Meadowbank Education and Employment Precinct Schools Project
Noise Impact Assessment

SSD 18_9343

Prepared by Acoustic Logic Consultancy

For School Infrastructure NSW

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Noise Impact Assessment - State Significant Development Application

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1 INTRODUCTION

This Noise Impact Assessment has been prepared by Acoustic Logic Consultancy on behalf of the NSW Department of Education (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18_9343) for the new Meadowbank Education and Employment Precinct Schools Project (hereafter referred to as the MEEPSP at 2 Rhodes Street, Meadowbank (the site).

The MEEPSP will cater for 1,000 primary school students and 1,620 high school students. The proposal seeks consent for:

- A multi-level, multi-purpose, integrated school building with a primary school wing and high school wing. The school building is connected by a centralised library that is embedded into the landscape. The school building contains:
  - Collaborative general and specialist learning hubs, with a combination of enclosed and open spaces;
  - Adaptable classroom home bases;
  - Four level central library, with primary school library located on ground floor and high school library on levels 1 to 3.
  - Laboratories and workshops;
  - Staff workplaces;
  - Canteens;
  - Indoor gymnasium;
  - Multipurpose communal hall;
  - Outdoor learning, play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements;
- An on-site car park for 60 parking spaces; and
- Construction of ancillary infrastructure and utilities as required.

The purpose of this Noise Impact Assessment is to address the Secretary's Environmental Assessment Requirements for SSD 18_9343. This table identifies the SEARs and relevant reference within this report.

Table 1-1 – SEARs Requirements - Acoustics

SEARs Item	Report Reference
5. Environmental Amenity	Section 5
12. Noise and Vibration	Section 5 and Section 6

In addition to above, as part of the NSW Department of Planning and Environment consultation additional comments have been provided by the NSW Environment Protection Authority (EPA).

In this report, we will:

- Identify nearby noise sensitive receivers and operational noise sources with the potential to adversely impact nearby development;
- Identify relevant State and EPA noise emission criteria applicable to the development;
- Predict operational noise emissions and assess them against acoustic criteria;
- If necessary, determine building and/or management controls necessary to ensure ongoing compliance with noise emission goals; and
- Identify and assess external noise impacts on the site (traffic, rail and industrial noise) and provide advice regarding building shell construction to address this impact.

In addition, a preliminary review of construction noise/vibration impacts will be presented.

This report has been amended to address the architectural changes on the Woods Bagot Drawings dated April 2019.

2 SITE DESCRIPTION AND PROPOSED WORKS

The Meadowbank Education and Employment Precinct Schools Project is to be constructed on land, formerly part of the Meadowbank TAFE College, now owned by the NSW Department of Education.

The property is bounded by Rhodes Street to the north east, the Meadowbank TAFE Campus to the east and south, and the T1 Northern Rail Line to the west.

Although not part of this SSDA the proposed building works will require the demolition of redundant TAFE buildings R, Q, O, T, V, W, X, S, Y1, Y3, Y4, Y5, Y6. The proposed new works, the subject of this SSDA will consist of:

- School building which will include learning spaces for primary and secondary students in the north portion of the site.
- The high school has its primary outdoor play areas on the western and southern boundary side of the site (towards the train line and Rhodes Street).
- The primary school has its primary outdoor play areas on the western and northern boundary side of the site (towards the existing Meadowbank TAFE oval).
- Primary school will accommodate approximately 1,000 students;
- High school will accommodate 1,500 students; and
- English Intensive Course will accommodate 120 students.

Site also incorporates a basement vehicle car park, which is accessed via a driveway located on Rhodes Street.

The proposal includes a 20-metre bus zone along the southern side of Rhodes Street as well as a 60-metre bus zone along the southern side of Macpherson Street. Together, these bus zones would be able to accommodate up to six buses at any one time.

The predominant noise source impacting the site is rail noise from the adjacent T1 Line (North Shore, Northern & Western) and noise from traffic movements on surrounding roads.

To a lesser degree, there is also noise from the industrial development on Rhodes Street (although as discussed in section 4.2, this industrial noise creates a lesser impact than the road traffic on Rhodes Street).

2.1 NEARBY NOISE RECEIVERS

Based on the site investigations the following nearby sensitive developments surround the site:

Receiver 1 - Residential dwellings located along Bank Street which is west of the site. Receiver 1 residences are located on the western side of the rail corridor. Majority of these dwellings do not have a line of sight with the proposed external playground (the raised rail corridor provides screening) with exception of 54 Bank Street which is located on higher ground. This is the closest residence to the site, and has line of sight to the playground and sports courts of the High School

Receiver 2 – Residential dwellings located adjacent to Macpherson Street. These dwellings lie adjacent to a primary travel route to/from the site.

Receiver 3 – Residential dwellings located adjacent to See Street. Residences are located along the eastern side of the road. While located away from the school itself, these dwellings lie adjacent to a primary travel route to/from the site

Receiver 4 – TAFE NSW Meadowbank campus will be located adjacent to the site, along the southern boundary of the site, with the nearest building being the Meadowbank Tafe College Library building located to the south-east corner of the project site.

Receiver 5 – Existing light industrial properties are located along the northern side of Rhodes Street which is to the north of the site.

Refer to Figure 2-1 below for detailed measurement and noise receiver locations.

Figure 2-1: Site Survey and Monitoring Positions. Sourced from SixMaps NSW.

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15 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.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

L_{Max} levels represent is the loudest noise event during a measurement period.

4 SURVEY OF AMBIENT NOISE LEVELS

Both long term unattended noise logging and attended noise measurements were conducted to quantify the existing acoustic environmental at the site.

4.1 UNATTENDED NOISE MEASUREMENTS

Unattended noise monitoring was conducted between Friday 15th of June 2018 and Tuesday 26th of June 2018 using one Acoustic Research Laboratories monitor and one Rion Noise Meter (with logging capabilities) set on A-weighted fast response mode. The monitor was calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded. In addition, calibration certificates are provided in Appendix 3 – Calibration Certificates.

Unattended noise monitors were installed at the following locations

- Location M1 – Adjacent to the driveway/boundary of 54 Banks Street. Noise logging conducted here is representative of the background noise levels at the nearest noise sensitive development to the site.

- Location M2 – This logger was placed on the awning of the existing TAFE Fitness Centre (Building S), in line with the proposed western façade of the high school. Logging at this location was conducted to examine the impact of rail noise on the proposed school buildings.

In addition to the above, it was also proposed to undertake unattended noise monitoring at one of the resident's located along either Mellor Street or Forsyth Street (adjacent to Macpherson Street). Acoustic Logic conducted a door knock on the morning (8:30am-9:00am) of Friday 15th June 2018 in order to request permission for a logger installation. However, during the door knock of 16-22 Mellor Street and 71-77 Forsyth Street nobody answered the door.

In addition to above we conducted another door knock in the afternoon (4:30pm-5:00pm) of Thursday 26th July 2018 to request permission for the logger installation, with luck at 22 Mellor Street and 77 Forsyth Street. However, 22 Mellor Street resident who answered did not speak English and the resident located at 77 Forsyth required permission from the land owner. In both situations we left a business card with our contact number and requested a call back. To the date of this report no such call has ever been received. Due to these results above, we proposed and carried out hour long attended measurements at the receiver location (Macpherson Street) on a multitude of occasions as presented below.

The measured rating background noise level (L_{90}) and average (L_{eq}) noise levels are presented below. The L_{eq}/average noise levels at both locations (M1 and M2) are primarily a result of train movements on the rail corridor to the west of the site as well as distant traffic noise from Victoria Road for location M2. The background noise levels at the site are consistent with what is expected in a suburban area.

In each case, weather affected data was excluded from the assessment in accordance with the NSW EPA *Noise Policy for Industry (NPfI) 2017* (i.e. average wind speed $\geq$ 5metres per second or during rain) procedures. All periods of weather affected data are highlighted in the logging graphs in Appendix A.

Table 4-1 – Measured *Unattended* Ambient Noise Levels

Monitoring Location	Measured *Unattended* Noise Levels dB(A)		
	Day (7:00am-6:00pm)	Evening (6:00pm-10:00pm)	Night (10:00pm-7:00am)
Location M1 Bank Street (See Figure 2-1)	42dB(A)$L_{90(7am-6pm)}$ 60dB(A)$L_{eq(7am-6pm)}$	40dB(A)$L_{90(6pm-10pm)}$ 59dB(A)$L_{eq(6pm-10pm)}$	38dB(A)$L_{90(10pm-7am)}$ 58dB(A)$L_{eq(10pm-7am)}$
Location M2 Fitness Centre (See Figure 2-1)	39dB(A)$L_{90(7am-6pm)}$ 58dB(A)$L_{eq(7am-6pm)}$	44dB(A)$L_{90(6pm-10pm)}$ 54dB(A)$L_{eq(6pm-10pm)}$	42dB(A)$L_{90(10pm-7am)}$ 53dB(A)$L_{eq(10pm-7am)}$

4.2 ATTENDED MEASUREMENT RESULTS (BACKGROUND NOISE, TRAFFIC NOISE AND INDUSTRIAL NOISE)

Attended background noise measurements were conducted using a Norsonic 118 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted. In addition, calibration certificates are provided in Appendix 3 – Calibration Certificates.

Attended noise measurements were undertaken at the following locations:

- Location 1 (Rhodes Street) – Adjacent to the existing Meadowbank TAFE Rhodes Street, in line with the Fitness Centre (Building S).
- Location 2 (Macpherson Street) – located along the southern boundary of the Mellor and Forsyth Street residents. Attended noise measurements here is representative of the background noise levels at the *Macpherson Street Resident's* located to the north east of the site.
- Location 3 (See Street) – Located along the western boundary of the See Street residents. Attended noise measurements here is representative of the background noise levels at the *See Street Residences* located to the east of the site.

The measured rating background noise level (L_{90}) and average (L_{eq}) noise levels are presented below. The L_{eq}/average noise levels at both locations are primarily a result of train movements on the rail corridor to the west of the site for Rhodes Street, distant traffic movements from Victoria Road and intermittent local traffic for both Macpherson and See Street. The background noise levels at the site are consistent with what is expected in a suburban area.

The noise measurement on Rhodes Street (table 4.3) is a combination of road traffic and industrial noise (of which the road traffic noise is the dominant noise source).

In each case, weather affected data was excluded from the assessment in accordance with the NSW EPA *Noise Policy for Industry (NPfI) 2017* (i.e. average wind speed $\geq$ 5metres per second or during rain) procedures. All periods of weather effected data are highlighted in the logging graphs in Appendix A.

Table 4-2 – Measured *Attended Background* Noise Levels

Monitoring Location	Measured *Attended Background* Noise Levels dB(A)$L_{90(1hour)}$				Comments
	Friday, 15th June 2018 (11am-2pm)	**Thursday, 26th July 2018 (8am-11am)**	**Thursday, 2nd August 2018 (10pm-1am)**	**Tuesday, 14th August 2018 (3pm-6pm)**	
Location 1 - Rhodes Street (See Figure 2-1)	50dB(A) $L_{90(1hour)}$	52dB(A) $L_{90(1hour)}$	40dB(A) $L_{90(1hour)}$	52dB(A) $L_{90(1hour)}$	Distant traffic noise from Victoria Road, intermittent traffic, nearby train movements and light industrial noise.
Location 2 - Macpherson Street (See Figure 2-1)	52dB(A) $L_{90(1hour)}$	54dB(A) $L_{90(1hour)}$	42dB(A) $L_{90(1hour)}$	53dB(A) $L_{90(1hour)}$	Distant traffic noise from Victoria Road, intermittent traffic, and light industrial noise.
Location 3 - See Street (See Figure 2-1)	50dB(A) $L_{90(1hour)}$	51dB(A) $L_{90(1hour)}$	41dB(A) $L_{90(1hour)}$	51dB(A) $L_{90(1hour)}$	Distant traffic noise from Victoria Road and Constitution Road (south of the site), intermittent impacts by local traffic.

*As a conservative approach we propose to adopt the lowest measured noise level from each of the attended measurements.

Table 4-3 – Measured *Attended Road* Noise Levels

Monitoring Location	Measured *Attended Road* Noise Levels dB(A)$L_{eq(1hour)}$				Comments
	Friday, 15th June 2018 (11am-2pm)	**Thursday, 26th July 2018 (8am-11am)**	**Thursday, 2nd August 2018 (10pm-1am)**	**Tuesday, 14th August 2018 (3pm-6pm)**	
Location 1 - Rhodes Street (See Figure 2-1)	58dB(A) $L_{eq(1hour)}$	59dB(A) $L_{eq(1hour)}$	49dB(A) $L_{eq(1hour)}$	58dB(A) $L_{eq(1hour)}$	Distant traffic noise from Victoria Road, intermittent traffic, nearby train movements and light industrial noise. Note – Noise from all industrial development along the length of Rhodes Street was observed. Mechanical noise from the Rhodes Street industrial developments is typically less than 52dB(A)L_{eq}, and quieter than the road traffic noise on Rhodes Street.

Table 4-3 – Measured *Attended Road* Noise Levels (Cont.)

Monitoring Location	Measured *Attended Road* Noise Levels dB(A)$L_{eq(1hour)}$				Comments
	Friday, 15th June 2018 (11am-2pm)	**Thursday, 26th July 2018** (8am-11am)	**Thursday, 2nd August 2018** (10pm-1am)	**Tuesday, 14th August 2018** (3pm-6pm)	
Location 2 - Macpherson Street (See Figure 2-1)	62dB(A) $L_{eq(1hour)}$	61dB(A) $L_{eq(1hour)}$	50dB(A) $L_{eq(1hour)}$	61dB(A) $L_{eq(1hour)}$	Distant traffic noise from Victoria Road, intermittent traffic, and light industrial noise.
Location 3 - See Street (See Figure 2-1)	59dB(A) $L_{eq(1hour)}$	62dB(A) $L_{eq(1hour)}$	47dB(A) $L_{eq(1hour)}$	60dB(A) $L_{eq(1hour)}$	Distant traffic Nosie from Victoria Road and Constitution Road (south of the site), intermittent impacts by local traffic.

5 NOISE EMISSION CRITERIA

The following noise controls are applicable to the site:

- NSW EPA document Noise Policy for Industry (NPfI) 2017.
- NSW EPA document Road Noise Policy (RNP) 2017.
- Appropriate guidelines for assessment of outdoor play areas.

5.1 OUTDOOR PLAY AREAS

Outdoor play areas are not typically assessed with reference to the same acoustic criteria as other noise sources. The AAAC guidelines recommend a more lenient "background+10dB(A)" noise emission goal for use of outdoor areas to residential receivers, provided it is limited to no more than 2 hours per day.

In our opinion:

- Noise from school playgrounds and other typical use of a school should not be required to strictly comply with numerical acoustic criteria. Decisions of the Land and Environment Court reflect this (see *Meriden v Pedavoli*, discussed in section 6.1).
- However, for assistance, AAAC guideline of adopting a "background+10dB(A)" noise emission assessment goal for child care centres will be discussed, but in the context of providing a guideline, not a mandatory level of acoustic performance.

Table 5-1 – Playground Noise Emission Goals - Residential (Background+10dB(A))

Noise Receiver	Background Noise Level – dB(A)L_{90} (7am-6pm)	Background + 10dB(A) noise emission goal (7am-6pm)
Receiver 1 Bank Street (See Figure 2-1)	42dB(A)L_{90}	52dB(A)$L_{eq(15min)}$
Receiver 2 Macpherson Street (See Figure 2-1)	52dB(A)L_{90}	62dB(A)$L_{eq(15min)}$
Receiver 3 See Street (See Figure 2-1)	50dB(A)L_{90}	60dB(A)$L_{eq(15min)}$

5.2 NSW EPA DOCUMENT – *"NOISE POLICY FOR INDUSTRY (NPFI) 2017"* – MECHANICAL NOISE AND ONSITE VEHICLE NOISE

The NSW EPA *Noise Policy for Industry (NPfI) 2017*, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{Aeq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant to a level that is consistent with the general environment.

The EPA's NPfI sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Noise levels are to be assessed at the property boundary or most affected point within.

5.2.1 NSW EPA *NPfI* Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{Aeq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted below have been presented previously in section 4. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 5-2 – NSW EPA *NPfI* Intrusiveness Noise Emission Goals

Location	Period/Time	Measured Rating Background Noise Level dB(A)$L_{90(Period)}$	Intrusiveness Noise Emission Goal (BG+5) dB(A)$L_{eq(15\ minutes)}$
Bank Street Residences (Receiver 1)	Day (7am-6pm)	42	47
	Evening (6pm-10pm)	40	45
	Night (10pm-7am)	38	43
Macpherson Street Residences (Receiver 2)	Day (7am-6pm)	52	57
	Evening (6pm-10pm)	52	57
	Night (10pm-7am)	42	47
See Street Residences (Receiver 3)	Day (7am-6pm)	50	55
	Evening (6pm-10pm)	50	55
	Night (10pm-7am)	41	46

5.2.2 NSW EPA *NPfI* Project Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The NSW EPA NPfI sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. In accordance with the procedure nominated by the NPfI the site and the surrounding residential receivers are either suburban or urban category, this is outlined below.

