Westmead Hospital Car Park

Noise Impact 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

DOCUMENT CONTROL REGISTER

Project Number	20151339.1
Project Name	Westmead Hospital Car Park
Document Title	Noise Impact Assessment
Document Reference	20151339.1/0211A/R1/JL
Issue Type	Email
Attention To	

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	13/10/2015	20151339.1/1310A/R0/JL	JL	GW	
1	2/11/2015	20151339.1/0211A/R1/JL	JL		GW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents an assessment of acoustic impacts associated with the proposed multi-deck car park to be located on the corner of Darcy Road and Institute Road, Westmead within the grounds of the Westmead Hospital.

In this report we will:

- Identify noise sources associated with the proposed development (vehicle noise from the car park building);
- Establish noise emission criteria with reference to the Parramatta City Council DCP and EPA noise emission guidelines;
- Predict operational noise associated with the car park;
- If necessary, determine building/management controls necessary to ensure that compliant noise emissions are achieved.

In addition, the report will include an in-principle review of construction noise. Relevant EPA construction noise will be identified and potential impacts on nearby development examined.

This report will assess construction and operational noise and vibration emissions from the proposed car parks as required by point 9 of the SEARS, application number SSD7262 and issued on 1st October 2015, which states:

"9. Noise and Vibration

Identify and provide a quantitative assessment of the main noise and vibration generating sources during construction and operation. Outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land. Relevant policies and guidelines:

- *NSW Industrial Noise Policy (EPA)*
- *Interim Construction Noise Guideline (DECC)*
- *Assessing Vibration: A Technical Guideline 2006."*

This report is based on the architectural drawings provided by HDR RD + MSJ, project number 232186, issue 7 and dated 29/10/2015.

2 SITE DESCRIPTION / PROPOSED DEVELOPMENT

The proposed car park will be located on the corner of Darcy Road and Institute Road, Westmead with the grounds of the Westmead Hospital. The car park will be eight storeys high, with a proposed capacity of 1,254 cars, and will operate 24 hours a day, 7 days a week. There will be an overhead walkway which will connect the proposed multi-storey car park to the Dental School Building to the immediate south-east.

Cars will be able to access the multi-storey car park via Institute Road and Darcy Road.

The majority of the car park will be naturally ventilated. Sections of the lower ground floor of the car park may be mechanically ventilated.

Additional works to be carried out will include:

- Demolition of on-grade car park number 7 and the trees within car park 7;
- Internal corridor works to the Dental School Building to the south-east;
- Widening of Institute Road,
- Demolition of existing fire services building and extension of Institute Road to new road proposed under Part 5 approval;
- New at-grade car parking area to the east of the proposed multi-storey car park.
- Landscaping works including improvements to the park land and pathways.

The nearest receivers to be potentially affected by the operation of the car park are detailed below:

- Receiver 1: Dental school building located approximately 17m south-east of the proposed car park. This building is a part of Westmead Hospital. This office has been advised that the windows on the north-western façade of this receiver (facing the proposed car park) remain closed except for maintenance. There are no sleeping areas in this building.
- Receiver 2: Catherine McAuley High School, located to the south-west of the site across Darcy Road. Classrooms facing the proposed car park have openable windows.

Figure 1 shows the site and potentially impacted receivers surrounding the site.

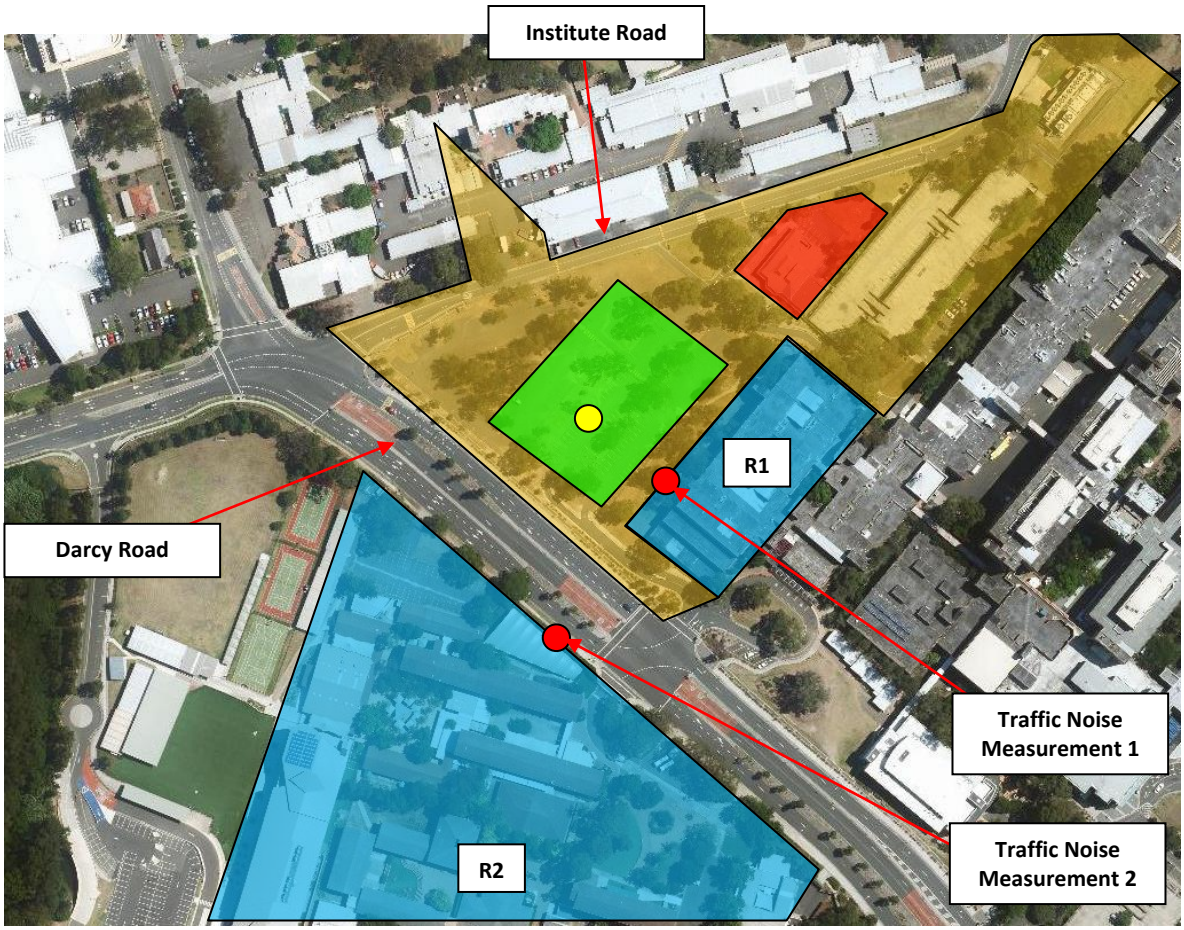


Figure 1 – Site Map

- Unattended Noise Monitor Location
- Attended Measurement Locations
- Site Area
- Proposed Multi-Storey Car Park
- Proposed At-Grade Car Park
- Nearby Noise/Vibration Receivers

3 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 interval.

