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Construction Noise Vibration Management Plan

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DOCUMENT CONTROL REGISTER

Project Number	20160872.2
Project Name	134-144 Pitt Street, Redfern
Document Title	Construction Noise Vibration Management Plan
Document Reference	20160872.2/0911A/R0/MF
Issue Type	Email
Attention To	Kaymet Corporation Pty Limited

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	9/11/2016	20160872.2/0911A/R0/MF	MF		BW

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1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to prepare a noise and vibration management plan for the proposed development at 134-144 Pitt Street, Redfern.

This report has been prepared to address the requirements of the following documents;

- NSW Environment Protection Agency document *"Interim Construction Noise Guideline".*
- NSW Environment Protection Agency document *"Assessing Vibration: A Technical Guideline".*
- Australian Standard AS2436:1981 *"Guide to Noise Control on Construction, Maintenance and Demolition Sites".*
- German Standard DIN 4150-3 *"Structural Vibrations: Effects of Vibration on Structures"*.

This document presents a discussion of the processes which will be followed in order to manage noise and vibration from the proposed works.

The principal issues, which will be addressed in this report, are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Identify likely sources of noise generation and predicted noise levels at nearby development.
- Formulation of a strategy for construction to comply with the standards identified in the above point.

2 SITE DESCRIPTION

The project site is located at 134-144 Pitt Street, Redfern. It is proposed to demolish the existing one and two storey residential buildings located on the site. Once these buildings are demolished construction three new residential buildings with two levels of basement parking.

The nearest noise and vibration receivers around project site are as follows:

- **Receiver 1:** bounding the site to the north is 64 Pitt Street, a two storey residential dwelling
- **Receiver 2:** bounding the site to the south is 74 Pitt Street, a two storey residential dwelling
- **Receiver 3:** to the west of the site, adjacent to Order Place, is 93 William Street, a two storey residential dwelling

Primary noise producing construction activities (and estimated duration) associated with the site has been summarised below:

- Demolition works – 3 Months.
- Archaeological Dig/Bulk Excavation – 4 Months.
- Erection of Structure – 5 Months.
- Remaining Construction – 10 Months.

It is proposed that drill piling will be undertaken at the project site.

As an approval has not been granted and no details regarding the hours of construction work are available, Acoustic Logic have assumed that typical construction hours referenced in the EPA Interim Construction Noise Guideline of 7am to 6pm Monday to Friday and 8am to 1pm on Saturday with no construction to take place on Sundays and Public Holidays.

For a detail aerial site photo for locations of all surrounding receivers and measurement locations see figure 1 below.

Proposed Site

Unattended Noise Monitor

Residential Receiver

Figure 1: Site Survey and Monitoring Positions
Sourced from SixMaps NSW

3 NOISE DESCRIPTORS

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.

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.

4 BACKGROUND NOISE MEASUREMENT

Background noise levels at the site have been measured based on the unattended noise logging undertaken by this office. Measured background noise levels are presented below. Refer to Appendix 1 for unattended noise monitoring data.

The measured background noise levels have been analysed for meteorological conditions (excessive wind and/or rain), as required by Section 3.4 of the EPA Industrial Noise Policy. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels. These areas are also highlighted in the logging data in Appendix 1.

Noise monitoring has been undertaken from 17th June 2016 to 24th June 2015. For detailed location refer to Figure 1. Detailed results have been summarised below.

Table 5 - Measured Rating Background Noise Levels

Location	Background noise level dB(A)L_{90}	
	(7am-6pm) (Weekdays)	(8am-1pm) (Saturday)
134-144 Pitt Street, Redfern	45	44

5 NOISE AND VIBRATION OBJECTIVES

5.1 NOISE

5.1.1 Department of Envonmental & Climite Change NSW – Interim Construction Noise Guideline

Interim Construction Noise Guideline section 4.1 Airborne noise explains that noise from construction works at residential properties should comply with the following recommendations.

In Table 2 the rating background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the *NSW Industrial Noise Policy* (EPA 2000).

As a guide, the difference between the internal noise level and the external noise level is typically 10 dB with windows open for adequate ventilation.

Table 2: Noise at residences using quantitative assessment

Time of day	Management level $L_{Aeq\ (15\ min)}$ *	
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • 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 meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

5.1.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site"

Noise emissions to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established.

- That 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.

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

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- If noise levels exceed "background + 10 dB(A)" noise goal at sensitive receiver locations, investigate and implement all practical and cost effective techniques to limit noise emissions. A background + 10 dB(A) criterion has been applied because, due to the size of the whole site, impacts at any one sensitive receiver are unlikely to occur for a greater period than 6 months.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions investigate management and other techniques to mitigate noise emissions.

5.2 VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation criteria presented in the British Standard BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment

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

5.2.1 Structure Borne Vibrations

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 1 - 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

5.2.2 Assessing Amenity

The Environmental Protection Authority "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This 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 regulate vibration within the construction site

Table 2 - EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	**Time**	**Preferred**	**Maximum**	**Preferred**	**Maximum**	**Preferred**	**Maximum**
Continuous Vibration							
Residences	**Daytime**	0.01	0.02	0.2	0.4	0.28	0.56
Impulsive Vibration							
Residences	**Daytime**	0.3	0.6	6.0	12.0	8.6	17.0

6 PROPOSED PROGRAMME & ASSOSCIATED NOISE SOURCES

The following sections detail the proposed programme for all stages of the development.

6.1 DEMOLITION (3 MONTHS)

The proposed noise producing activities include;

- Demolition carried out using a 12 tonne excavator where required.
- Materials will be removed from the site using trucks during approved hours from NSW Department of Planning.

6.2 ARCHAEOLOGICAL DIG/BULK EXCAVATION (4 MONTHS)

- It is anticipated that archaeological dig and bulk excavation will be detailed and be done predominantly in clay.
- The majority of excavation work will be done using a 12 tonne excavator.

6.3 ERECTION OF STRUCTURE (5 MONTHS)

- This involves the construction of new building structure.
- The processes involved in this activity include delivery of materials, erection of the building, the use of concrete pumps and internal works.

6.4 EXTERNAL FINISHES WORKS

This involves installation primarily of façade glazing and brickwork to the exterior of the building. This work will be implemented once the building structure is complete and formwork has been removed.

7 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

Noise impact will be determined from primary processes and equipment. The sound power levels of these activities is presented below.

Table 3 - Sound Power Levels of the Proposed Equipment

EQUIPMENT /PROCESS	SOUND POWER LEVEL dB(A)
Demolition, Excavation, Piling	
12t Truck	108
Excavator with Pneumatic Hammer	114
Excavator	110
Impact drill	105
Angle grinders	114
Electric Saw	111
CFA Piling	107
Concrete Pump	109
Construction	
12t Truck	108
Concrete Pump	109
Drilling	105
Mobile Crane	106
Angle grinders	114

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

- On-site measurements
- Table A1 of Australian Standard 2436-2010
- Data held by this office from other similar studies.

