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Warringah Mall

Construction Noise and Vibration Management Plan

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1 EXECUTIVE SUMMARY

A noise and vibration management plan has been developed that will be used to manage impacts from demolition, excavation and construction activities associated with the Warringah Mall development to comply with the broad objectives of the Australian Standard 2436-2010" Guide to Noise Control on Construction, Maintenance and Demolition Sites".

The principal objective is to undertake detailed evaluation of all work to be performed during the construction period and to forecast the potential impact. The noise forecasts will be used to formulate and streamline effective regulation and mitigation measures.

The principal issues that will be addressed in this document are:

1. Identification of the specific activities that will be conducted and the associated noise sources,
2. Identification of all potentially noise sensitive receivers, including residence, churches, commercial premises, schools and properties containing noise sensitive equipment.
3. The development, hours of work and excavation period,
4. The construction noise objective specified in the conditions of consent,
5. The construction vibration criteria specified in the conditions of consent,
6. Determination of appropriate noise and vibration objectives for each identified sensitive receiver,
7. Noise and vibration monitoring, reporting and response procedures,
8. Assessment of potential noise and vibration from the proposed demolition, excavation and construction activities,
9. Description of specific mitigation treatments, management methods, and procedures that will be implemented to control noise and vibration during construction.
10. Procedure for notifying residence of construction activities that are likely to affect their amenity through noise and vibration.
11. Contingency plans to be implemented in the event of non-compliances and/or noise complaints.
12. Compliance with Australian Standard 2436-2010" Guide to Noise Control on Construction, Maintenance and Demolition Sites" and NSW EPA "*Interim Construction Noise Guideline*".

2 INTRODUCTION

This document presents the excavation and construction noise and vibration plan that will be used to manage noise and vibration from the construction of residential buildings at Warringah Mall.

The objectives of this management plan are the minimisation of noise and vibration emissions from excavation and construction works and to assist in maintaining a satisfactory environment around the site.

In recognition of the requirement to minimise noise emissions from the site to surrounding residential and commercial premises this study has been commissioned. The principal objective of this study is to undertake advance evaluation of all work to be performed during the excavation and construction phase of the project and forecast the potential impact of noise. The noise forecasts will be used to formulate and streamline effective regulation and mitigation measures. As a part of this process on going testing may be used to evaluate the noise regulation strategies and ensure that they are effective.

The principal issues which will be addressed in this document are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Formulation of a strategy for construction to comply with the standards identified in the above point.
- Development of a monitoring programme to measure and regulate noise and vibration at all potentially affected locations.
- Establishment of direct communication networks between affected groups including surrounding receivers, site contacts and Acoustic Logic Consultancy.

3 SITE DESCRIPTION

The subject proposal includes the upgrading of the existing Warringah Mall.

The site is bounded to the east by Pittwater Road (which carries high volumes of traffic volumes), existing commercial tenancies to the north and west.

The potentially affected residential receivers include those residence to the south and east of the site as detailed in the Figure below.

Figure 1 below illustrates the locations of the proposed development, noise sources and noise monitors/measurement.

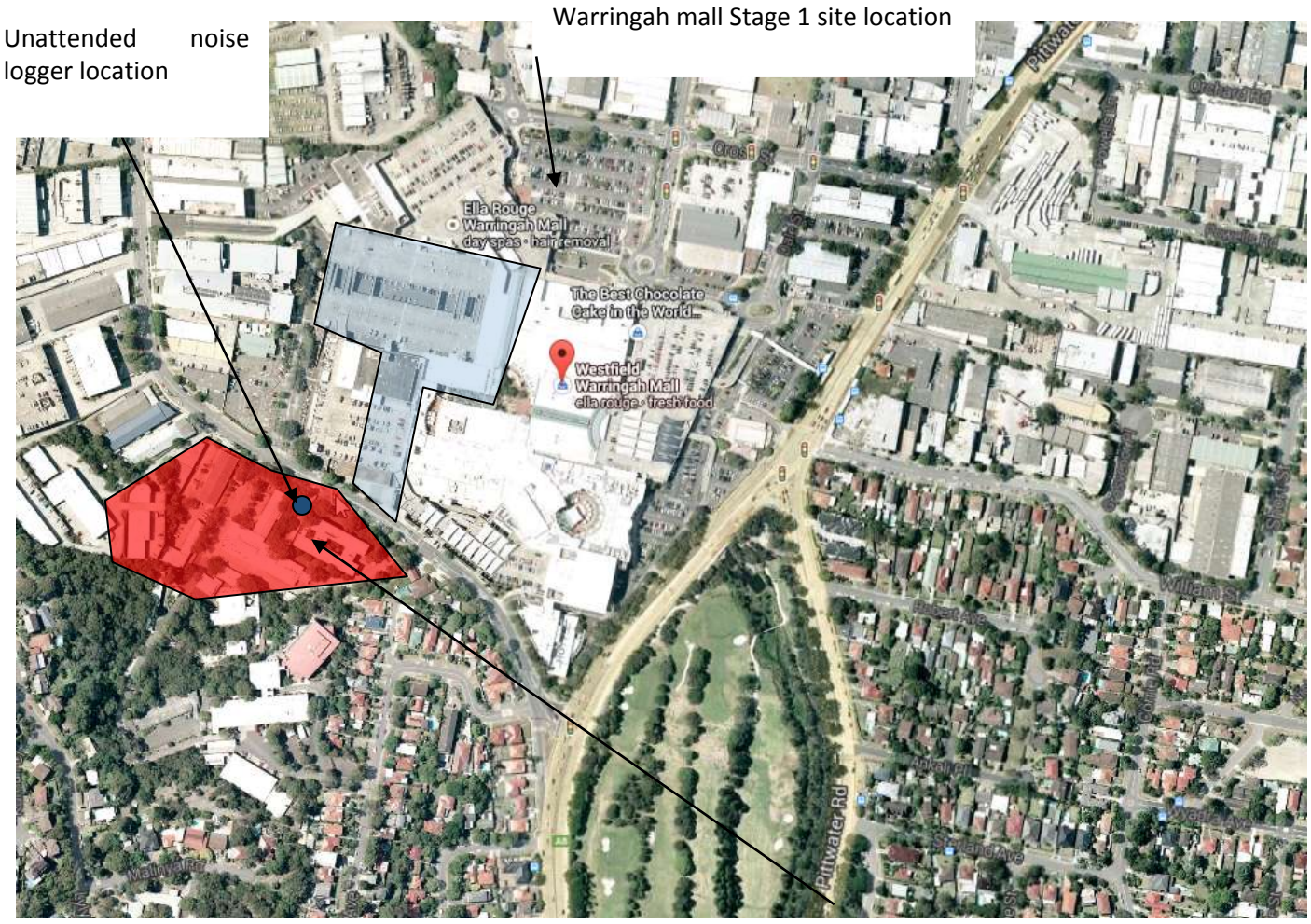


Figure 1 – Site Location

PROJECT DESCRIPTION

The proposed hours of operation for the activities to be conducted on the site include the following:

1. Working Hour's - 7.00am to 7.00pm inclusive Monday to Friday
   - 7.00am – 5.00pm Saturday
2. Demolition and excavation to occur within the proposed hours detailed above.
3. Concrete finishing during the construction stage may be completed outside of the hours. Concrete finishing would be required to be conducted in conjunction with the controls detailed in this report and no later than midnight Monday to Friday.

4.1 DEMOLITION

Demolition required at the site consists of removal of the internal fittings and fixtures including the demolition of masonry walls and floors after internal strip-out is complete.

Demolition of the structural elements will then be required and will utilise machines such as a 30t excavators, hammers and the like.

At all times throughout the demolition and loading out works there will be personnel on hand to control dust with a hand held hose. The concrete and masonry rubble will be loaded onto trucks for recycling.

4.2 EXCAVATION

Excavation for the required levels will be performed in dirt and removal of rock (which is typically the greatest noise producing activity) is not required.

The proposed methods for excavation includes up to 35 tonne excavators with buckets and there is only limited (if any) rock hammering required on the site during the excavation stage. These methodologies have been adopted in conjunction with best practice procedures to mitigate noise impact to surrounding receivers.

As there is no removal of rock required at the site the greatest noise producing activities of hydraulic hammering, ripping, milling and the like is not required on the site.

4.3 CONSTRUCTION

This section details the proposed methods for construction of the new building.

4.3.1 Erection of Structure

This involves the construction of new building structure. The processes involved in this activity include the construction of bored piles to support the basement slab and structure, delivery of materials, erection of formwork, pouring of concrete, and stripping of formwork. All materials for form working and structural steel are transported to the work face using the site tower cranes and man/material hoists. Concrete will be pumped using concrete pumps.

4.3.2 External Working Activities

This involves installation primarily of façade glazing and masonry work to the exterior of the building and the external floor finishes within the confines of the centre. This work will be implemented once the building structure is complete and formwork has been removed

4.3.3 Internal Fitout and Finishes

This involves all internal fitout work from the installation plasterboard of ceilings, services installation to painting and joinery. All work covered under this section, will be contained within the building, with the facade providing a barrier to the direct transmission of noise to the exterior.

5 SOUND POWER LEVELS

Noise impact will be determined from all processes and equipment, which are involved in the activities outlined above by defining the levels of sound, which they generate.

The A-weighted sound power levels for all the component parts of the above-described activities are outlined in the tables below.

Table 1 – Construction Activities – Sound Power Levels

Construction Activity	Equipment / Process	Sound Power Level – dB(A)L_{10}
Demolition and Fit-out	Hammering	110
	Drilling	94
	Impact drill	112
	Electric Saw	94
	Angle Grinders/Small jack hammer for tile removal	114

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

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

6 ASSESSMENT CRITERIA

The assessment of noise and vibration impact associated with the proposed upgrading of the Warringah Mall will be conducted in compliance with the requirements of the EPA's Interim Construction Noise Guideline and the Australian Standard AS2436- Guide to Noise Control on Construction Maintenance and Demolition Site.

6.1.1 EPA – Interim Construction Noise Guideline

The Interim Construction Noise Guideline outlines that the transmission of noise generated by various construction/demolition activities will primarily occur via two paths:

- Airborne Noise
- Ground-borne Noise

6.1.1.1 Airborne Noise Transmission Criteria for Residential Receivers

Table 2 of the Interim Construction Noise Guideline outlines the management levels for noise at residences depending on the hours of construction. The management levels are outlined in the table below.

Table 2 – Noise Management Levels for Residential Receivers

Time of Day	Management Level dB(A)$L_{eq(15mins)}$
Recommended standard hours: Monday to Friday(7am – 6pm); Saturdays (8am – 1am) and no works on Sunday or public holidays	Noise affected RBL* + 10dB
Outside recommended standard hours	Noise affected RBL* + 5dB

Table 3 – ICGN Recommended Construction Noise Management Levels

Receiver	Management Level	External Sound Level, $L_{eq\ 15\ min}$ dB(A)	Where Applied
Residential	Noise Affected Level[1]	Background + 10dB(A)	Externally – Normal Working hours
	Highly Noise Affected Level[2]	75dB(A)	Externally – Normal Working hours
	Noise Affected Level[1]	Noise affected RBL* + 5dB	Externally - Outside recommended standard hours
Commercial Office	Noise Affected Level	70dB(A)	Externally (When in use)

1: Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise.

2: Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.

6.2 MEASURED BACKGROUND NOISE LEVELS

As part of this assessment background noise logging was undertaken at a representative location of the worst affected residential receivers as detailed in Figure 1 above and reported in this section of the report.

6.2.1 Measurement Period

The long-term monitoring was conducted from the 16th May to the 21st May 2014.

6.2.2 Measurement Equipment

The unattended long-term monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. 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.

6.2.3 Measurement Results

The measured background noise levels are presented in Table 4 below.

Table 4 – Measured Background Noise levels

Location	Time Period	Background Noise Level db(A) $L_{90\ (15min)}$
Worst affected residential receiver	Day	47
	Evening	37
	Night	31

6.2.4 Construction Noise Criteria

The resulting noise levels criteria for construction noise during the proposed extended hours period is detailed in the table below.