Table 5-3 – NSW EPA *NPfI* Project Amenity Noise Objective

Location	Period/Time	Project Amenity Noise Objective
Receiver 1 (Bank Street) Suburban Receiver	Day (7am-6pm)	53 dB(A)$L_{eq(15\ minutes)}$
	Evening (6pm-10pm)	43 dB(A)$L_{eq(15\ minutes)}$
	Night (10pm-7am)	38 dB(A)$L_{eq(15\ minutes)}$
Receiver 2 & 3 (Macpherson Street & See Street) Suburban Receiver	Day (7am-6pm)	53 dB(A)$L_{eq(15\ minutes)}$
	Evening (6pm-10pm)	43 dB(A)$L_{eq(15\ minutes)}$
	Night (10pm-7am)	38 dB(A)$L_{eq(15\ minutes)}$
Industrial Receivers	When in use	70dB(A)$L_{eq(15\ minutes)}$
School Classroom (TAFE Meadowbank)	When in use	35dB(A)$L_{eq(1\ hour)}$ (Internal)

5.2.3 Sleep Arousal Assessment

In addition to the above, the NSW EPA *NPfI* provides an assessment procedure for assessing any potential sleep arousal impacts for when any noise is generated between 10:00pm and 7:00am (i.e. night period). Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the *NPfI*, to assess potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:

  Where the subject development/premises night-time noise levels at a residential location exceed:

  - *$L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
  - *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater,*

  a detailed maximum noise level event assessment should be undertaken.

Based on the above the following noise objectives apply:

Table 5-4 – Sleep Arousal Criteria (*Average*/L_{Aeq} Noise Levels)

Location	Rating Background Level dB(A)$L_{90(10pm-7am)}$	Rating Background Level + 5dB(A)	Governing Criteria dB(A)$L_{eq(15\ minutes)}$
Receiver 1 (Bank Street)	38	43	43
Receiver 2 (Macpherson Street)	42	47	47
Receiver 3 (See Street)	41	46	46

Table 5-5 – Sleep Arousal Criteria (*Maximum*/L_{Max} Noise Events)

Location	Rating Background Level dB(A)$L_{90(10pm-7am)}$	Rating Background Level + 15dB(A)	Governing Criteria dB(A)L_{Max}
Receiver 1 (Bank Street)	38	53	53
Receiver 2 (Macpherson Street)	42	57	57
Receiver 3 (See Street)	41	56	56

- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables above, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA *NPfI*, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

5.3 NOISE FROM TRAFFIC ON PUBLIC STREETS/DROP OFF ZONE

For land use developments with the potential to create additional traffic on public streets the development should comply with the NSW EPA *Road Noise Policy (RNP) 2011*.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

Table 5-6 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Local Road (Rhodes Street, Macpherson Street, Mellor Street and See Street)	Day (7am to 10pm)	55 dB(A)$L_{eq(1hour)}$
	Night (10pm to 7am)	50 dB(A)$L_{eq(1hour)}$

However, if existing noise levels exceed those in the table above, Section 3.4 of the Road Noise Policy is applicable, which states that an increase in the existing noise level of 2dB(A) would be considered a barely perceptible increase to the average person.

5.4 CONSTRUCTION ACTIVITIES

5.4.1 Construction Noise

Relevant guidelines are:

- NSW Environmental Protection Authority (EPA) document – *"Interim Construction Noise Guideline (ICNG) 2009"*; and
- Australian Standard AS2436:2010 – *"Guide to noise and vibration control on construction, demolition and maintenance sites"*.

5.4.1.1 NSW Environmental Protection Authority (EPA) document – *"Interim Construction Noise Guideline (ICNG) 2009"*

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background for residential receivers – this level is referred to as the "noise effected level". The noise emission goals for nearby development is as follows:

Table 5-7 – Noise Emission Goal – Residential Properties

Noise Receiver	Measured Background Noise Levels dB(A)$L_{90(7am-6pm)}$	Noise Effected Level BG + 10dB(A)$L_{eq(15min)}$
Receiver 1 (Bank Street)	42	52
Receiver 2 (Macpherson Street)	52	62
Receiver 3 (See Street)	50	60

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

Construction noise levels to other surrounding receivers are as follows:

Table 5-8 – Noise Emission Goal – Other Developments

Development Type	Noise Goal dB(A) $L_{eq(15mins)}$
Industrial Developments	75
Meadowbank TAFE - Classrooms	45

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

Where compliance with the above targets cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (i.e. – adopt DECC/Council guidelines).
- 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.

5.4.2 Construction Vibration

5.4.2.1 To Surrounding Receivers

Vibration caused by construction should 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 (amenity), 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.

5.4.2.1.1 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 5-9 – 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

5.4.2.1.2 Assessing Amenity

Department of Environment and Conservation NSW "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 5-10 – 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

5.4.2.2 To Rail Corridor

5.4.2.2.1 Amenity Criteria

The EPA document *Assessing Vibration: A technical guideline* is typically adopted when assessing vibration impacts on nearby land users. There are no directly applicable amenity criteria with respect to users of the rail infrastructure.

In our opinion, the criteria adopted for Workshops would be the most applicable when setting criteria for vibration amenity impacts on users of rail infrastructure.

Table 5-11 – Construction Vibration Goals (Human Comfort)

Location	**Time**	**Peak Particle Velocity (mm/s)**	
		Preferred	**Maximum**
Continuous Vibration			
Workshops	**When in use**	1.1	2.2
Impulsive Vibration			
Workshops	**When in use**	18	36

5.4.2.2.2 Damage Criteria

Based on our experience, the vibration criteria typically imposed by Sydney trains for the protection of their infrastructure is as follows:

- Warning Level: 6.5mm/s Peak Particle Velocity (PPV)
- Stop Work Level: 12.5mm/s (PPV)

We propose to adopt these levels.

6 NOISE EMISSION ASSESSMENT

An assessment of operational noise emissions is presented. The following noise sources are assessed:

- Noise from the outdoor play areas.
- Noise from internal (classroom) areas.
- Vehicular noise on site (use of car parks, vehicle circulation).
- Noise created on public roads as a result of traffic generated by the site.
- Noise from mechanical plant, PA system and school bells.

6.1 NOISE FROM THE PLAYGROUND

Noise emissions from the use of the outdoor play areas is predicted at nearby residences based on the following assumptions/information:

- Number of students and position:
    - Primary School – 700 Students on south-western external playground (remainder inside building or on outdoor areas on structure)
    - High School – 1,000 Students on western external playground (remainder inside building or on outdoor areas on structure)
- Playground noise measurements:
    - High School – noise level per student of 89dB(A), based on measurements conducted at South Sydney High School measurement.
    - Primary School - noise level per student of 83dB(A) one in two, based on measurements conducted at Anzac Park Public School.
- All play areas in operation at once (on grade and on structure).
- Sports courts noise measurements – Use of sports courts for competitive sports is a potentially more intensive use of these spaces compared to typical playground use. As a part of studies of play ground noise emission, ALC have undertaken measurements noise created on sports courts. In our experience, noise from an intensive use of *one* sports court (competitive basketball, a louder than typical sporting activity) is approximately 61dB(A) when standing 10m from the edge of the court. This data is then used to predict noise levels at nearby properties (taking into account that there is more than one court, and the relative position between the court and the residences.

Predicted noise levels are as follows:

Table 6-1 – Predicted Noise Emission from Playground

Activity	Noise Receiver	Predicted Noise from Playground dB(A)$L_{eq(15minute)}$	"Background+10dB(A) noise emission goal – dB(A)$L_{eq(15minute)}$	Complies
General Playing Activities (Recess & Lunch)	Receiver 1 - Bank Street Residences - Generally	51	52	Yes
	Receiver 1 - 54 Bank Street	56	52	No
	Receiver 2 & 3 - Macpherson & See Street	50	52	Yes
Competitive Activities (Active Sports)	Receiver 1 - Bank Street - Generally	53	52	No
	Receiver 1 - 54 Bank Street	58	52	No
	Receiver 2 & 3 - Macpherson & See Street	52	52	No

With respect to the above:

- Typical playground use:
  - Noise emissions are typically compliant with a "background+10dB(A)" noise emission goal that is commonly adopted in the assessment of outdoor recreation spaces.
  - An exceedance of 4dB(A) is predicted at the 54 Bank Street resident, given its proximity to the high school playground, and given the rail corridor embankment does not provide any noise screening (unlike the other Banks Street residences).
- Use of sports courts for competitive sports would typically be 2dB(A) louder again.

However, in our opinion, the exceedances are not unreasonable for the following reasons:

- Noise from school playgrounds is not addressed in the Ryde Council DCP, nor is it a noise source intended to be governed by documents such as the EPA Noise Policy for Industry (NPfI) 2017. It is common (and almost unavoidable) in school development that a playground is located in close proximity to residential development. In this regard we note that in *Meriden v Pedavoli [2009 NSWLEC 183]* the NSW Land and Environment Court noted "*All noise that emanates from the normal activities at a school is not offensive"*. The Court had regard to the fact that there was other school development in the local government area in which playgrounds adjoin residential development and the fact the proposed use was permissible in the zone. This is consistent with the proposed development.

- In addition, located between the playgrounds and the Bank Street residences is an existing rail corridor has trains (both passenger and freight) which operate from 5:30am to 12:30am every day.

- Notwithstanding this, a "background+10dB(A)" guideline has been included in this assessment to provide some assistance in quantifying noise impacts. As noted above, there is an exceedance of this guideline at 54 Banks Street.

- With respect to 54 Banks Street, we note:

    - Given 54 Banks Street is elevated relative to the playground, use of perimeter fencing/screens would be of no benefit, as the screen would be overlooked (unless it is over 10-15m high, which is not practical).

    - Given that 54 Banks Street is located immediately adjacent to a rail line, this site is already subject to an existing noise source that is in fact louder than the school noise will be. It would be expected that this property has acoustically upgraded windows to address the rail noise.

    - As noted above, a playground located near a residential boundary is a common scenario in school development (example: Meadowbank Public School, Rydalmere Public School, Ermington West Public School and Marsden High School). At the subject site, the playground is located at least 75m away, which is significantly further than what typically occurs for most schools.

6.2 NOISE FROM INTERNAL AREAS (CLASSROOMS AND SCHOOL HALL)

We note that is it is preferred that classrooms be naturally ventilated (by leaving the windows open).

Being an internal area, noise from classrooms should comply with a "background +5dB(A)" at nearby residences (as noise from internal areas is more controllable that noise from a playground).

As the building is located in the north-eastern corner of the site the nearest residential receiver is the properties bounding Macpherson Street (Approximately 65m).

During all uses of the classroom (teacher speaking, or during group work, audio visual learning and children speaking normally), noise emissions would comply with a background + 5dB(A) goal.

6.3 NOISE GENERATED BY TRAFFIC ON PUBLIC ROADS/DROP OFF ZONE

Noise created as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy.

Primary access/egress to the site is via a driveway/car park on Rhodes Street.

Predictions of noise generation are based on the following:

- An assumed sound power level of a car driving on a public road (at 40km/h) of 93dB(A).

- It is assumed that there are approximately 650 passenger vehicle movements per peak hour generated by the site. (Refer 2031 project trip generation in *Transport and Accessibility Impact Assessment* dated 18/4/2019 – GTA Consultants, tables 7.4-7.7)

- A 50/50 split between McPherson Street and Mellor Street for traffic approaching the school.

Noise emissions are predicted at the building facade of the residences on Macpherson/Mellor Street.

Predicted noise levels are as follows:

Table 6-2 – Noise Generated by Vehicles/Road Traffic – Peak Hour (2031 Predicted Traffic Generation)

Receiver Location	Predicted Noise Level – dB(A)$L_{eq(15minute)}$	Criteria dB(A)$L_{eq(15minute)}$	Compliance
Macpherson/Mellor Street Residences	59dB(A)	55dB(A)$L_{eq(15min)}$	No. Therefore consider cumulative impact with existing traffic.

As noted in the table above, the 2031 predicted traffic volumes will exceed 55dB(A)$L_{eq(1hr)}$ at the build facades of nearby residences. However:

- As noted in table 4.3, the existing traffic noise levels at the McPherson/Mellor Street residences is 61-62dB(A)$L_{eq(1hr)}$.
- If the projected 59dB(A) from new traffic is added to the existing 61dB(A), the combined traffic will result in an total noise level of 63dB(A)$L_{eq(1hr)}$, an increase of only 2dB(A). An increase of 2dB(A) is considered satisfactory where the existing traffic noise levels already exceed 55dB(A) (see section 5.3).

Noise from projected traffic associated with the site is therefore compliant with EPA Road Noise Policy Guidelines.

6.4 NOISE FROM MECHANICAL PLANT, PUBLIC ADDRESS SYSTEM AND SCHOOL BELL

Detailed acoustic design of mechanical plant cannot be undertaken at approval stage, as plant selections and locations are not finalised. However, detailed acoustic assessment of all ventilation or other plant items should be undertaken at CC stage, once equipment items are selected and location is finalised.

In regard to the school bell/PA system, the system should minimise noise spill to adjacent properties

- Speaker positioning/selection:
    - Detailed selection or locations of PA systems are unknown at this stage. However, to ensure compliance with the BG+10 criteria, we make the following comments;
        - An assumption has been made that speakers are going to be installed on the façade of the building.
        - Speakers installed on the façade should not exceed the following maximum noise level when measured at 5m from the speaker (SPL @ 5m)
        - Northern Façade – 75dB(A) @ 5m distance.
        - Eastern Façade – 75dB(A) @ 5m distance.
        - Southern Façade – 81dB(A) @ 5m distance.
        - Western Façade – 79dB(A) @ 5m distance.

In addition to above, we provide the following design considerations when PA design is undertaken.

- Speaker location and direction can be used to reduce noise spill to neighbouring properties while still maintaining suitable noise levels within the school grounds (typically 70-75dB(A)).

- Broadly speaking, more speakers, closer to the noise receiver (i.e. playground) is a more effective way to provide coverage of the external areas while reducing noise spill to neighbouring properties.

- Similarly, highly directional speakers (angled downwards) will also reduce noise spill. Speakers with a drop of at least 5dB(A) for mid-frequencies noise for each 10 degrees in the horizontal plane outside of the coverage area should be considered.

- Use of a noise limiter system:

  - By limiting the maximum possible signal sent to a speaker, this can reduce intermittent increased noise generation as a result of the system user excessively raising their voice or holding the microphone too close. The schools currently engaged contractor would most likely be above to provide such as system.

  - In all likelihood, the limiter system would require that the system be installed, and volume adjusted such that the School was satisfied that a sufficient noise level has been reached in the assembly area, and the noise limit then set based on that.

6.5 COMMUNITY USE OF THE SITE

Community use of the site will be permitted to external areas and internal areas within the site.

6.5.1 External areas

Community use of the sports courts will be permitted, however:

- The courts shall not be used for organised competitive sports which typically the loudest use noise levels through shouting, cheering or whistles).

- It will be during daytime hours only.

- The mode of usage for the School's courts will be of a similar nature to the community's usage of a public park. Accordingly, we are of the opinion that the impact of any noise generated through normal use will be tolerable and reasonable.

- The nearest residence, at a distance of approximately 50 metres from the sports courts, is not expected to experience intrusive noise impacts.

- Public parking shall not be provided on the School property.

6.5.2 Internal Spaces

- Noise from typical internal activities (night classes or similar) will comply with a BG + 5dB noise target even if windows to the internal areas are left open.

- Where there is an expectation that an activity, such as music or singing, might give rise to a greater level of noise than is typical, external perimeter windows to that space should be closed to mitigate the noise impacts. However, windows in the southern facade of the building can remain open to provide natural ventilation without any risk of residences to the south being exposed to noise impact."

6.6 CUMULATIVE NOISE IMPACTS

There are multiple noise sources associated with the site – vehicle noise, playground noise and plant/equipment noise being the most significant. In addition, the individual impacts tend to affect different noise receivers (playgrounds impact 54 Bank Street, vehicle noise impacts MacPherson/Mellor Street). An issue of cumulative noise impact will not typically arise as the primary noise sources impact different locations.

Further:

- Playground noise has been assessed with reference to a background + 10dB(A) criteria (and will intermittently exceed this noise level at some locations).