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 measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

4 SURVEY OF AMBIENT NOISE

A survey of existing ambient noise at the site was undertaken using a long term noise logger installed on site. The logger was installed at the location of the proposed multi-storey car park (refer to figure 1). The unattended background noise measurements were supplemented by attended noise measurements conducted at the nearest receivers (refer to figure 1 for locations).

Unattended noise monitoring was conducted from the 8th to the 15th October 2015 using an Acoustic Research Laboratories noise monitor set to A-weighted fast response. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix 1.

The attended traffic noise measurements were conducted on the 15th October 2015 between 5pm and 6pm. Attended measurements were undertaken using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 sound level calibrator. No significant drift was recorded.

Measured background noise levels obtained from the unattended noise measurements are presented below. Refer to Appendix 1 for the unattended noise monitoring data.

Table 1 – Measured Background Noise Levels

Noise Descriptor	Daytime (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
Background Noise Level (L_{90})	47	47	45

The measured traffic noise levels are presented in the table below:

Table 2 – Measured Traffic Noise Levels

Measurement Location	Time Period	Measured Noise Level dB(A)$L_{eq(15min)}$
Dental School Building (Location 1, refer to figure 1)	5:15pm	52dB(A)$L_{eq(15min)}$
Catherine McAuley High School, 3.5m from kerb (Location 2, refer to figure 1)	5:30pm	65dB(A)$L_{eq(15min)}$

5 NOISE EMISSION CRITERIA

The following noise controls and guidelines are applicable to the site:

- Parramatta City Council DCP;
- NSW EPA Road Noise Policy;
- Australian Standard AS2107:2000;
- EPA Industrial Noise Policy;
- EPA Interim Construction Noise Guidelines;
- Australian Standard AS2436:2000.

5.1 CAR PARK OPERATION NOISE

Noise from the cars manoeuvring within the car parks will be assessed against the requirements of the Parramatta City Council DCP, the NSW EPA Road Noise Policy and Australian Standard AS2107:2000.

5.1.1 Parramatta City Council DCP

The Parramatta City Council DCP does not have any specific noise emission criteria for commercial development. In the absence of this, noise emissions from cars manoeuvring within the car park will be assessed to the internal areas of the nearest receivers based on the requirements of the NSW EPA Road Noise Policy and Australian Standard AS2107:2000.

5.1.2 NSW EPA Road Noise Policy

The noise criteria in the EPA Road Noise Policy applicable to the nearest receivers of the proposed car park are presented in the table below:

Table 3 – NSW EPA Road Noise Policy Internal Noise Criteria

Existing Sensitive Land Use	Time Period	Assessment Criteria
School Classrooms (receiver 2)	Day (7am-10pm)	40dB(A)$L_{eq(worst\ 1hr,\ when\ in\ use)}$ (internal)

The Road Noise Policy only specifies internal noise criteria for hospital wards. Given that the dental school building (receiver 1) does not have any sleeping areas, the Road Noise Policy states that internal noise level criteria for other spaces in hospitals may be obtained from the 'maximum' levels outlined in Australian Standard AS2107:2000.

5.1.3 Australian Standard AS2107:2000

The internal noise criteria of Australian Standard AS2107:2000 relevant to this site are outlined in the table below:

Table 4 – AS2107:2000 Internal Noise Criteria

Type of Occupancy/Activity	Time Period	Recommended Maximum Design Sound Level, LA_{eq} dB(A)
Health Buildings – Dental Clinics, Office Areas, Consulting Rooms, Surgeries (Receiver 1)	When in Use	45dB(A)$L_{eq(worst\ 1hr)}$

5.2 MECHANICAL SERVICES NOISE

5.2.1 Parramatta City Council DCP

In the absence of any specific criteria relating to noise emissions from commercial development in the Parramatta City Council DCP, mechanical noise emissions from the car park have been assessed in accordance with the requirements of the NSW Environmental Protection Authority (EPA) Industrial Noise Policy. Although the proposed development is not strictly an industrial development, the provisions of the Industrial Noise Policy can be applied to a wide range of land uses in order to develop noise emission goals. Noise generated from the car park should comply with the EPA Industrial Noise Policy's Intrusiveness and Amenity Criteria.

5.2.2 INP - Intrusiveness Assessment

The Industrial Noise Policy Intrusiveness Criteria Intrusiveness criteria requires that noise from the site not exceed the background noise level by more than 5dB(A)$L_{eq(15min)}$ when measured at the nearest residential receivers.

Table 5 – EPA INP Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)$_{L90}$	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
All Potentially Affected Residential Properties	Day Time (7am – 6pm)	47	52
	Evening (6pm – 10pm)	47	52
	Night (10pm-7am)	45	50

5.2.3 INP - Amenity Assessment

The amenity criteria provide external noise emission goals of nearby receivers for the different areas of occupancy and are presented below.

Table 6 - EPA Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A)$L_{eq(Period)}$
All Potentially Affected Residential Properties	Urban	Day Time (7am – 6pm)	55
		Evening (6pm – 10pm)	45
		Night (10pm-7am)	40
Hospital Ward	All	Noisiest 1-hour period	55
School classroom - internal	All	Noisiest 1-hour period when in use	40

5.3 CONSTRUCTION NOISE IMPACTS

5.3.1 EPA Interim Construction Noise Guidelines (ICNG)

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise effected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise effected level". For residential properties, the "noise effected" level occurs when construction noise exceeds ambient levels by more than:
    - 10dB(A)$L_{eq(15min)}$for work during standard construction hours (7am-6pm Monday to Friday and 8am to 1pm on Saturdays) and
    - 5dB(A)$L_{eq(15min)}$for work outside of standard construction hours.
- "*Highly noise affected level".* Where noise emissions are such that nearby properties are "highly noise effected", noise controls such as respite periods should be considered. For residential properties, the "highly noise effected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

For hospital wards, operating theatres and classrooms at schools, the ICNG recommends that construction noise should not exceed 45dB(A)$L_{eq(15min)}$ within the internal areas of these receiver types.

5.3.2 Australian Standard AS2436:2010 "Guide to noise control on construction, maintenance and demolition sites

The Australian Standard AS2436 states that where all reasonable and available measures have been taken to reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites AS2436:2010 *"Guide to noise control on construction, maintenance and demolition sites"* nominates the following:

a. That reasonable suitable noise criterion is established,

b. That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours, and

c. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the demolition, excavation and construction site.

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic comprises between construction sites and potential noise affected receivers.

5.3.3 Construction Noise Objectives

A summary of the applicable construction noise objectives at the nearest affected receivers

Table 7 – Construction Noise Emission Criteria

Location	Noise Emission Criteria - dB(A)$L_{eq(15min)}$
Receiver 1: Dental School Building to the South-East	45dB(A)$L_{eq(15min)}$ internally
Receiver 2: Catherine McAuley High School to the south-west	45dB(A)$L_{eq(15min)}$ internally

6 NOISE EMISSION ASSESSMENT

Noise associated with the development will consist of:

- Noise emissions from the operation of the car park, which is assessed with reference to the NSW EPA Road Noise Policy and Australian Standard AS2107:2000. Noise sources will consist of:
    - Noise from cars manoeuvring within the car parks.

