144-146 Boronia Road, Greenacre

DA Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed new boarding house to be located at 144-146 Boronia Road, Greenacre.

This document addresses noise impacts associated with the following:

- Traffic noise impacts from Boronia Road, Greenacre.
- Noise emissions from following;
    - Mechanical plant to service base building;
    - Noise associated with the operation of the community room; and
    - Noise associated with the driveway/carpark.

ALC have utilised the following documents and regulations in the noise assessment of the development:

- City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline 2008';*
- Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors';* and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – *'Noise Policy for Industry (NPfI) 2017'*.

This assessment has been conducted using the CK Design architectural drawings, see details below.

Table 1 – Architectural Drawing List

Architect	Drawing Number	Drawing Title	Date	Revision
CK Design	A1-04	SITE/DEMOLITION PLAN	JAN 18	A
	A1-05	SITE ANALYSIS		
	A1-06	SITE ANALYSIS		
	A1-07	GROUND FLOOR PLAN		
	A1-08	FIRST FLOOR PLAN		
	A1-09	ROOF PLAN		
	A1-10	ELEVATIONS		
	A1-11	ELEVATIONS		
	A1-12	SECTIONS		

2 SITE DESCRIPTION

The proposed new boarding house development is located at 144-146 Boronia Road, Greenacre and contains 6 blocks. Blocks A & B have forty-four apartments spaced over two floors, Blocks C, D & E have twelve apartments located on ground level. Block F contains a community room and garbage facilities. Twenty-two (eleven cars and eleven motorbike) on grade parking is provided in the centre of the development.

Acoustic investigation has been carried out by this office in regards to the developments surrounding the site, which has been detailed below:

- Residential dwellings to the North, across Boronia Road;
- Residential dwellings to the South;
- Residential dwellings to the East and;
- Residential dwellings to the West.

Site investigation indicates that Boronia road carries a moderate to high volume of traffic.

The nearest residential noise receivers around the project site include:

- Receiver 1 - Residential dwellings located at 141-153 Boronia Road, situated to the north, residential receivers are single and double story;
- Receiver 2 - Residential dwellings located at 12A-17 Orana Place, situated to the south, residential receivers are single and double story;
- Receiver 3 - Residential dwellings located at 134-142 Boronia Road, situated to the east, residential receivers are single story and;
- Receiver 4 - Residential dwellings located at 148-156 Boronia Road, situated to the west, residential receivers are single story.

A site map, measurement description and surrounding receivers are presented in Figure 1 below.

Figure 1: Site Survey and Monitoring Positions
Sourced from Six Maps

3 ENVIRONMENTAL 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 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing 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 intervals.

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

4 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted at the site to establish the background noise levels which will be used as basis for this assessment.

4.1 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

4.1.1 Measurement Equipment

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

4.1.2 Measurement Location

An unattended noise monitor was installed in the backyard of 144 Boronia Road. For a detailed location refer to Figure 1. See Figure 2 below for a photo of the installed noise monitor:

Figure 2 : Photo of the Noise Monitor installed on site.

4.1.3 Measurement Period

Unattended noise monitoring was conducted from Tuesday, 5th June 2018 to Wednesday, 13th June 2018.

4.1.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the table below.

4.1.5 Unattended Noise Measurements

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix 1 provides the results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in the Table below.

Table 2 – Unattended Noise Monitor – Location 1 – Rating Background Noise Level

Date	Measured Rating Background Noise Level dB(A)L_{90}		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am Next Day)
Tuesday, 5th June, 2018	-	44	-
Wednesday, 6th June, 2018	41	43	40
Thursday, 7th June, 2018	41	46	43
Friday, 8th June, 2018	42	49	42
Saturday, 9th June,2018	42	44	41
Sunday, 10th June, 2018	43	45	41
Monday, 11th June, 2018	40	43	41
Tuesday, 12th June, 2018	41	44	39
Wednesday, 13th June, 2018	-	-	42
Median	**41**	**44**	**41**

4.1.6 Summarised Rating Background Noise Levels

Summarised rating background noise levels are presented below.

Table 3 - Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level dB(A)$L_{90(period)}$
Project Site	Day (7am-6pm)	41
	Evening (6pm-10pm)	44*
	Night (10pm-7am)	41

***Note: Based on the requirements of the NSW EPA Noise Policy for Industry (2017) the RBL during the daytime period should be adopted for setting up the noise emission criteria if the RBL of the evening period is higher than the daytime noise level.**

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Onsite investigation indicates that the primary external noise source around site is traffic movements from Boronia Road.

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria and standards;

- City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline 2008'; and*
- Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'.*

5.1.1 Bankstown Development Control Plan 2015

No specific noise level criteria are detailed within the Bankstown Development Control Plan 2015. Given this, the 'Developments near Rail Corridors or Busy Roads – Interim Guideline" and AS2107-2016 is referred to in establishing the internal noise goals for external noise intrusion impacts from traffic movements along Boronia Road.

5.1.2 NSW Department of Planning and Environment's Document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline'*

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
  - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*
  - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

5.1.3 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*

Australian Standard AS 2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS 2107-2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 4 - Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A)$L_{eq(period)}$
Living Areas	40-45dB(A)$L_{eq(when\ in\ use)}$
Sleeping Areas	35-40dB(A)$L_{eq(10pm\text{-}7am)}$*
Bathrooms, Ensuites, Laundry	45dB(A)$L_{eq(when\ in\ use)}$

*Night-time period has been adopted from the NSW EPA Road Noise Policy (RNP) 2011.

5.1.4 Summary of Criteria

The governing project criteria is presented in the Table 5 below.

Table 5 - Summary of Internal Noise Level Criteria

Space	Internal Traffic Noise Criteria dB(A)$L_{eq(period)}$
Bedroom	35dB(A)$L_{eq(9hour)}$
Living Space	40dB(A)$L_{eq(15hour)}$
Bathrooms, Ensuites, Laundry	45dB(A)$L_{eq(When\ in\ use)}$

5.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish traffic surrounding environmental noise levels impacting the development.

5.2.1 Measurement Equipment

Attended measurements of traffic noise were undertaken by this office. Measurements were conducted using a Norsonic 140 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.

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

5.2.2 Measurement Locations

Attended Traffic Noise Measurements: These were conducted along Boronia Road, see figure 1 for the measurement location. Noise measurements had a 180° view of Boronia Road and were 3m from the kerb.

An unattended noise monitor was installed in the rear of the property as indicated in Figure 1. The noise monitor had an obstructed view of traffic.

5.2.3 Measurement Period

Attended traffic noise measurements were undertaken between the hours of 10:00am to 10:30am on Thursday, 14th June 2018.

Unattended noise monitoring was conducted from Tuesday, 5th June 2018 to Wednesday, 13th June 2018.

5.2.4 Measured Traffic Noise Measurements

Unattended and attended traffic noise measurements have been summarised below for each location.

5.2.4.1 Attended Traffic Noise Measurements

The following table presents the results of the attended traffic noise measurements.

Table 6 – Attended Traffic Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)$L_{Aeq\ (15Mins)}$
Boronia Road, Greenacre (See Figure 1) 3m from kerb 180° view of the road	10:00am – 10:30am Thursday, 14th June, 2018	70dB(A)

5.2.4.2 Unattended Noise Measurements

The following table presents the results of the unattended traffic noise measurements.

Table 7 – Unattended Traffic Noise Measurements

Date	Measured Traffic Noise Level dB(A) dB(A)L_{Aeq}	
	Day (7am-10pm)	**Night (10pm-7am)**
Tuesday, 5th June, 2018	-	-
Wednesday, 6th June, 2018	56	52
Thursday, 7th June, 2018	53	51
Friday, 8th June, 2018	54	51
Saturday, 9th June,2018	53	51
Sunday, 10th June, 2018	52	50
Monday, 11th June, 2018	53	50
Tuesday, 12th June, 2018	53	51
Wednesday, 13th June, 2018	-	52
Logarithmic Average	**53**	**51**

5.2.4.3 Summarised External Noise Levels

The existing traffic noise levels listed in the table below were determined based on the unattended noise monitoring measurements.