- Plant and equipment noise is assessed with reference to the more stringent Noise Policy for Industry (essentially, a “background+5dB(A) assessment).

- The plant and equipment noise is required to be much quieter than the playground noise. Provided that plant noise emission goals are achieved, the cumulative impact of plant noise in addition to playground noise will not be significant (the overall noise level is a product of the playground noise, being the dominant noise source).

With respect to the cumulative impact of the various playgrounds, the cumulative impact of multiple playgrounds was considered, as stated in section 6.1

With respect to the cumulative impact of road traffic noise and playground noise:

- Periods of peak traffic generation will not occur at times of peak playground use.

- Further, as noted above, the primary playground noise impact in on 54 Banks Street while the traffic noise impact is on MacPherson/Mellor Street.

In light of the above, provided that the individual noise sources are appropriately managed, there will be no further impact as a result of cumulative noise.

6.7 RECOMMENDATIONS

We recommend the following acoustic treatments/management controls to ensure compliance with EPA and SEARs noise emission guidelines.

- Community use of the school:
    - Use of the internal spaces during evening time for community events is acceptable.
    - Use of external spaces not recommended. (in the event of a the sports facilities is used for organised sporting completions we would expect that would be subject to a separate application, and would which would include a noise emission assessment).

- It is recommended that a detailed design of the proposed School PA system is carried out at CC stage.

- If buses are waiting in local roads for pickups, engines should be switched off.

- Detailed acoustic review of all external plant items should be undertaken following equipment selection and duct layout design. All plant items will be capable of meeting noise emission requirements of Council and the EPA Industrial Noise Policy, with detailed design to be done at CC stage. This should include detailed acoustic review of any proposed PA system (speaker location, directionality, noise limiter etc).

- no organised competitive sports. No night time use of the sporting fields.

- no on-site parking for community.

- windows closed or rooms on southern façade if used by community in the evenings for any activity involving music, singing or powered tools.

6.8 CONSTRUCTION NOISE

6.8.1 Noise impacts

Primary noise generating activities which are a part of this application are demolition, excavation and erection of structure (formwork construction, concrete pumps, slab finishing works). We note that approximately 581 truck movements are anticipated during the ground remediation phase. Use of hand tools, particularly in external areas will also have the potential to result in noise levels intermittently exceeding EPA guidelines.

Typically, construction noise and vibration would be reviewed in detail after approval stage (once a contractor is appointed and construction methods and durations have been agreed on). It is common practice that a condition of consent be imposed requiring that a Construction Noise and Vibration Management Plan be prepared prior to commencement of works.

However, based on preliminary review, we note:

- Exceedance of the “background+10dB(A)” noise goal will be unavoidable at times given the proximity to the nearby residences.
- Acoustic treatments such as noise screens around work areas will provide no material benefit, as nearby development is multistorey and will overlook and screening.
- As the TAFE Meadowbank campus will be operating during the period of construction activities, we would recommend that scheduling of respite periods should be negotiated with Meadowbank TAFE. Negotiation should take into consideration student holiday breaks and typical class hours.

In light of the above, a noise management plan will be critical to ensure reasonable amenity for the nearby receivers. We recommend that any construction noise management plan should consider:

- Notification of the noisy works (excavation, concrete pours) should be provided to the nearby residents. The notification should outline the expected duration of the activity and provide contact details in the event of complaint.
- Dumping/loading of waste material should be done as far as practicable from the residential properties.
- Location of concrete pumps as par as practicable from residential property boundaries.

- If practicable, use of electric cranes as opposed to diesel cranes.
- Trucks should turn off their engines if queuing outside the site or if they arrive at the site prior to 7am.

6.8.2 Vibration impacts

Primary vibration generating activities are bulk excavation (if in rock) and demolition. As there are no sensitive receivers adjacent to the demolition and bulk exaction areas the impacts of these works should be minimal.

We note that the Ausgrid main substation for the suburb of Meadowbank is located nearby. It would be recommended to consult Ausgrid on applicable vibration criteria applicable to their development.

Excavation in soil is not typically expected to create vibration levels exceeding EPA guidelines.

7 EXTERNAL NOISE IMPACTS

Onsite investigations indicate that the site is affected by rail noise from the nearby corridor and traffic movements from Rhodes Street and See Street.

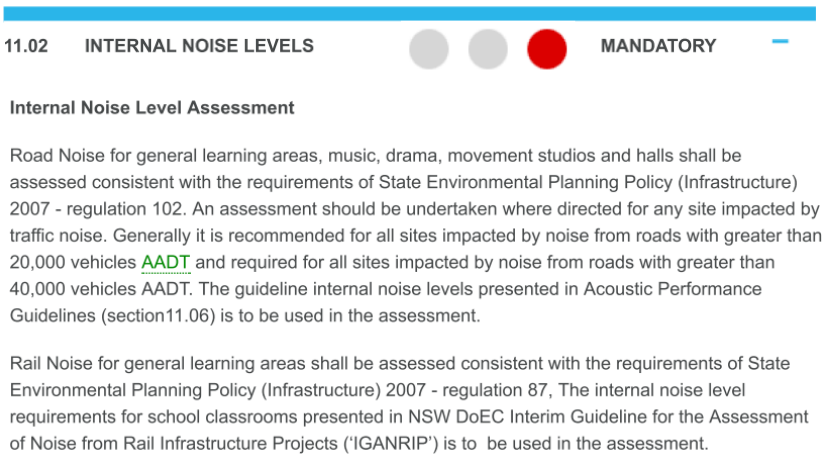
7.1 INTERNAL NOISE CRITERIA

Internal noise levels will be assessed based on the requirements of the following:

- NSW Department of Education document – *"Educational Facilities Standards and Guidelines (EFSG) 2017".*
- NSW Environmental Protection Authority (EPA) document – *"Road Noise Policy (RNP) 2011".*

7.1.1 NSW Department of Education document – "Educational Facilities Standards and Guidelines (EFSG) 2017"

NSW Department of Education document Educational Facilities Standards and Guidelines (EFSG) 2017 states the following for internal noise levels.



11.02 INTERNAL NOISE LEVELS MANDATORY

Internal Noise Level Assessment

Road Noise for general learning areas, music, drama, movement studios and halls shall be assessed consistent with the requirements of State Environmental Planning Policy (Infrastructure) 2007 - regulation 102. An assessment should be undertaken where directed for any site impacted by traffic noise. Generally it is recommended for all sites impacted by noise from roads with greater than 20,000 vehicles AADT and required for all sites impacted by noise from roads with greater than 40,000 vehicles AADT. The guideline internal noise levels presented in Acoustic Performance Guidelines (section11.06) is to be used in the assessment.

Rail Noise for general learning areas shall be assessed consistent with the requirements of State Environmental Planning Policy (Infrastructure) 2007 - regulation 87, The internal noise level requirements for school classrooms presented in NSW DoEC Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects ('IGANRIP') is to be used in the assessment.

In addition, it states the following:

Table 7-1 – DoE EFSG Guidelines on internal noise levels and reverberation times

Room	Internal noise level ($dB(A)L_{eq}$)
Computer Labs	40
Conference Room	35
Engineering Workshops	50

Table 7-2 – DoE EFSG Guidelines on internal noise levels and reverberation times (Cont.)

Room	Internal noise level ($dB(A)L_{eq}$)
Gymnasiums	45
Interview & Counselling Rooms	35
Kitchens	50
Lecture Rooms	30-35
Libraries	35-40
Study Rooms	35
Teaching Spaces (Primary and Secondary	35

7.1.2 NSW Environmental Protection Authority (EPA) document – *"Road Noise Policy (RNP) 2011"*

Table 4 on page 12 of the *Road Noise Policy* states the following noise levels for classrooms.

Table 7-2 – Internal Noise Levels for Schools – Road Noise Policy (RNP)

Land Use	Internal noise level ($dB(A)L_{eq(1hour)}$)
School Classrooms	40

7.2 MEASURED NOISE LEVELS

Onsite noise measurements have been undertaken by this office for both rail noise and traffic noise.

Table 7-3 – Measured Road Traffic Noise Levels

Noise Source	Time of day	Measured Noise Level $dB(A)L_{eq(1hour)}$
Rail Noise from Adjacent Corridor (Western Façade of School Building)	Day (9am to 5pm)	$61dB(A)L_{eq(1hour)}$
Traffic Noise from Rhodes Street (North-eastern Façade of School Buildings)	Day (9am to 5pm)	$59dB(A)L_{eq(1hour)}$
Traffic Noise from See Street (Southern Façade of School Buildings)	Day (9am to 5pm)	$62dB(A)L_{eq(1hour)}$

7.3 RECOMMENDATIONS

We recommend:

- Windows to the western façade (towards rail corridor) of the building should be constructed using 6.38mm laminated glass (R_w 31). It is proposed that the windows would be closer (by sound or teacher activated actuator) in the event of freight train passby. Remaining external noise events are not expected to produce noise levels that would impact the use of classrooms.

- Windows to the northern façade (towards Rhodes Street), eastern facade (towards See Street) and southern façade (towards TAFE oval) should be constructed using 6mm float (R_w 29).

- Windows which face into the internal courtyard of the building should be constructed from 5mm float (R_w 28).

- After hours use of the hall by the community will require the windows and doors of the hall to be closed during use other than on the southern façade.

8 CONCLUSION

Acoustic Logic Consultancy (ALC) have been conducted a noise impacts assessment associated with the Meadowbank Education and Employment Precinct Schools Project located at 2 Rhodes Street, Meadowbank. This assessment has been assessed with reference to relevant NSW EPA and City of Ryde Council acoustic guidelines.

An analysis of typical operational noise (classroom noise, vehicles and equipment) indicates that the site is capable of complying with relevant noise emission criteria.

An analysis of playground noise will exceed the ambient + 10dB(A) from time to time. Noise impacts from the playgrounds is keeping with typical school developments.

Acoustic treatments for control of noise generation have been presented in section 6.5 of this report. Detailed acoustic review of mechanical plant and public-address systems should be undertaken once design is further progressed (plant selections finalised etc). In-principal review indicates that noise emissions are capable of complying with EPA Industrial Noise Policy and Council requirements.

Community use of the site has been addressed in section 6.5, with management recommendations provided in section 7.3.

Review of road traffic noise impacting the site indicates that there are areas of the site where windows to internal areas (libraries, classrooms, School Hall) need to be closed in order to meet Department of Education internal noise levels. Recommended glass thicknesses have been specified in section 7.3. Mechanical engineer is to advise whether by closing the windows is a supplementary fresh air system is required.

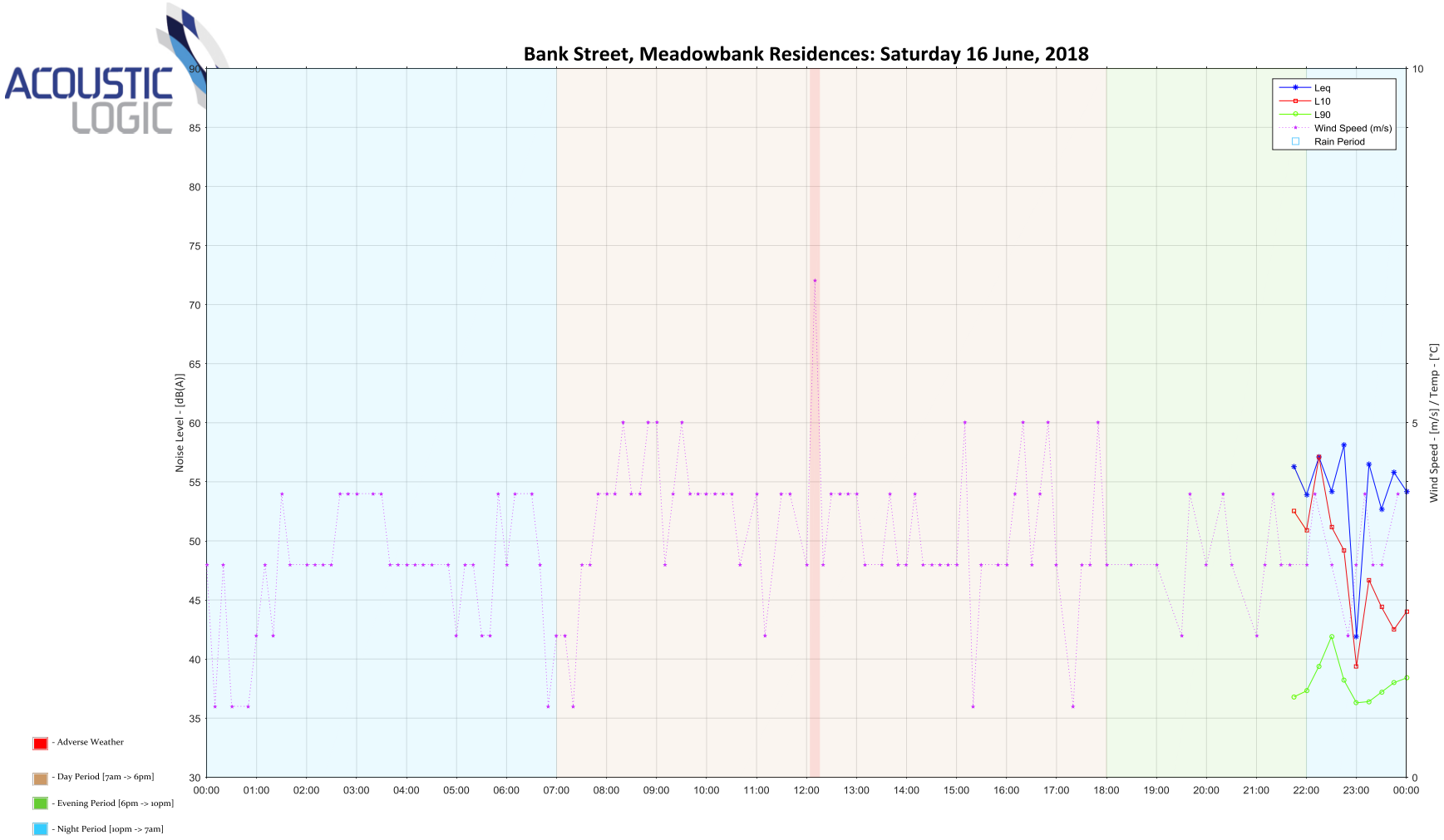
Please contact us should you have any further queries.