In addition, a discussion of construction noise will be presented.

The nearest potentially affected receivers are:

- Receiver 1: Dental school building located approximately 17m south-east of the proposed car park. This building is a part of Westmead Hospital.
- Receiver 2: Catherine McAuley High School, located to the south-west of the site across Darcy Road.

6.1 CAR PARK NOISE ASSESSMENT

Predictions will be made based on the following data/assumptions:

- Sound power level of a car travelling at 10km/hr being 84dB(A)L_{eq}, based on measurements conducted by this office;
- Worst case scenario of 1,254 cars entering into the multi-storey car park over two hour time period (filling the car park from the bottom levels up to the top level) and 50 cars entering into the at-grade car parking area to the east of the proposed multi-storey car park over a two hour time period;
- Windows of the dental school building (receiver 1) are closed. Based on information provided to this office.
- Classrooms of Catherine McAuley High School (receiver 2) facing proposed carpark are open. It is assumed that a 10dB(A) noise reduction occurs when an external noise source travels into an internal area through an open window/door.

6.1.1 Predicted Noise Levels

Noise emissions from cars manoeuvring within the car park at the nearest receivers will be assessed against the internal noise criteria of the EPA Road Noise Policy and AS2107:2000 as outlined in sections 5.1.2 and 5.1.3 respectively.

The predicted noise levels in the internal areas have been calculated.

Table 8 – Predicted Noise Levels from Car Park Noise

Receiver Location	**Predicted Noise Level – dB(A)$L_{eq(15min)}$ (internal)**	**Noise Emission Criteria dB(A)$L_{eq(worst\ 1hr)}$**	**Complies**
Receiver 1: Dental School Building	38dB(A)$L_{eq(15min)}$ (windows closed)	45dB(A)$L_{eq(worst\ 1hr)}$	Yes
Receiver 2: Catherine McAuley High School	41dB(A)$L_{eq(15min)}$ (windows open)	40dB(A)$L_{eq(worst\ 1hr)}$	See discussion in section 6.1.2.

6.1.2 Discussion

In light of the predicted noise levels presented in section 6.1.1 above, we note the following:

- Noise emissions from cars manoeuvring in the proposed car parks will be compliant with noise emission goals within the internal areas of the dental school (receiver 1) with windows closed.

- Noise emissions from cars manoeuvring in the proposed car parks within the internal areas of the nearest classrooms of the Catherine McAuley High School (receiver 2) will exceed the noise emission goals by 1dB(A)L_{eq}. However, we note the following with respect to this exceedance:

    - This exceedance is only predicted during a worst case scenario of use of the proposed car park (that is, 1,254 cars entering the multi-storey car park and 50 cars entering the at grade car park to the east within a two hour period).

    - The predicted noise levels assume that the windows/doors of the classrooms are open. With windows/doors closed, noise emissions from the car park to the internal areas of the classrooms would be reduced by a further 10-20dB(A) of the predicted noise levels presented in the table above.

    - Based on the attended traffic noise measurements conducted along Darcy Road in front of the school (see figure 1 and table 2), noise levels within the nearest classrooms with windows open from existing traffic noise alone is predicted to be approximately 54dB(A)L_{eq}. Given this, noise impacts on the internal areas of classrooms with windows open during a period of peak use of the proposed car park (41dB(A)L_{eq}) will be insignificant.

    - Based on the above, it can be reasonably stated that any additional noise generated by the operation of the proposed car park will not be perceivable over and above the existing traffic noise already impacting the Catherine McAuley High School.

6.1.3 Recommendations

The following development controls should be incorporated to ensure that noise impacts on the nearest receivers are minimised:

- The car park pavement shall be smooth to ensure minimal vertical displacement and potential for noise generated by wheel to concrete impacts. The surface finish shall be of broom finish or similar to minimise squealing of car tyres.

- Grates and any cover plates are to be fixed flush and tight.

- Detailed review of any mechanical plant (such as car park supply and exhaust fans) should be undertaken at CC stage, once plant selections and locations are finalised. Compliance with EPA Industrial Noise Policy requirements will be achievable using standard acoustic treatments (in duct lining/attenuators, equipment enclosures etc.).

6.2 CONSTRUCTION IMPACTS

6.2.1 Construction Noise Emission Assessment

6.2.1.1 Source Noise Data

The A-weighted sound power levels for typical equipment/processes anticipated to be used during the construction of the project site are outlined in Table below.

Table 9 – Sound Power Levels

STAGE	EQUIPMENT /PROCESS	SOUND POWER LEVEL dB(A)$L_{10(15min)}$
Demolition	Angle Grinder	105
	Hammering	110
	12 tonne Truck	100
Piling	CFA Piling	103
Excavation	Excavator with Pneumatic Hammer	118
Construction	Angle grinders	105
	Electric Saw	102
	Drill	95
	Hammering	110
	Air compressor	86
	Concrete Pump	105
	Concrete Vibrator	100
	Cement Mixing Truck	105
	Crane	96

The noise levels presented in the above table are derived from the following sources, namely:

- On-site measurements
- Table D2 of Australian Standard 2436-1981
- Data held by this office from other similar studies.

6.2.1.2 Construction Noise Emission Predictions

Indicative noise emissions from construction activities above have been predicted to the nearest noise receivers and are presented below.

Table 10 –Predicted Construction Noise Levels

Receiver Location	Predicted noise Level dB(A)$L_{eq,\ 15min}$			
	Demolition	Piling	Excavation	Construction
Receiver 1: Dental School Building (internal, windows closed)	48	41	56	48
Receiver 2: Catherine McAuley High (internal, windows closed)	42	35	50	42

6.3 INDICATIVE NOISE EMISSION CONTROLS

Given that specific excavation/construction methodologies have not been established at this stage, the predicted noise level presented above are approximate. Based on the predictions above, we make the following indicative recommendations with respect to controlling construction noise impacts on nearby receivers:

- Appropriate consultation with adjacent occupants is recommended, especially to address any potential construction noise issues during examination periods at both receivers.
- Equipment shall be well maintained.
- Stationed equipment shall be located as far as possible towards the northern boundary of the site and screened by enclosure.
- Trucks and concrete trucks must turn off their engines during idling to reduce impacts on adjacent receivers (unless truck ignition needs to remain on during concrete pumping).

6.4 VIBRATION IMPACT ASSESSMENT

The following guidelines will be adopted to address construction vibration impacts:

- German Standard DIN 4150-3 (1999-02): *"Structural Vibration – Effects of Vibration on Structures"* – which will be used to assess and limit building damage risk.

- EPA Assessing Vibration a technical guideline – which contains guidelines to assess and limit impacts on building occupant's amenity.

Site investigation indicated that the nearest vibration sensitive receiver is:

- Receiver 1: Dental School Building located approximately 17m to the south-east of the site.