8 ASSESSMENT OF POTENTIAL NOISE EMISSIONS

The noise emission to the nearest receiver has been predicted based on the noise data above and recommended noise control in Section 10. For detailed predictions see the following tables.

Construction Phase	Construction Plant	Plant Noise Level dB	Receiver Location	Predicted Noise Range dB(A) Leq		Noise Criteria dB(A) L90	Exceedance		Management Conditions
						BG+10	8am-6pm		
Demolition and Excavation	Hammering	120	Receiver 1	65	56	58	7	-2	See Sections 9, 10, 11 and 12
			Receiver 2	65	56	58	7	-2	
			Receiver 3	66	56	58	8	-2	
			Receiver 4	66	56	58	8	-2	
	Concrete Sawing	115	Receiver 1	60	51	58	2	-7	
			Receiver 2	60	51	58	2	-7	
			Receiver 3	61	51	58	3	-7	
			Receiver 4	61	51	58	3	-7	
	Excavator	114	Receiver 1	59	50	58	1	-8	
			Receiver 2	59	50	58	1	-8	
			Receiver 3	60	50	58	2	-8	
			Receiver 4	60	50	58	2	-8	
	Concrete Trucks	107	Receiver 1	52	43	58	-6	-15	
			Receiver 2	52	43	58	-6	-15	
			Receiver 3	53	43	58	-5	-15	
			Receiver 4	53	43	58	-5	-15	
	Trucks	100	Receiver 1	45	36	58	-13	-22	
			Receiver 2	45	36	58	-13	-22	
			Receiver 3	46	36	58	-12	-22	
			Receiver 4	46	36	58	-12	-22	

Construction Phase	Construction Plant	Plant Noise Level dB	Receiver Location	Predicted Noise Range dB(A) Leq		Noise Criteria dB(A) L90	Exceedance		Management Conditions
						BG+10	8am-6pm		
Construction and Fitout	Hammering	120	Receiver 1	65	56	58	7	-2	See Sections 9, 10, 11 and 12
			Receiver 2	65	56	58	7	-2	
			Receiver 3	66	56	58	8	-2	
			Receiver 4	66	56	58	8	-2	
	Angle Grinders	114	Receiver 1	59	50	58	1	-8	
			Receiver 2	59	50	58	1	-8	
			Receiver 3	60	50	58	2	-8	
			Receiver 4	60	50	58	2	-8	
	Impact Drill	110	Receiver 1	55	46	58	-3	-12	
			Receiver 2	55	46	58	-3	-12	
			Receiver 3	56	46	58	-2	-12	
			Receiver 4	56	46	58	-2	-12	
	Cement Pump	107	Receiver 1	52	43	58	-6	-15	
			Receiver 2	52	43	58	-6	-15	
			Receiver 3	53	43	58	-5	-15	
			Receiver 4	53	43	58	-5	-15	
	Trucks	100	Receiver 1	45	36	58	-13	-22	
			Receiver 2	45	36	58	-13	-22	
			Receiver 3	46	36	58	-12	-22	
			Receiver 4	46	36	58	-12	-22	

9 AMELIORATIVE MEASURES

9.1 SITE SPECIFIC RECOMMENDATIONS

Site specific recommendations as follows:

9.1.1 Potential Vibration and Structure Borne Noise Impacts

- Noise from construction works impacting residential receivers will be generally mitigated by the perimeter fence or external facade of the building.

9.1.2 Rock Breaking and Sawing

Hammering will typically produce the loudest noise levels emanating from the site and have the highest potential for noise impacts on surrounding receivers. On this basis, it is recommended that surrounding receivers are consulted on the processes of the demolition phase (particularly rock breaking). Management processes will include:

- Loud activities (such as rock breaking) should be typically undertaken within hours which would be mutually agreeable. For example;
    - Due to the proximity of the adjacent receivers, scheduling of activities will be the most feasible means to mitigate noise impacts. It is recommended that high noise impact works such as hammering, hydraulic hammering and piling be restricted to the hours of
        - 08.00am – 12.00pm and 1.00pm – 5.00pm Monday to Friday;
        - 09.00am – 12.00pm Saturdays

        Equipment set up prior to this time is acceptable.
    - Demolition and excavation contractor will be responsible for the demolition of the existing structure located on site. As the demolition contractor, they are responsible for the management and implantation of all noise mitigation measurements including respite periods.
    - Conduct load out of demolished materials whilst undertaking detailed demolition.
    - Repeat the process.
    - This process would provide respite periods between heavy demolition activities.
- Substituting rock breaking during excavation for alternative measures such as milling or ripping where possible. Refer to Section 11.1.
- Sawing and then lifting (where practical). It should be noted that sawing will also produce high noise levels, but will be typically less in duration.
- All transient plant should be selected to be wheeled (rubber wheels) not tracked where practical.
- All plant/equipment shall be maintained as per noise control methods and procedures outlined in this report.
- Any significant acoustic treatment of breaking, sawing and excavation works is not feasible – surrounding developments are multi-storey, negating any benefit that could be provided by noise screens. Accordingly, these activities should be managed so as to reduce noise impacts, as is consistent with AS2436 when strict compliance with noise emission goals is

not achievable. We therefore recommend that rock breaking and sawing works are scheduled to minimise impacts on surrounding sensitive receivers. It should be noted that the hoarding surrounding the site will generally provide some shielding of construction noise to the general public (ie. at lower heights).

9.1.3 Excavator Noise

Excavators will be typically used for long periods of time during the demolition and excavation periods. For the most part, excavators will only be in a slight exceedance of the criteria unless in close proximity to receivers (ie. up to boundaries).

Where prolonged excavator use is necessary, excavators could be moved to another part of the site to offer the receiver closest to the excavator some respite. Where practical and feasible, by moving the excavator from working on one part of the site to the opposite side of the site can provide up to a 10dB(A) reduction in noise levels impacting receiver locations.

9.1.4 Vehicle Noise

Vehicle noise will be generally low impact in this instance. Notwithstanding, best practice techniques which will minimise noise include the following:

- Trucks, trailers and concrete trucks must turn off their engines when on site to reduce impacts on adjacent land use (unless truck ignition needs to remain on during concrete pumping).

9.1.5 Respite Periods

Due to the proximity of the adjacent receivers, scheduling of activities will be the most feasible means to mitigate noise and vibration impacts. It is recommended that high noise impact works such as hammering, hydraulic hammering and piling be restricted to the hours of

- **08.00am – 12.00pm and 1.00pm – 5.00pm Monday to Friday**;**
- **09.00am – 12.00pm Saturdays****

******Equipment set up prior to this time is acceptable.

9.1.6 Other Activities

- CFA Piling is proposed to be used during the construction period of the project.
- Typically, noise from most construction activities will comply with the construction noise objectives at surrounding receiver locations. Sensitive residential receivers surrounding the site will have negligible impact from construction noise on the site during the demolition and excavation period which will typically exhibit the loudest noise levels.
- In the event of complaint, noise management techniques identified in this report should be employed to minimise the level of noise impact. This may include community consultation and scheduling of loud construction processes.
- Notwithstanding above, general management techniques and acoustic treatments are included below which may be implemented on a case-by-case basis to reduce noise emissions to surrounding receivers.