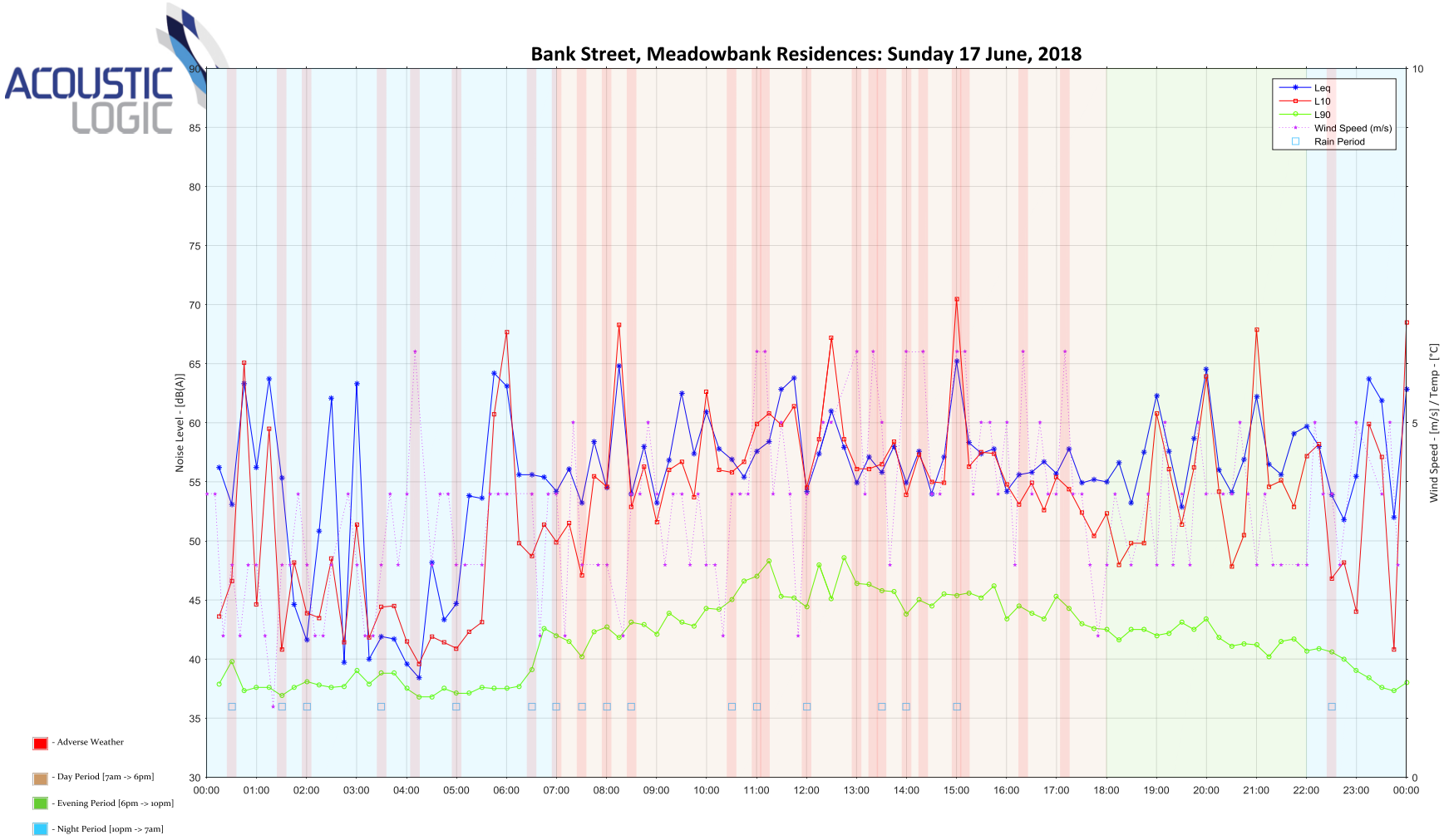
Yours faithfully,

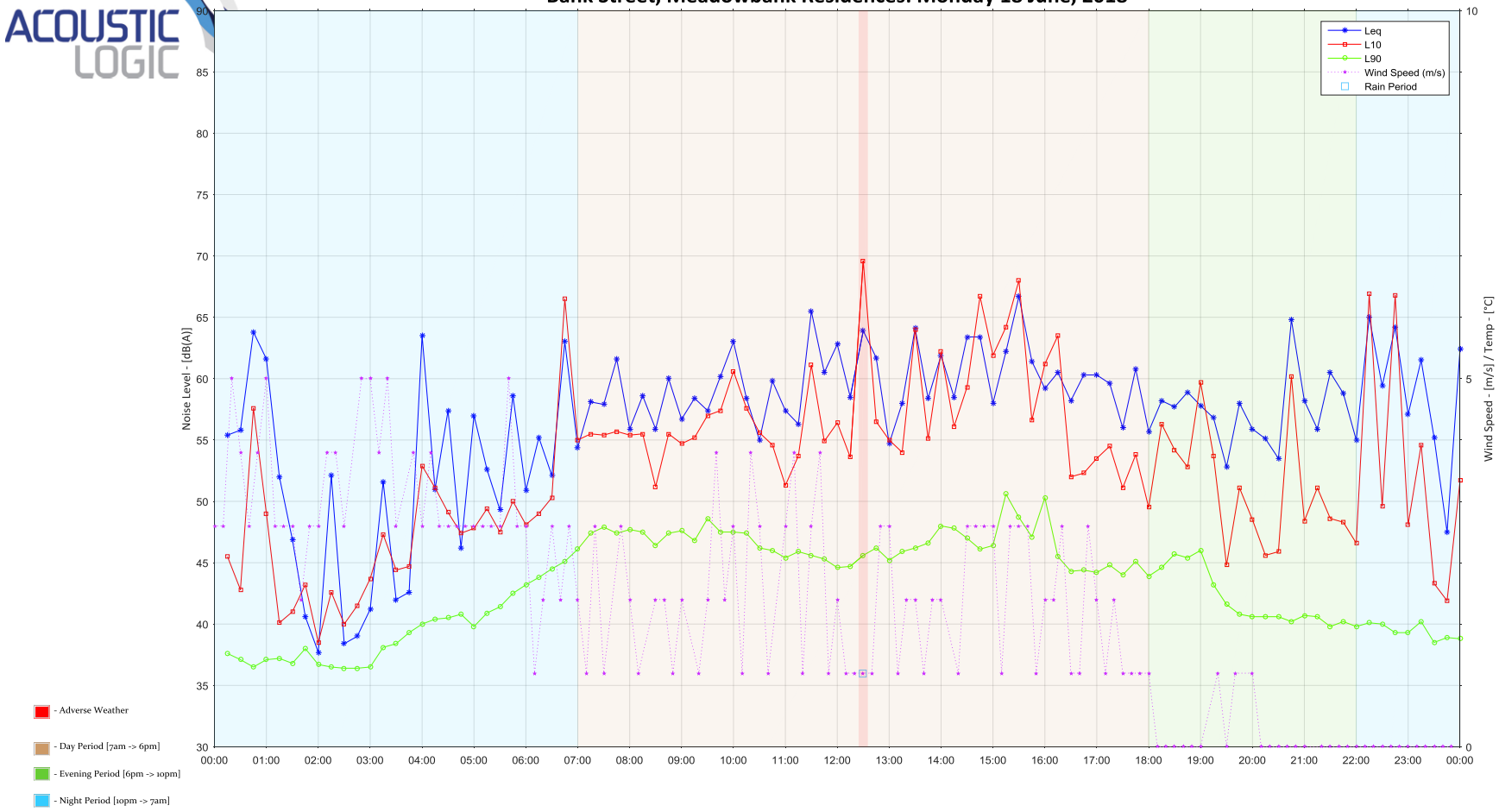
Acoustic Logic Consultancy Pty Ltd
Thomas Taylor

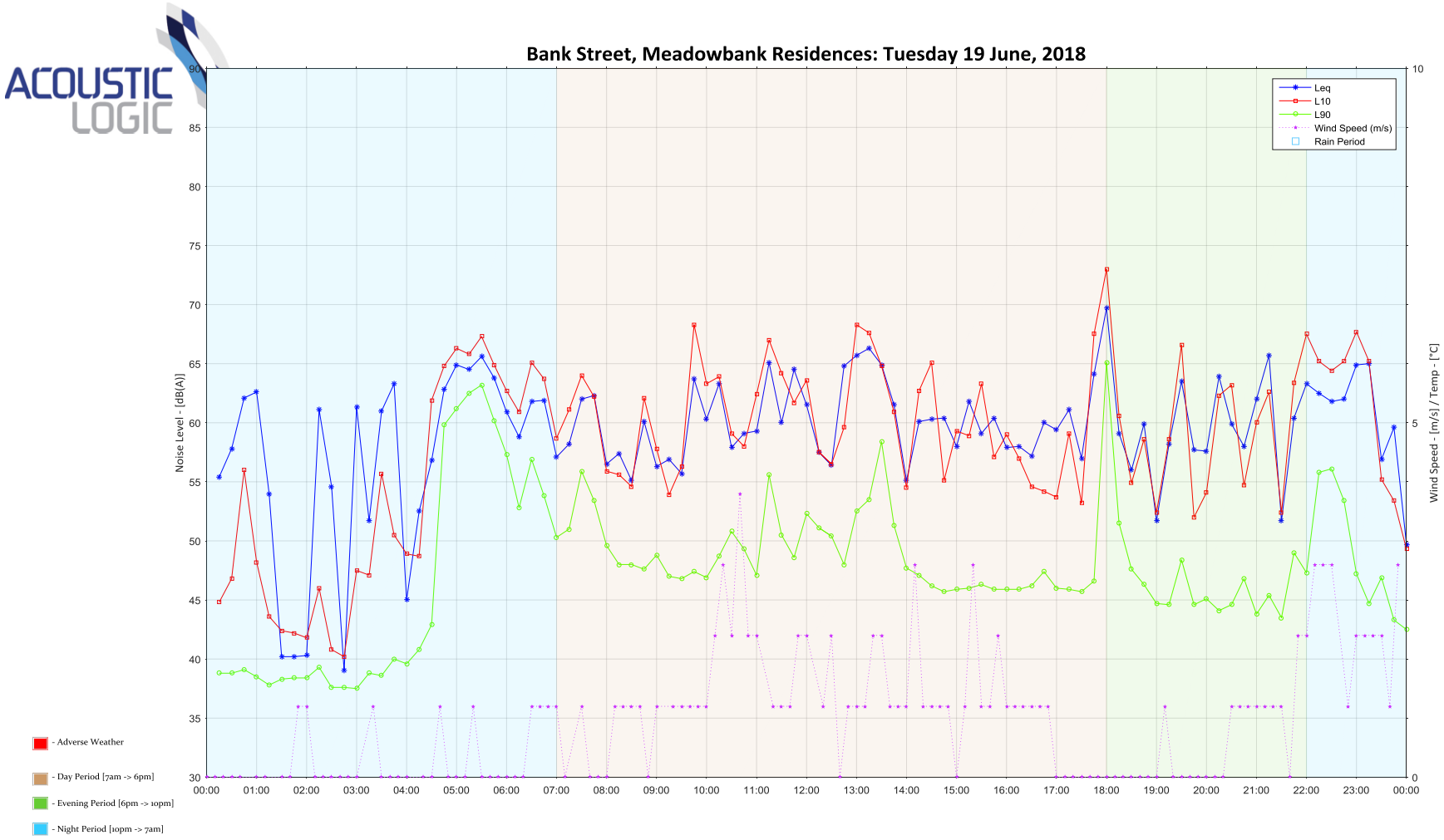
APPENDIX 1 – UNATTENDED NOISE MONITORING RESULTS LOCATION M1 – BANK STREET

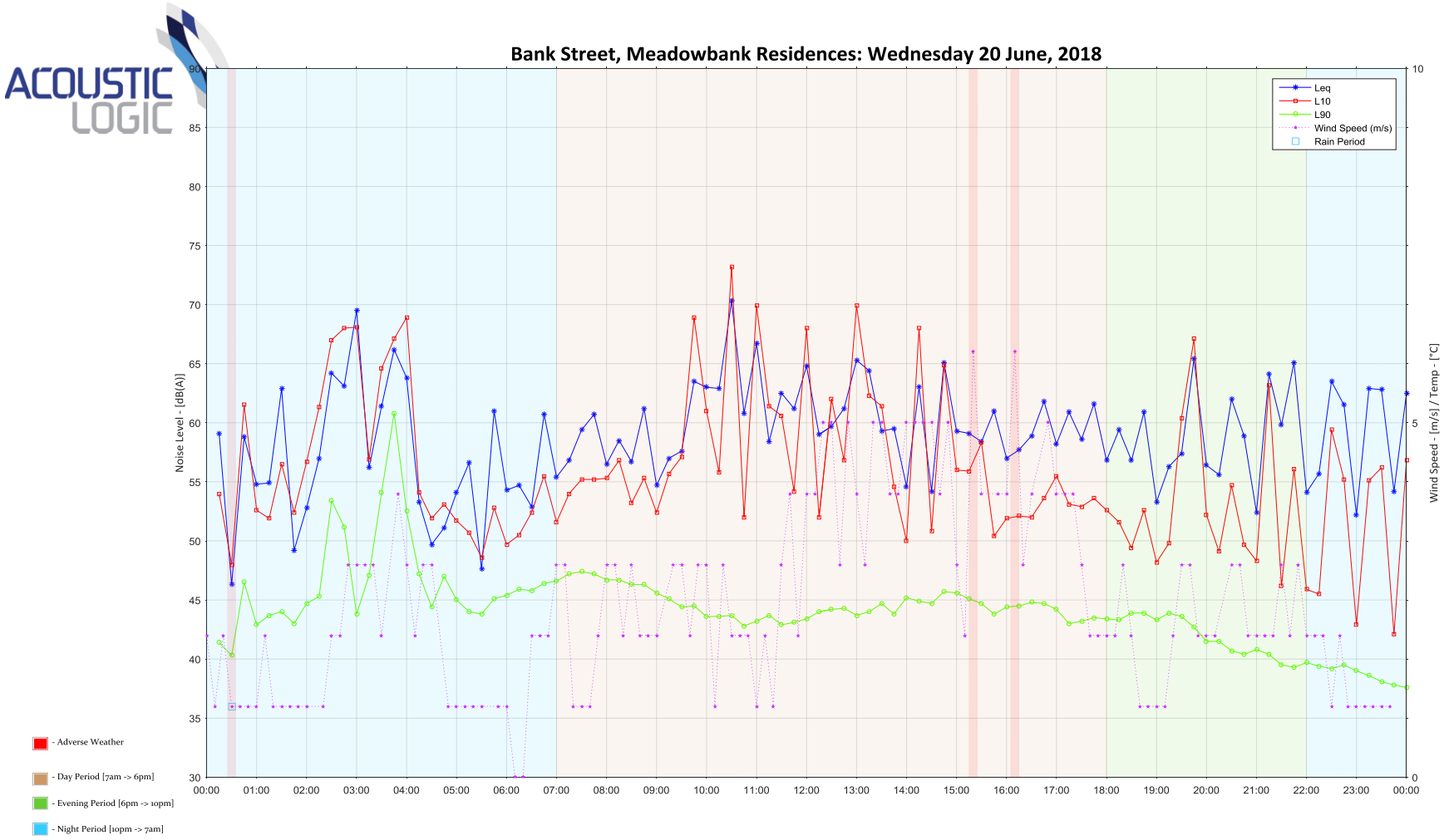
(WEATHER DATA HAS BEEN COLLECTED FROM SYDNEY OLYMPIC PARK ARCHERY CENTRE WEATHER TOWER)

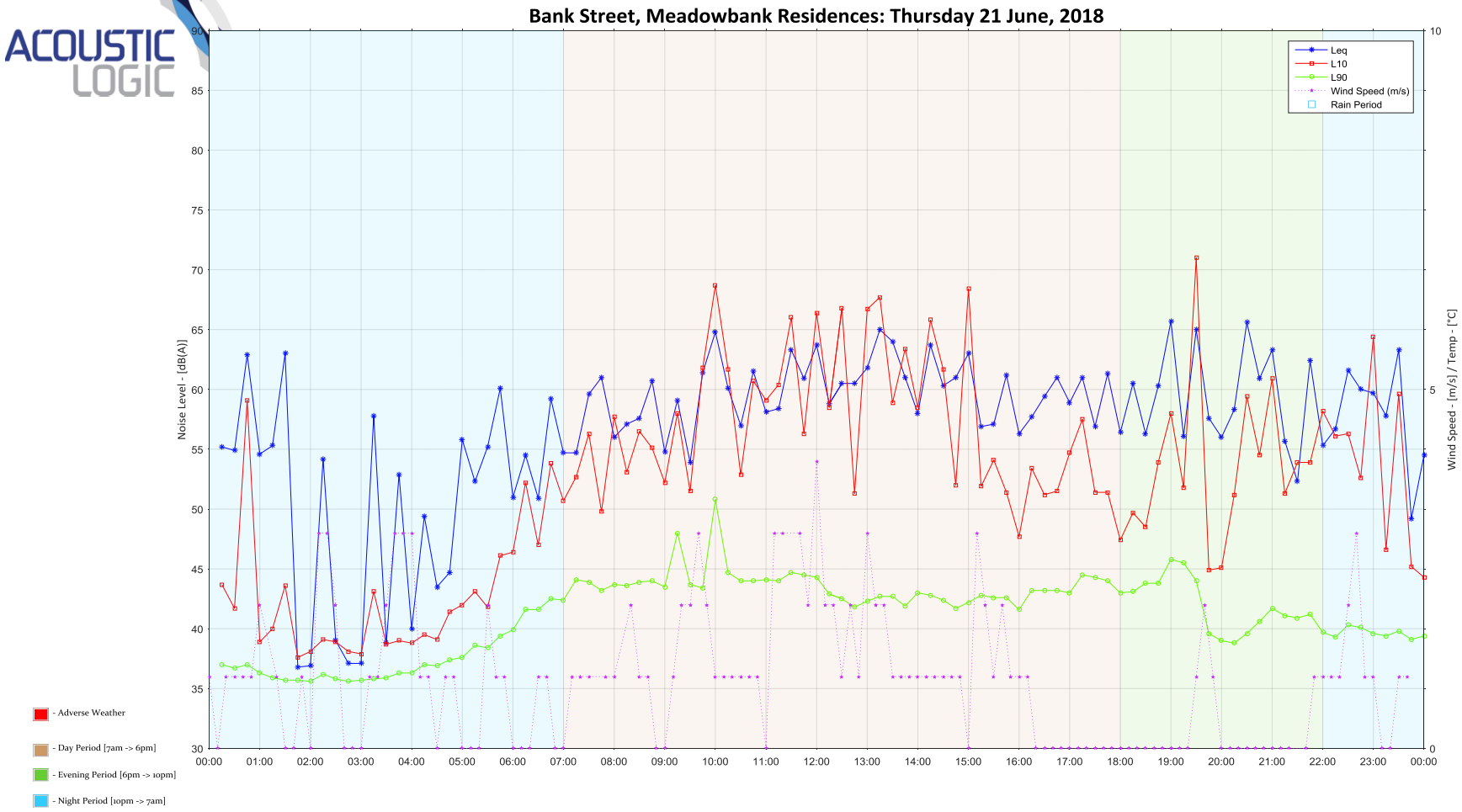

Bank Street, Meadowbank Residences: Saturday 16 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