Table 5 – Resulting Extended Hours Period Noise Criteria

Time of Day	Level dB(A)$L_{eq(15mins)}$
Monday to Friday(7am – 6pm); Saturdays (8am – 1am) and no works on Sunday or public holidays	57
Evening periods up until 10pm	42
Night time periods 10pm to 7am	36

6.3 AUSTRALIAN STANDARD 2436-2010 "GUIDE TO NOISE CONTROL ON CONSTRUCTION MAINTENANCE AND DEMOLITION SITE"

Where compliance with EPA requirements cannot be achieved, noise emissions must be managed in accordance with the principles outlined in AS 2436:

- A reasonable suitable noise criterion is established;
- All practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

6.3.1 Summary of Applicable Guidelines

Based on these guidelines, the following procedure will be used to assess noise emissions:

- For residential receivers surrounding the subject site, a noise level of 10 dB(A) above background level at these receiver is allowed during recommended standard hours.
- For residential receivers surrounding the subject site, a noise level of 5 dB(A) above background level at these receiver is allowed during the proposed working hours outside of normal working hours.
- If noise levels exceed the project specific noise goal at sensitive receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions.
- If the noise goals are still exceeded after applying all practical engineering controls to limit noise emissions investigate management controls and other techniques to mitigate noise emissions.

6.4 VIBRATION CRITERIA

It is proposed to adopt the following vibration guidelines:

- 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 Interim Construction Noise Guideline – which contains guidelines to assess and limit impacts on building occupant's amenity based on the "Assessing Vibration: A Technical Guide".

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

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 1.

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 6 – 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

Based on the surrounding receiver types and building constructions the proposed vibration criteria ensuring no structural or architectural damage is 10mm/s.

6.5 ASSESSING AMENITY

On occupied levels of the building, for the type of vibration producing activities proposed, vibration induced within the adjacent buildings is likely to impact amenity well before the damage limits are reached.

The EPA Interim Construction Noise Guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and manage vibration from proposed activities.

6.6 DAMAGE LIMITS

Project specific vibration limits have been developed based on:

- The recommendations in Table 2.
- The vibration sources producing the highest vibration levels would not generate significant vibration at frequencies of less than 10Hz.
- The appropriate vibration limit for the nearby residential dwellings is 10mm/s.

6.7 AMENITY GOALS

The amenity levels nominated in Assessing Vibration: A Technical Guide (2006) will be used to set vibration goals that should be achieved where reasonable and feasible to prevent adverse human discomfort caused by vibration generated by excavation.

6.8 VIBRATION DISCUSSION

Based on the proximity of the propose works to the surrounding residential receivers there is no expected vibration impact on any surrounding receivers.

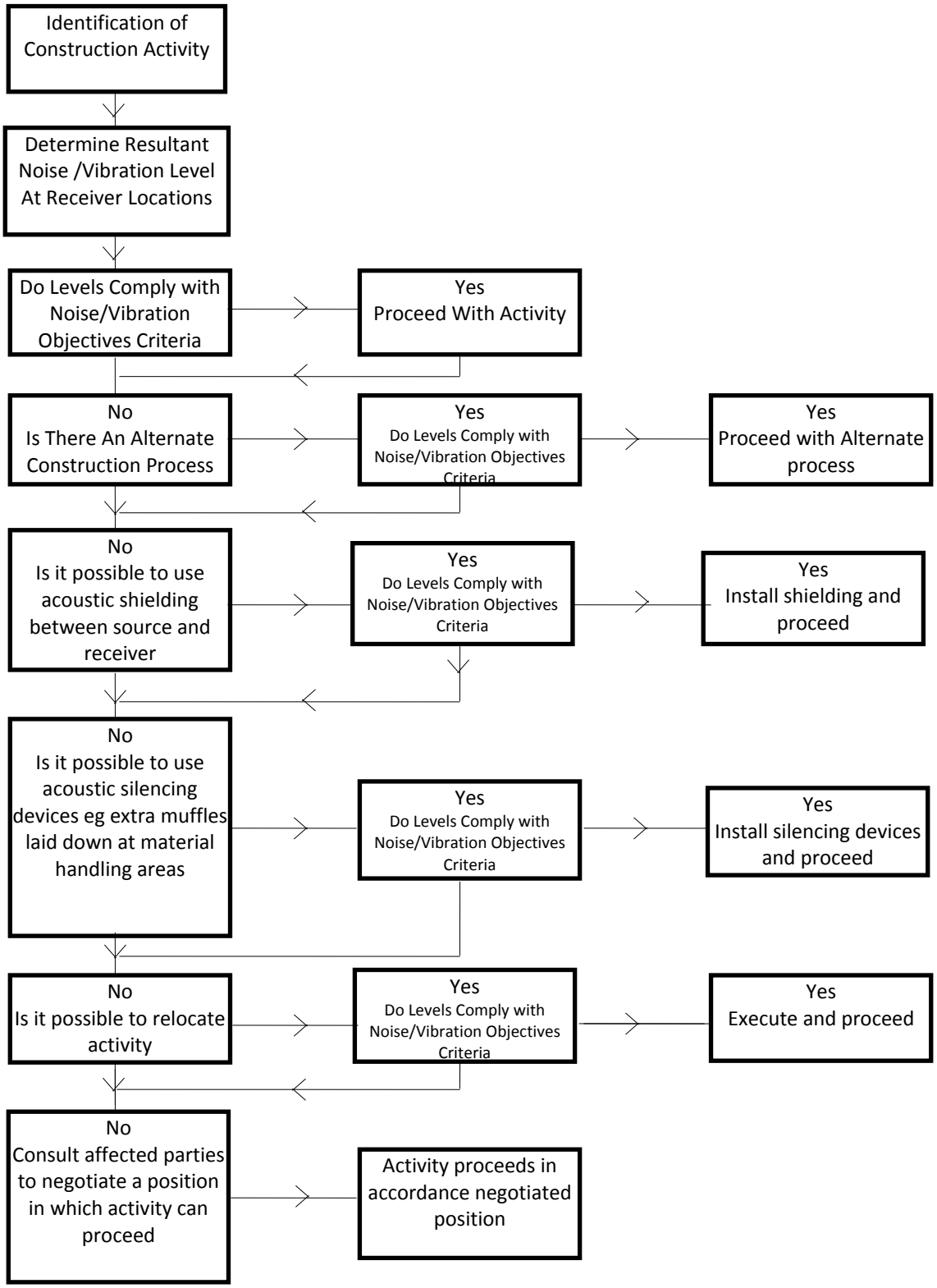
7 CONTROL OF DEMOLITION, EXCAVATION AND CONSTRUCTION NOISE AND VIBRATION

As a part of the noise management plan a detailed study will be undertaken of each of the proposed activities which will occur as a part of the excavation and construction works on this project.