10 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

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

The flow chart presented in Figure 2 illustrates the process that will be followed in assessing construction activities.

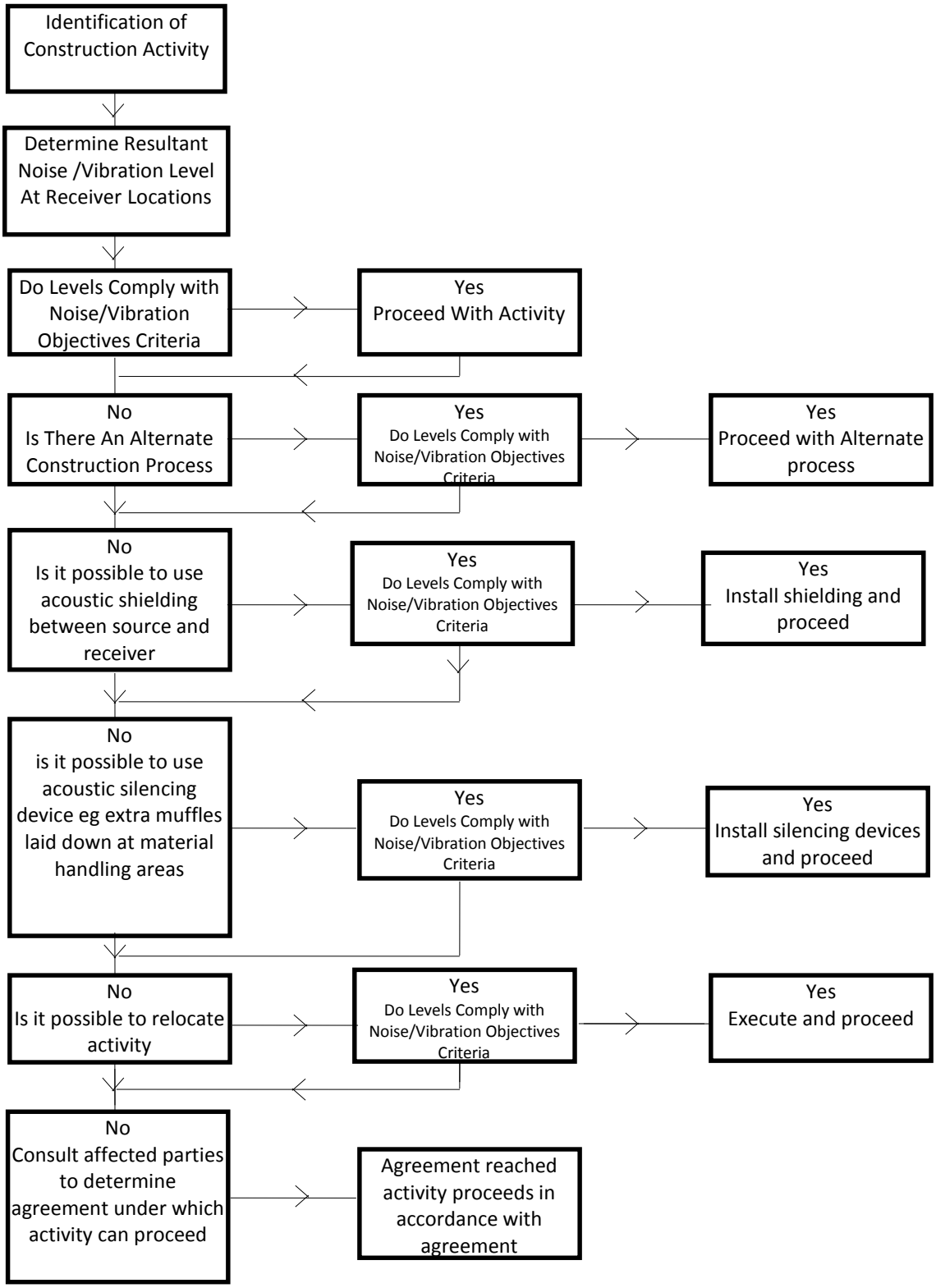


Figure 2 – Process Flowchart

11 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.

11.1 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.

It should be noted that pre-drilling, saw cutting and ripping will be incorporated in the excavation/hammering methodology of the demolition component. Based off previous experience and advice provided by the demolition contractor, additional use of drilling, sawing and ripping of masonry or concrete elements will aid in the use of hammering on site. The reduction in hammering required to break down the concrete and masonry elements will entail reduce the amount of noise and vibration levels which are been emitted from the site, affecting the surrounding neighbours.

11.2 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 however this will not beneficial in this instance due to receivers overlooking the site.

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 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(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 that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

11.3 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.

11.4 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).

11.5 TREATMENT OF SPECIFIC EQUIPMENT

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

11.6 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. It is recommended that all available and reasonable treatments and mitigation strategies presented in this report be adopted to minimise noise emissions from the excavation and construction activities on site.

11.7 NOISE AND VIBRATION MONITORING

In the event a complaint is received from the adjoining sensitive receives to the north, south and west, we recommend noise and vibration monitoring to be conducted at these boundary locations, to verify the level if impact and ensure compliance with the criteria found in Section **Error! Reference source not found.** of this report.

Monitoring and reporting procedure will be conducted as follows (if required – in the case of complaints only).

11.7.1 Equipment and Locations

11.7.1.1 Vibration Monitoring

Vibration monitoring will be conducted using Texcel ETM type monitors with externally mounted tri-axial geophones. The geophones will be located along the property boundary of the subject site; preferably mounted on the wall of receiver building.

The monitors can be programmed to transmit an SMS text or audible alarm (on site) for any measured events of vibration exceedance.

11.7.1.2 Noise Monitoring

Noise monitoring will be conducted using Acoustic Research Laboratories Pty Ltd noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the monitoring period. The noise monitor was 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 response.

11.7.2 Download and Service of Vibration and Noise Monitors

Download and service of the vibration loggers will be typically conducted every two weeks. The monitors can be connected to remotely, in the event verification of exceeded trigger events are required.

In the event multiple events of exceedances are triggered by the monitor, following verification that these events are a result of construction activities on site and not extraneous affects, data relevant to that period will be downloaded and tabulated in a graph format to be forwarded to the Project manager for review.

It is proposed that reports are provided fortnightly with any exceedance in the vibration criteria reported as detailed in this report.