The criteria and the application of this standard are discussed in separate sections below.

6.4.1 Building Damage Limit

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 5.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 11 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

6.4.2 Amenity Criteria

Table 2.2 of EPA "Assessing Vibration: A technical guideline" specified the following vibration goal for human comfort:

Table 12 –Preferred and Maximum Weighted RMS values Vibration Acceleration (m/s2) 1-80 Hz

Location	Assessment Period	Preferred Values Z-axis	Preferred Values X & Y-axis	Maximum Values Z-axis	Maximum Values X & Y-axis
Continuous Vibration					
Office	Day time	0.020	0.014	0.040	0.028
Impulsive Vibration					
Office	Day time	0.64	0.46	1.28	0.92

Acceptable values for intermittent vibration shall comply with the requirements in Table 2.4 of EPA "Assessing Vibration: A technical guideline" detailed as below.

Table 13 - Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Day time preferred value	Day time maximum value
Office	0.40	0.80

6.4.3 Vibration Safety Guard System

Proposed activities that have the potential to produce significant ground vibration include:

- Demolition
- Excavation and anchoring.
- Hydraulic hammering.

6.4.3.1 Safeguards to Protect Sensitive Structures

It is impossible to predict the vibrations induced by the demolition/excavation/construction operations on site at potentially affected receivers. This is because vibration level is principally proportional to the energy impact which is unknown nature of terrain in the area (type if soil), drop weight, height etc.

Acoustic Consult should undertake monitoring of initial demolition/excavation /construction process when conducted near potentially affected receivers to ensure that vibration criteria set out in section 8.1 are not exceeded.

6.4.4 Vibration Monitoring (if required)

In the event that complaints are made from the nearest receiver regarding vibration impacts from the subject site, vibration monitors will be installed at the property boundary of the neighbouring site nearest to the subject site to monitor vibration levels.

6.4.4.1 Downloading of Vibration Monitoring Data

Downloading of the vibration monitor data will be conducted on a regular basis. In the event of exceedance of the vibration criteria, downloading of the vibration monitor data will be conducted more frequently. Results obtained from the vibration monitor will be presented in a graph format and will be forwarded to the client for review. It is proposed that reports are provided fortnightly with any exceedances in the vibration criteria reported as detailed in this report.

6.4.4.2 Presentation of Vibration Logger Results

A fortnightly report will be submitted to project manager via email summarising the vibration events. The vibration exceedance of limit is recorded the report shall be submitted within 24 hours. Complete results of the continuous vibration logging will be presented in fortnight reports including graphs of collected data.

7 CONCLUSION

This report presents an acoustic assessment of potential noise impacts from the proposed multi-deck car park to be located on the corner of Darcy Road and Institute Road, Westmead at Westmead Hospital.

An assessment of noise impacts from the operation of the proposed car park have has been presented 6.1 of the report. Recommendations have been presented in section 6.1.3.

An indicative assessment of construction noise and vibration impacts has been presented in section 6.2 of this report.

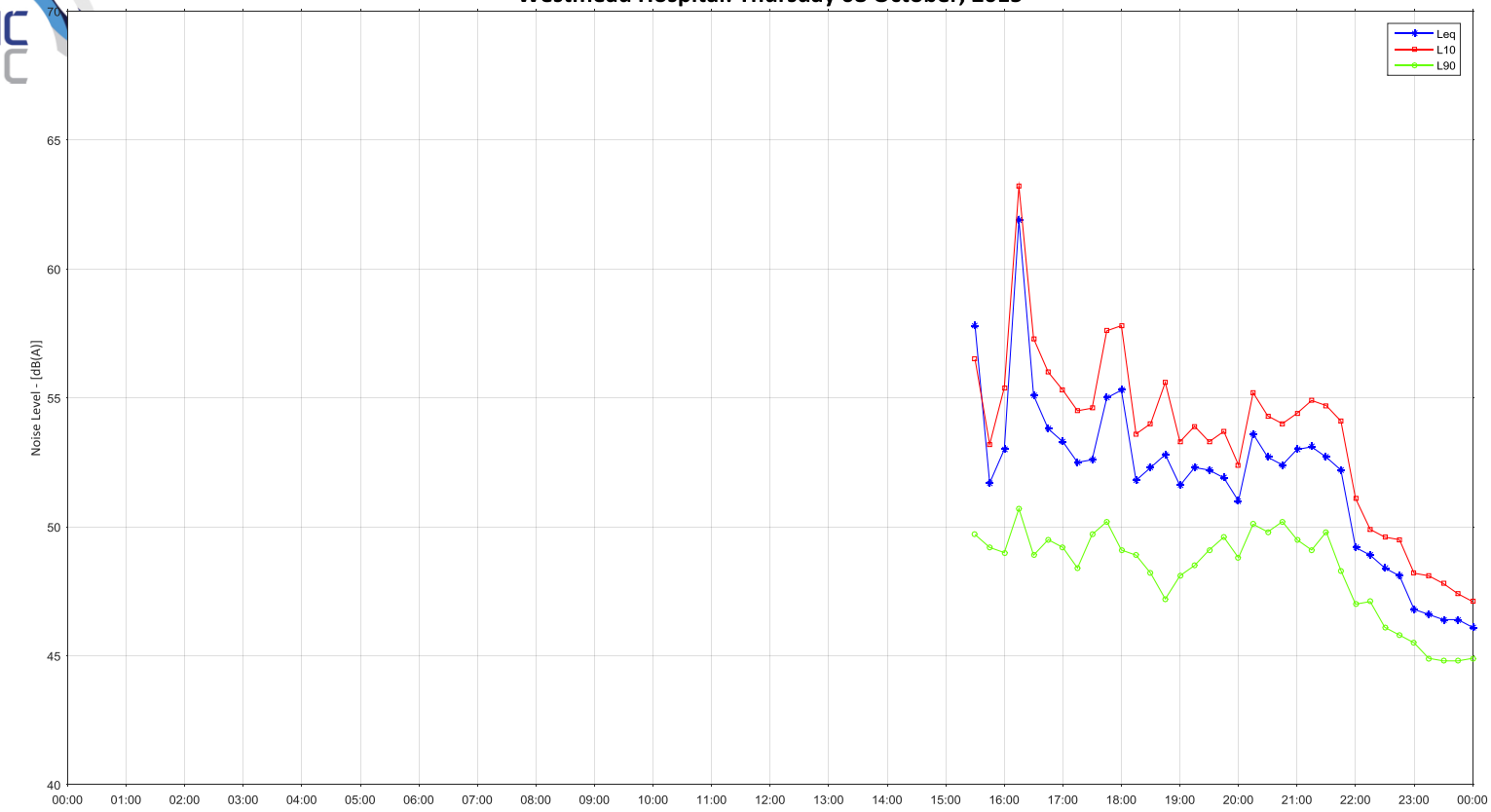
We trust this information is satisfactory. Please contact us should you have any further queries.

