DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

Blacktown Workers Seniors Living, 170 Reservoir Road, Arndell Park

SYDNEY
A: 9 Sarah St
MASCOT 2020
T: (02) 8339 8000

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20181515.2
Project Name	Blacktown Workers Seniors Living, 170 Reservoir Road, Arndell Park
Document Title	Masterplan DA Acoustic Assessment
Document Reference	20181515.2/0102A/R1/JL
Issue Type	Email
Attention To	Paynter Dixon Constructions Pty Limited

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	23/01/2019	20181515.2/2301A/R0/JL	JL		GW
1	1/02/2019	20181515.2/0102A/R1/JL	JL		JL
2	07/10/2019	20181515.2/0102A/R2/JL	JD		

TABLE OF CONTENTS

1 INTRODUCTION

This report presents our study of acoustic impacts associated with the Masterplan seniors living apartments and residential aged care facility (RACF) development, comprising of Buildings A-G and a RACF to be located at 170 Reservoir Road, Arndell Park.

In this report we will:

- Conduct an external noise impact assessment on the proposed development and recommend acoustic treatments to ensure that a reasonable level of amenity is achieved within the project site for future occupants.

- Identify potential noise sources generated by the site and determine noise emission goals and any required acoustic treatments/management controls for the development to meet the requirements of Council and the NSW EPA guidelines.

- Conduct a cursory assessment of noise emissions associated with truck deliveries to the loading dock of the residential aged care facility and make recommendations to ensure compliance with the relevant noise emission requirements.

The analysis will be undertaken with reference to the Site Compatibility Certificate drawing set provided by Allen Jack & Cottier Architects titled *Blacktown Retirement Resort*, Revision 1 and dated August 2019.

2 SITE DESCRIPTION

The site is located at 170 Reservoir Road, Arndell Park. The proposed Masterplan development will involve the construction of 9 buildings, with 8 of the buildings being used for seniors living apartments (Buildings A-H) with a total of 480 independent living units and one building used as a RACF with a total of 160 beds. A brief deception of each building is detailed below;

- Building A – 3 stories with additional level for basement parking
- Building B – 5 stories with additional level for basement parking
- Building C – 4 stories with additional level for basement parking and ground floor residential amenities
- Building D – 5 stories with additional level for basement parking and ground floor residential amenities
- Building E – 7 stories with additional level for basement parking
- Building F – 5 stories with additional level for basement parking
- Building G – 5 stories with additional level for basement parking
- Building H – 4 stories with additional level for basement parking
- RACF – 4 stories with additional level for basement parking. It has been proposed that the loading dock for the RACF may be located either in the basement of the RACF or along Penny Place as indicated in figure 2.

Existing development on the Blacktown Workers Sports Club precinct include the following:

- The main sports club building to the north of the development,
- Lawn bowls club, baseball field and tennis courts located further to the north of the development.
- Two sports fields located north-west of the development.

Roadways in the vicinity of the site are as follows:

- Reservoir Road to the immediate east of the site, which carries medium to high volumes of traffic;
- Penny Place to the south of the site, which carries low volumes of traffic;
- Holbeche Road to the far north of the site, which carries medium to high volumes of traffic;
- Walters Road to the far west of the site, which carries low to medium volumes of traffic;
- In addition, the Great Western Highway is located approximately 130m south of the site, and carries high volumes of traffic.

Surrounding development in the vicinity of the site are as follows:

- Residential development to the east of the site across Reservoir Road;
- The Blacktown Workers Sports Club and associated sporting facilities to the north of the site.
- Commercial development to the immediate west and south of the site.

In particular, a loading dock belonging to Thermal Mark Transport Refrigeration is located near the south-western boundary of the site. Refrigeration trailers are brought to this loading dock for maintenance work. The operating hours of the Thermal Mark Transport Refrigeration are 8am-4pm.

An aerial photograph is of the site is shown in figure 1 below. In addition, the layout of the various stages of the development are presented in figure 2 below.