The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart which follows illustrates the process which will be followed in assessing construction activities.

CONTROL OF NOISE AND VIBRATION



8 CONSTRUCTION NOISE ASSESSMENT

Construction noise emissions associated with internal activities have been predicted based on the proposed program and associated equipment.

8.1 NOISE PREDICTION

Prediction was conducted to investigate the potential for noise impact from internal fit-out works during the extended hours' period to the surrounding receivers.

The predictions are based on the following assumptions:

- The prediction is based on the worst case scenario that the loudest typical activity was being conducted within the area nearest to the receiver. This assumes that one angle grinder or one small jack hammer is being used within the building which is closest to the potentially worst affected receiver to the south of the side.

- The sound power levels detailed in Table 1 have been used to calculate internal sound pressure levels impacting on the façade based on:

    - The size and room characteristic.

    - The calculated sound pressure level was assumed to occur consistently across the entire façade of the work area.

- The existing glazing of the Building are assumed to be minimum 6mm float with an STC/R_w rating of 29.

The predicted noise levels at the nearby receivers are presented below. The predicted levels are based on the assumption that the loudest typical piece of equipment (angle grinder/small jackhammer) is in use (and hence represents a worst case scenario prediction).

Table 7 – Predicted Construction Noise Levels

Activity	Receiver Location	Predicted Noise Level dB(A) $L_{av\ max}$ 15min	Construction Noise Criteria dB(A) $L_{av\ max}$ 15min	Complies	Acoustic Treatments / Comments
Internal Demolition /Fit-out	Potentially worst affected residential receiver	32	36	Yes	No acoustic treatments required providing the façade is closed

8.2 SAMPLE NOISE CALCULATIONS

In addition to the noise prediction detailed in the section above, a sample calculation is presented below.

The sample calculation presents the potentially worst case scenario – noise from the loudest typical work activity, located in the worst possible location (Level 1 female amenities in on the northern façade) is assessed at the nearest noise sensitive receiver.

1. Sound power (Angle Grinder in Level 1 north female amenities): 114 dB(A)
2. Correction – Noise absorption within worksite: -14 dB
3. Correction – 25 m^2 glazed area of shop front: 8 dB
4. Transmission loss of glazed shop front of worksite (6mm float): -33 dB
5. Distance Correction (approximately 50 m): -43 dB

Resultant Noise level at residential receiver façade: 32 dB(A)

Predicted noise emission of the loudest typical activity complies with the noise emission goal of 36 dB(A).

9 NOISE AND VIBRATION CONTROL METHODS

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

9.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers, ripping and/or milling machines lower levels of noise will result.

9.2 ACOUSTIC BARRIER

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be achieved. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

9.3 MATERIAL HANDLING

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

9.4 SILENCING DEVICES

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

9.5 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. A noise plan will be developed for this project outlining work procedures and methods for minimising noise.

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Where practical, loading of these vehicles should occur as far as possible from any sensitive receiver.

9.6 REGULAR NOISE CHECKS OF EQUIPMENT

To determine the requirement for silencing devices on machinery it is proposed to undertake fortnightly noise check. Noise levels of all machines on site will be measured and if they are found to be higher than nominated for that equipment type, items such as mufflers and engine shrouds will be examined to ensure they are in good working order.

A record of these measurements will be kept on a form similar to that shown below (Construction Appliance Compliance Certificate).

This measure is expected to maintain noise at constant levels, and prevent any increases.

9.7 NOISE MONITORING

Noise monitoring can be undertaken to determine the effectiveness of measures which are been implemented. The results of monitoring can be used to devise further control measures in the event noise complaints can not be managed in other ways.

9.8 TIME MANAGEMENT

All construction activities will be conducted with the working hours as detailed within this report.

9.9 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

WARRINGAH MALL

Construction Appliance Compliance Certificate

Month .....

Year .....

Plant Item .....

Group .....

Allowable Noise Level .....

Measured Noise Level .....

Complies Yes ☐ No ☐

Issuing Engineer .....

Sub-Contractor .....

Project Manager .....

10 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

This section details steps which are to be taken to establish communication with the affected receivers and procedures to follow in the event of a complaint.

10.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continual communication is required between all parties which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and options available.
- Identify group concerns generated by the project, so that they can be addressed.
- Ensure that concerned individuals or groups are aware of and have access to the Complaints Register which will be used to address any construction noise related problems should they arise.

To ensure that this process is effective, regular scheduled meetings will be required for a finite period, until all issues have been addressed and the evidence of successful implementation is embraced by all parties.

An additional step in this process is to produce a newsletter informing the groups of the progress of the works and the upcoming construction activities.

10.2 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedences and identify the required changes to work practices. In the case of an exceedence of the vibration limits all work potentially producing vibration shall cease until the exceedence is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedences are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Required remedial action, if required.
- Validation of the remedial action.
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable, noise measurements at the affected receiver, an investigation of the activities occurring at the time of the incident, inspection of the activity to determine whether any undue noise is being emitted by equipment, and whether work practices being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified at soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed the additional training and counselling of employees should be carried out.

The results of any corrective actions arising from a complaint shall be validated by measurement or other method where applicable.

11 STAFF TRAINING

Responsibilities and reporting requirements of all members of management and staff responsible for the implementation of each element of the plan shall be defined.

Training to introduce the Noise Management Plan and explain details of noise sources, noise level targets, personnel roles and responsibilities, communication and complaint handling procedures shall be undertaken for all relevant employees upon commencement.

12 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Noise and vibration monitoring may either consist of manned and/or unmanned measurements.

Monitoring can be conducted by Acoustic Logic if necessary during the excavation and construction phase of the project. In the event complaints are received and a noise investigation is required from neighbours the following process will be followed:

1. Determine the validity of the complaint
2. Determining the offending plant/equipment/process
3. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
4. Implementing additional acoustic treatment in the form of localised barriers, silencers etc
5. Selecting alternative equipment/processes

In the event that monitoring indicates exceedences of the noise/vibration limits immediate action in accordance with chart 1 should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with.

12.1 REPORTING REQUIREMENTS

The following shall be kept on site by the contractor.

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in section 9.2.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedences occurring including, the actions taken and results of follow up monitoring with the outcomes recorded.

13 SITE SPECIFIC MANAGEMENTS

To ensure compliance with the noise levels criteria detailed in this report the following site specific management controls are recommended to be adopted as part of the proposed works:

1. All material deliveries and removals to be conducted within the normal hours of work of 7am to 7pm Monday to Friday and 7am to 5pm Saturdays.