11.7.3 Presentation of Noise and Vibration Logger Results

A fortnightly report will be submitted to project manager via email summarising the vibration events. Exceeding criteria events associated with the construction activities on site, shall be downloaded and reported within 24 hours. Complete results of the continuous vibration logging will be presented in fortnight reports including graphs of collected data.

11.7.4 Persons to receive alarms (Vibration)

The following personnel will receive GSM alarms:

1. Acoustic consultant/advisor (1 person).
2. Demolition/excavation site foreman.
3. Any other representative nominated by the Building Contractor.

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.

11.8 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.

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

11.9 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise and vibration impacts to surrounding receivers.

12 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

12.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continuous 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; and
- Ensure that concerned individuals or groups are aware of and have access to a Constructions Complaints Register which will be used to address any construction noise related problems should they arise.

Community consultation should be undertaken prior to works through the builder. This includes meetings and correspondence with the following affected parties:

- Residential Receiver 1 – located at 2-20 Albert Street, Redfern;
- Residential Receiver 2 –located at 129A-173 Pitt Street, Redfern;
- Residential Receiver 3 –located at 146-150 Pitt Street, Redfern;
- Residential Receiver 4 –located at 153-167 George Street and 25-27 Albert Street, Redfern.

12.2 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 exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance 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 exceedances 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; and
- 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.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as 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.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

12.3 REPORTING REQUIREMENTS

The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in this report.

2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.

3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.

4. A report detailing complaints received and actions taken shall be presented to the construction liaison committee.

12.4 CONTINGENCY PLANS

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical

13 CONCLUSION

A noise and vibration assessment has been undertaken of the proposed construction activities to identify whether these activities would impact sensitive receivers around the 134-144 Pitt Street, Redfern site.

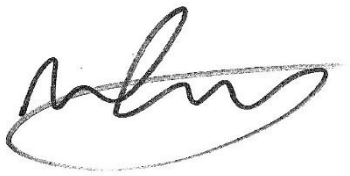
The assessment of construction noise and vibration indicates that management measures will be needed to limit noise impacts to the residential and commercial buildings adjacent to the site.

Vibration impacts are not expected to exceed allowable limits, but as a safeguard it is recommended to conduct vibration monitoring during the initial demolition and excavation phases.

Dust emission criteria have been set up in this report based on the requirements of the Environmental Protection Authority. Detailed dust mitigation methods have been recommended in this report.

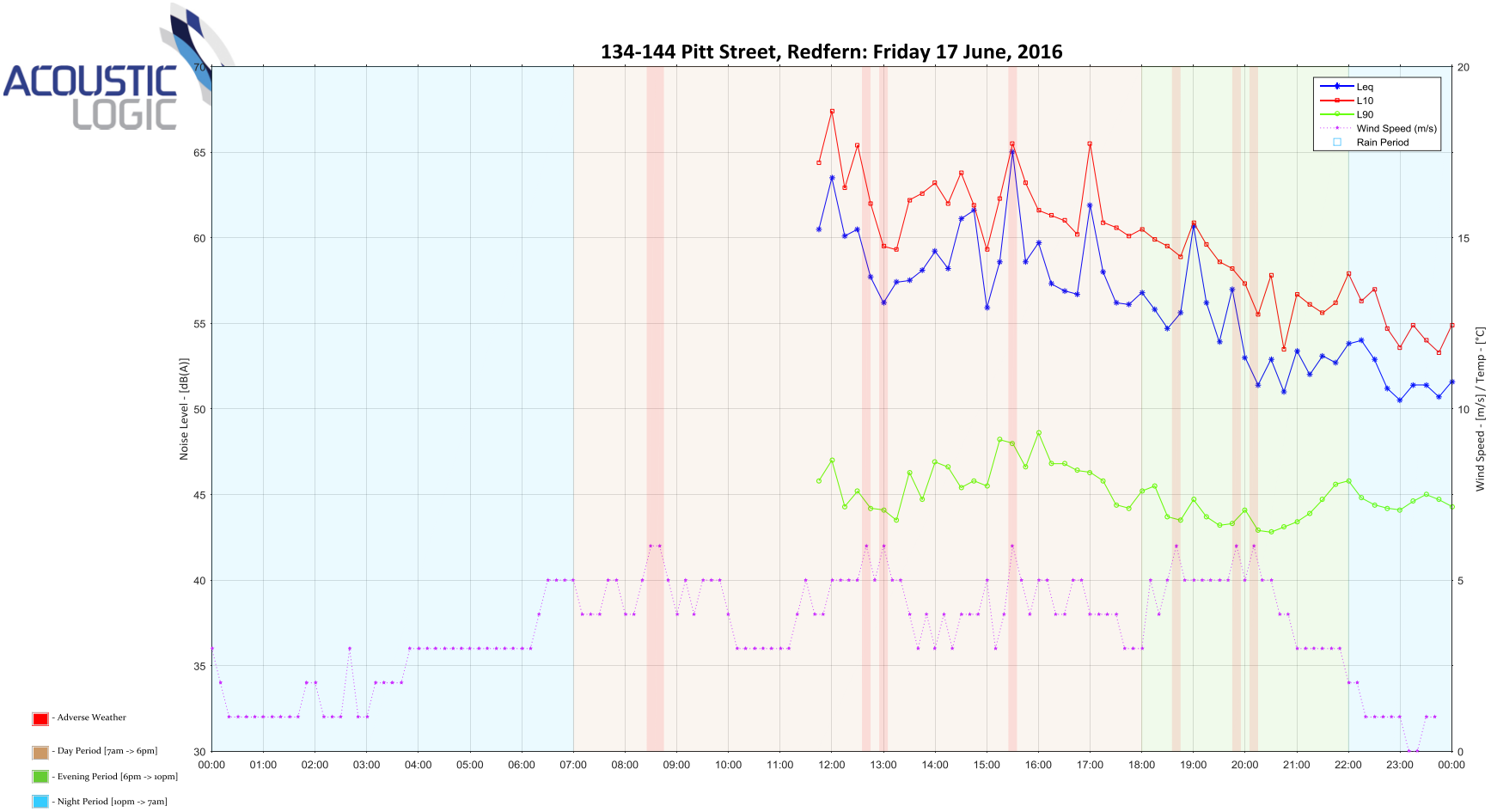
We trust this information is satisfactory. Please contact us should you have any further queries.