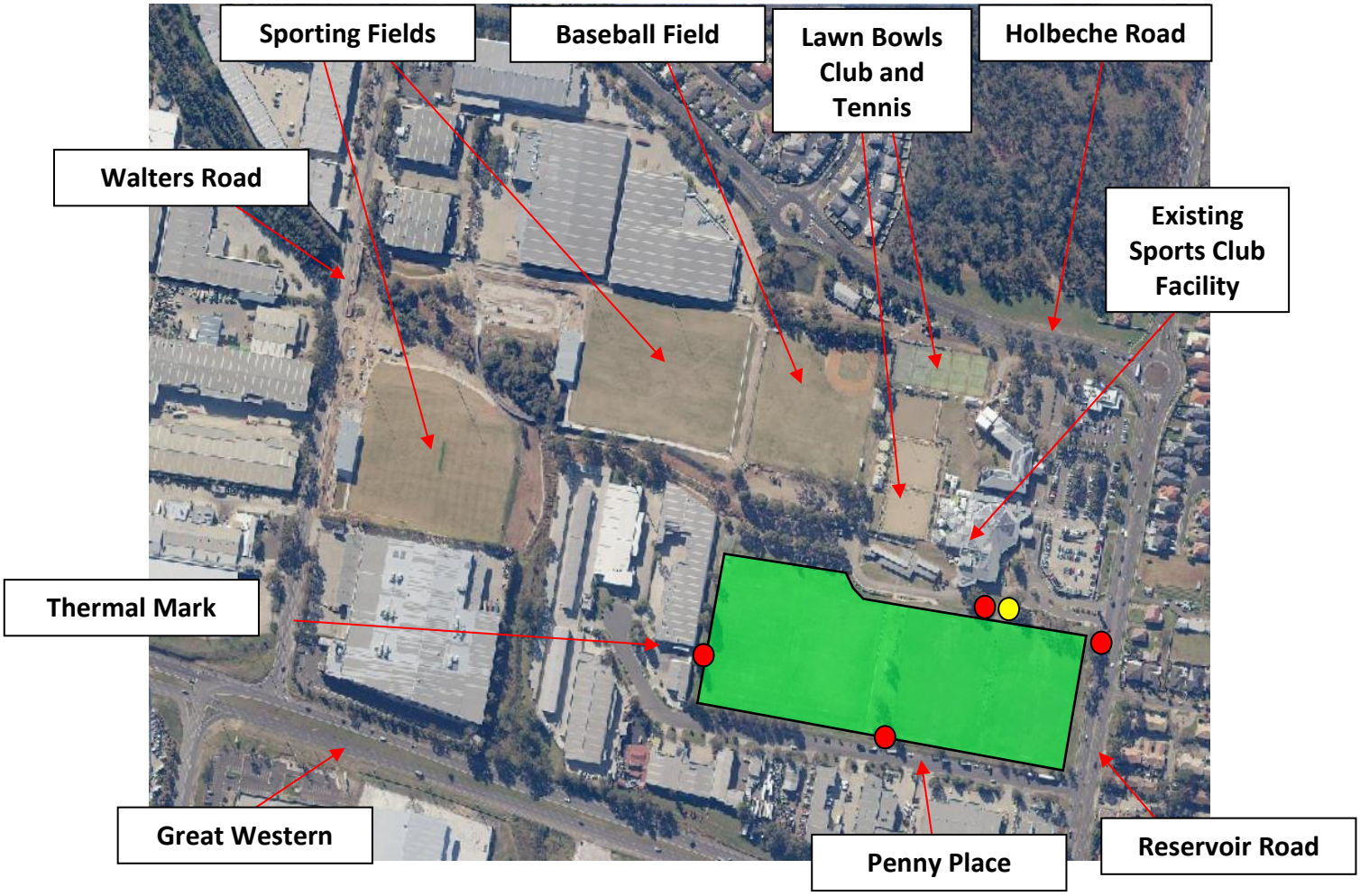


Figure 1 – Site Map

Figure 2 – Layout for Masterplan

Potential Loading Dock Location for RACF along Penny Place. Alternatively, Loading Dock Will be in Basement of RACF

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise, three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement 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 at the source.

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

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

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION ASSESSMENT

The major external noise sources are traffic noise along neighbouring streets, noise from the operation of the existing club building adjacent to the project site, sports activities from the nearby sporting fields and operational noise from the Thermal Mark Transport Refrigeration development located to the west of the site.