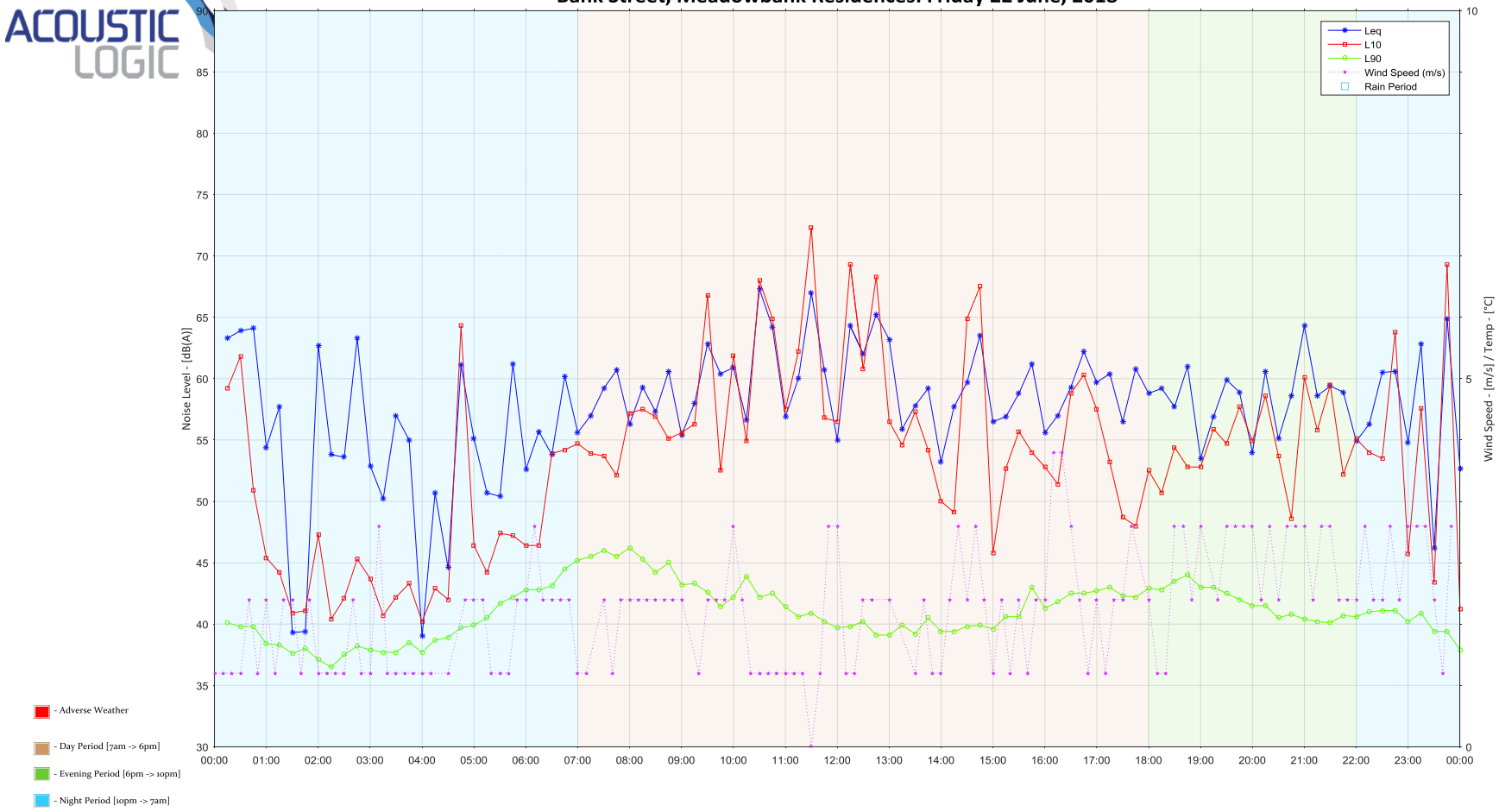

Bank Street, Meadowbank Residences: Sunday 17 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

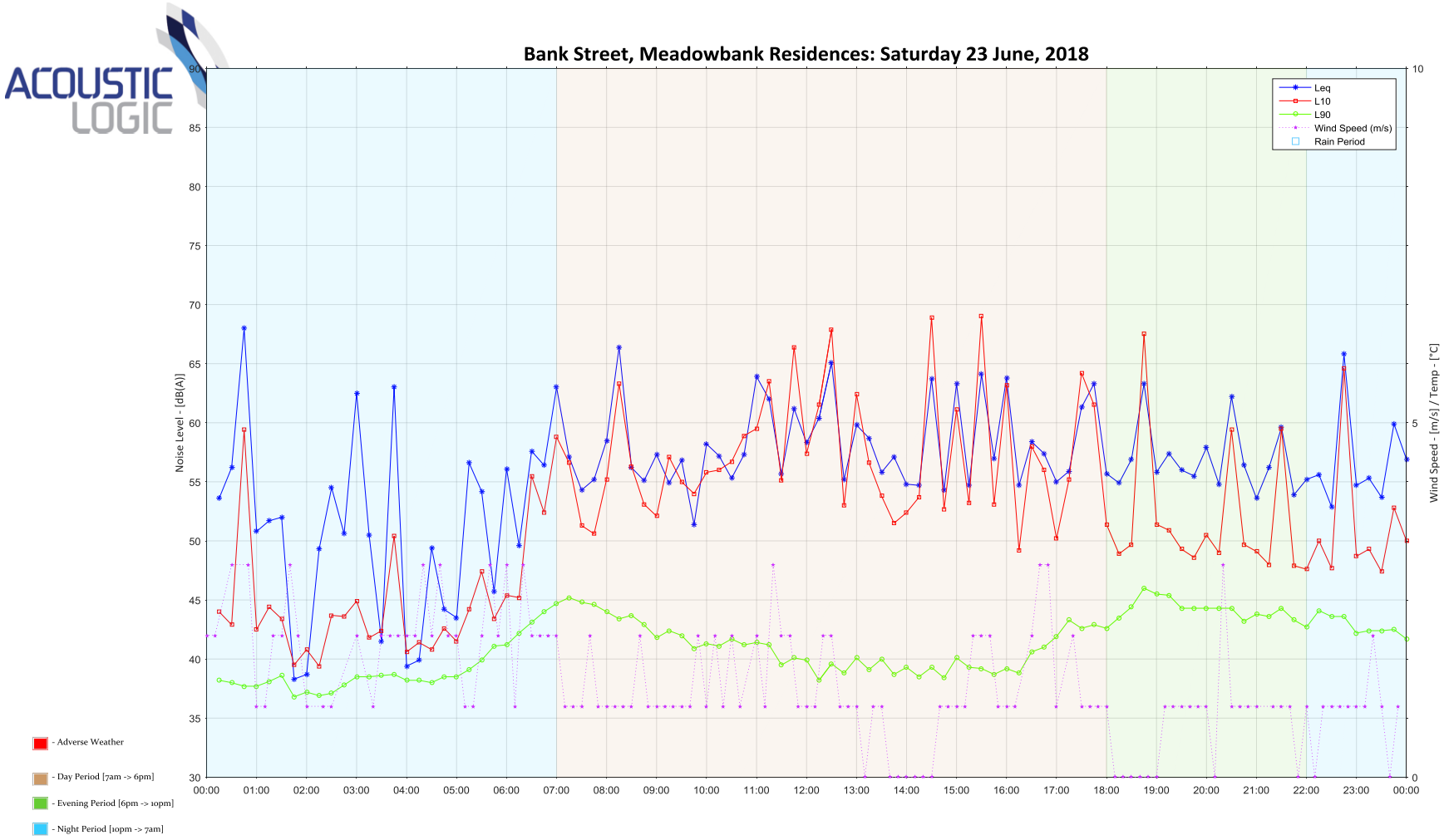

Bank Street, Meadowbank Residences: Monday 18 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

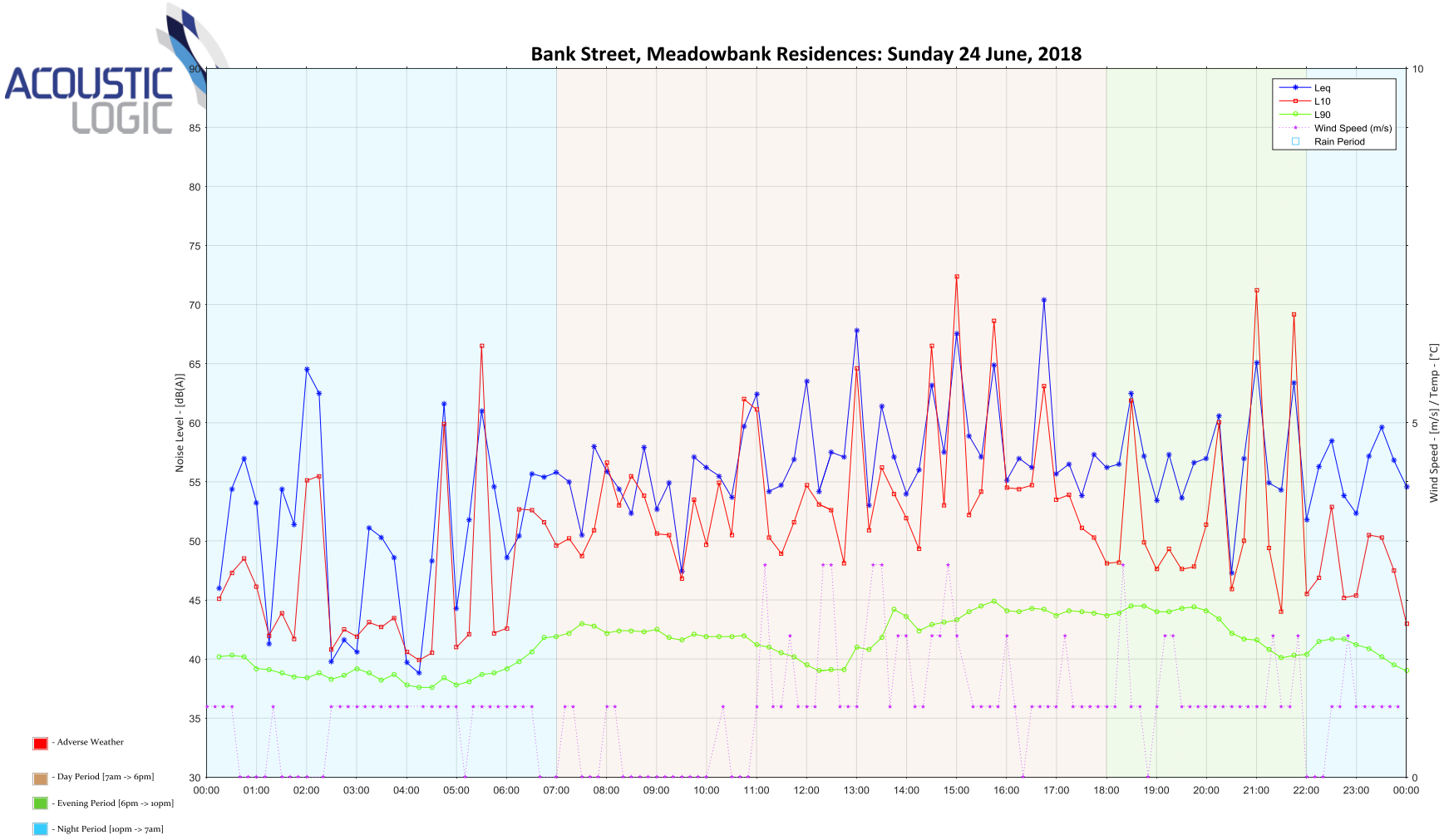

Bank Street, Meadowbank Residences: Tuesday 19 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

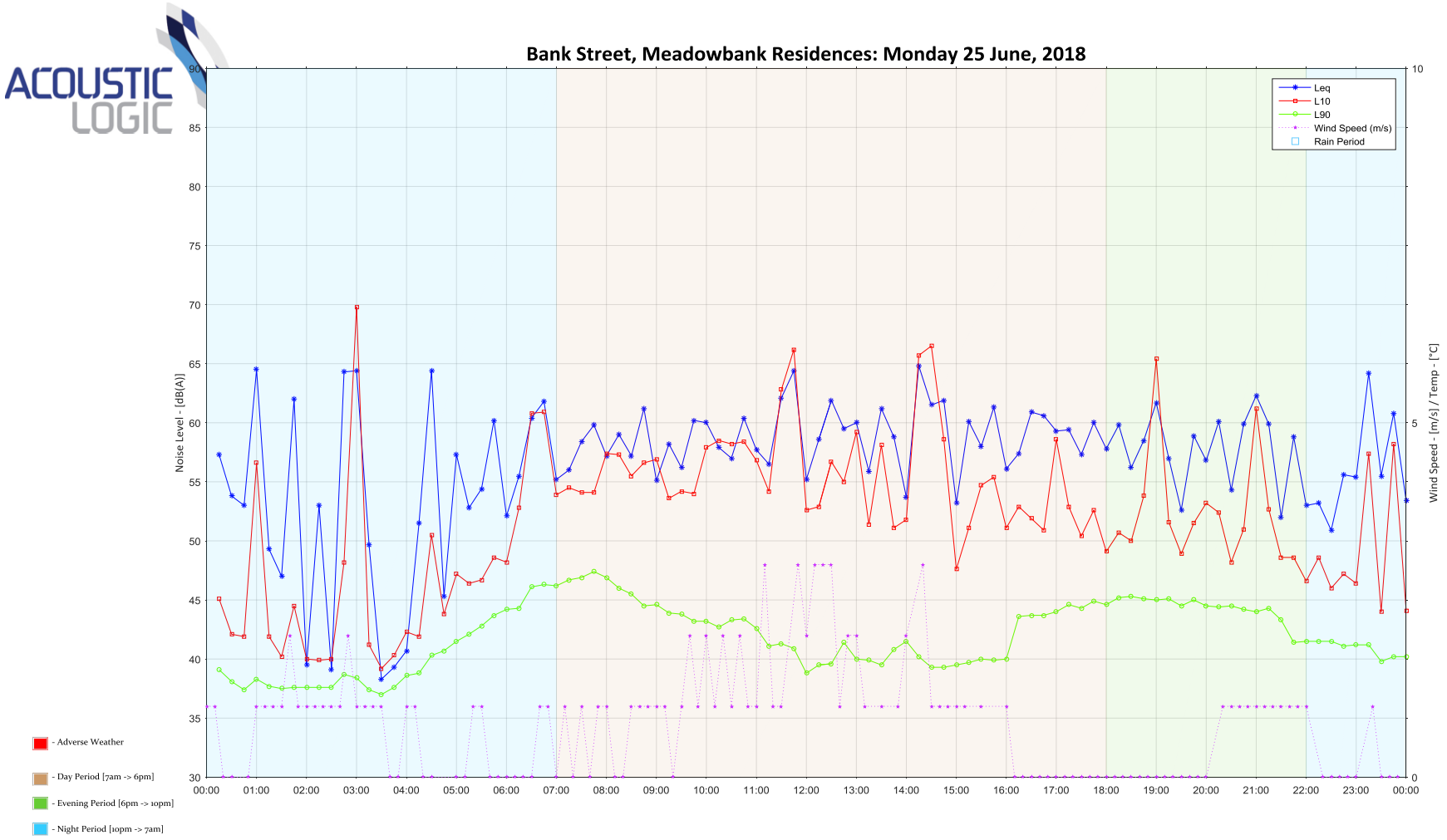

Bank Street, Meadowbank Residences: Wednesday 20 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