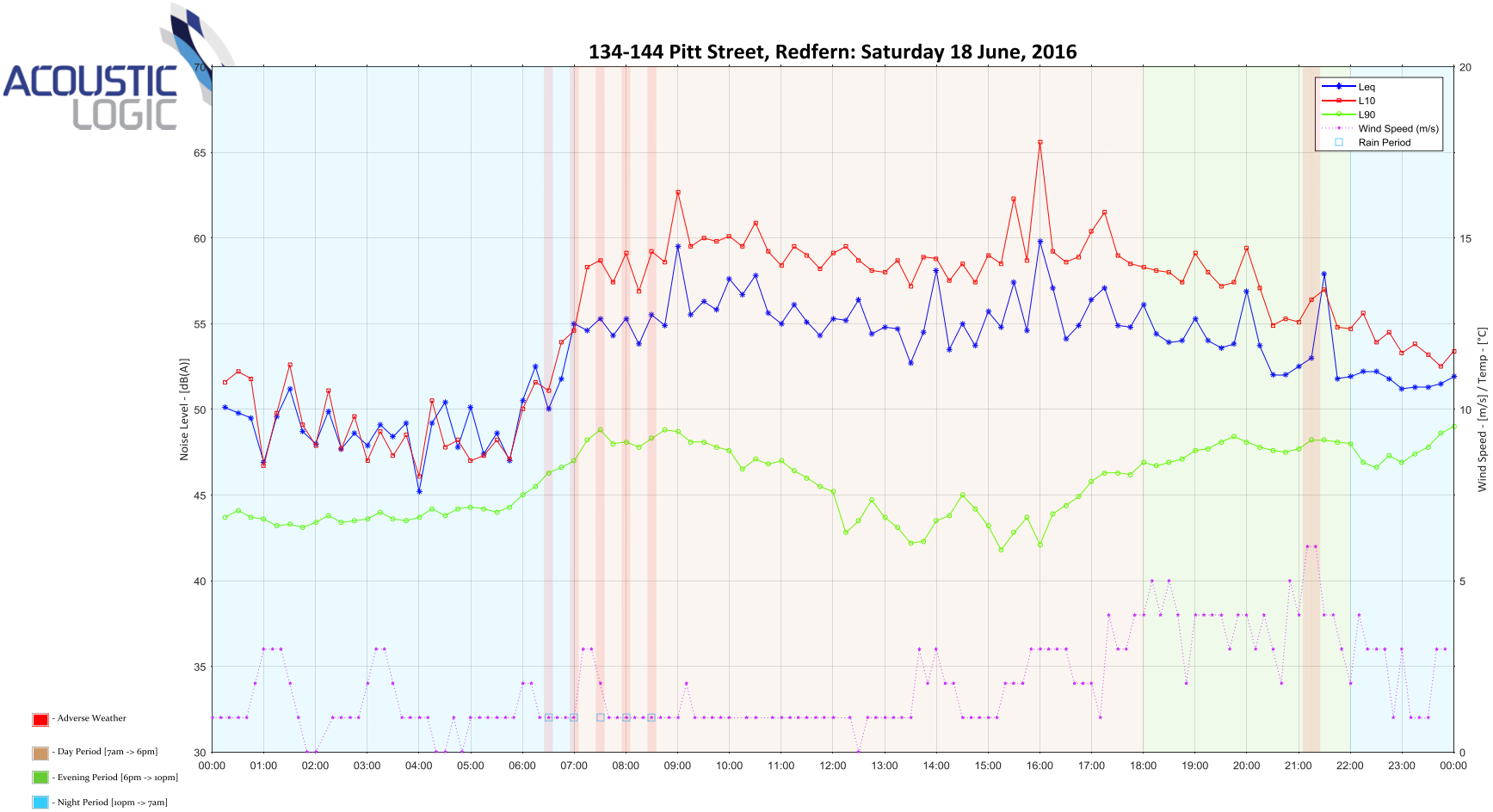
Yours faithfully,

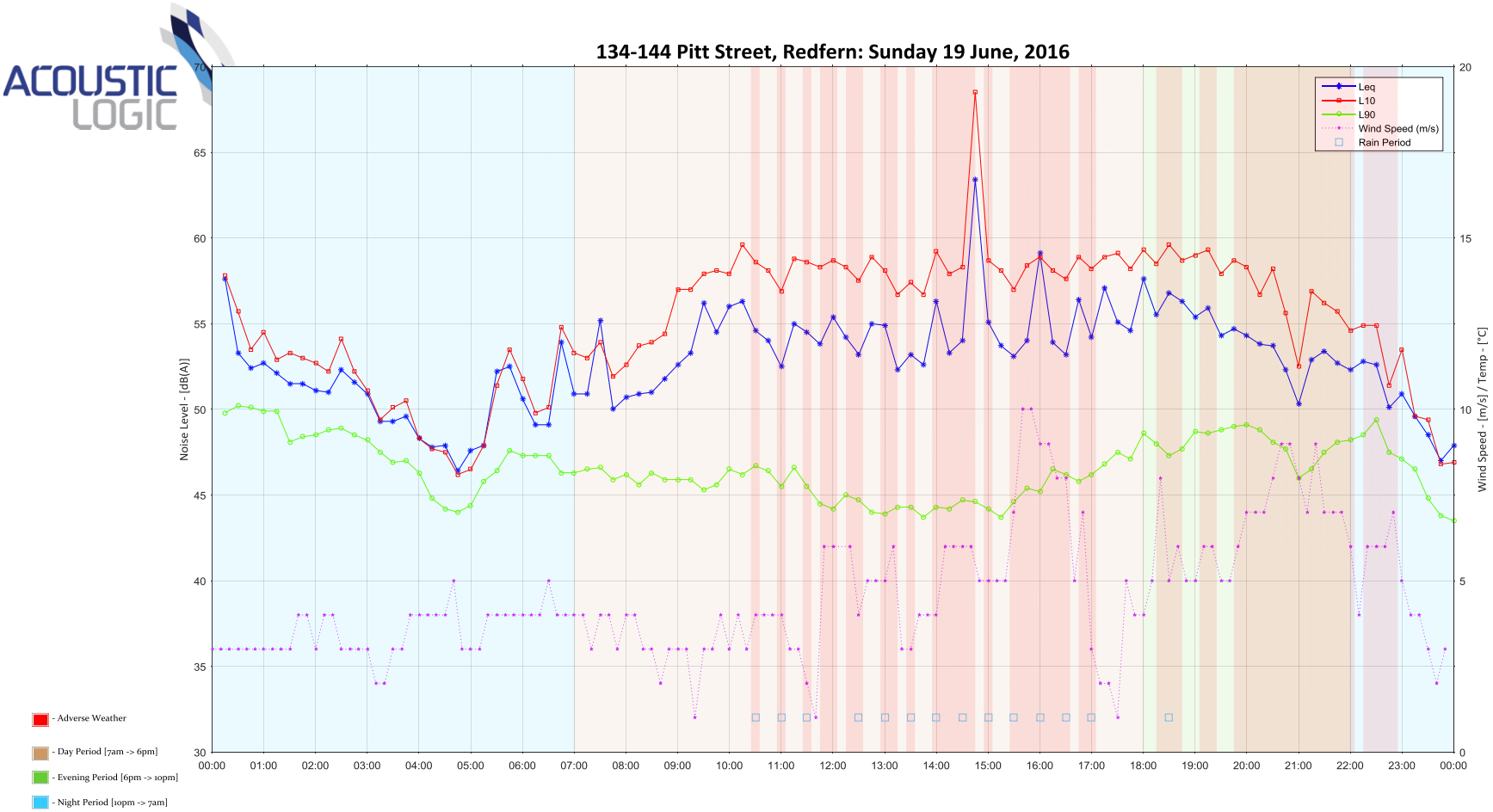