4.1 EXTERNAL NOISE INTRUSION CRITERIA

4.1.1 Blacktown City Council DCP 2015

There are no specific noise intrusion requirements set within the Blacktown DCP 2015.

As such, external noise impacts on the seniors living apartments and common areas of the RACF will be assessed against the requirements of the NSW Department of Planning's *Development Near Rail Corridors and Busy Roads (Interim Guideline)* and Australian Standard AS2107:2016.

4.1.2 NSW Department of Planning's 'Development Near Rail Corridors and 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 LAeq 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."*

4.1.3 Australian Standard AS2107:2016

The internal noise criteria AS2107:2016 to be adopted for the common areas of the development are presented in the table below. This internal noise criteria are to be achieved with windows closed.

Table 1 – AS2107 Acoustic Criteria

Room Type	Time of Day	Internal Noise Criteria
Common Rooms and Lounge/Dining of RACF	Day (7am-10pm)	45 dB(A) $L_{eq,\ 15hr}$
Community Facilities	Day (7am-10pm)	45 dB(A) $L_{eq,\ 15hr}$

4.1.4 Summarised Internal Noise Criteria

The summarised internal noise criteria are presented in the table below:

Table 2 – Summarised Internal Noise Criteria for Senior Living Apartments & RACF

Room Type	Time Period	Internal Noise Criteria
Seniors Living Apartments Bedrooms	Night (10pm-7am)	35 dB(A) $L_{eq\ (9\ hour)}$
Seniors Living Apartments Living Areas	Day (7am-10pm)	40 dB(A) $L_{eq\ (15\ hour)}$
Common Rooms and Lounge/Dining of RACF	Day (7am-10pm)	45 dB(A) $L_{eq\ (15\ hour)}$
Community Facilities	Day (7am-10pm)	45 dB(A) $L_{eq,\ 15hr}$

4.2 EXTERNAL NOISE SOURCE MEASUREMENTS

4.2.1 Existing Traffic Noise Levels

The main source of traffic noise impacting the site is Reservoir Road to the immediate east of the site and Great Western Highway, located approximately 200m south of the site. In addition, there is intermittent noise from the operation of the club building located to the north of the proposed development.

Existing traffic noise levels from the roadways and noise from the club were determined by means of attended and unattended noise measurements.

4.2.1.1 Traffic Noise from Reservoir Road

4.2.1.1.1 Unattended Noise Measurements

The long term monitoring was conducted using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

The noise monitor was located on top of a shed as indicated in figure 1 and was measuring noise impacts from Reservoir Road as well as noise emanating from the club building to the north of the development. The noise monitor was on site from the 31st October to the 9th November 2018. Refer to Figure 1 for monitor location, and Appendix 1 for the associated noise data.

4.2.1.1.2 Attended Noise Measurements

Attended noise measurements were undertaken to supplement the long term noise monitoring on the 9th November 2018 between 4:00pm and 5:00pm. Measurements were undertaken using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 sound level calibrator. No significant drift was recorded. See figure 1 above for location.

4.2.1.1.3 Measurement Results

The measured/ predicted traffic noise levels for day/night periods from Reservoir Road are presented below.

Table 3 – Predicted External Noise Level (Traffic Noise along Reservoir Road)

Location	Time Period	Traffic Noise Level dB(A)
Eastern Façade of Eastern-Most Building (Building A, facing Reservoir Road)	Day (7am – 10pm)	64dB(A) $L_{Aeq(15\ hour)}$
	Night (10pm – 7am)	61dB(A) $L_{Aeq(9\ hour)}$
Northern Façade of North Eastern-Most Building (Building C & D, facing Club Building)	Day (7am – 10pm)	59dB(A) $L_{Aeq(15\ hour)}$
	Night (10pm – 7am)	56dB(A) $L_{Aeq(9\ hour)}$

4.2.1.2 Traffic Noise from Great Western Highway

4.2.1.2.1 Unattended Noise Measurements

The long term monitoring of Great Western Highway has previously been conducted by this office at a nearby location using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

The noise monitor was located approximately 9m from the Reservoir Road kerb and was on site from the 7th to the 15th June 2012.

4.2.1.2.2 Attended Noise Measurements

Attended noise measurements were undertaken to compliment the long term traffic noise along the Great Western Highway monitoring on the 15th June 2012 between 7:00am and 8:00am. Measurements were undertaken using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 sound level calibrator. No significant drift was recorded. See figure 1 above for location.