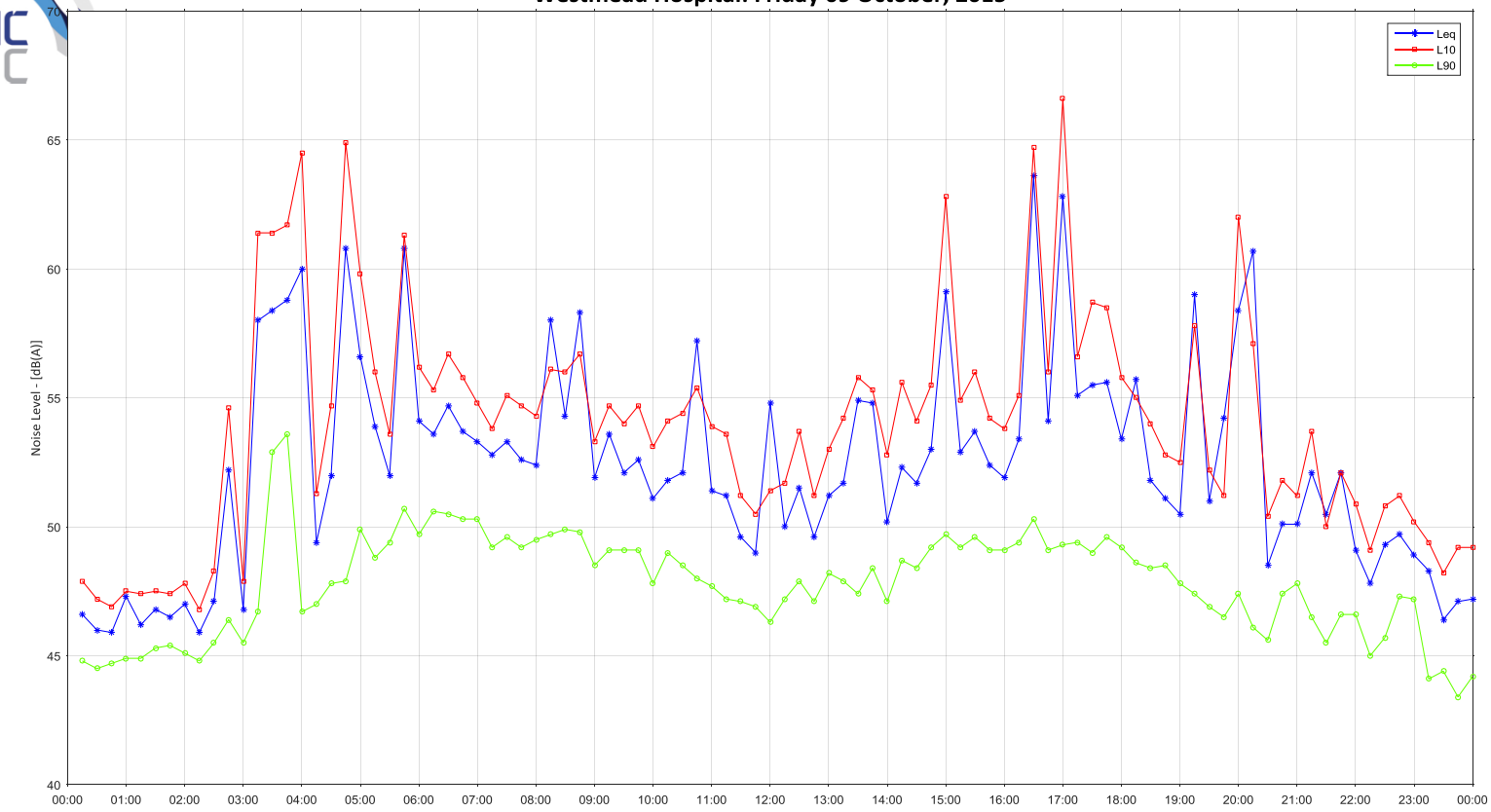
Yours faithfully,

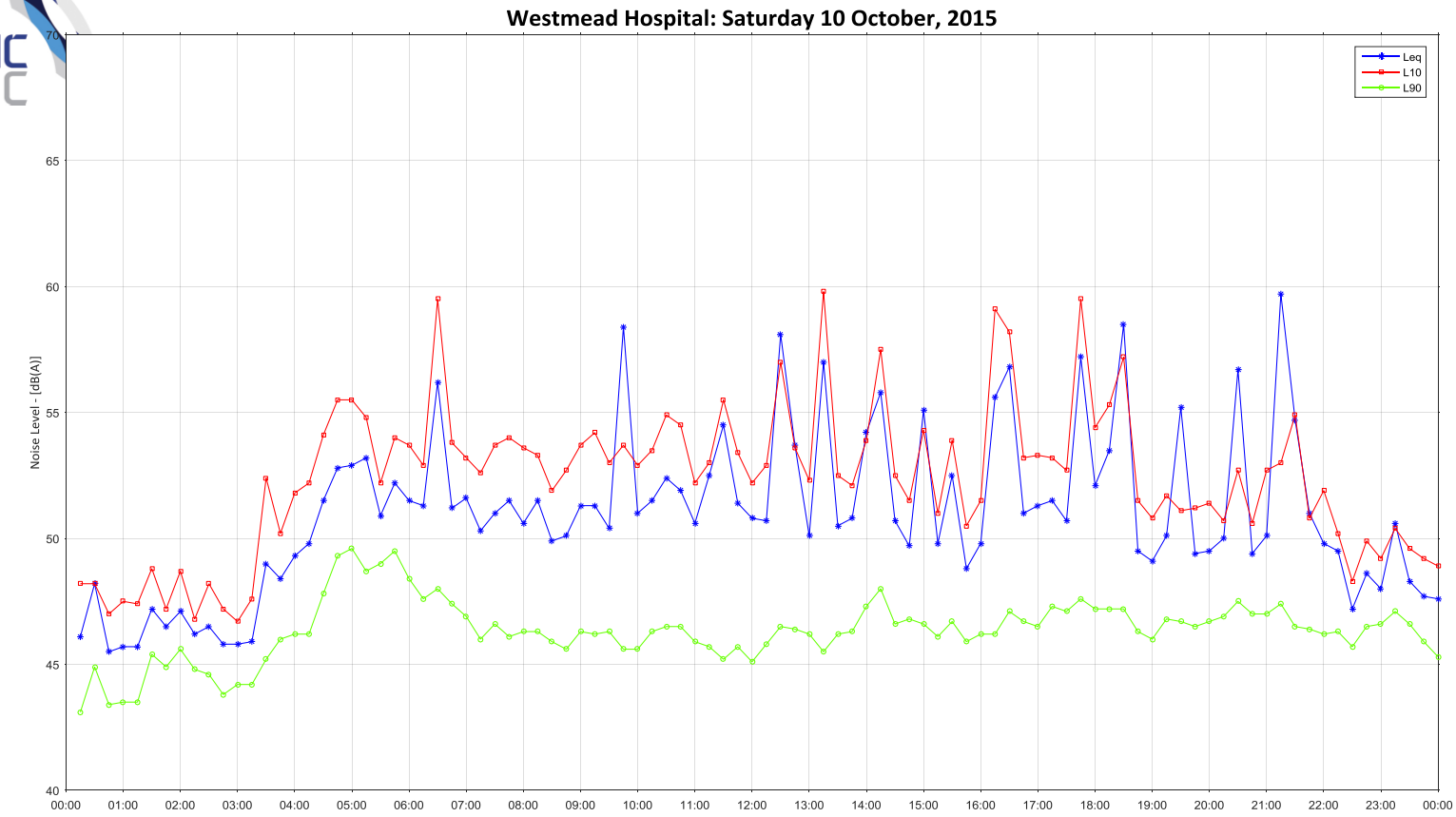
Acoustic Logic Consultancy Pty Ltd
Justin Leong

