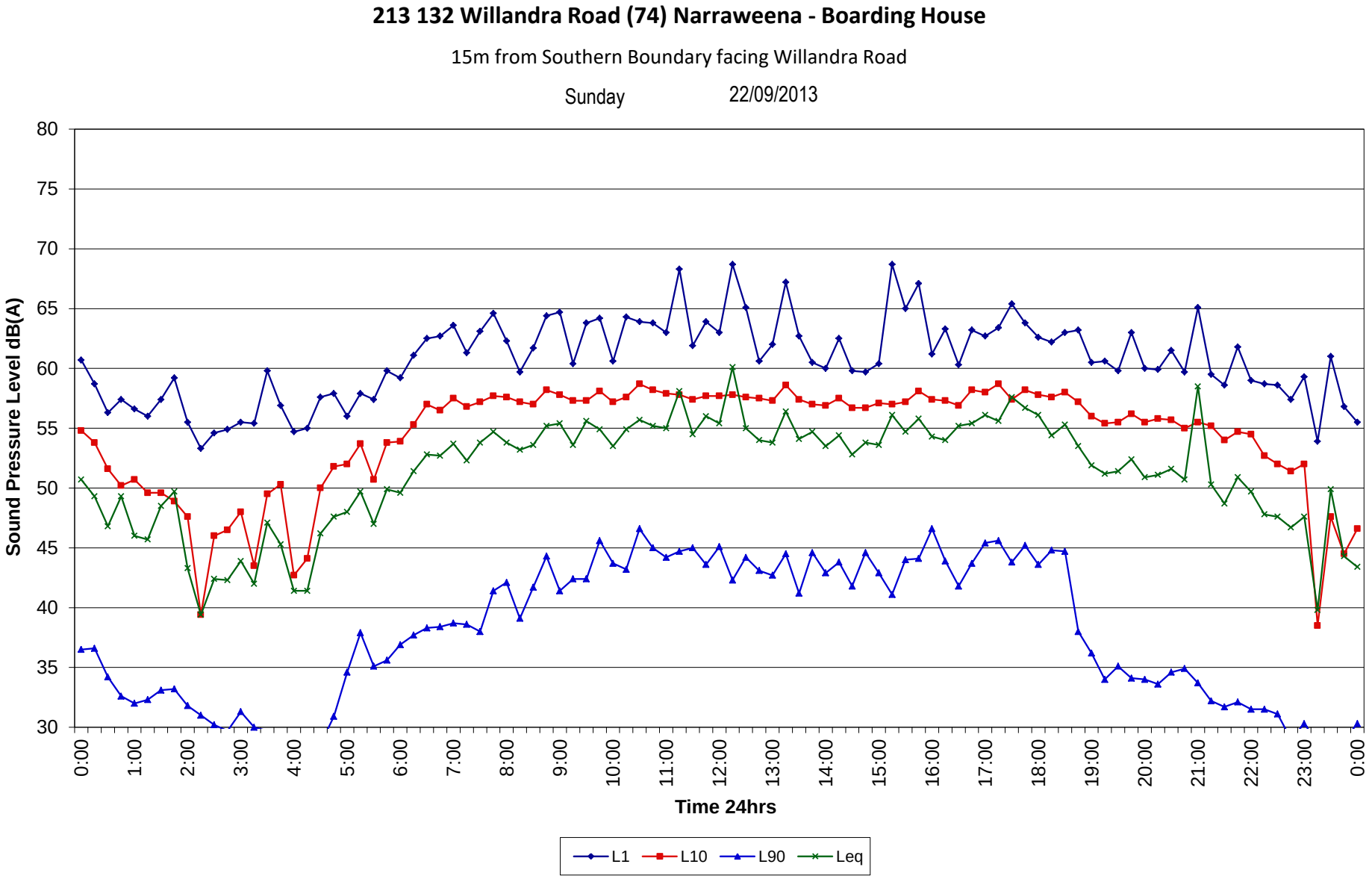
213 132 Willandra Road (74) Narraweena - Boarding House
15m from Southern Boundary facing Willandra Road
Sunday
22/09/2013
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
0:00
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Time 24hrs
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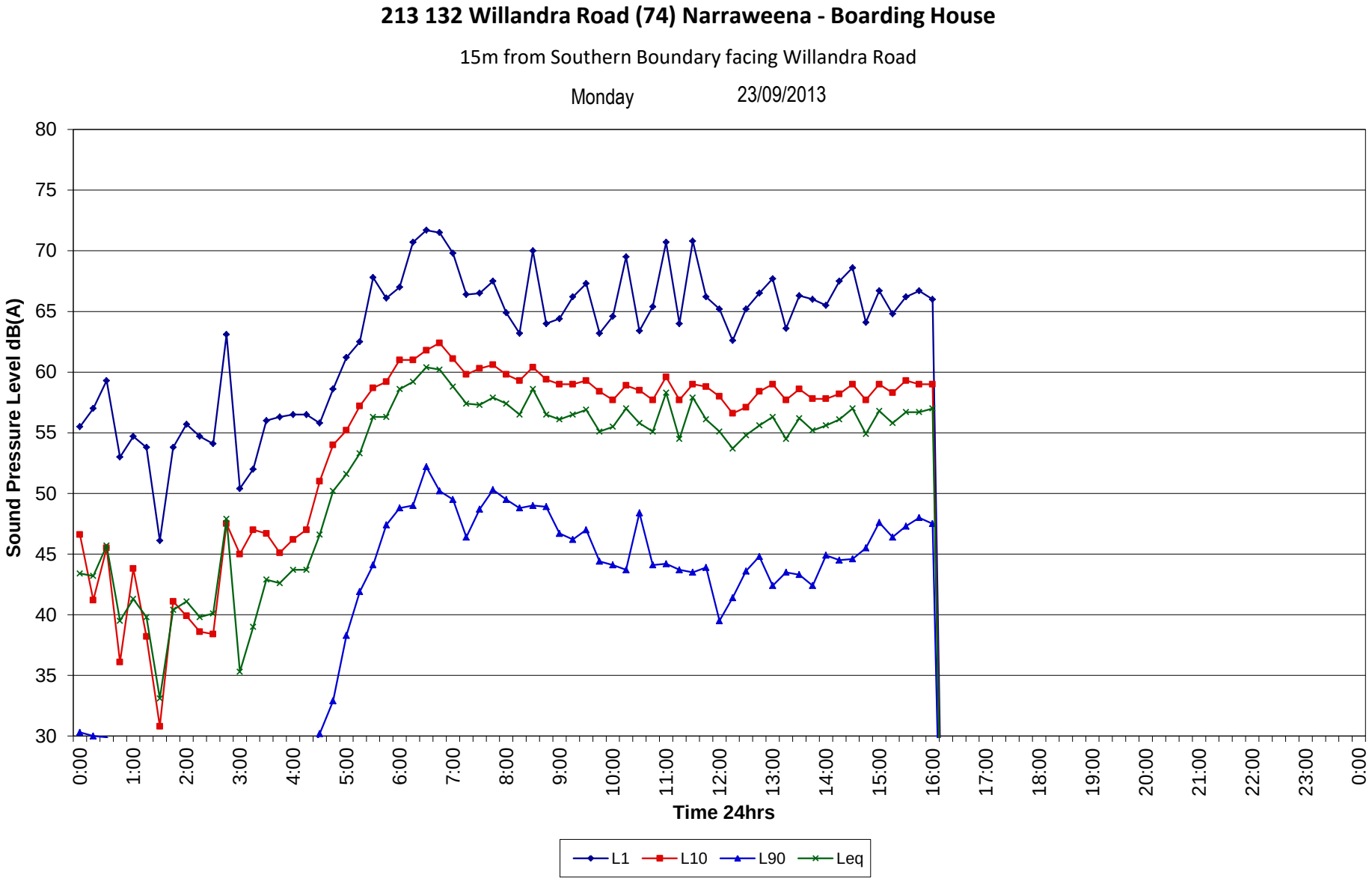
Leq