Table 8 – Measured Existing Traffic Noise Levels

Location	Summary of Measured Existing Traffic Noise Level	
	Daytime (7am-10pm) dB(A) $L_{Aeq\ (15hour)}$	**Night time (10pm-7am) dB(A) $L_{Aeq\ (9hour)}$**
Boronia Road, Greenacre (See Figure 1)	70dB(A)$L_{eq(15hour)}$	68dB(A)$L_{eq(9hour)*}$

*Note: The night time traffic noise level along Boronia Road was adjusted based on the measurement during the day and the difference between the unattended noise monitoring data.

5.3 NOISE INTRUSION ANALYSIS

Traffic noise intrusion into the proposed development was assessed using the measured and predicted noise levels above.

Calculations were undertaken taking into account the orientation of windows, barrier effects *(where applicable)*, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

5.4 RECOMMENDED CONSTRUCTIONS

5.4.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended constructions are detailed in Appendix 2 *"Glazing Mark-up".*

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 9 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
6mm Float	29
6.38mm Laminated	31
10.38mm Laminated	35

5.4.2 External Wall Construction

External walls will be constructed from concrete or masonry elements, this proposed structure will not require any further acoustic upgrading.

In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

5.4.3 External Roof & Ceiling Construction

External roof will be constructed from concrete or masonry elements for Blocks A and B, this proposed structure will not require any further acoustic upgrading, however; Blocks C, D and E will be of a light weight sheet metal construction, this system will not be sufficient to achieve acoustic requirements, further acoustic upgrading is required. See below for details.

Table 10 – External Light Weight Roof Construction

Block	External Lining	Truss System	Internal Lining
C, D & E	0.5mm Sheet Metal	Minimum of 200mm Airgap with 75mm thick 11kg/m^3 glasswool insulation	1 x 13mm Plasterboard

In the event that any penetrations are required through the external skin, an acoustic grade sealant should be used to minimise all gaps.

5.4.4 Entry Doors

External opening entry doors shall have glazing thicknesses equal to those recommended in section 5.4.1 Recommended Glazing Construction, and are to have Raven RP10 to the top and sides, and Raven RP38 to the underside of the door.

5.4.5 Mechanical Ventilation

With respect to natural ventilation of the dwelling, the NSW Department of Planning document "Development near Busy Roads and Rail Corridors - Interim Guideline" dictates that:

> *"If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia."*

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

The southern façades of all residential blocks can have their windows open, however; in order to achieve suitable internal noise levels; windows need to be *closed* on ALL remaining facades.

Although windows on the façades can be openable, the required internal noise level is only achieved when the windows are closed.

Should any supplementary fresh air (ventilation system or other) be required, it should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above are not reduced and does not exceed Council criteria for noise emissions to nearby properties.

6 NOISE EMISSION ASSESSMENT

The noise emissions from the project site shall comply with the requirements of the following;

- City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*; and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – *'Noise Policy for Industry (NPfI) 2017'*.

6.1 NOISE CRITERIA

6.1.1 City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*

The Bankstown Development Control Plan 2015 document does not have specific noise emission criteria, therefore; ALC will only adopt the NSW EPA *Noise Policy for Industry 2017* criteria for this assessment.

6.1.2 NSW EPA document – *'Noise Policy for Industry (NPfI) 2017'*

The NSW EPA Noise Policy for Industry (NPfI) 2017, has two criteria which need to be satisfied; namely the Intrusiveness noise level criteria and the Project amenity noise level criteria. The project noise trigger level is then established based on the lower of the intrusiveness and project amenity levels.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.1.2.1 Intrusiveness Noise Level Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} 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 are presented in Section 4.1.6. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 11 – Intrusiveness Noise Level Criteria

Location	Period/Time	Intrusiveness Noise Level Criteria dB(A)$L_{Aeq(15min)}$
Nearby Residences	Day (7am-6pm)	46
	Evening (6pm-10pm)	46
	Night (10pm-7am)	46

6.1.2.2 Project Amenity Noise Level Criteria

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 Industrial noise policy sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 3 categories to distinguish different residential areas. They are rural, suburban, urban. This site is categorised by urban receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

The project amenity noise level is calculated by taking the recommended amenity noise level (as presented in table 2.2 on pager 11 of the policy), subtracting 5dB(A) and then adding 3dB(A) to convert from $L_{Aeq,\ period}$ to a $L_{Aeq,\ 15\ minute}$ descriptor. The project amenity noise level criteria are presented in the table below.

Table 12 – Project Amenity Noise Level Criteria

Location	Period/Time	Project Amenity Noise Level Criteria dB(A)$L_{Aeq(15min)}$
Nearby Residences – Urban Receiver	Day 7am-6pm)	58
	Evening (6pm-10pm)	48
	Night (10pm-7am)	43

6.1.2.3 Project Noise Trigger Level

The project noise trigger level (as outlined in section 2.1 of the policy) is the lower of the intrusiveness and project amenity noise levels. The project noise trigger levels are presented in the table below.

Table 13 – Project Noise Trigger Level Criteria

Location	Period/Time	Project Noise Trigger Level Criteria dB(A)$L_{Aeq(15min)}$
Nearby Residences	Day (7am-6pm)	46
	Evening(6pm-10pm)	46
	Night(10pm-7am)	43

6.1.3 Sleep Arousal Criteria

Potential sleep arousal impacts should be considered for noise generated before 7am or after 10pm.

Short duration, intermittent noise events (such as cars driving by) are typically assessed for potential sleep disturbance.

Potential impacts are assessed using the recommended procedure in the NSW EPA Noise Policy for Industry. As recommended in the policy, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An assessment should be conducted to determine if noise levels at a residential location during the night time period (10pm-7am) exceed:
  - $L_{Aeq,\ 15min}$ 40dB(A) or the prevailing RBL (rating background noise level) plus 5 dB, whichever is greater, and/or
  - L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater.

The policy does not explicitly state where noise impacts should be assessed within the residential location. For the purposes of this assessment, noise impacts will be assess at the location immediately outside a resident's bedroom window. If the noise events are compliant with this criterion, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The criteria is set out below.

Table 14 – Sleep Arousal Criteria

Location	Background Noise Level (10pm-7am)	Sleep Arousal Criteria dB(A)
Nearby Residents	41dB(A)L_{90}	46dB(A)$L_{Aeq(15min)}$ 56dB(A)L_{Max}

- Step 2 - If there are noise events that could exceed the step 1 criteria, then a more detailed 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 EPA Noise Policy for Industry, 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.*

6.2 NOISE EMISSION ASSESSMENT

6.2.1 Mechanical Plant Noise

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services to the closest residential receivers should comply with the requirements of section 6.1.

6.2.2 Ground Floor Community Room

Noise generated by the ground floor community room is assessed in this section.

6.2.2.1 Background Music

The assessment has been based on noise levels that occur during the worst-case situation. This event would correspond to maximum use periods e.g. Friday, Saturday nights.

Table 15 - Typical Worst Background Music Noise Levels

Music Type	Sound Pressure Level dB(A) L_{10}
Ambient Music within the Ground Floor Community Room	Up to 75

Table 16 – Maximum Internal Music Noise Level, dB L_{10}

	Octave Band Centre Frequency (Hz)									
	31.5	63	125	250	500	1k	2k	4k	8k	**A-wt.**
Ambient Music	76	80	82	76	71	68	67	63	62	**75**

6.2.2.2 Patron Noise

The main noise source in the indoor area would be patron speech, with a sound power level of 77 dB(A) L_{10} per patron.

Noise from patrons using the community room has been predicted at the nearest residences. The noise level predicted at each receiver is based on proposed number of people that may access the indoor community room area with up to 1 in 2 people talking at any one time.

The noise emission levels were corrected for distance attenuation, façade reflection and the number of patrons to determine the resultant noise level. The L_{10} sound power level spectrum used in the calculations to predict the impact of patrons utilising the indoor community area is presented

below. Predicted noise levels have also taken into account the effect of noise attenuation treatments recommended in Section 6.3.