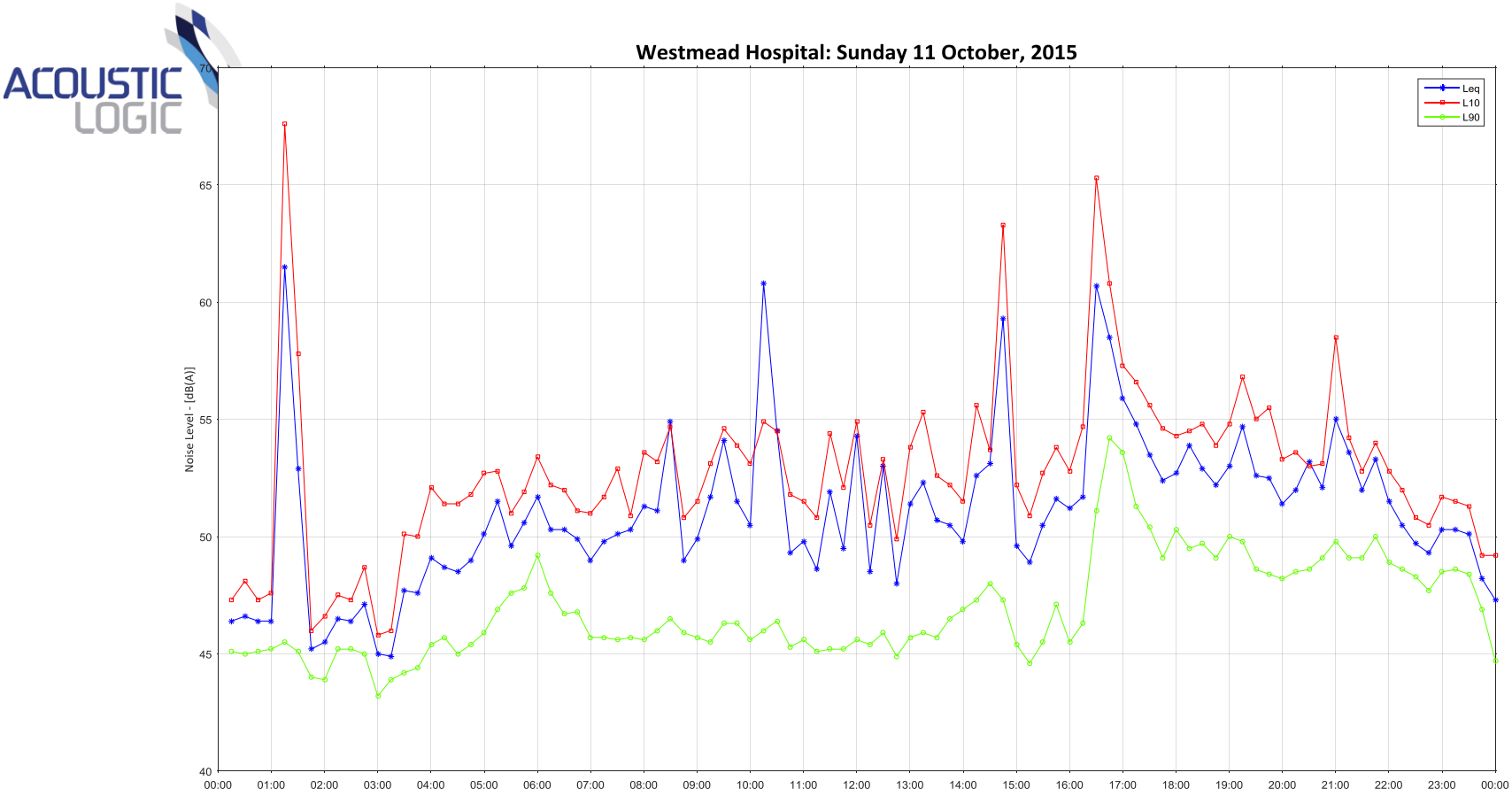
APPENDIX 1 – UNATTENDED NOISE MONITORING DATA

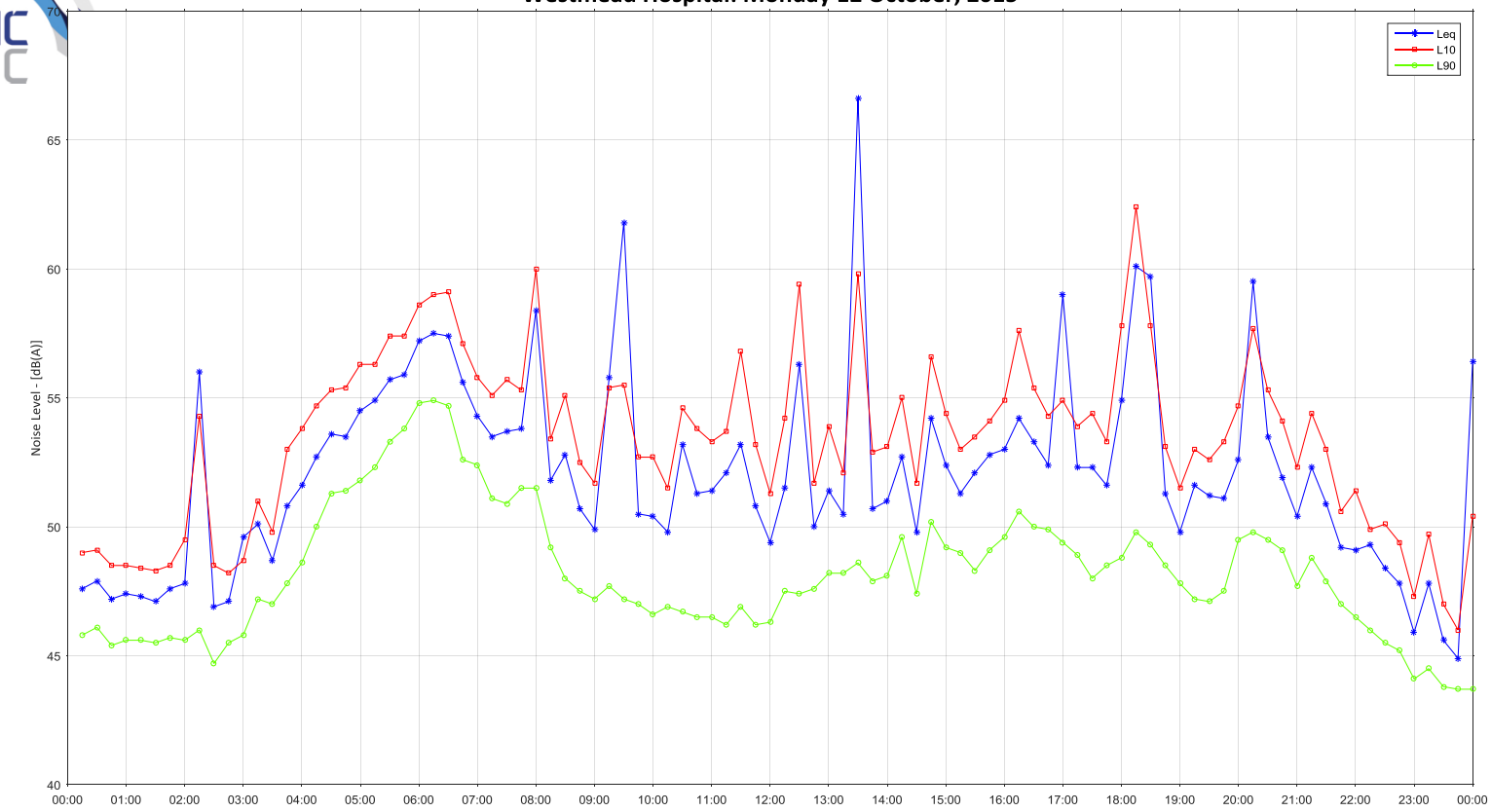
Westmead Hospital: Thursday 08 October, 2015