4.2.1.2.3 Measurement Results

The measured/ predicted traffic noise levels for day/night periods from Great Western Highway are presented below.

Table 4 – Predicted External Noise Level (Traffic Noise Along Great Western Highway)

Location	Time Period	Traffic Noise Level dB(A)
Upper Levels of Southern Façade South Western-Most Building (RACF Buidling, facing Great Western Highway)	Day (7am – 10pm)	62dB(A) $L_{Aeq(15\ hour)}$
	Night (10pm – 7am)	59dB(A) $L_{Aeq(9\ hour)}$

4.2.2 Noise Impacts from Sporting Fields

Noise from sports activities from the baseball field to the north and the two sports fields to the north-west have the potential to impact the proposed development. The primary noise source from these sports fields will be spectator noise.

This office has been advised that the general operating hours of the sporting fields are 7am to 10pm Mondays to Fridays and 7am to 7pm on Saturdays and Sundays.

Potential spectator numbers for each of these sports are as follows:

- Baseball Field to the North: 200 spectators;
- Two Sports Fields to the North-West: 350 spectators for each sport field (combined 700 spectators between these two fields).

4.2.2.1 Spectator Noise Measurements

Noise measurements were conducted by this office of spectator noise during a baseball game at the site. Measurements were conducted on the 12th December 2015 between 9am and 11am using a Norsonics Type 140 precision sound level analyser, set to A-weighted fast response. The precision sound level analyser was calibrated before and after the measurements using a Norsonics 1251 sound level calibrator. No significant drift was recorded.

The measured spectator noise level is presented below. The measurement was conducted over a 15 minute period with active, consistent cheering from the spectators throughout the measurement.

Table 5 – Measured Spectator Noise Level

Noise Source	Measured Noise Level
8 Spectators Measured at 8m Distance	68dB(A)$L_{eq\ (15min)}$

4.2.2.2 Predicted Spectator Noise Level from Sport Fields

Using the measured spectator noise levels presented in section 4.2.2.1 and the spectator numbers for the various sports outlined in section 4.2.2, noise impacts on development from the sports fields can be predicted. Predicted spectator noise levels at the nearest residential tower are based on the assumption that spectators and distributed evenly around the perimeter of each playing field.

The predicted noise level from the sports fields (assuming all are operating at capacity) at the nearest residential tower (building G) is presented in the table below. The predicted noise level factors in losses due to distance attenuation.

Table 6 – Predicted Noise Level from Sports Fields

Noise Source	Assessment Location	Predicted Noise Level
Spectator Noise from Sporting Fields and Baseball Field	Northern Façade of North Western-Most Building (Building E)	60dB(A)L_{eq}

4.2.3 Surrounding Commercial/Industrial Noise Measurements

Industrial noise sources surrounding the site are as follows:

- Loading/maintenance dock of the Thermal Mark Transport Refrigeration located near the western boundary of the site.

The measured results for the above sources are:

- Loading/maintenance dock of the Thermal Mark Transport Refrigeration: noise measurements were carried out between 3:30pm and 4:30pm on the 7th December 2015. Noise generated by operation of one semi-trailer type Thermal Mark Transport Refrigeration at the loading dock at the western boundary of the site was recorded. The typical noise level 62dB(A)L_{eq} at proposed western façade of worst affected residential tower (building H) when a refrigeration unit is operating in the loading dock. This office has been advised that the operating hours of the Thermal Mark Transport Refrigeration site are 8am-4pm.

4.2.4 Heavy Vehicle Movements along Penny Place

Due to the commercial development to the south of the site, there are regular heavy vehicle movements along Penny Place (to the immediate south of the site). Noise impacts on the senior living apartments and RACF from heavy vehicle movements along Penny Place will be predicted using the following assumptions:

- Sound power level of 105dB(A)L_{eq} for a semi-trailer truck (based on measurements conducted by this office);
- Truck travelling along Penny Place at a speed of 10km/hr;
- 8 semi-trailer truck movements along Penny Place during peak hour use.

Based on these assumptions, predicted noise impacts on the proposed senior living apartments and RACF are presented in the table below. The predicted noise level factors in losses due to distance attenuation.