Table 17 – L_{10} Sound Power Level Spectrum of Single Patron, dB

	Octave Band Centre Frequency (Hz)									
	31.5	63	125	250	500	1k	2k	4k	8k	**A-wt.**
Patron Noise (Normal Voice)	62	62	67	70	74	75	70	61	48	**77**

6.2.2.3 Recommendation

Noise emissions from the operation of the project site has been analysed and the following acoustic treatments are recommended to ensure that the external noise emissions comply with the criteria presented in Section 6.1:

1) Noise emissions from the plant servicing the project site shall be carried out at CC stage to ensure that the overall noise emissions satisfy the requirements in Section 6.1.
2) The facade of the Community Room shall be minimum 10.38mm laminated glazing with acoustic seals equal to Raven RP 10 on top and sides, RP38 at bottom. The door(s) shall remain closed during music activities.
3) The Community Room shall be closed before 10pm and no operation before 8am.
4) No more than 20 people in the community room at any one time.
5) The maximum allowable sound pressure level within the community room is 75 dB(A). A sound limiter shall be installed within the community room.

6.2.3 Driveway and Carpark

An on-grade car park will be provided in the centre of the development for use by the residents. The car park proposed to have eleven parking spots for cars and eleven parking spots for motorbikes.

Noise emissions at nearby development will be predicted based on the following assumptions:

- Cars/bikes are driving in the car park at approximately 5-10km/h.
- Over a 15-minute average there will be 3 cars or bikes either entering or departing the car park and driveway. This is based on the peak hour vehicle movement predicted in the Development Application Traffic Assessment (title *Traffic Parking Impact Assessment*, dated May 2018, prepared by *Hemanote Consultants Pty Ltd).*
- The average sound power level per car when driving within the car park is 84dB(A)L_{eq}.
- The average sound power level per motorbike when driving within the car park is 89dB(A)L_{eq}.
- Time taken to either enter or depart the carpark or driveway is 90 seconds.

Predicted noise levels based on above are as follows:

Table 18– Car Park & Driveway Noise Emission Assessment

Receiver Location	Predicted Noise Level dB(A)$L_{eq(15mins)}$	Acoustic Criteria dB(A)$L_{Aeq(15mins)}$	Complies
Receiver 1	43	46 (7am-6pm) 46 (6pm-10pm) 43 (10pm-7am)	Yes
Receiver 2	42		
Receiver 3	39		
Receiver 4	39		

7 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed new boarding house development to be located at 144-146 Boronia Road, Greenacre.

Provided that the treatments set out in section 5 of this report are employed, internal noise levels shall comply with the requirements below:

- City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*;
- NSW Department of Planning and Environment's document – *'Developments near Rail Corridors or Busy Roads – Interim Guideline 2008'; and*
- Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'.*

External noise emissions criteria have been setup in this report to satisfy the requirements from the following documents;

- City of Canterbury Bankstown (Formerly Bankstown City Council) document – *'Bankstown Development Control Plan (DCP) 2015'*; and
- NSW Department of Environment and Heritage, Environmental Protection Authority document – *'Noise Policy for Industry (NPfI) 2017'*.

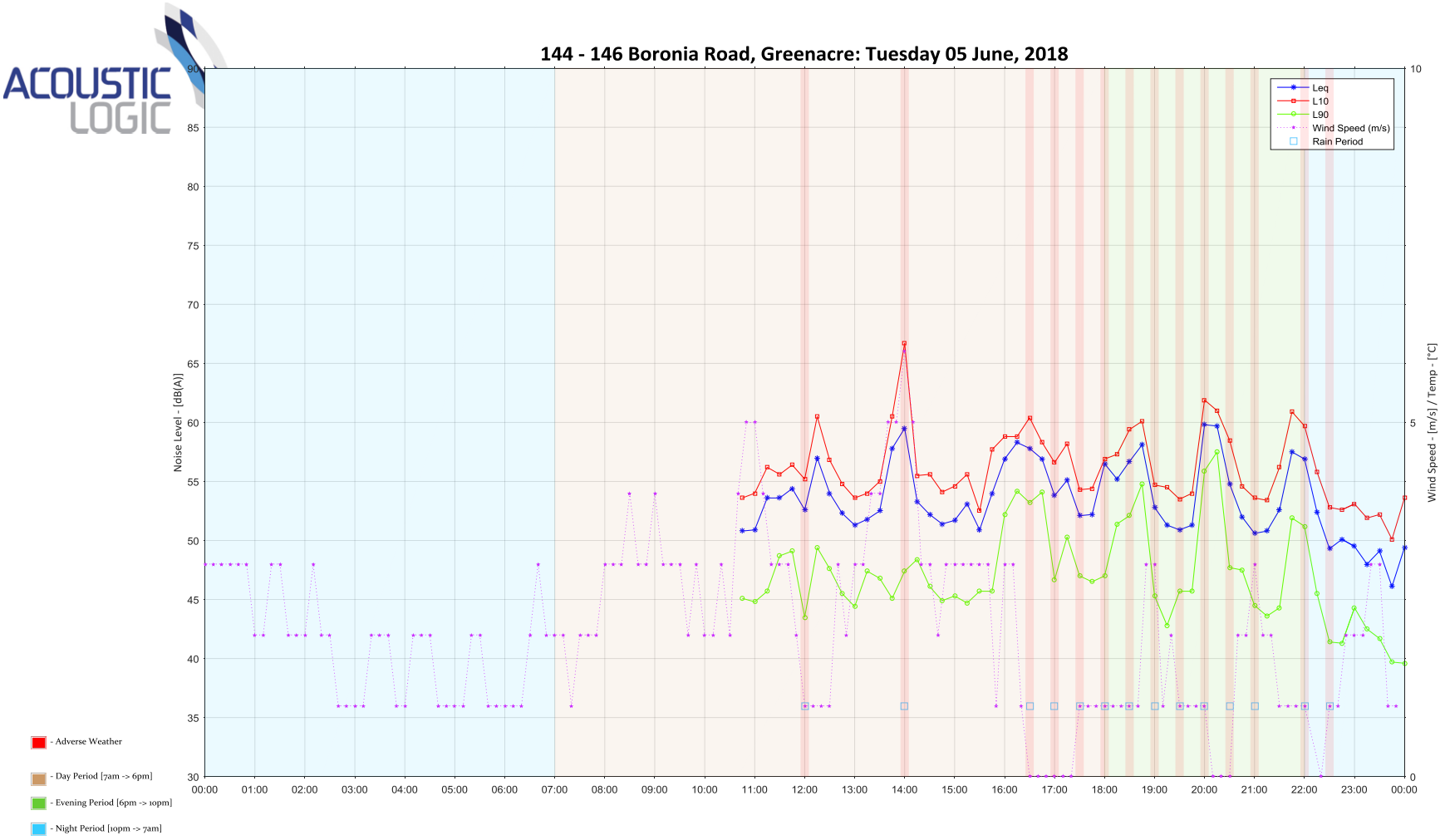
Noise emissions from car park and drive way fully satisfy the requirements above, acoustic controls for community room has been detailed in Section 6.2.2.3 and plant noise emission will be reviewed at CC stage to ensure that the overall noise emissions comply with the requirements in Section 6.1.