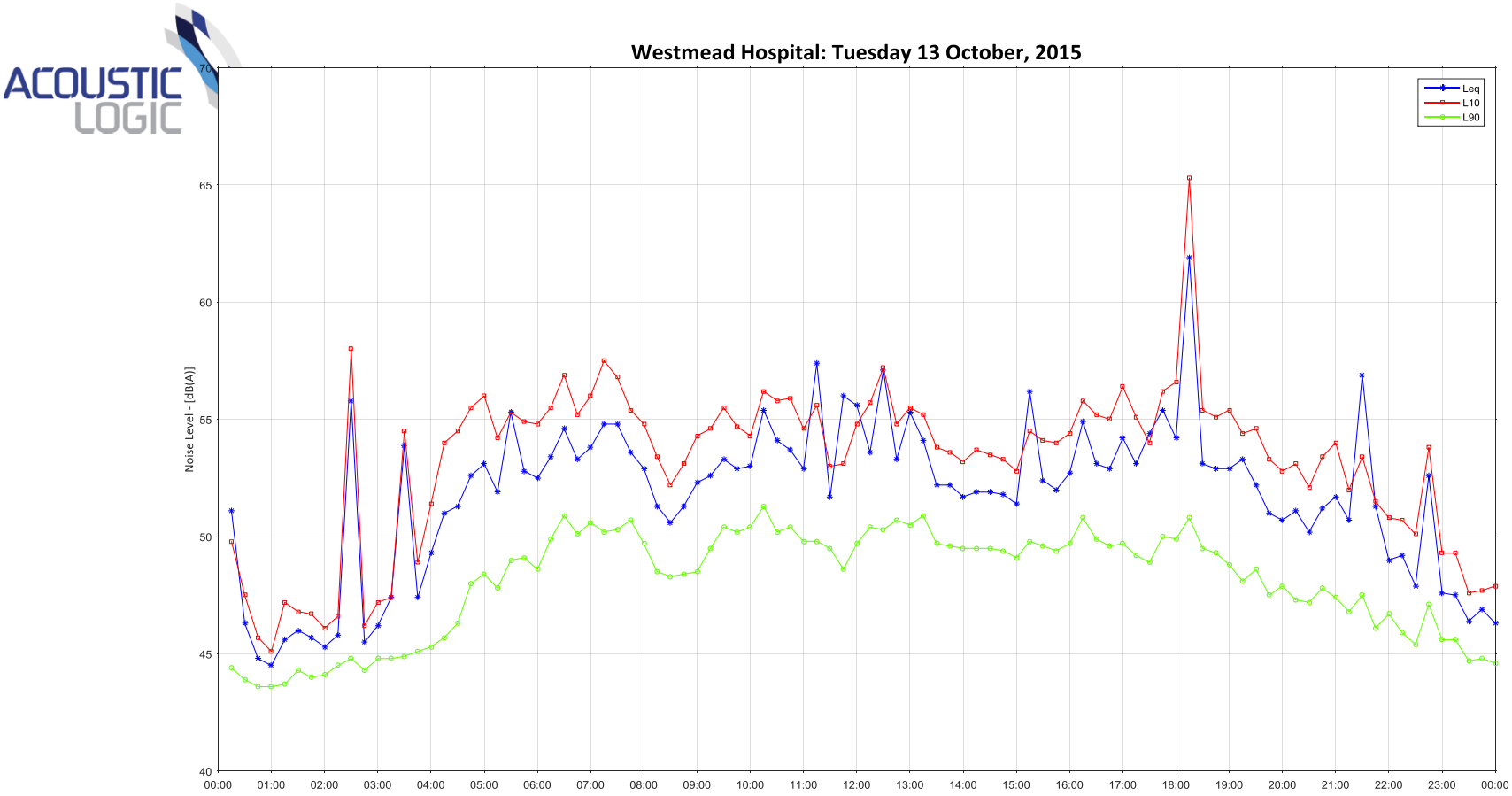


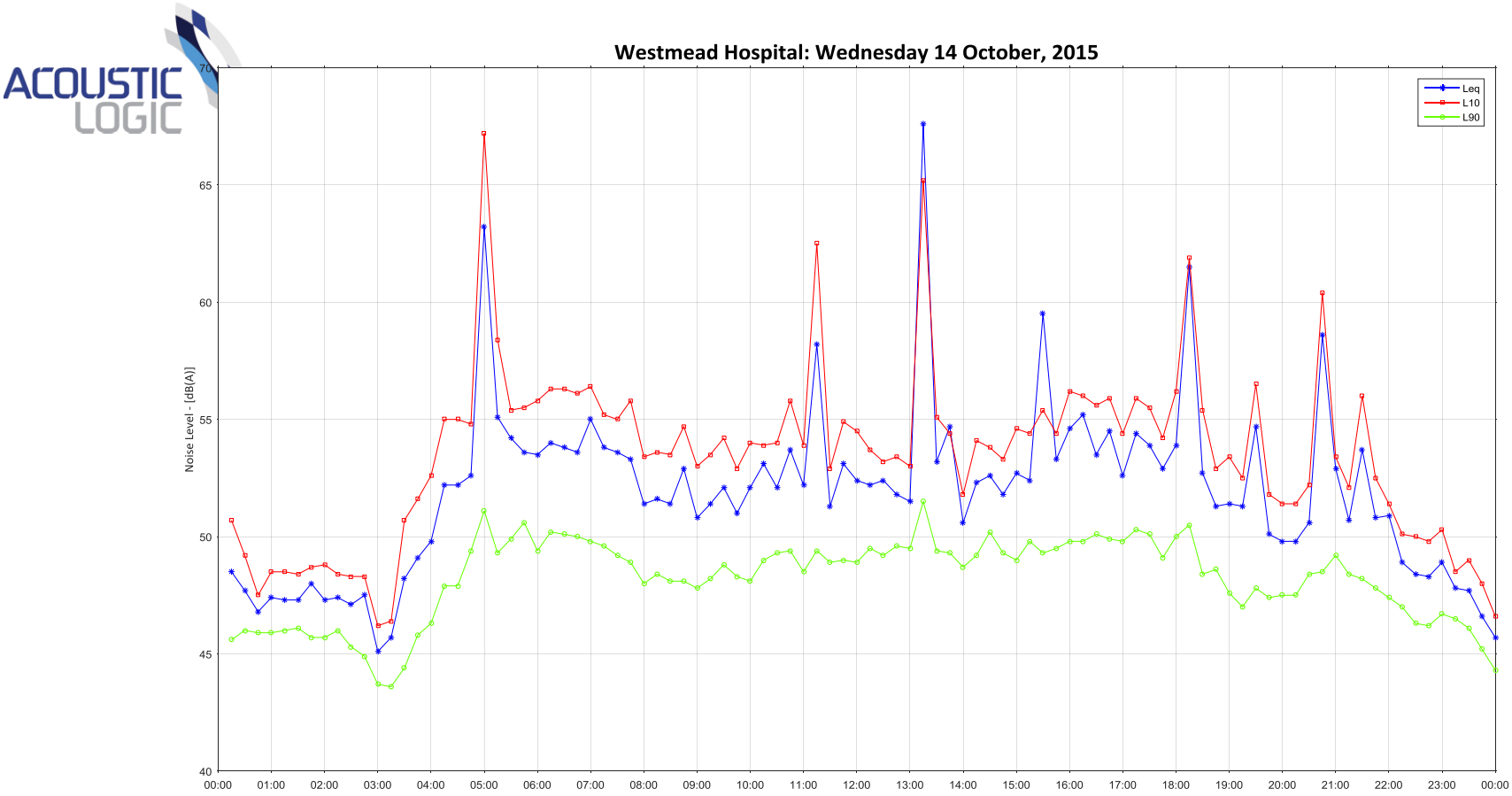

Westmead Hospital: Friday 09 October, 2015
Noise Level - [dB(A)]
Leq
L10
L90
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

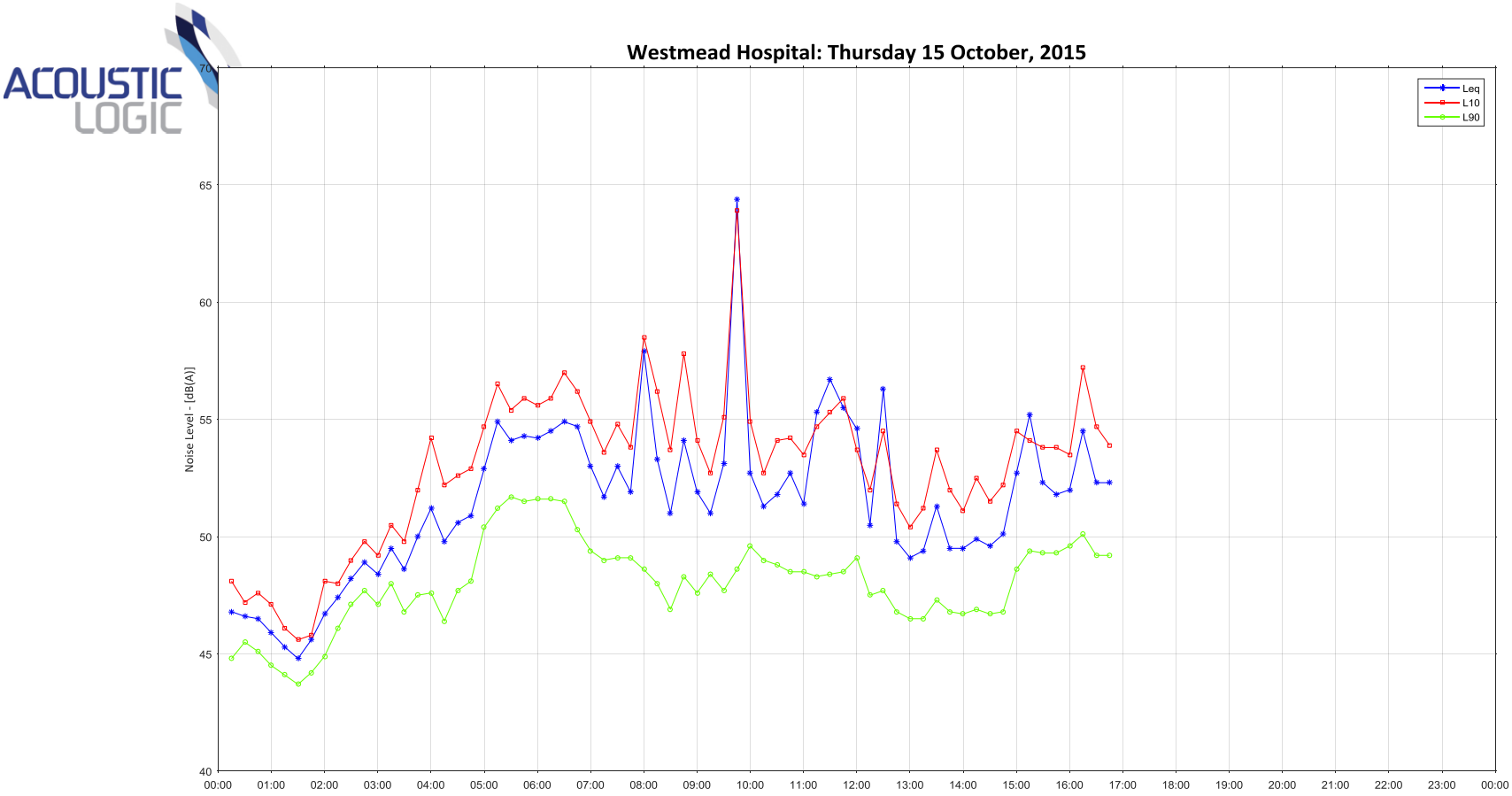

Westmead Hospital: Saturday 10 October, 2015
Noise Level - [dB(A)]
Leq
L10
L90
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Westmead Hospital: Sunday 11 October, 2015
Noise Level - [dB(A)]
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Leq
L10
L90


Westmead Hospital: Monday 12 October, 2015
Noise Level - [dB(A)]
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Leq
L10
L90


Westmead Hospital: Tuesday 13 October, 2015
Noise Level - [dB(A)]
Leq
L10
L90
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Westmead Hospital: Wednesday 14 October, 2015
Noise Level - [dB(A)]
Leq
L10
L90
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Westmead Hospital: Thursday 15 October, 2015
Noise Level - [dB(A)]
Leq
L10
L90
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00