2. All internal strip out can be conducted without additional acoustic treatments and management controls during the proposed working hours.

3. During the excavation and demolition phases of the project high noise generating activities including hammering, saw cutting and the like are to be conducted at a maximum distance away from the south and east of the site for maximum distance to the residential receivers between 5pm and 10pm Monday to Friday and 1pm and 5pm Saturdays.

4. Any specific activities required to be conducted outside of the proposed working hours will be applied for as an additional special working application.

5. Proposed concrete finishing works are to be limited to the following:

    a. Concrete pumping to be completed no later than 7pm.

    b. Finishing of concreting such as helicopters, concrete vibrating and the like to be completed no later than midnight.

6. All proposed internal fioutout and installations can be conducted without additional acoustic treatments and controls once the external façade has been installed.

14 DISCUSSION

As a result of the proposed extended hour's period and the works which will be able to be conducted during these times, the required overall period for the construction phase will be reduced. The result of this reduce construction period will hence reduce the impact on the surrounding receivers and minimise any potential impacts resulting from construction activities.

15 CONCLUSION

A noise and vibration management plan has been developed for the Warringah Mall development that will be used to manage impacts from demolition, excavation and construction activities to comply with the broad objectives the Australian Standard 2436-2010" Guide to Noise Control on Construction, Maintenance and Demolition Sites".

The Management Plan proposes controls and safeguards. The objective of these controls is to ensure that all work is carried out in a highly controlled manner that will minimise impacts on the nearby residential and commercial receivers.