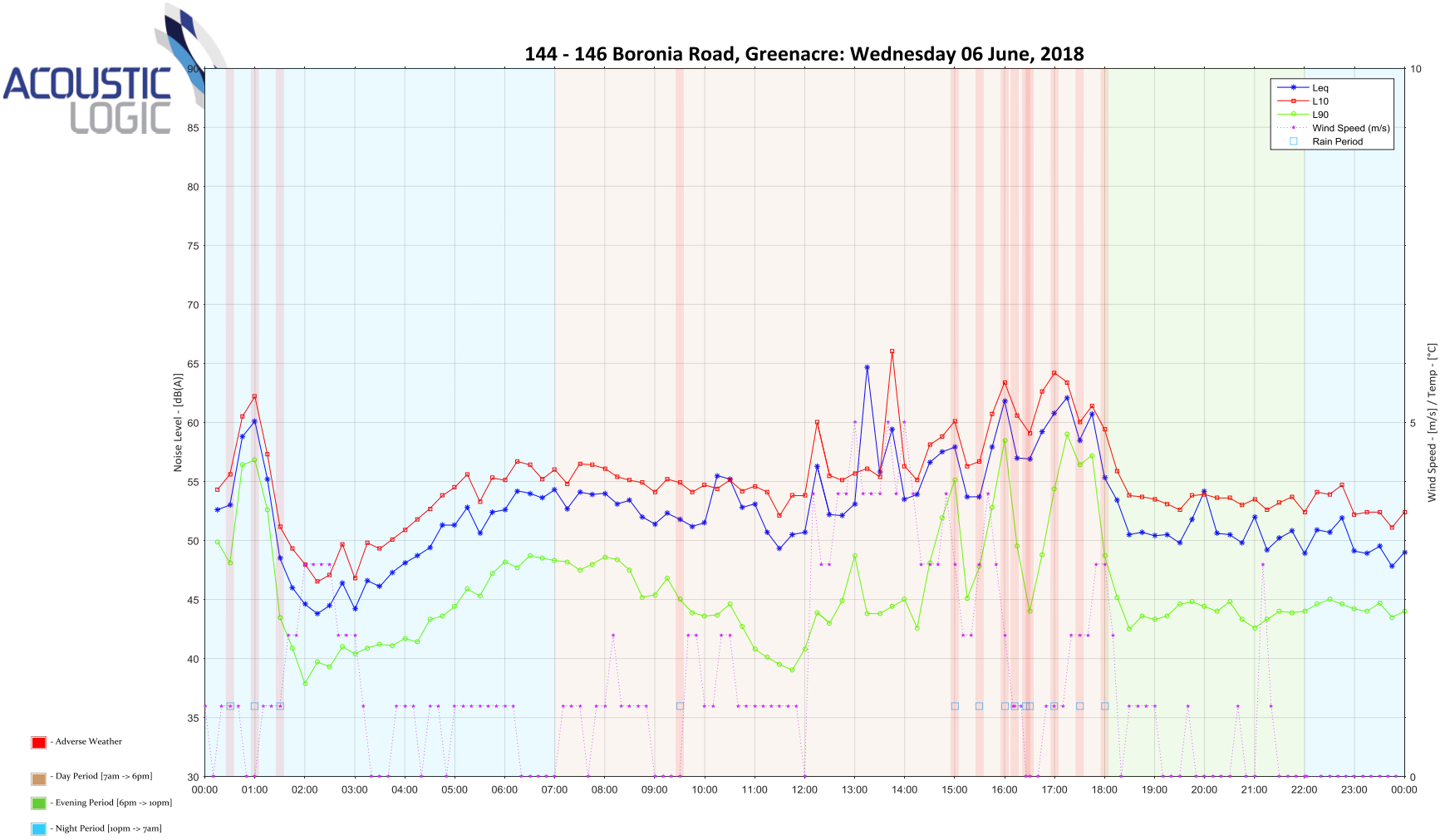
Please contact us should you have any further queries.