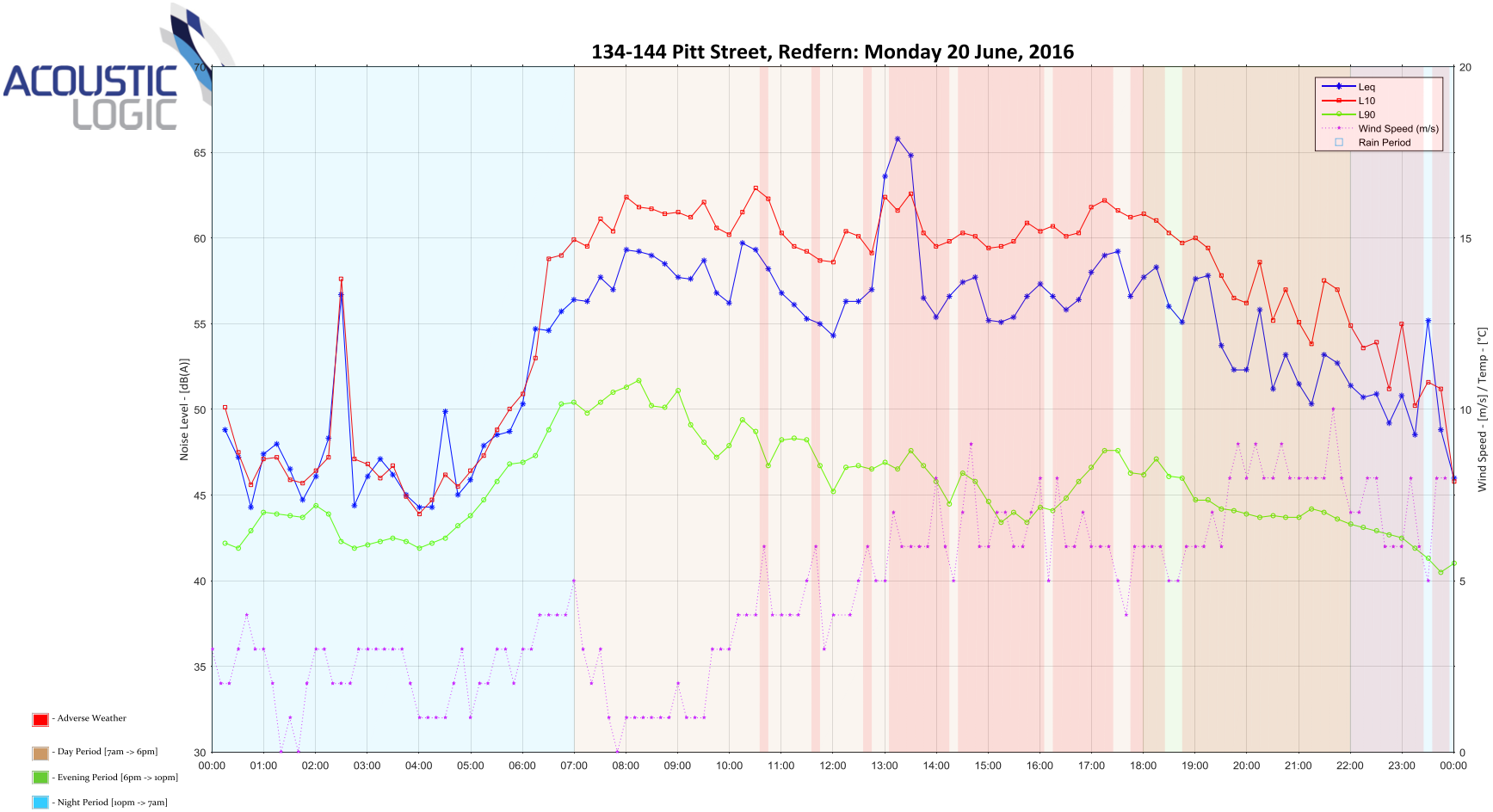
Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