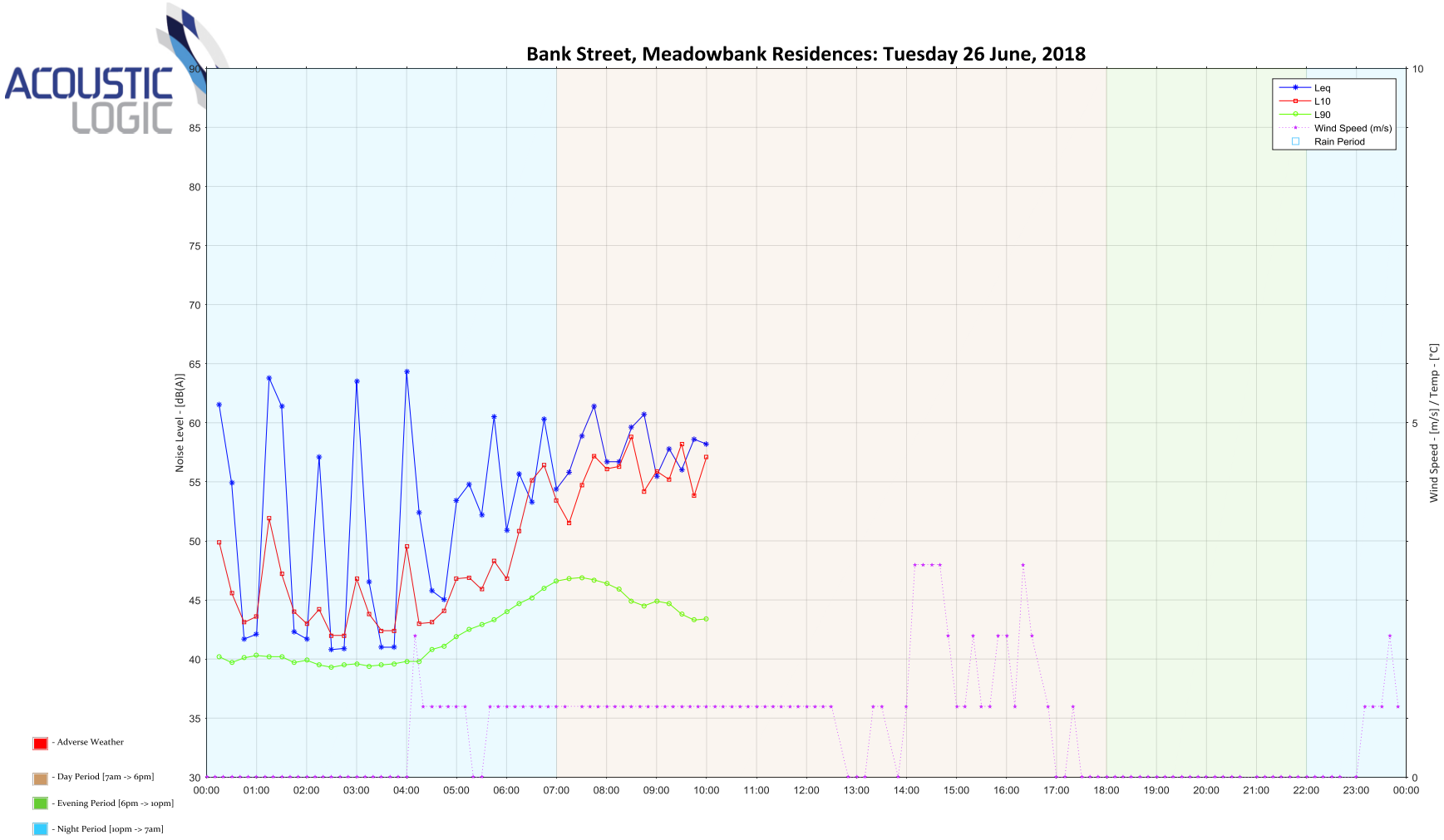

Bank Street, Meadowbank Residences: Thursday 21 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Bank Street, Meadowbank Residences: Friday 22 June, 2018
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]


Bank Street, Meadowbank Residences: Saturday 23 June, 2018
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]

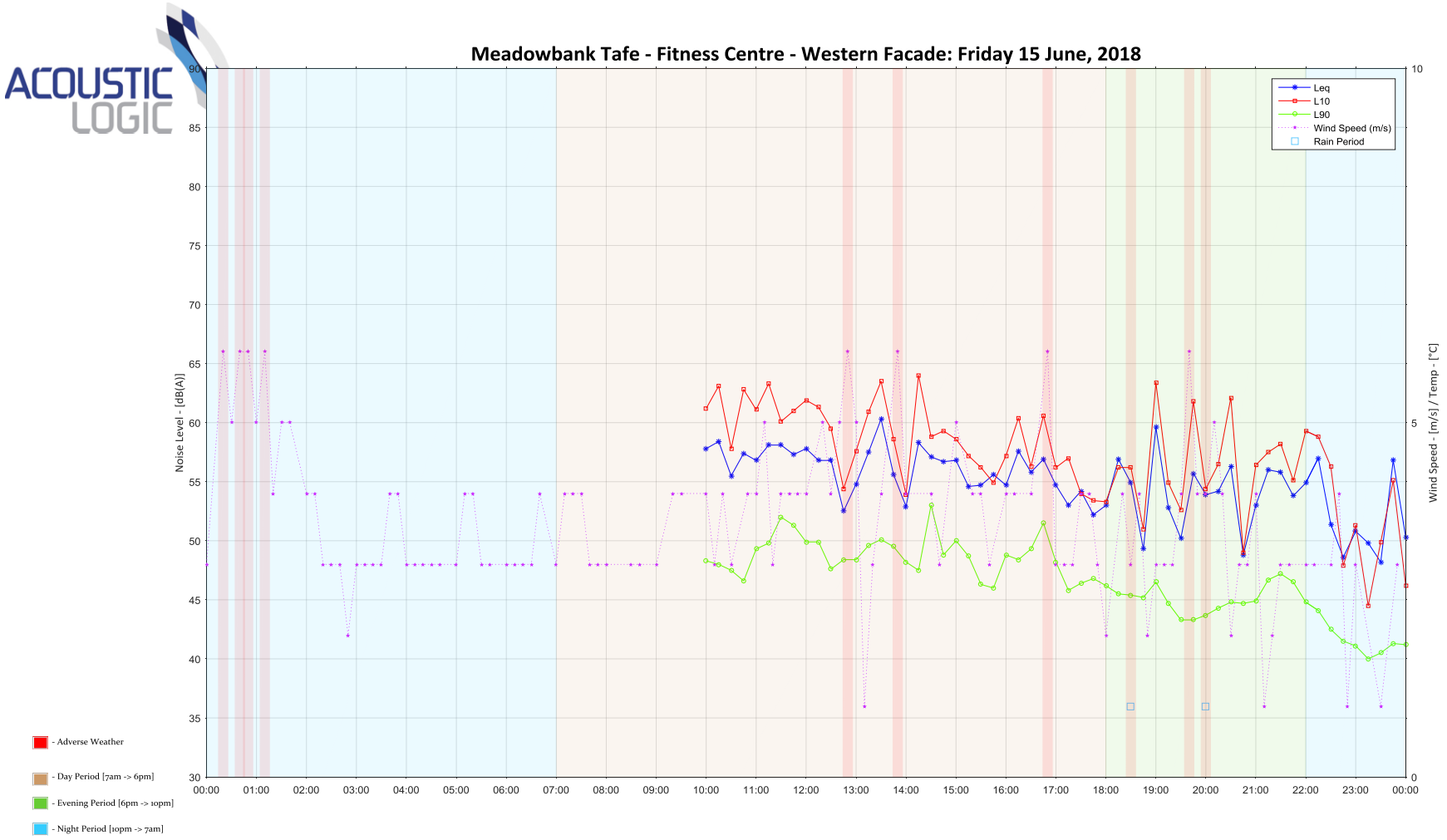

Bank Street, Meadowbank Residences: Sunday 24 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

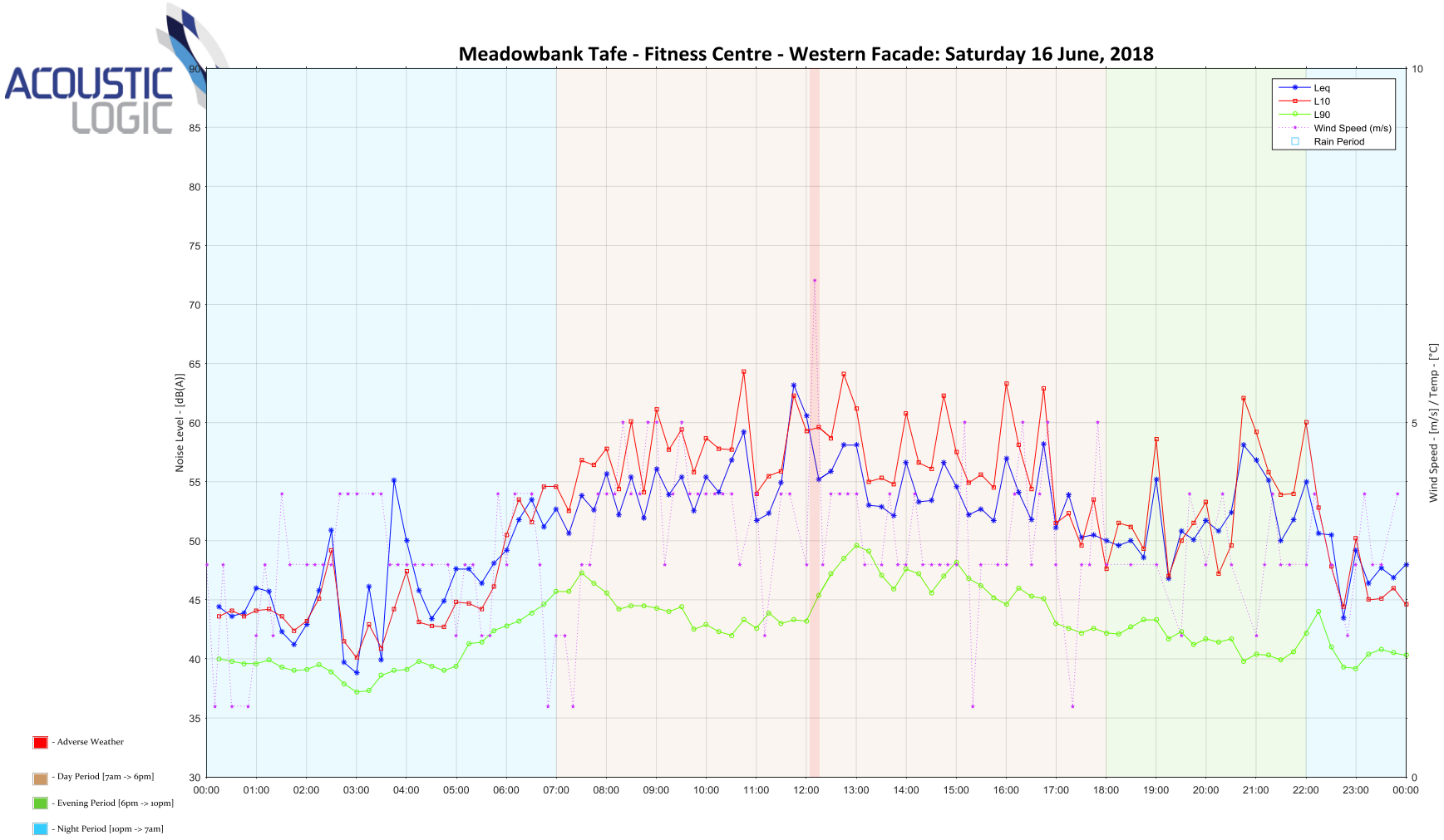

Bank Street, Meadowbank Residences: Monday 25 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

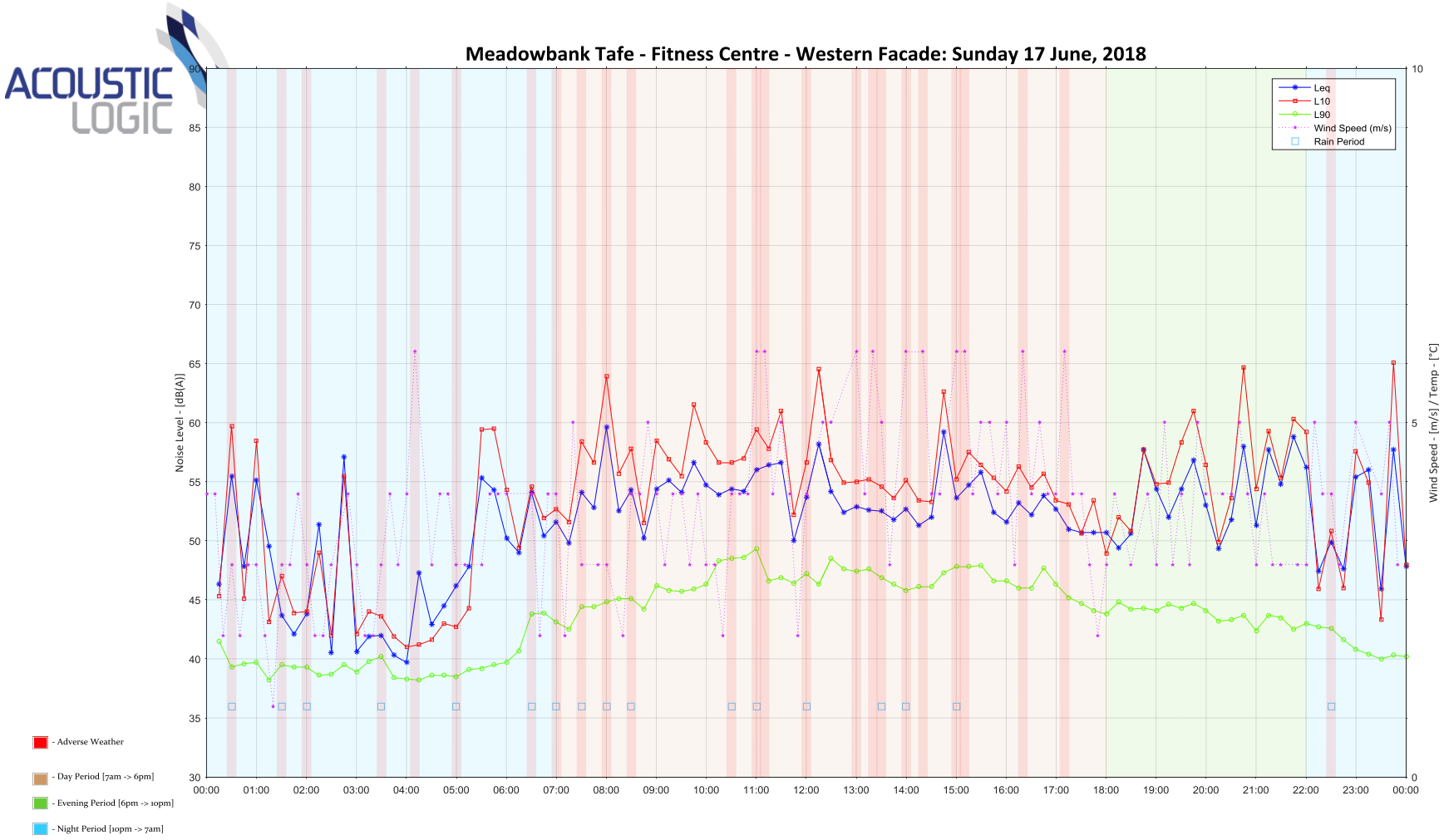

Bank Street, Meadowbank Residences: Tuesday 26 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