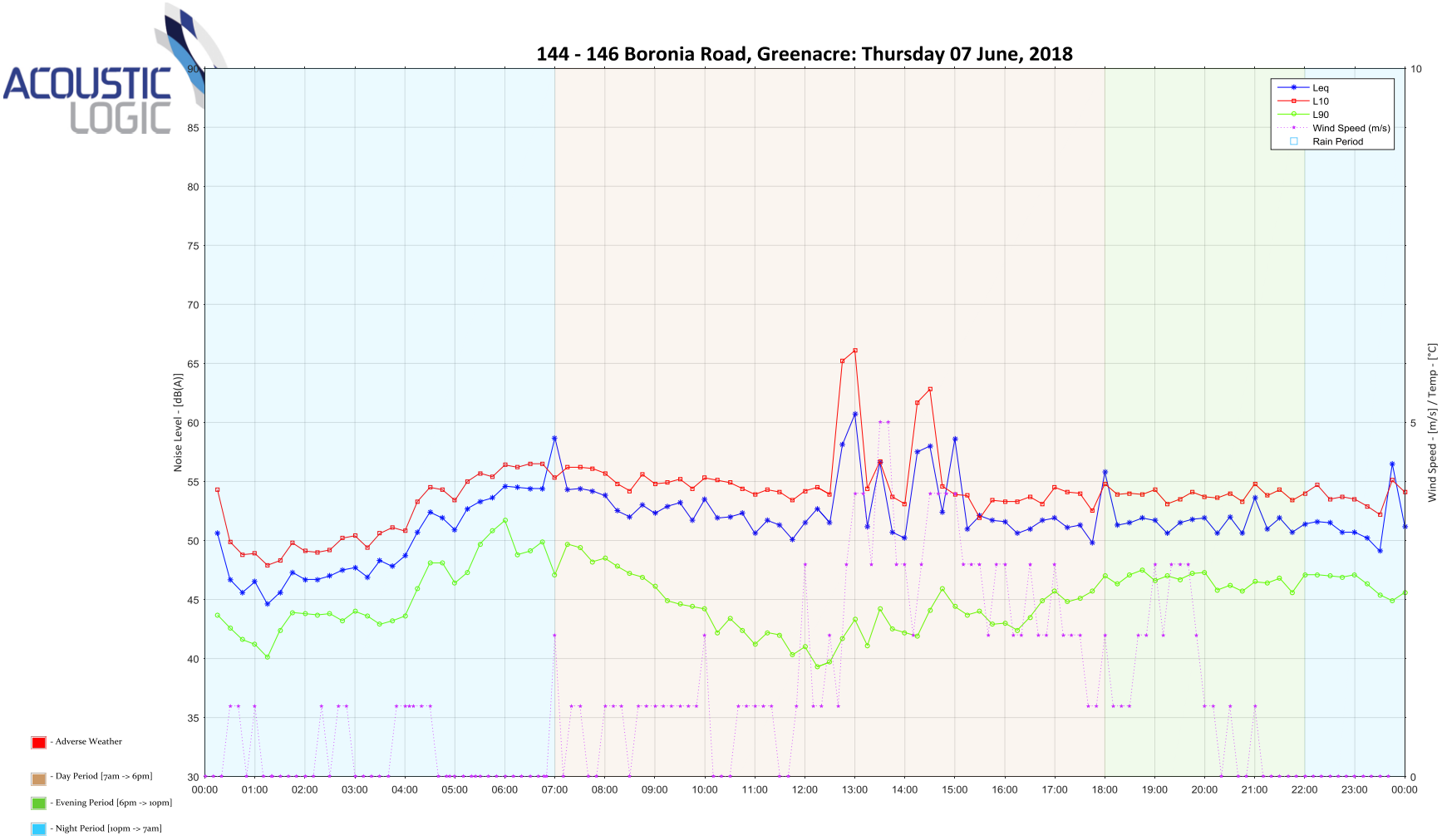
Yours faithfully,

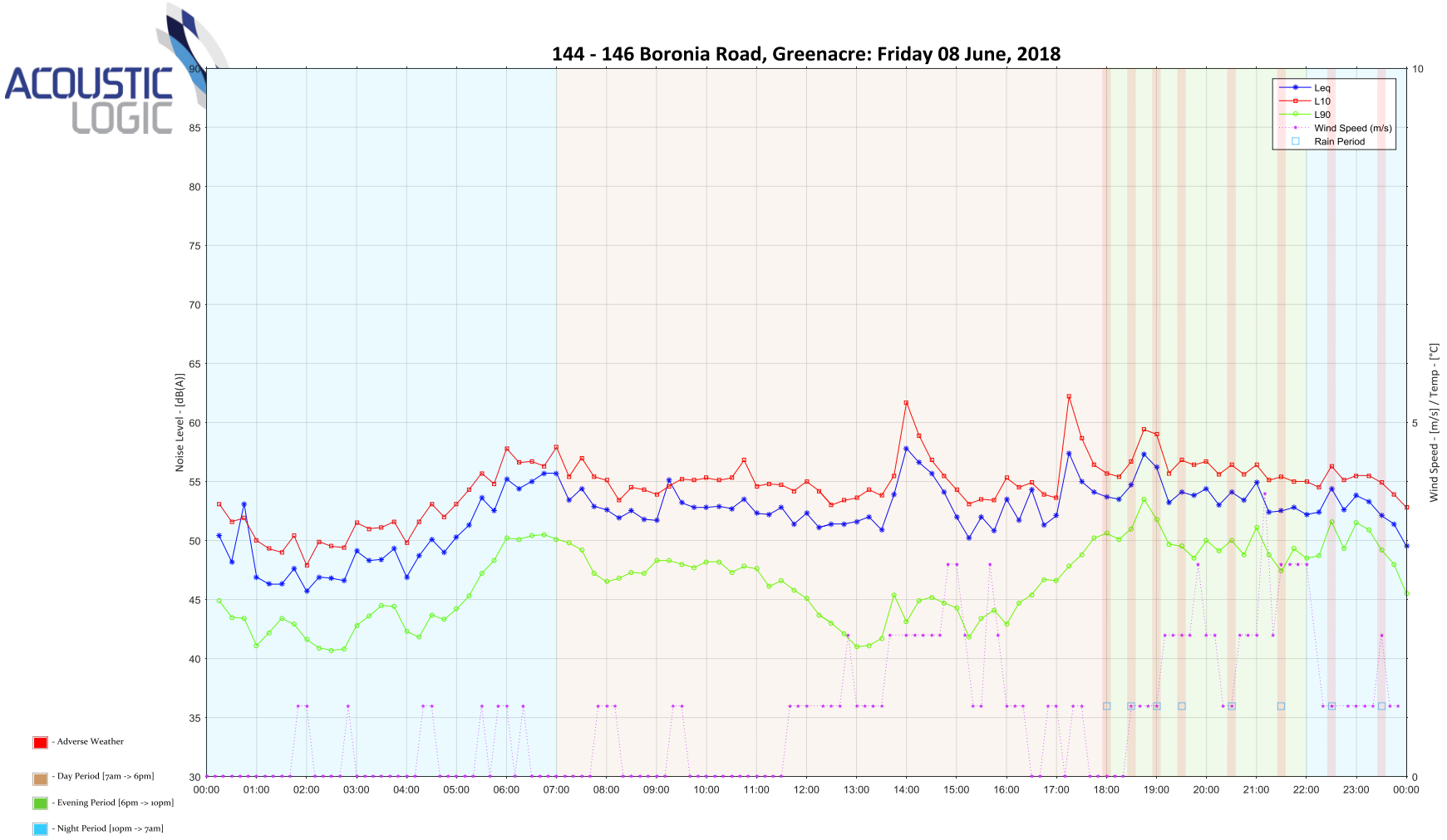
Acoustic Logic Consultancy Pty Ltd
Shane Nichols

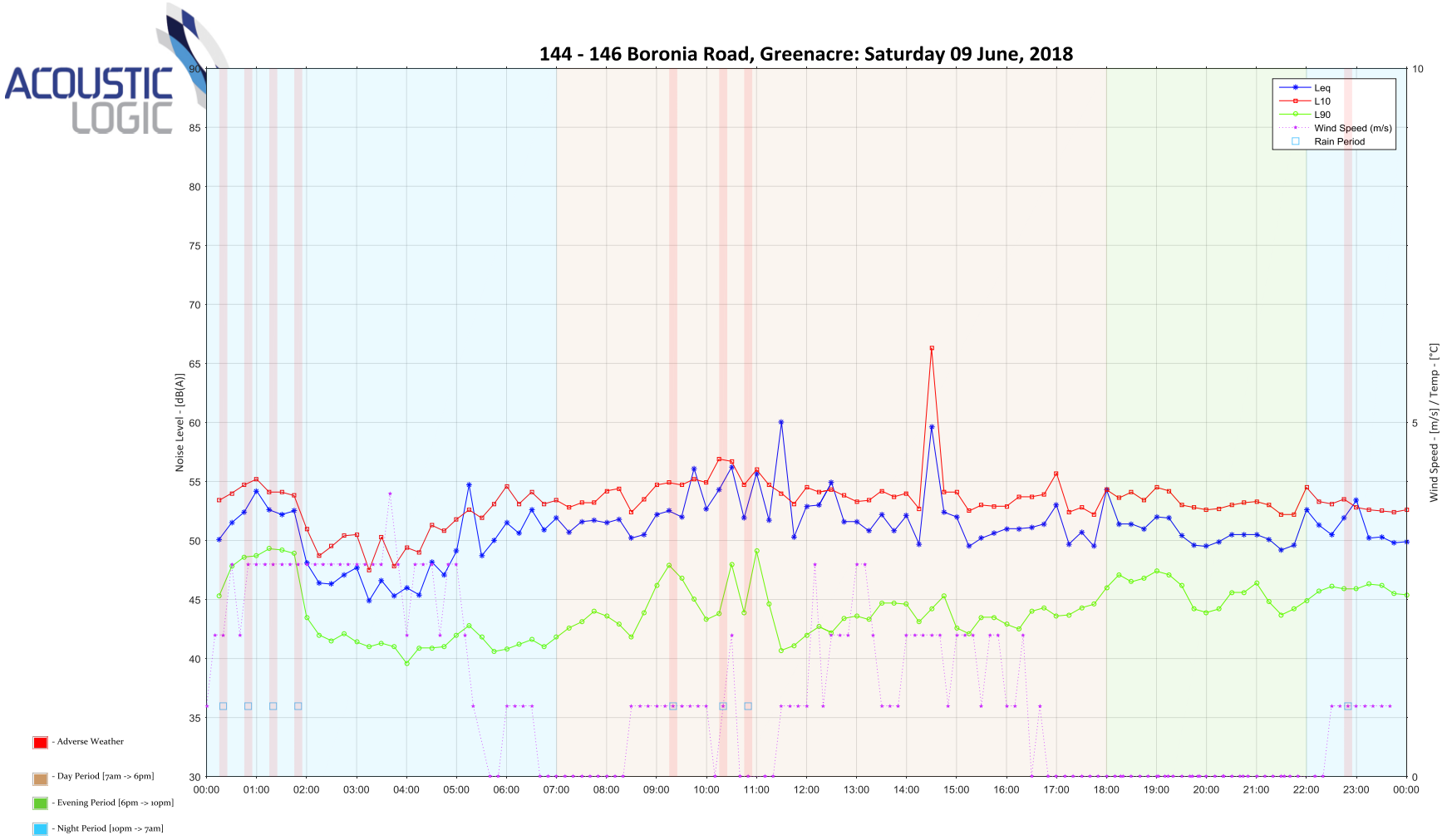
APPENDIX ONE – UNATTENDED NOISE MONITORING DATA – REAR OF THE SITE