APPENDIX 1 – UNATTENDED NOISE MONITORING DATA


134-144 Pitt Street, Redfern: Friday 17 June, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
70
65
60
55
50
45
40
35
30
20
15
10
5
0
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
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Saturday 18 June, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Sunday 19 June, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Monday 20 June, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
70
65
60
55
50
45
40
35
30
20
15
10
5
0
00:00
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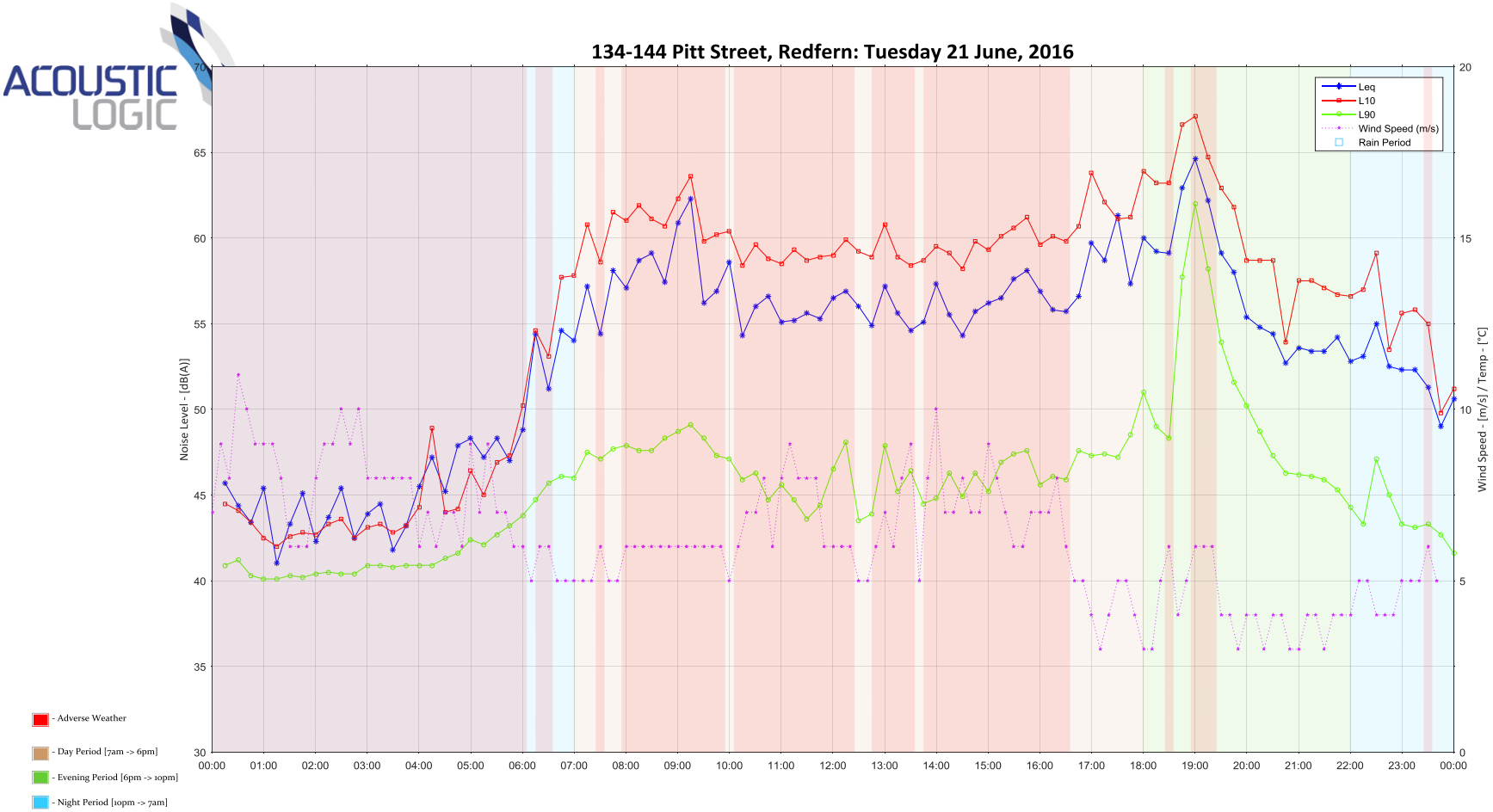
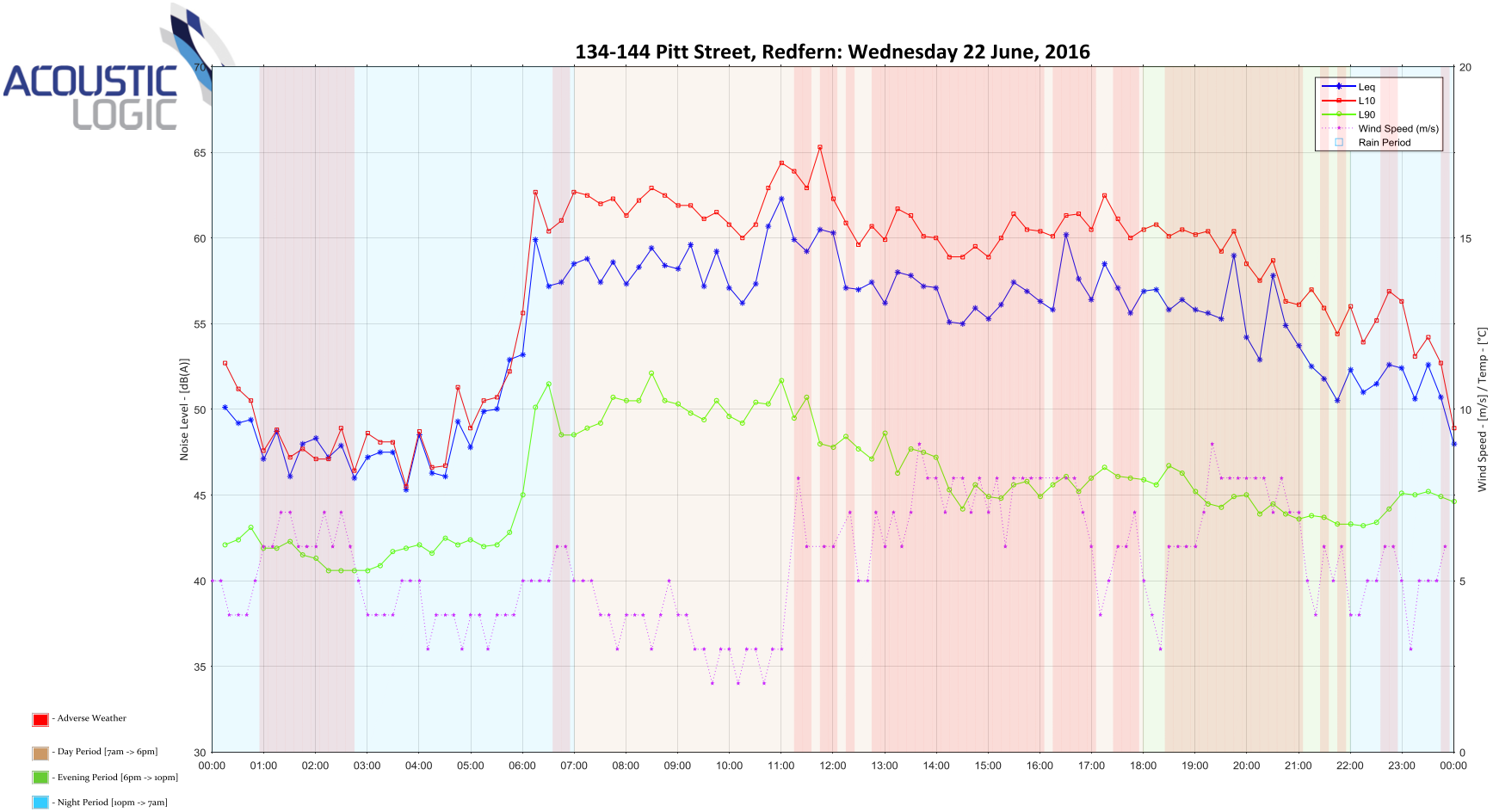