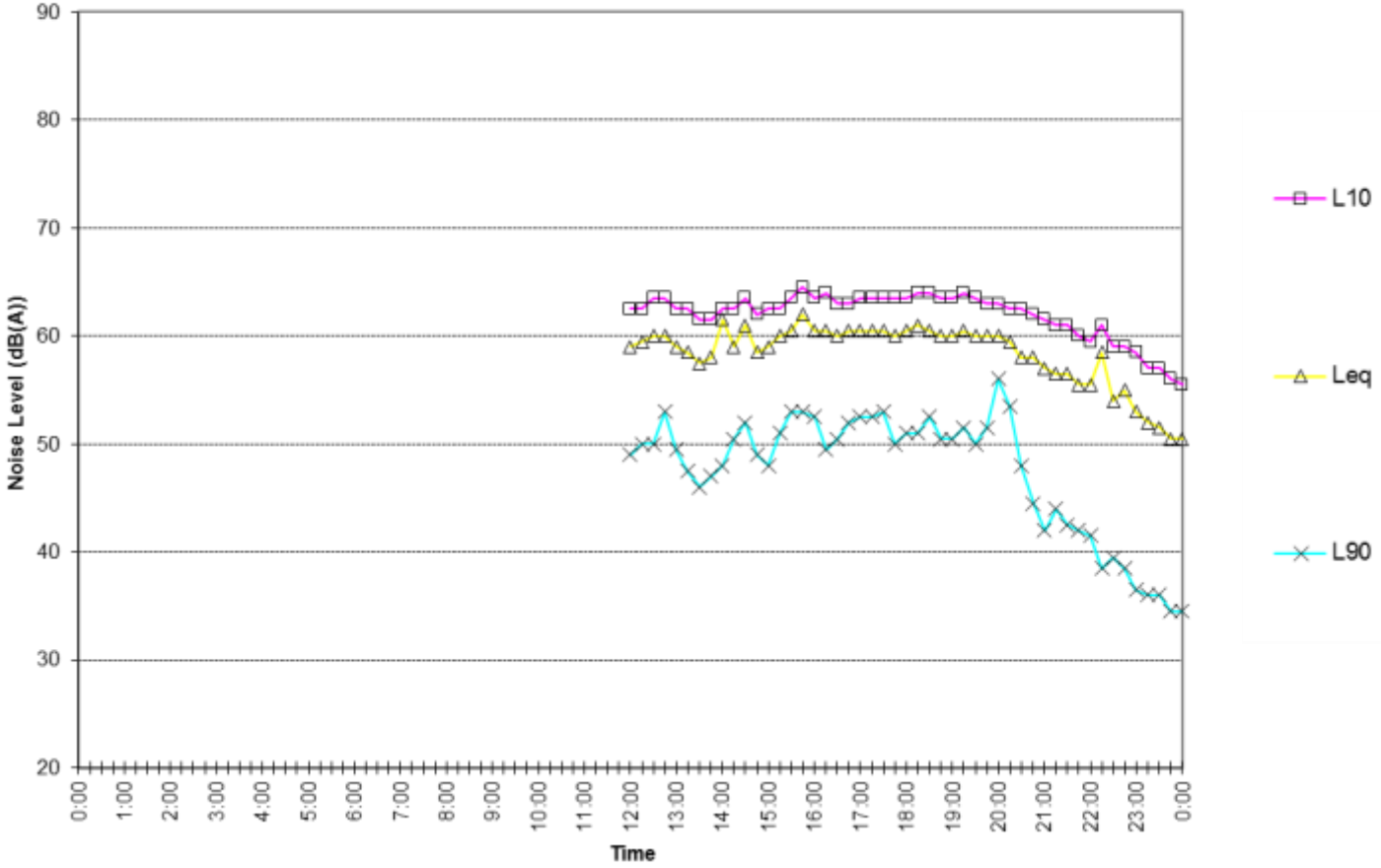
Prepared by

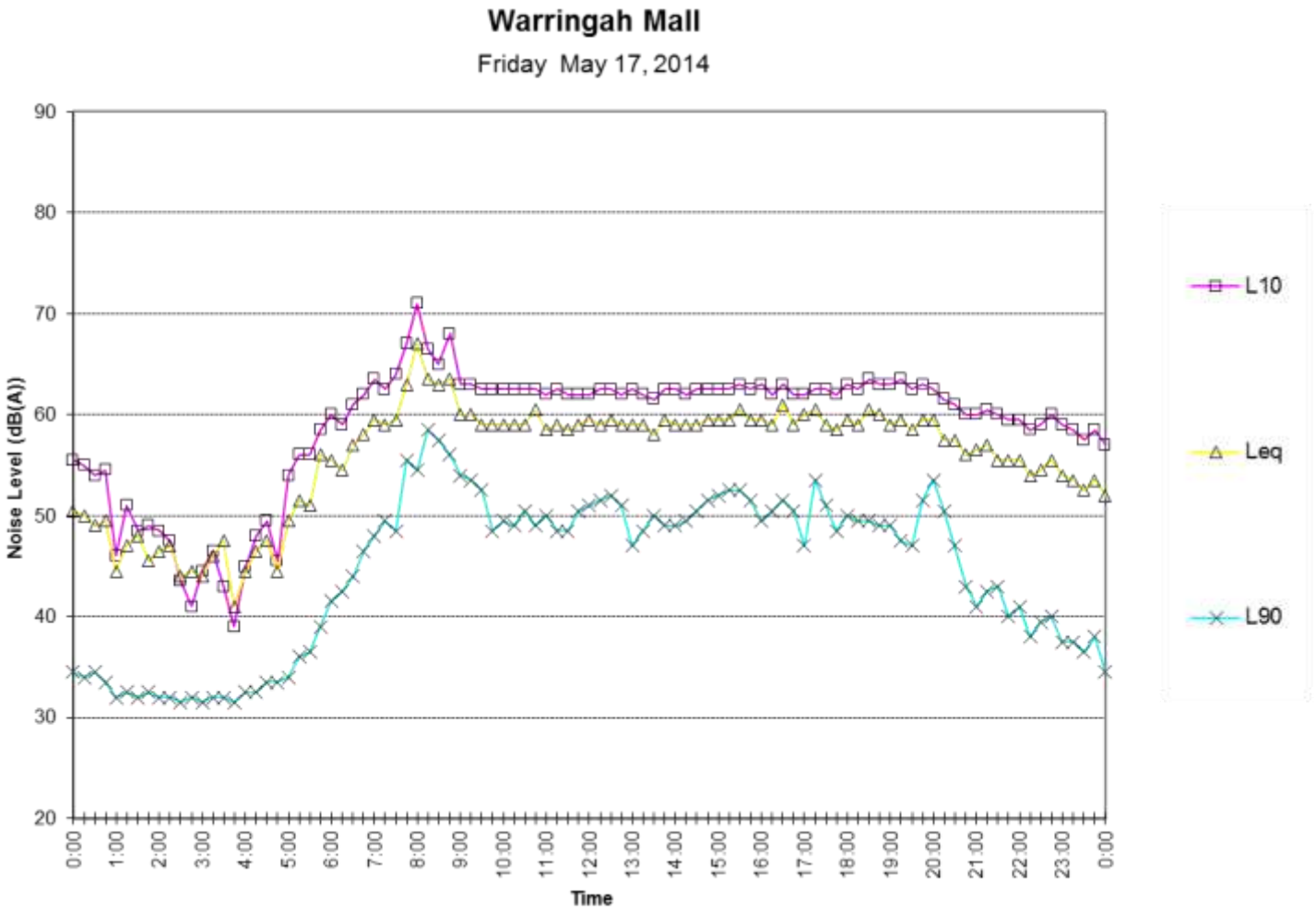
ACOUSTIC LOGIC CONSULTANCY PTY LTD
Ben White