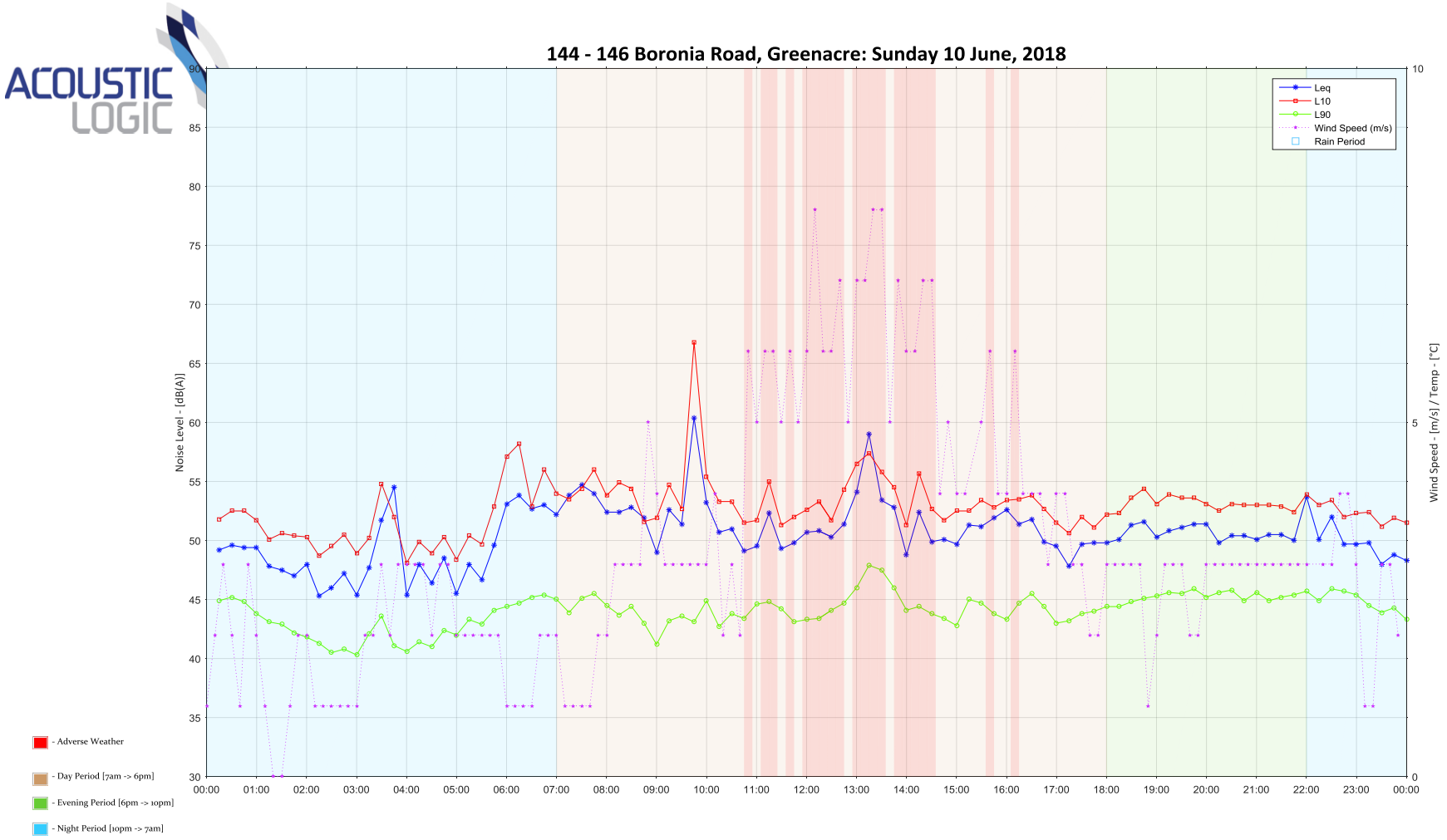

144 - 146 Boronia Road, Greenacre: Tuesday 05 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

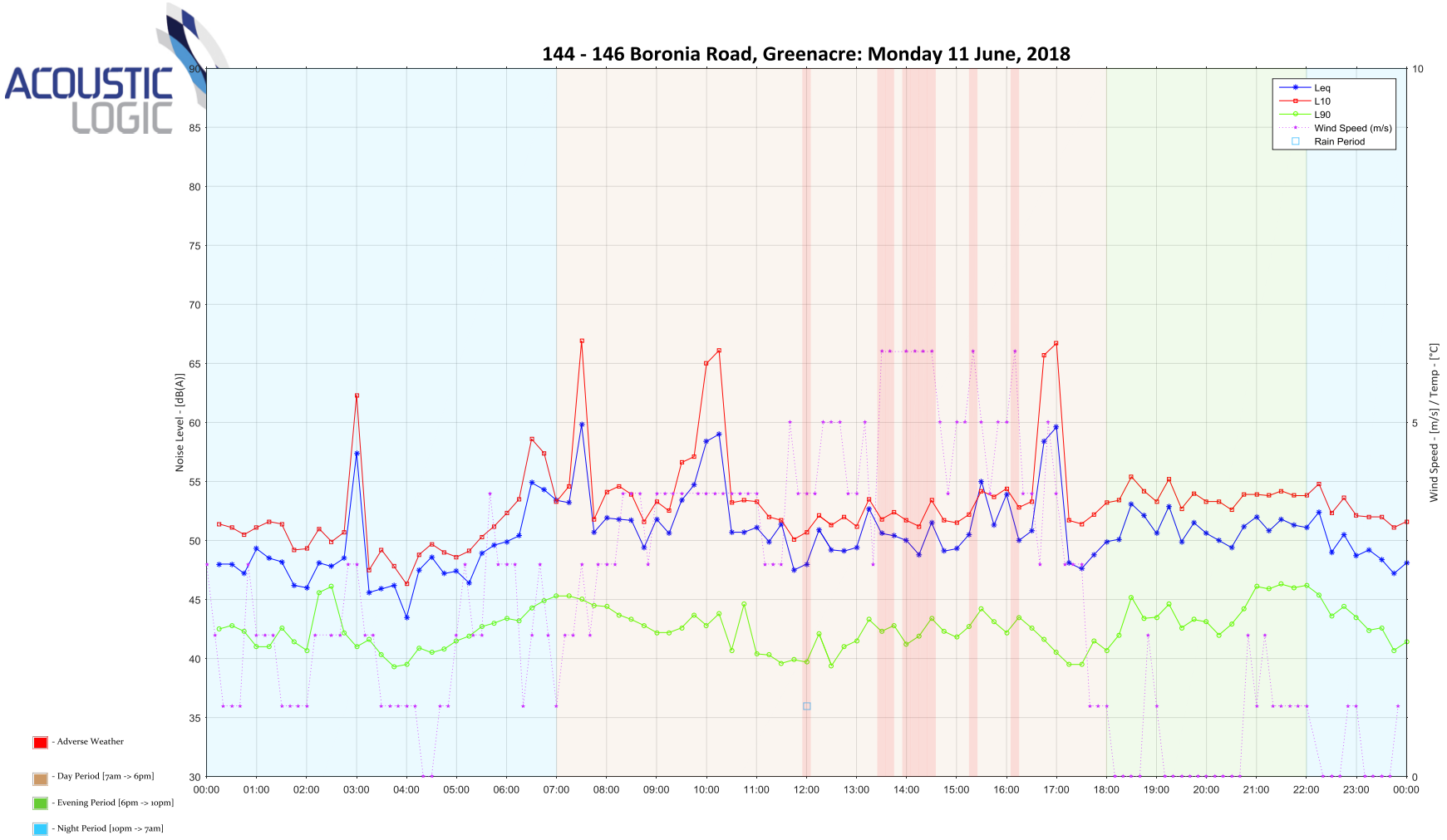

144 - 146 Boronia Road, Greenacre: Wednesday 06 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