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Tuesday 21 June, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Wednesday 22 June, 2016
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
70
65
60
55
50
45
40
35
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15
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21:00
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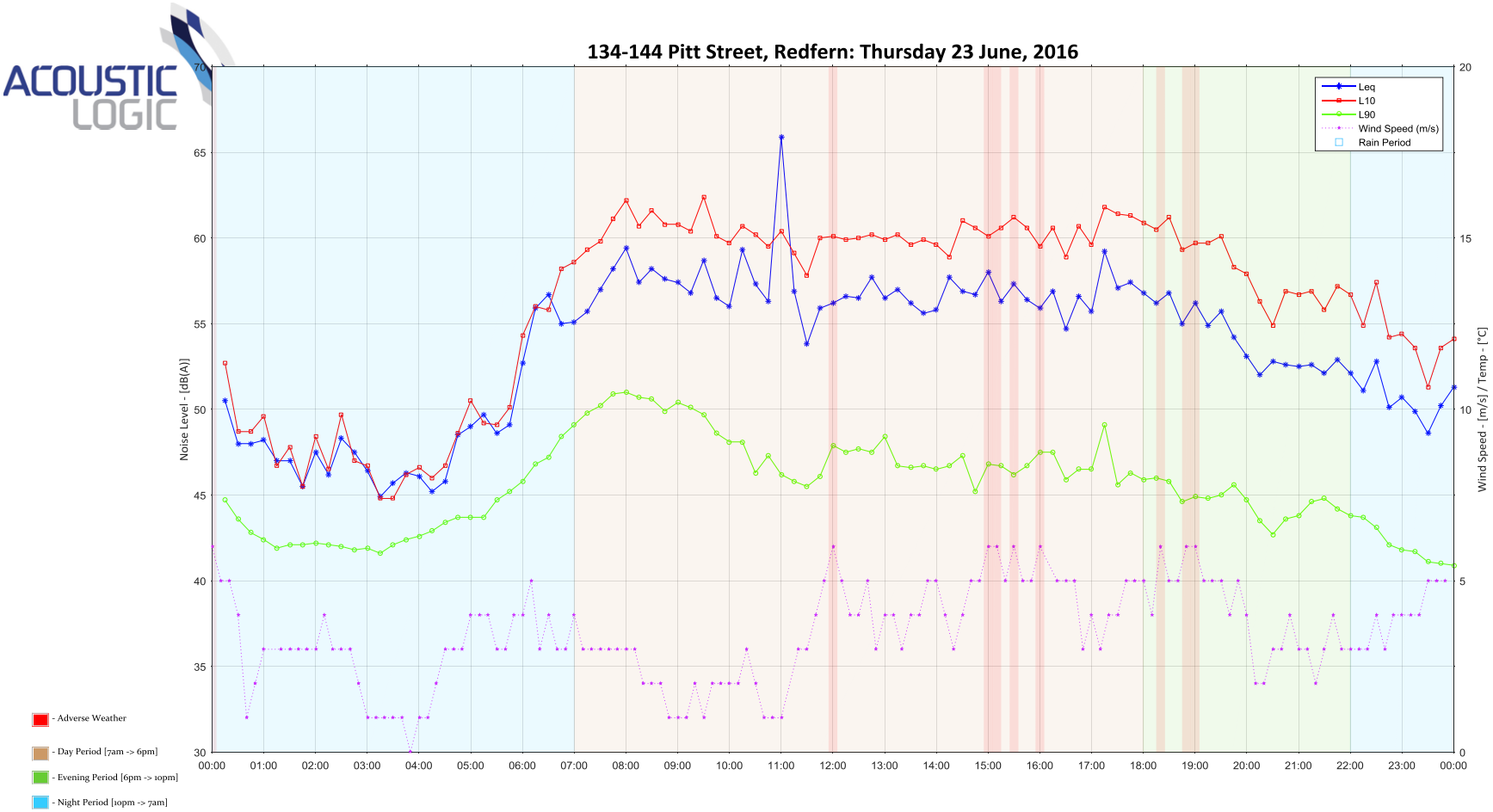
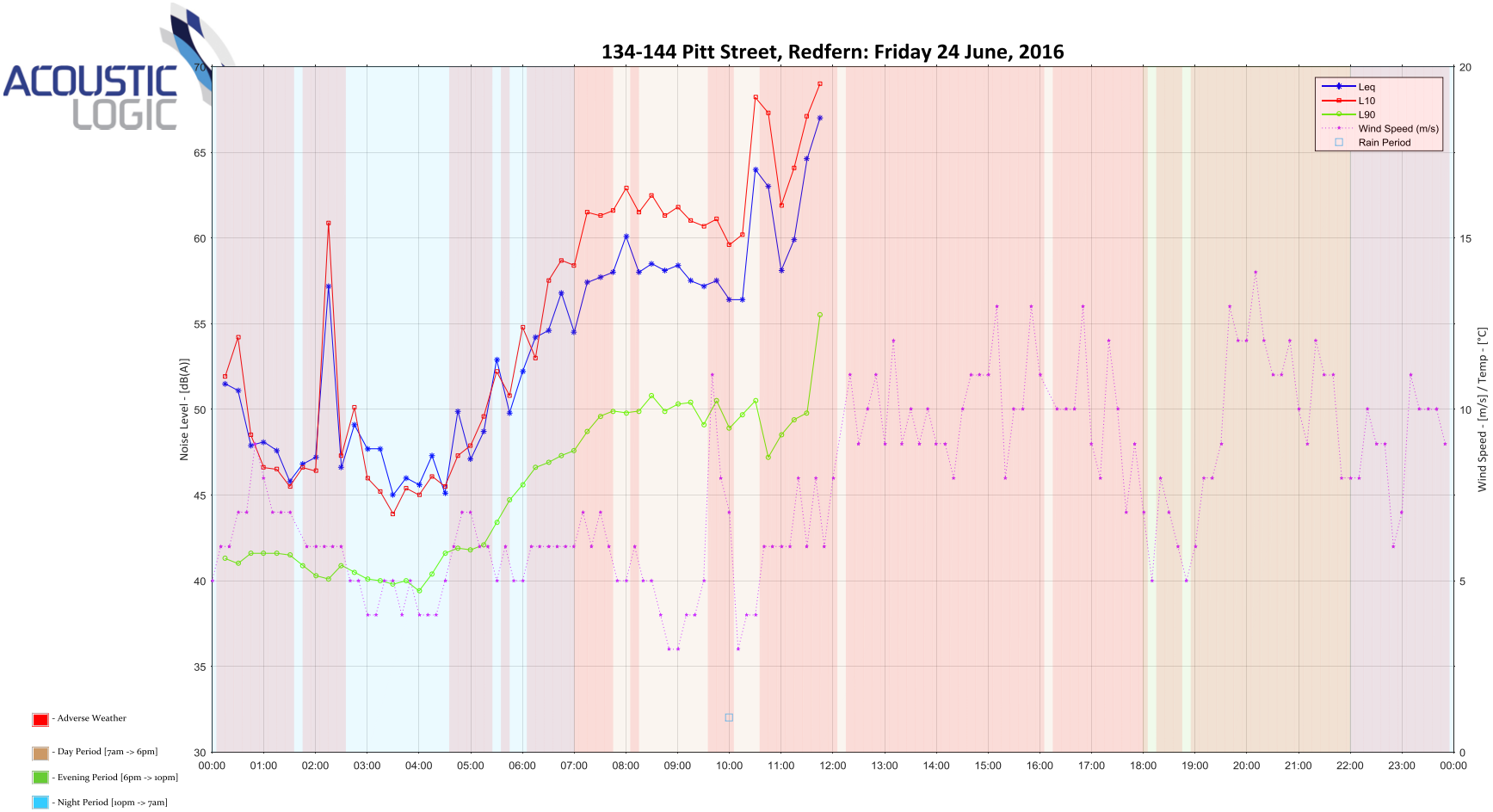
23:00
00:00
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Thursday 23 June, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


134-144 Pitt Street, Redfern: Friday 24 June, 2016
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]