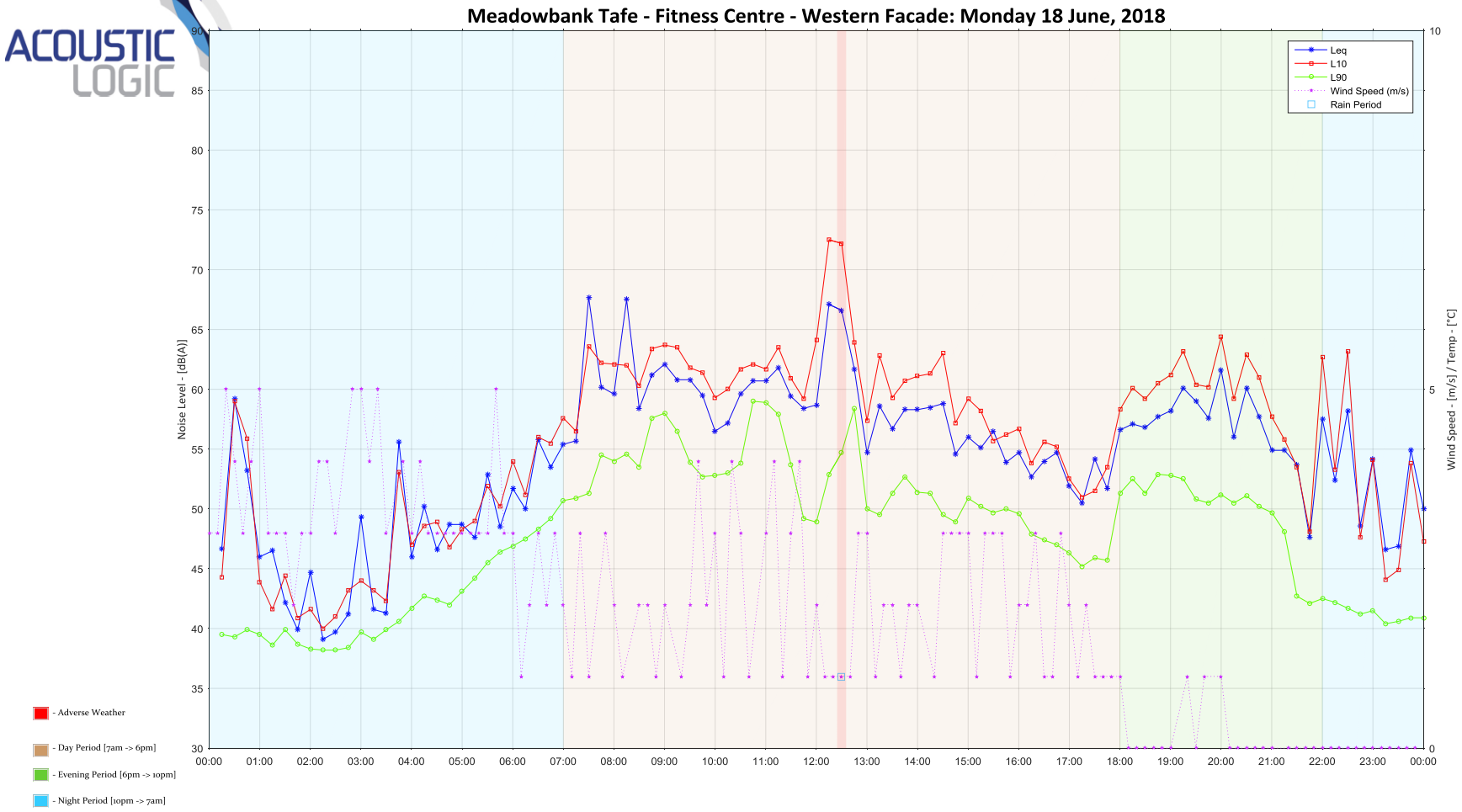
APPENDIX 2 – UNATTENDED NOISE MONITORING RESULTS LOCATION M2 – FITNESS CENTRE

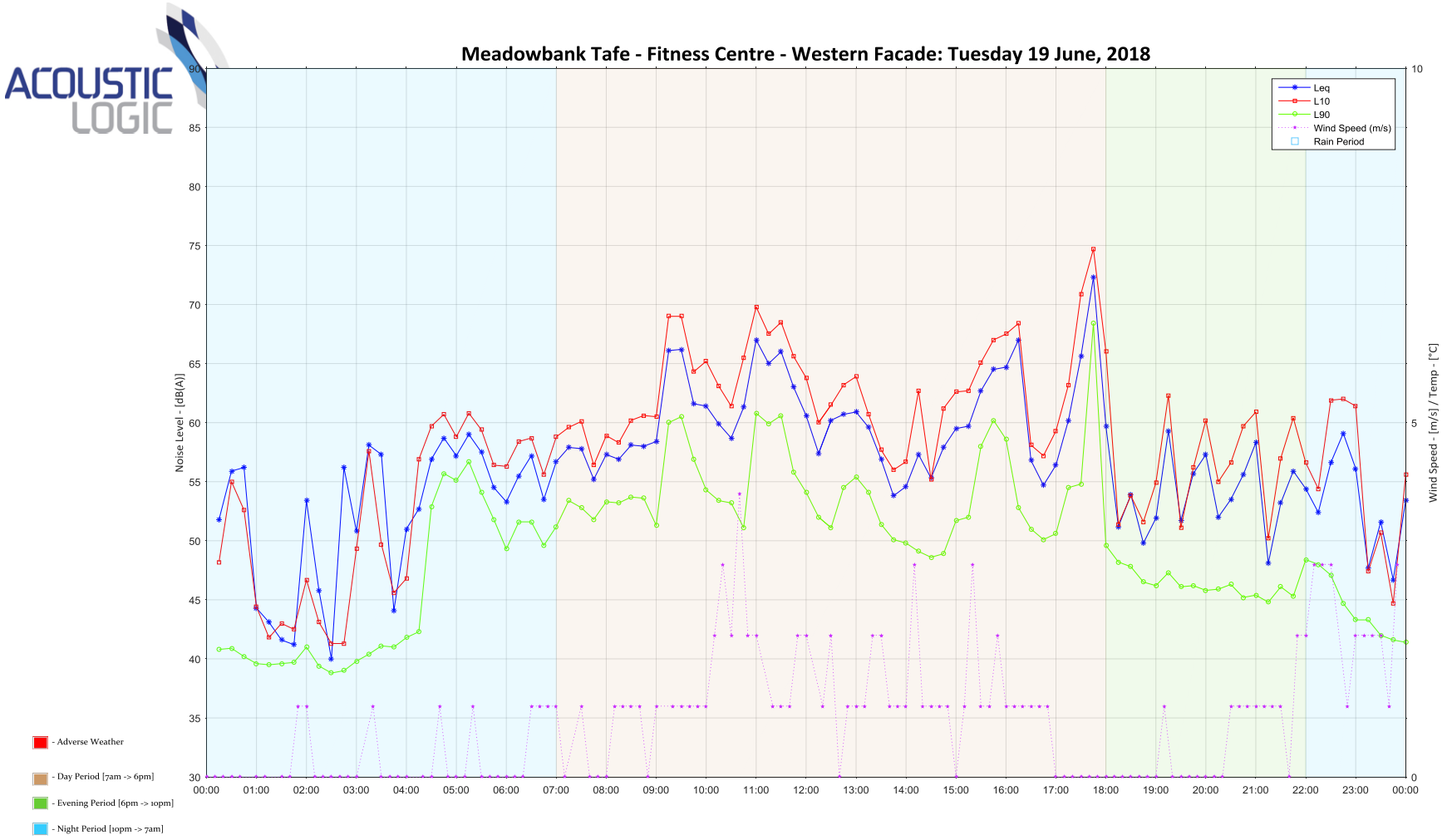
(WEATHER DATA HAS BEEN COLLECTED FROM SYDNEY OLYMPIC PARK ARCHERY CENTRE WEATHER TOWER)

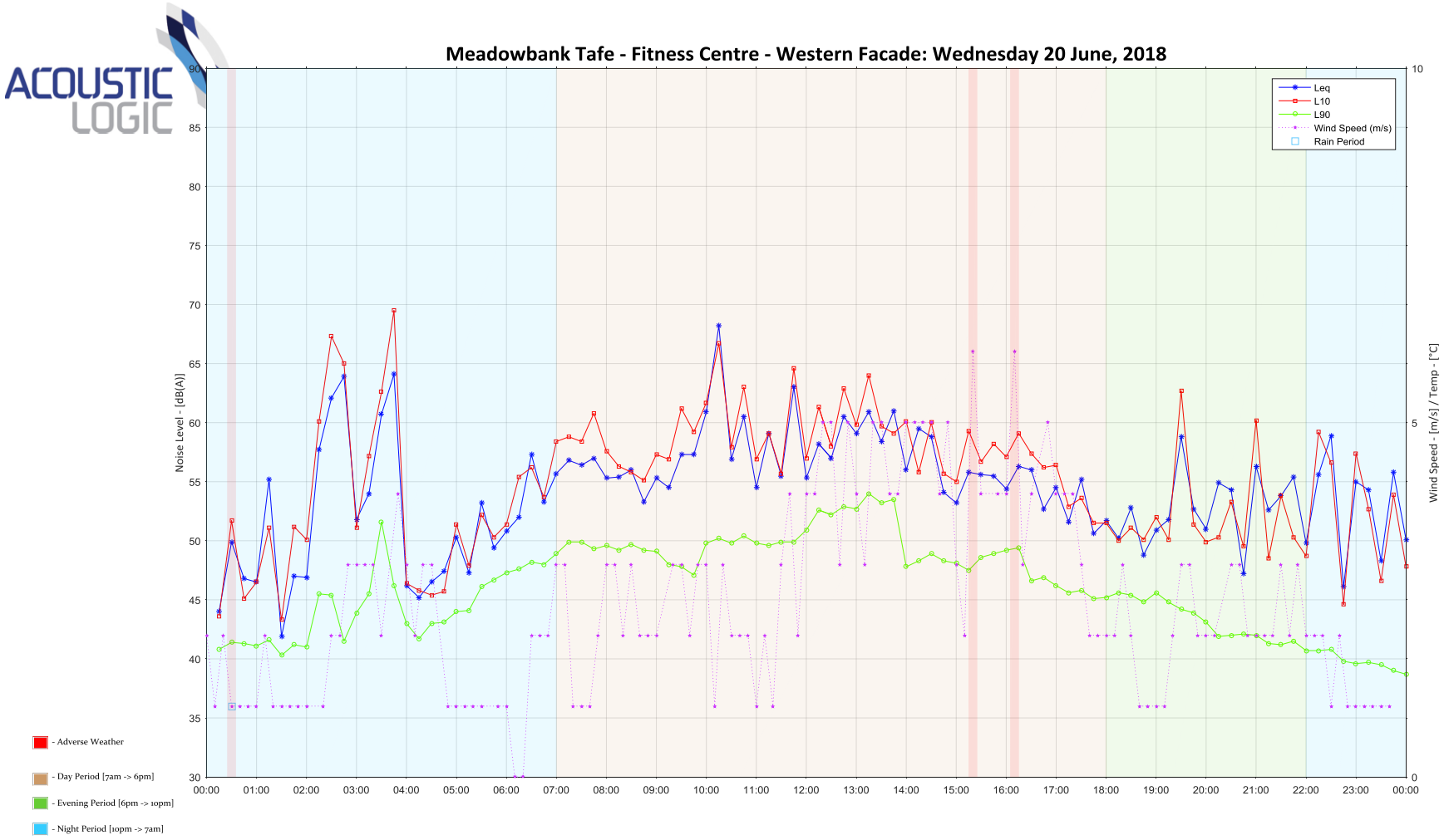

Meadowbank Tafe - Fitness Centre - Western Facade: Friday 15 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

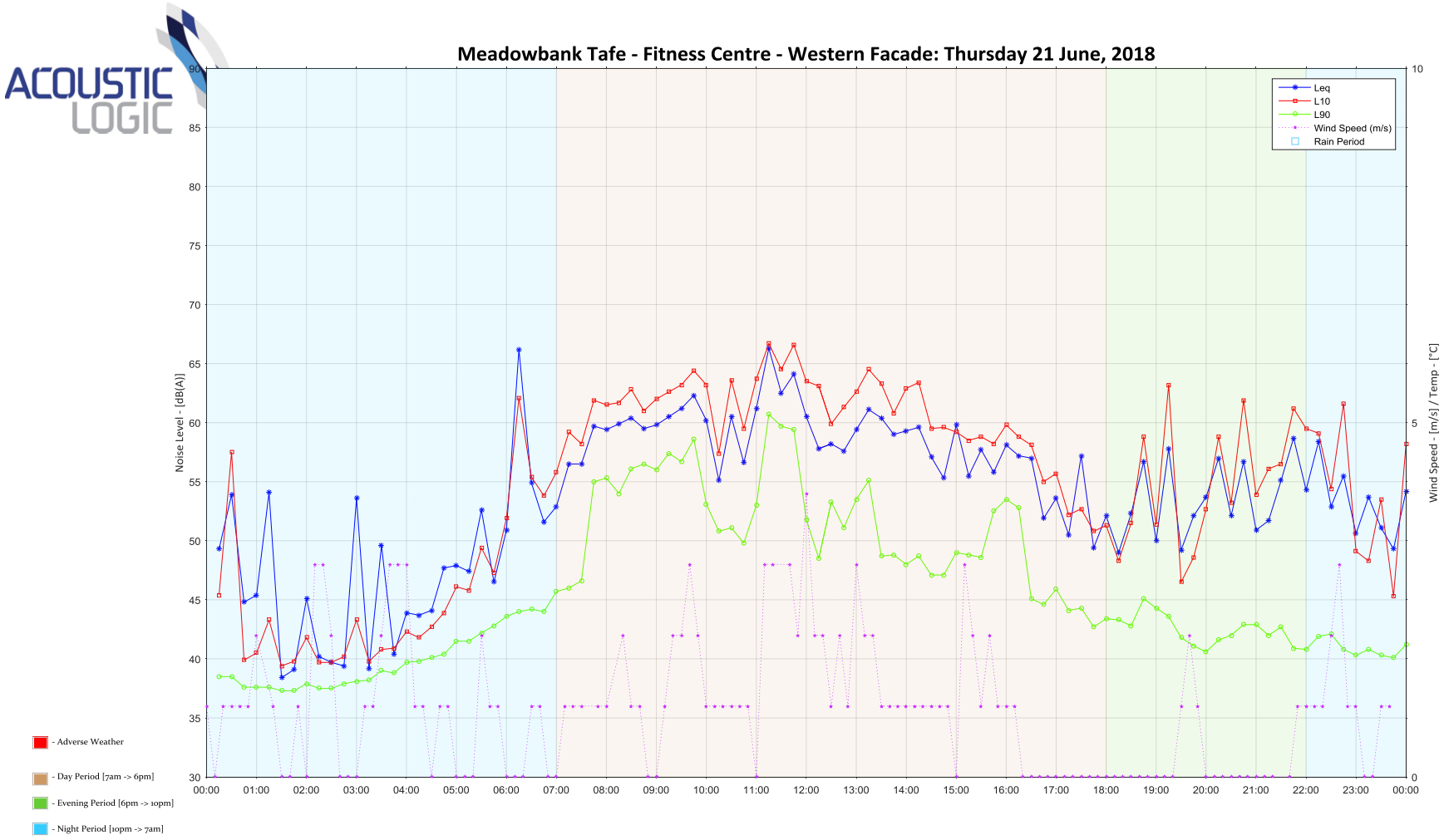

Meadowbank Tafe - Fitness Centre - Western Facade: Saturday 16 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

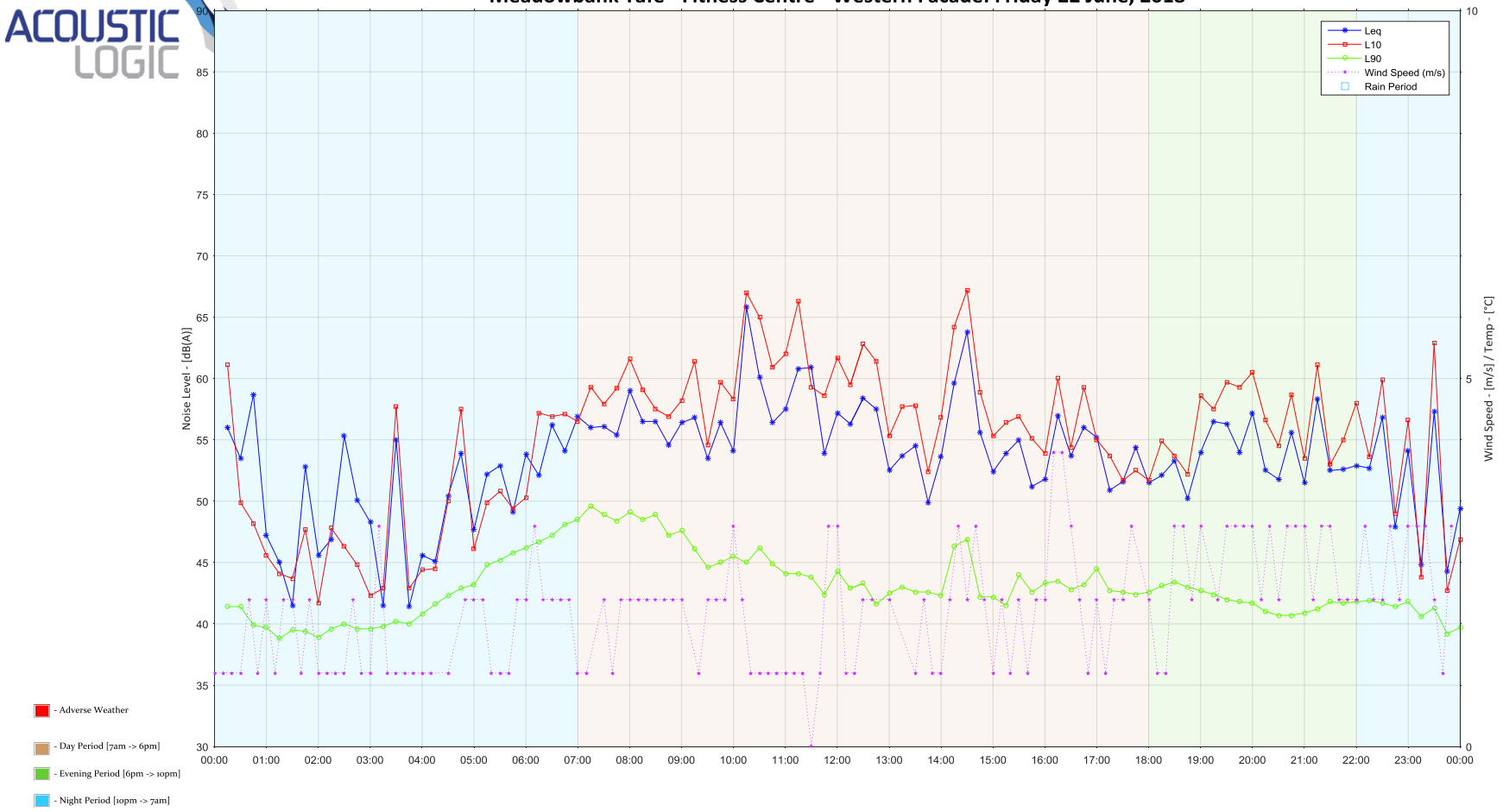

Meadowbank Tafe - Fitness Centre - Western Facade: Sunday 17 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