213 132 Willandra Road (74) Narraweena - Boarding House
15m from Southern Boundary facing Willandra Road
Monday
23/09/2013
Sound Pressure Level dB(A)
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Time 24hrs
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Leq

APPENDIX C: GLOSSARY OF ACOUSTIC TERMS

dB

A decibel (dB) is a unit of measurement that represents sound levels. The human ear can perceive a large range of sound levels however it responds to the change in sound levels in a non-linear fashion, therefore for convenience the decibel is a logarithmic unit of measurement.

The table below sets out the subjective effect of changes in sound level:

Change in Sound Level (dB)	Change in Acoustic Energy	Change in Loudness
3	2 times	Just Perceptible
5	3 times	Clearly Perceptible
10	10 times	Double the Loudness
20	100 times	Much Louder

For example, a 1-2dB change is unlikely to be perceptible, however a change of 5-10dB will be a significant increase or decrease in loudness.

dB(A)

Decibel "A-weighted", A frequency weighted filter applied to sound levels to represent the relative loudness perceived by the human ears response, as our hearing is less sensitive to low frequencies and very high frequencies.

The table below sets out the typical sound levels for various environments:

Sound Level dBA	Subjective Reaction	Typical Experience
140	Intolerable	Threshold of Pain
130		
120	Deafening	Rock Breaker at 1m
110		
100	Loud	Live Band Concert
90		
80	Loud	Aircraft Overhead
70		Inside Busy Restaurant

60	Moderate	Inside Small Cafe
50		Office Open
40	Quiet	Outside Suburban
30		Quiet Bedroom
20	Very Quiet	
10		Recording studio

The disadvantage of using dBA is that, as a single number e.g. 50dBA, it gives no indication of the distribution of sound energy across the frequency spectrum. See *Octave Band Centre Band Frequency*.

L_{A90} An A-weighted sound level that is exceeded for 90% of the measurement period, representing the quietest 10% of noise of the measurement, commonly used for background noise levels. It is typically referred to as an average minimum.

L_{Aeq} Equivalent sound pressure level, An averaged A-weighted sound level, over a specified period of time, corresponding to the same energy equivalence as the actual fluctuating sound level over that period. It is commonly used to measure the ambient noise level.

Ambient Noise The combined noise level from all noise producing sources within a given environment. It is typically measured by the L_{Aeq}.

Background Noise The underlying noise level within the *Ambient Noise*. This is measured as an *L_{A90}* quantity and defined as "the noise level that is exceeded for 90% of the time measured", or simply the lowest 10% of noise measured. The background noise is measured in the absence of the noise source in question.

Assessment Background Level (ABL) The individual background noise level for each time period. It is generally calculated by taking the *L_{A90}* for each daytime / evening / night-time period.

Rating Background Level (RBL) The overall background noise level for each period. It is calculated for each time period by taking the median (middle) value from all the daytime / evening / night-time *ABL* figures measured.

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