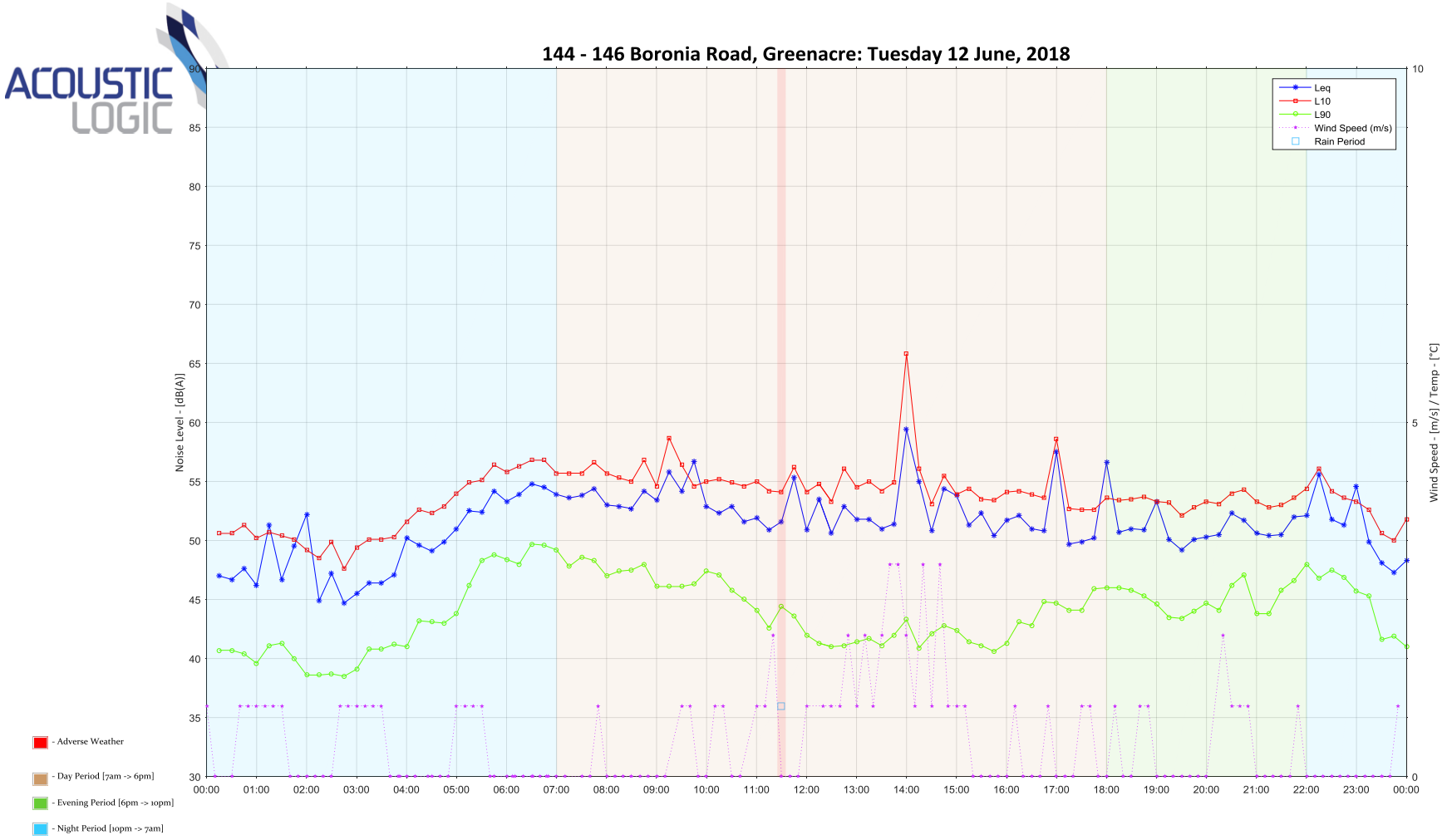

144 - 146 Boronia Road, Greenacre: Thursday 07 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

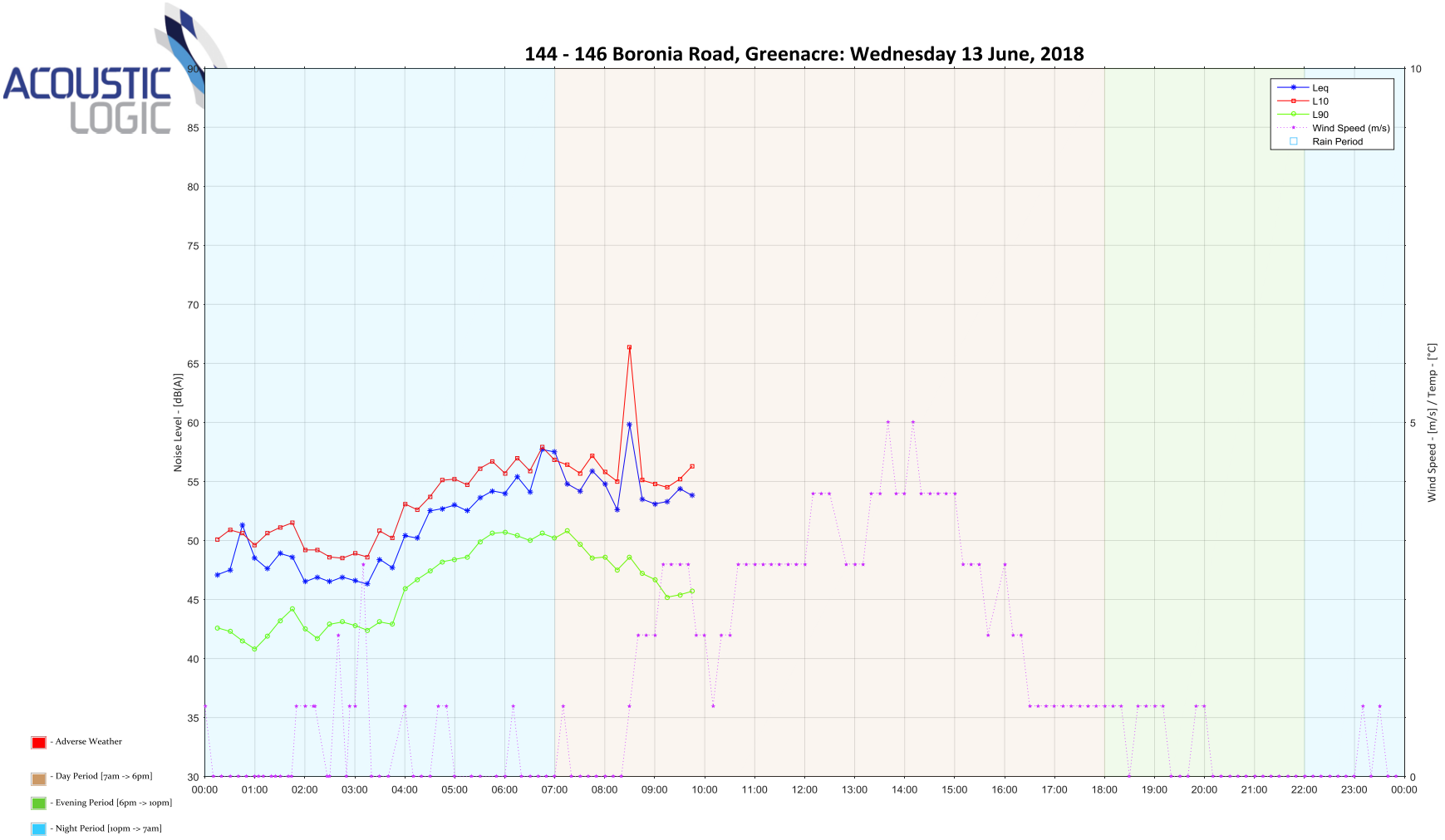

144 - 146 Boronia Road, Greenacre: Friday 08 June, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


144 - 146 Boronia Road, Greenacre: Saturday 09 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]


144 - 146 Boronia Road, Greenacre: Sunday 10 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]


144 - 146 Boronia Road, Greenacre: Monday 11 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]


144 - 146 Boronia Road, Greenacre: Tuesday 12 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]


144 - 146 Boronia Road, Greenacre: Wednesday 13 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 TWO – GLAZING MARK-UP

ALC Glazing Mark-up Key

= 6mm Float

= 6.38mm Laminated

= 10.38mm Laminated

CK design
design + interiors
75 MARION ST, HARRIS PARK NSW 2150
P: +61 9633 4633 - M: 0411 222 888
E: chris@ckdesign.net.au
W: www.ckdesign.net.au

No.	Description	Date
A	FOR CONSULTANTS COORDINATION	14/02/2018
B	ISSUED FOR DEVELOPMENT APPLICATION	15/05/2018

ROOF PLAN

DEVELOPMENT APPLICATION

NEW GENERATION BOARDING HOUSE

CLIENT: MR & MRS VALIOTIS

ADDRESS: 144-146 BORONIA RD, GREENACRE

Scale	1 : 100
Drawn by	TA
Date	JAN 18
Checked by	CK
Sheet number	A1-09
Project number	17053-03