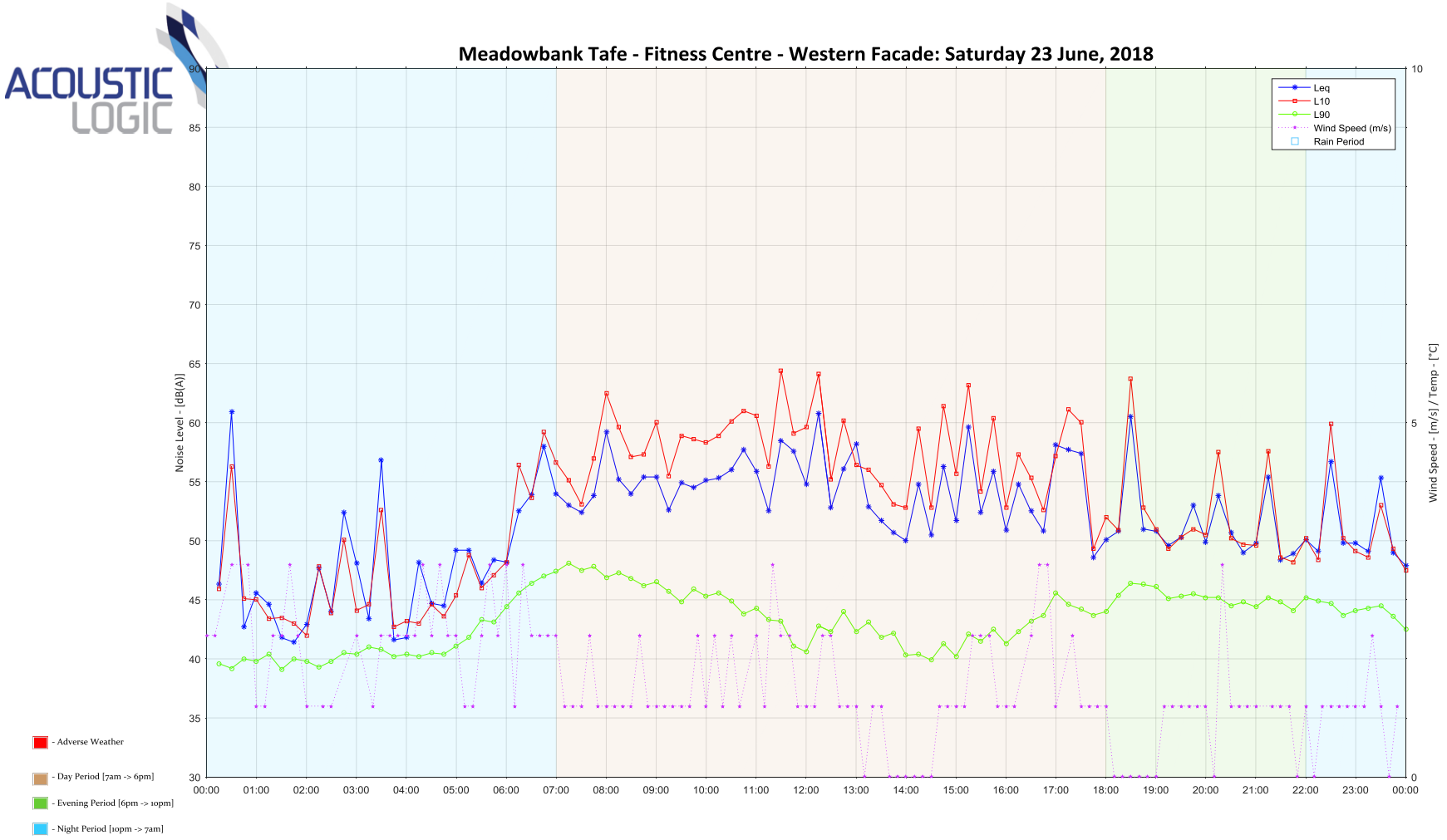

Meadowbank Tafe - Fitness Centre - Western Facade: Monday 18 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

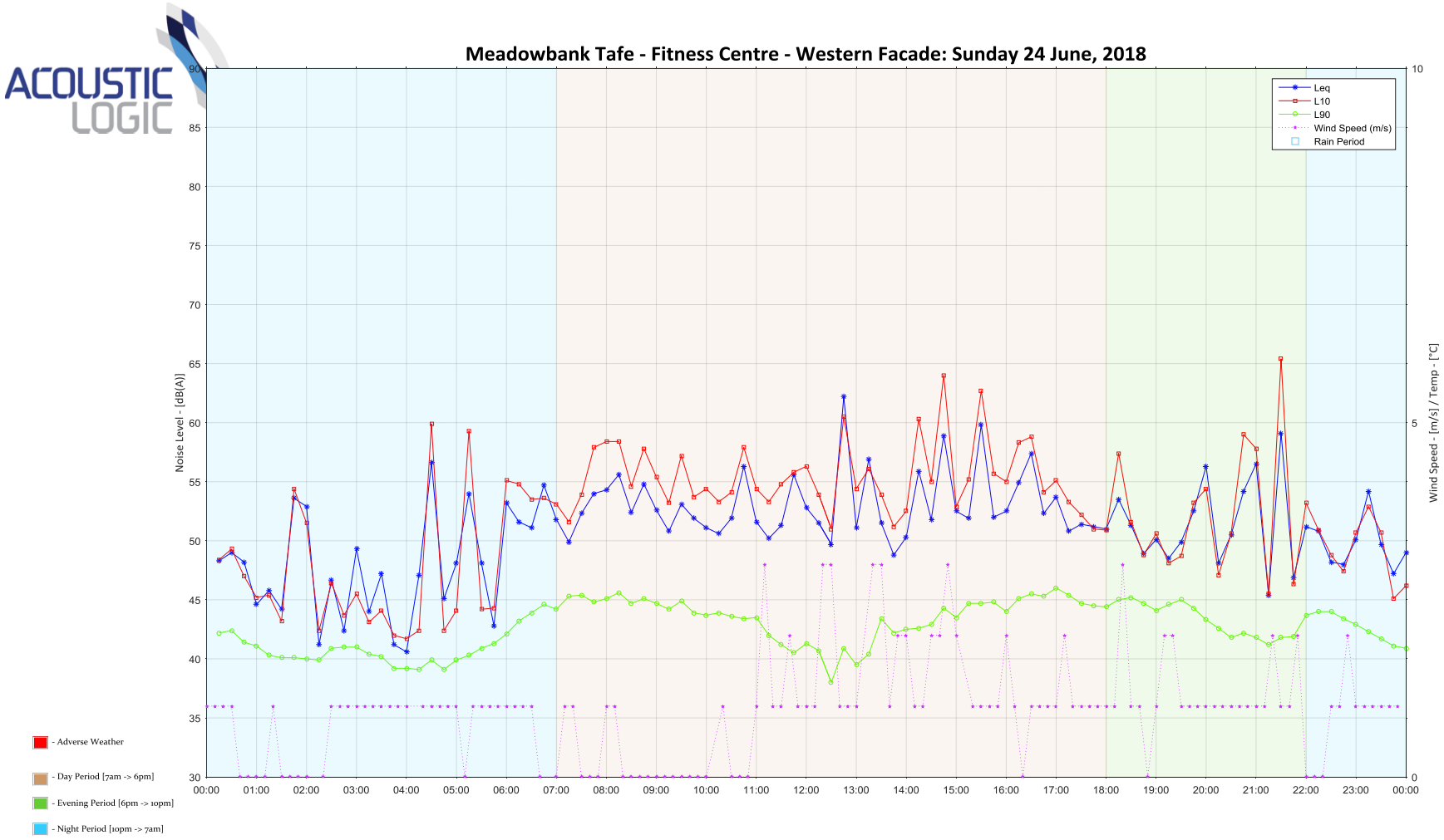

Meadowbank Tafe - Fitness Centre - Western Facade: Tuesday 19 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

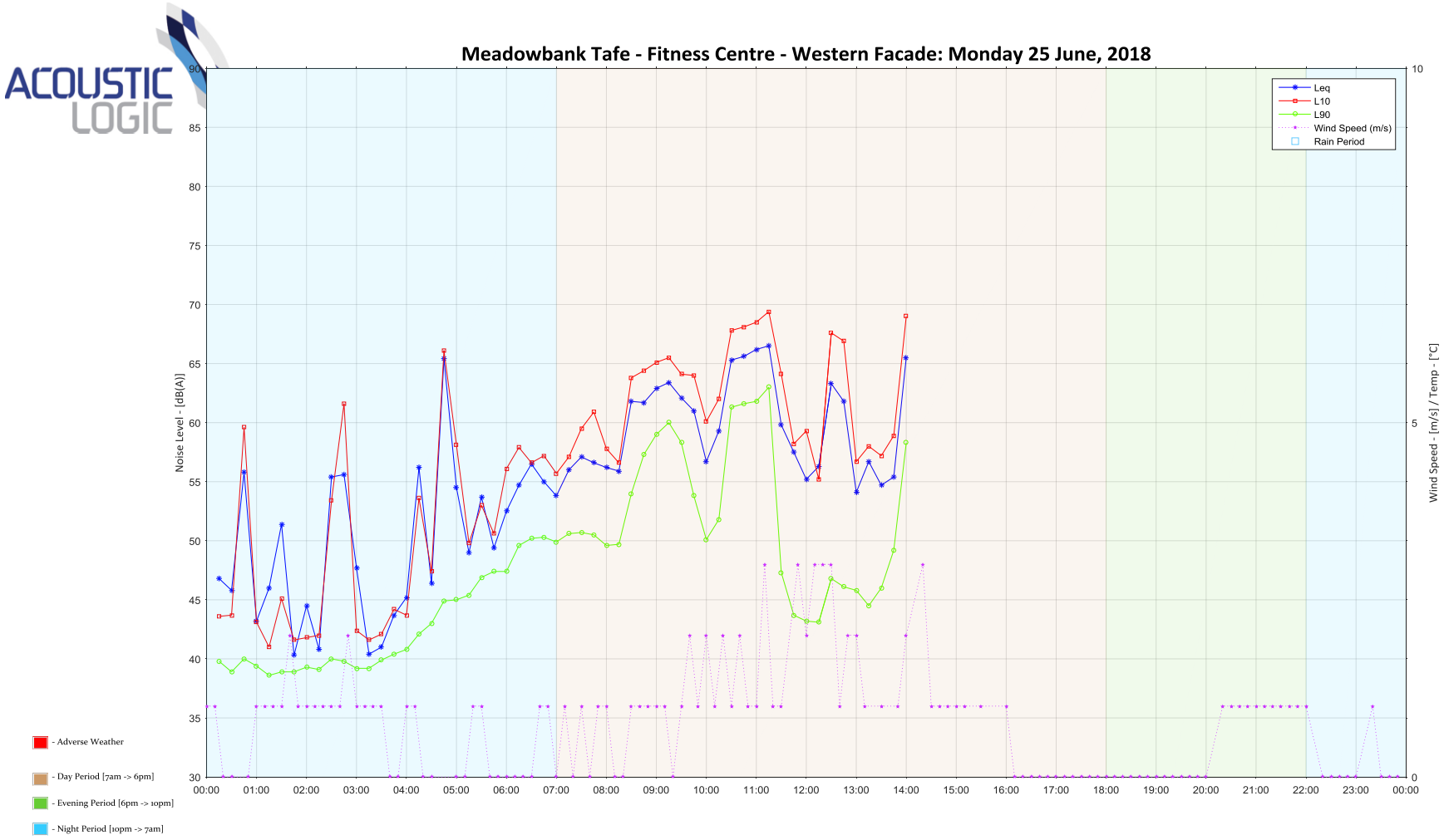

Meadowbank Tafe - Fitness Centre - Western Facade: Wednesday 20 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


Meadowbank Tafe - Fitness Centre - Western Facade: Thursday 21 June, 2018
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]


Meadowbank Tafe - Fitness Centre - Western Facade: Friday 22 June, 2018
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]


Meadowbank Tafe - Fitness Centre - Western Facade: Saturday 23 June, 2018
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]


Meadowbank Tafe - Fitness Centre - Western Facade: Sunday 24 June, 2018
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]


Meadowbank Tafe - Fitness Centre - Western Facade: Monday 25 June, 2018
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]

APPENDIX 3 – CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C18025

Client Details	Acoustic Logic Consultancy Pty Ltd 9 Sarah Street MASCOT NSW 2020
Equipment Tested/ Model Number :	Norsonic 118
Instrument Serial Number :	30642
Microphone Serial Number :	312023
Pre-amplifier Serial Number :	30813

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.5°C	**Ambient Temperature :**	22.3°C
Relative Humidity :	43.4%	**Relative Humidity :**	43.4%
Barometric Pressure :	99.57kPa	**Barometric Pressure :**	99.46kPa

Calibration Technician :	Vicky Jaiswal	**Secondary Check:**	Aaron Skeates-Udy
Calibration Date :	18 Jan 2018	**Report Issue Date :**	22 Jan 2018

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.16dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Norsonic 118 Sound Level Meter

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C18142

Client Details	Acoustic Research Labs Pty Ltd Level 7, Bld 2, 423 Pennant Hills Road Pennant Hills NSW 2120
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00184110
Microphone Serial Number :	173006
Pre-amplifier Serial Number :	74636

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22°C	**Ambient Temperature :**	22.2°C
Relative Humidity :	53.6%	**Relative Humidity :**	55.8%
Barometric Pressure :	99.94kPa	**Barometric Pressure :**	99.92kPa

Calibration Technician : Vicky Jaiswal
Secondary Check: Riley Cooper
Calibration Date : 13 Mar 2018
Report Issue Date : 13 Mar 2018
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.07°C*
12.5kHz	*±0.21dB*	*Relative Humidity*	*±0.58%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Rion NL-42EX - 118 Sound Level Meter (with logging capabilities)

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
AS 1259.1:1990 - AS 1259.2:1990
Calibration Certificate

Calibration Number C17661

Client Details	Acoustic Research Labs Pty Ltd Leve; 7, Bld 2, 423 Pennant Hills Road Pennant Hills NSW 2120
Equipment Tested/ Model Number :	ARL EL-315
Instrument Serial Number :	15-203-506
Microphone Serial Number :	91831
Pre-amplifier Serial Number :	26957

Atmospheric Conditions

Ambient Temperature :	23.9°C
Relative Humidity :	50.8%
Barometric Pressure :	98.88kPa

Calibration Technician : Jason Gomes — **Secondary Check:** Riley Cooper
Calibration Date : 18 Dec 2017 — **Report Issue Date :** 19 Dec 2017

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	*Pass*	10.3.4: Inherent system noise level	*Pass*
10.2.3: Frequency weighting	*Pass*	10.4.2: Time weighting characteristic F and S	*Pass*
10.3.2: Overload indications	*Pass*	10.4.3: Time weighting characteristic I	*Pass*
10.3.3: Accuracy of level range control	*Pass*	10.4.5: R.M.S performance	*Pass*
8.9: Detector-indicator linearity	*Pass*	9.3.2: Time averaging	*Pass*
8.10: Differential level linearity	*Pass*	9.3.5: Overload indication	*Pass*

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.16dB*	*Temperature*	*±0.07°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±0.58%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.017Pa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

The sound level meter under test has been shown to conform to the type 2 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.

NATA
WORLD RECOGNISED ACCREDITATION

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

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NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

ARL EL-315 Noise Monitor