APPENDIX 1: NOISE LOGGING DATA

Warringah Mall

Thursday May 16, 2014




Warringah Mall
Friday May 17, 2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
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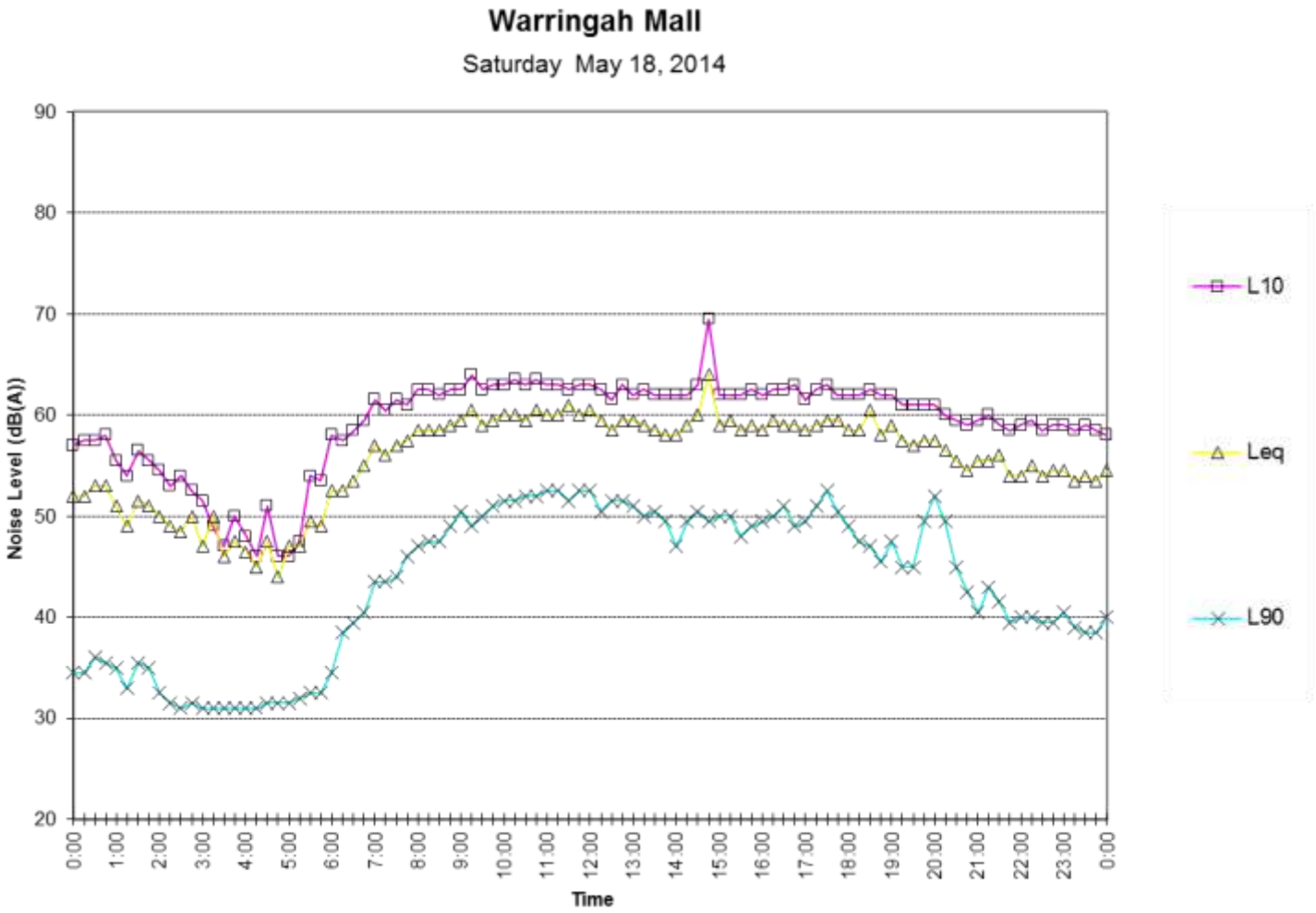
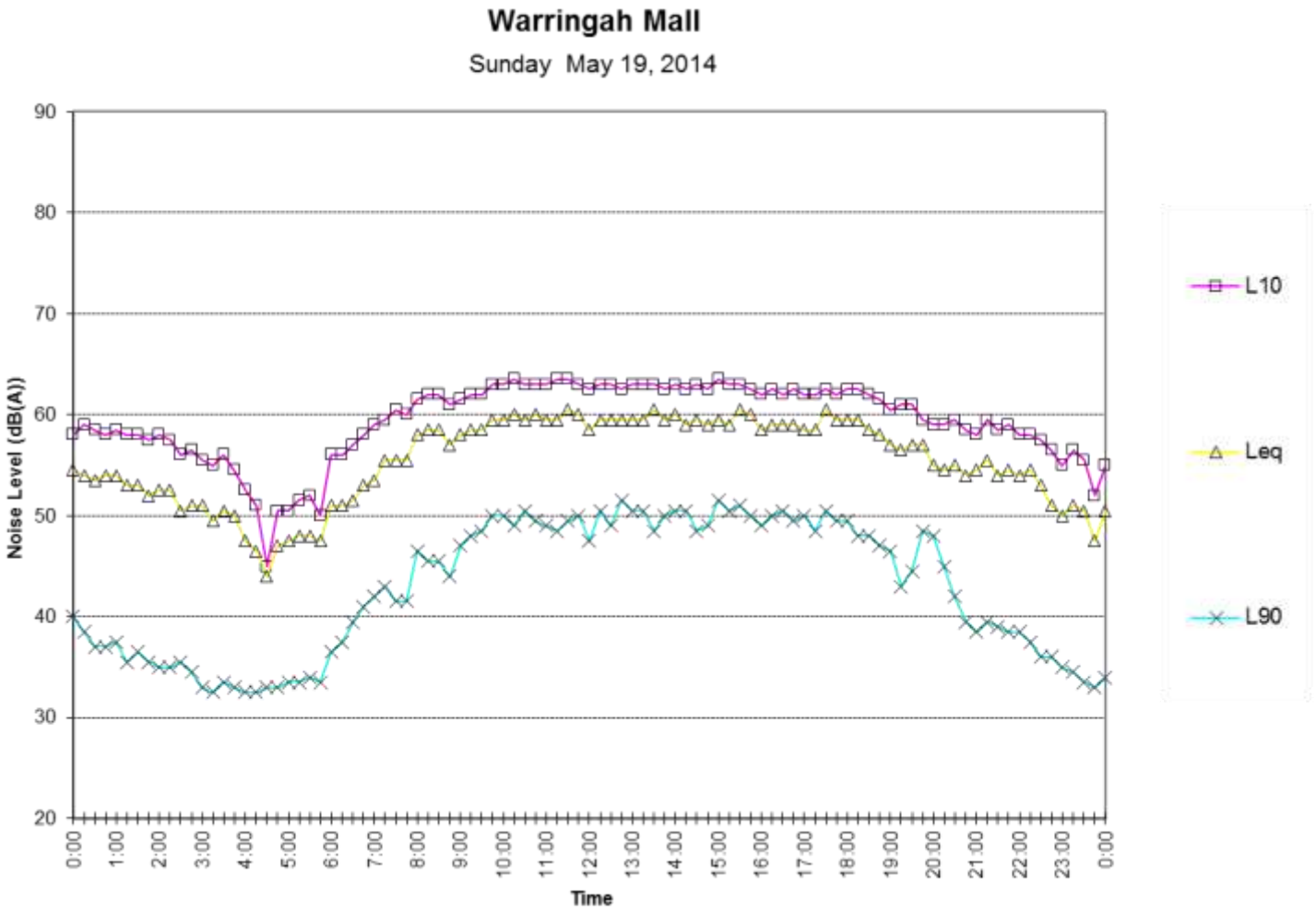
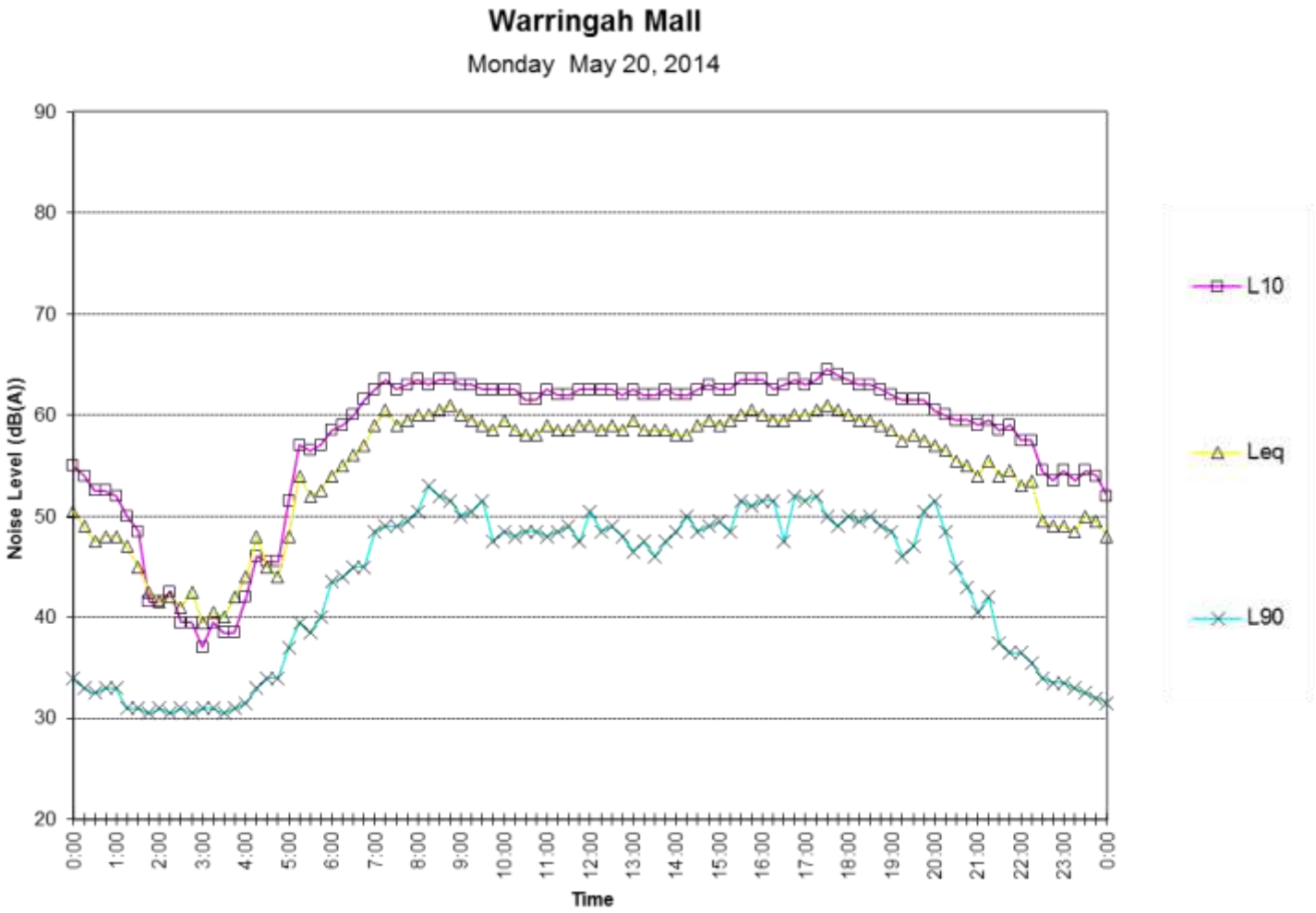
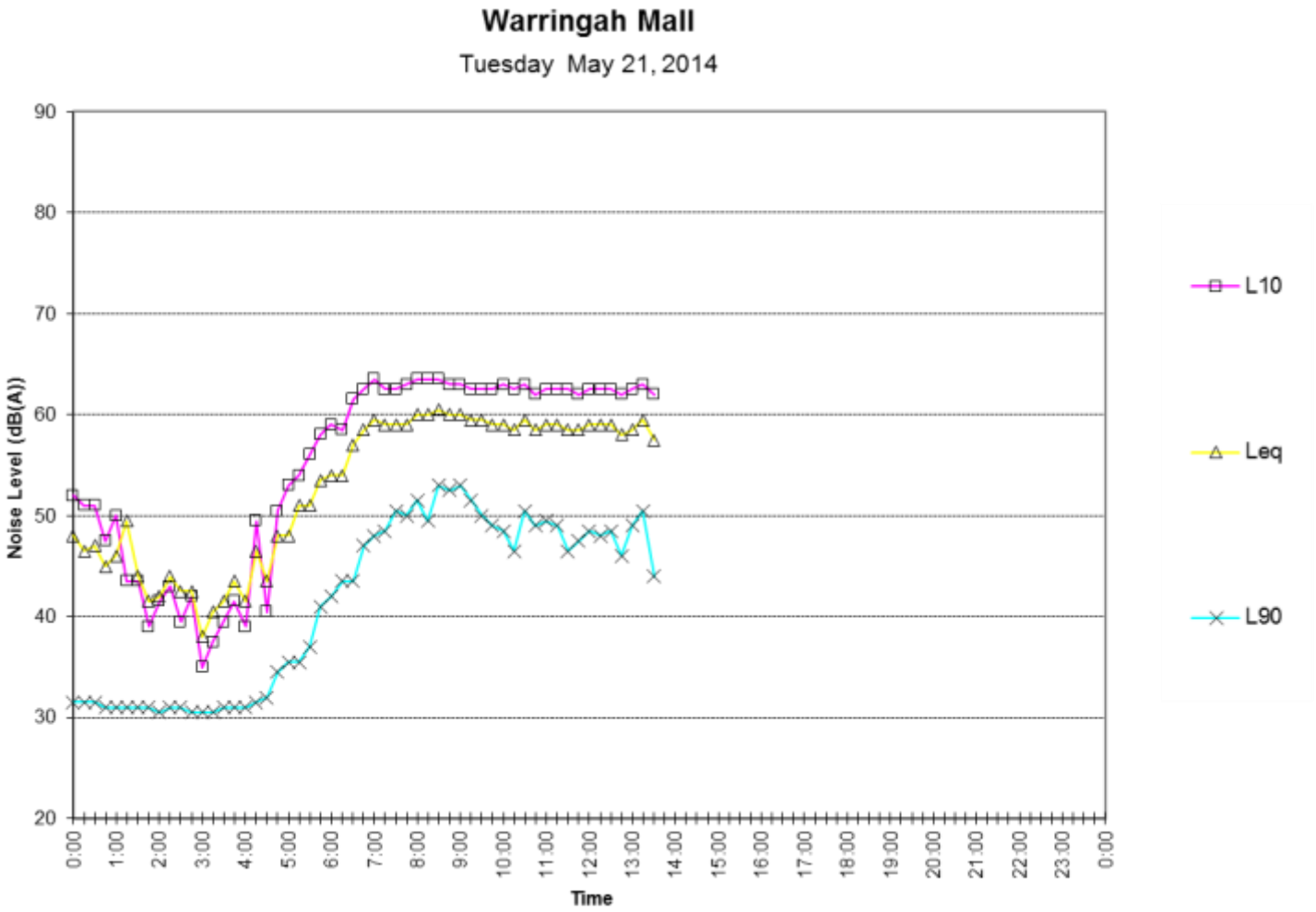

Warringah Mall
Saturday May 18, 2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90


Warringah Mall
Sunday May 19, 2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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
0:00
Time
L10
Leq
L90


Warringah Mall
Monday May 20, 2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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
0:00
Time
L10
Leq
L90


Warringah Mall
Tuesday May 21, 2014
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
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
0:00
Time
L10
Leq
L90