Door Schedule				
Mark	Width	Height	Function	Count
01	2320	2400	Exterior	54
02	4000	2400	Exterior	3
03	1000	2400	Exterior	57
04	5500	2400	Exterior	1

Grand total: 115

Window Schedule			
Mark	Width	Height	Count
01	900	900	58
02	3000	600	6
03	1800	1200	1

Grand total: 65

NOTE:
1. ALL WINDOWS 2.0m ABOVE GROUND LEVEL ARE REQUIRED TO HAVE A BARRIER DEVICE TO LIMIT THE WINDOW OPENING TO NO MORE THAN 125mm IN ACCORDANCE WITH CLAUSE 3.9.2.5 OF BCA
2. ALL WINDOWS AND DOOR SIZES TO BE CONFIRMED ONSITE PRIOR TO MANUFACTURING AND INSTALLATION
3. REFER TO BASIX FOR ALL WINDOW AND DOOR SPECIFICATION AND RATINGS
4. ALL STAIR TREADS AND NOSING STRIP TO COMPLY WITH AS 4586-2013 AND TABLE 3.9.1.1 OF BCA
5. ALL SMOKE ALARMS ARE TO BE INTERCONNECTED

ALC Glazing Mark-up Key

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= 10.38mm Laminated

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No.	Description	Date
A	FOR CONSULTANTS COORDINATION	14/02/2018
B	ISSUED FOR DEVELOPMENT APPLICATION	15/05/2018

GROUND FLOOR PLAN

DEVELOPMENT APPLICATION

NEW GENERATION BOARDING HOUSE

CLIENT: MR & MRS VALIOTIS

ADDRESS: 144-146 BORONIA RD, GREENACRE

Scale	1 : 100
Drawn by	TA
Date	JAN 18
Checked by	CK
Sheet number	A1-07
Project number	17053-03

Door Schedule				
Mark	Width	Height	Function	Count
01	2320	2400	Exterior	54
02	4000	2400	Exterior	3
03	1000	2400	Exterior	57
04	5500	2400	Exterior	1

Grand total: 115

Window Schedule			
Mark	Width	Height	Count
01	900	900	58
02	3000	600	6
03	1800	1200	1

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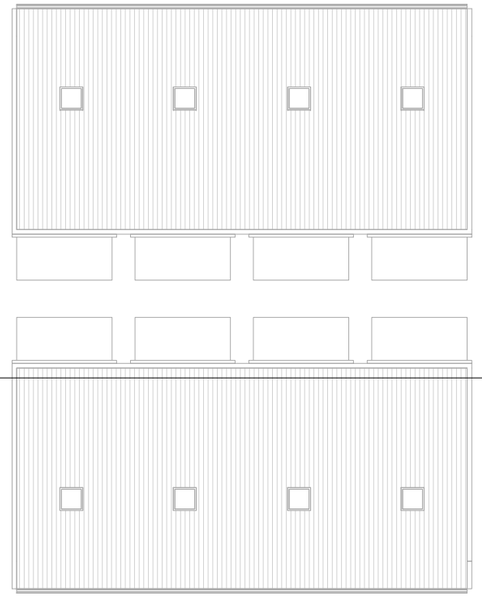
5. ALL SMOKE ALARMS ARE TO BE INTERCONNECTED

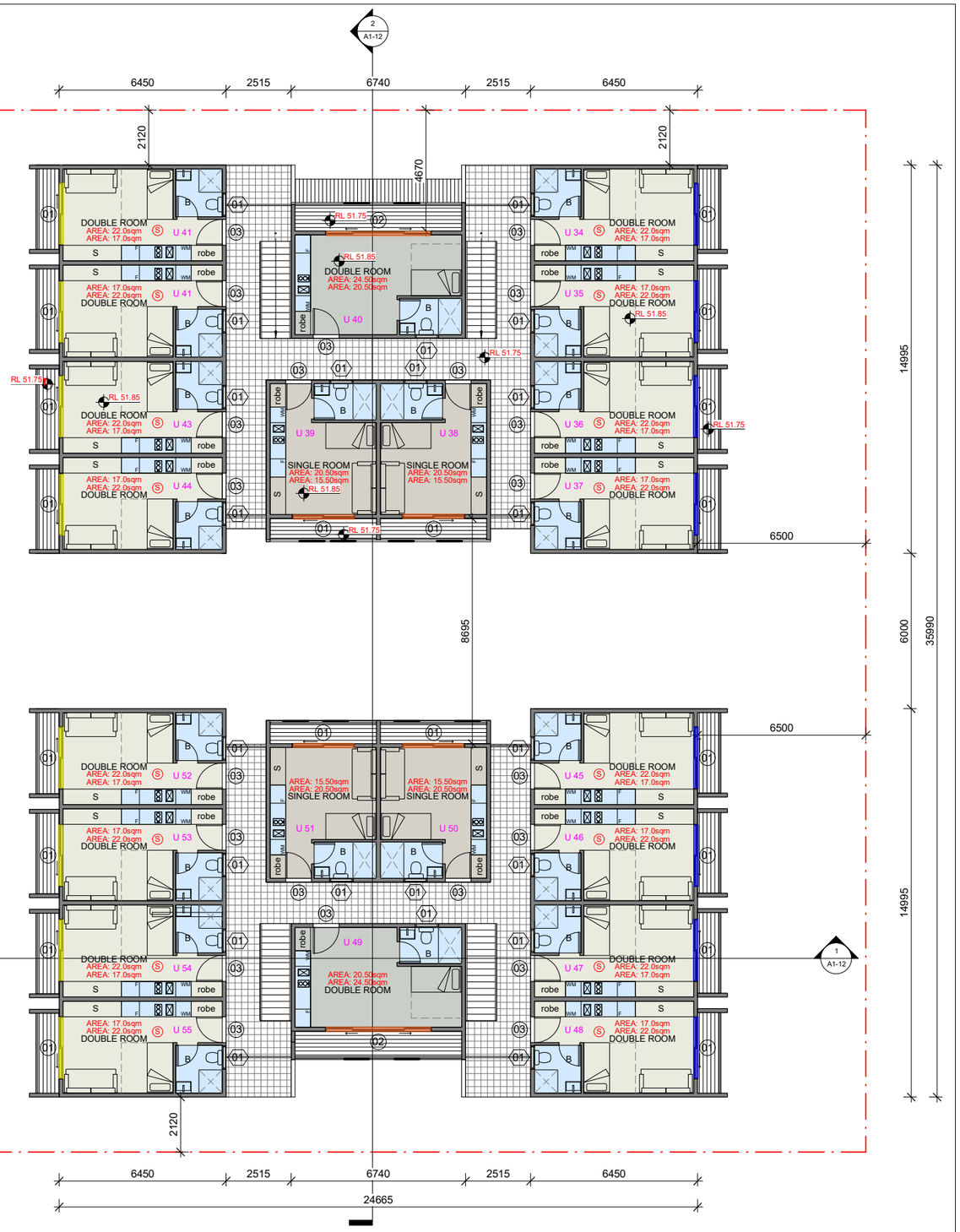
ALC Glazing Mark-up Key

= 6mm Float

= 6.38mm Laminated

= 10.38mm Laminated





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No.	Description	Date
A	FOR CONSULTANTS COORDINATION	14/02/2018
B	ISSUED FOR DEVELOPMENT APPLICATION	15/05/2018

FIRST FLOOR PLAN

DEVELOPMENT APPLICATION

NEW GENERATION BOARDING HOUSE

CLIENT: MR & MRS VALIOTIS

ADDRESS: 144-146 BORONIA RD, GREENACRE

Scale	1 : 100
Drawn by	TA
Date	JAN 18
Checked by	CK
Sheet number	A1-08
Project number	17053-03