Table 7 – Predicted Noise Level from Truck Movements along Penny Place

Noise Source	Worst Noise Impacted Location	Predicted Noise Level
Semi-trailer Truck at 10km/hr	Southern Façade of Southern Residential Towers	59dB(A)L_{eq}

4.3 RECOMMENDATIONS

External noise intrusion into the proposed development were assessed using the measured noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

The constructions necessary to achieve the noise levels are detailed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

4.3.1 Glazed Windows and Doors

The recommended glazing constructions are outlined below in the following tables. The glazing thickness recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations.

Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed below.

Note: Glazing to be reviewed at CC stage based on construction drawings.

Table 8 - Minimum Glazing Recommendations Buildings A

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
East	Apartment Bedrooms / Living	10.38mm laminated	Yes
North, South, West	Apartment Bedrooms / Living	6.38mm laminated	Yes

Table 9 - Minimum Glazing Recommendations Buildings B

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
North, East, West	Apartment Bedrooms / Living	6.38mm laminated	Yes
South	Apartment Bedrooms / Living	6mm float	Yes

Table 10 - Minimum Glazing Recommendations Buildings C & D

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
North, East	Apartment Bedrooms	6.38mm laminated	Yes
	Apartment Living Rooms	6mm float	Yes
South, East	Apartment Bedrooms / Living	6mm float	Yes
All	Community Facilities	6mm float	Yes

Table 11 - Minimum Glazing Recommendations Buildings E

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
All	Apartment Bedrooms / Living	6.38mm laminated	Yes

Table 12 - Minimum Glazing Recommendations RACF

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
East, South, West	Bedrooms	6.38mm laminated	Yes
North	Bedrooms	6mm float	Yes
All	Common Room and Lounge/Dining	6mm float	Yes

Table 13 - Minimum Glazing Recommendations Buildings F & G

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
East, South, West	Apartment Bedrooms	6.38mm laminated	Yes
	Apartment Living Rooms	6mm float	Yes
North	Apartment Bedrooms / Living	6mm float	Yes

Table 14 - Minimum Glazing Recommendations Buildings H

Facade	Room Type	Glazing Assembly	Acoustic Seals Required
East	Apartment Bedrooms / Living	10.38mm laminated	Yes
North, South	Apartment Bedrooms / Living	6.38mm laminated	Yes
West	Apartment Bedrooms / Living	6mm float	Yes

These glazing recommendations will achieve the internal noise goals outlined in section 4.1. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria listed below.

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC/R_w rating of the glazing assembly below the values nominated in the table below. **Note that mohair type seals will not be acceptable for the windows requiring acoustic seals.**

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC/R_w requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 15 – Minimum STC/R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum STC/R_w of Installed Window	Acoustic Seals
6mm float	29	Yes
6.38mm laminated	31	Yes
10.38mm laminated	35	Yes

4.3.2 External Walls

For external walls of masonry construction, no acoustic upgrade is required. There should be no vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed. In the event lightweight external constructions are used, these are to be reviewed at CC stage.

4.3.3 Roof / Ceiling Construction

The proposed concrete roof for the development will be acoustically acceptable and will not require any additional treatment.

4.3.4 Ventilation Requirements

With respect to natural ventilation of a dwelling, it is common acoustic practice that if the noise level within the dwelling is within 10dB(A) of the target noise level (as set out in section 4.1.2) with the windows open, then a suitable level of acoustic amenity is achieved even if the window is left open (see for example NSW Department of Planning document "*Development near Busy Roads and Rail Corridors - Interim Guideline*):

- *"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 (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

All rooms will need to have their windows closed in order to achieve the internal noise goals.

A mechanical engineer is to confirm if supplementary ventilation is required to the rooms in order to meet the ventilation requirements of AS1668.1.

Any supplementary/mechanical ventilation system should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above is not reduced and does not exceed Council criteria for noise emission to nearby properties.

5 NOISE EMISSION CRITERIA

This section of the report presents the noise emission criteria that are applicable to the site. The main noise generating activities to be addressed are:

- Noise from mechanical plant servicing the development;
- Noise from truck deliveries to the RACF loading dock.

In addition, a review will be conducted of speech noise from residents of the proposed development impacting the commercial development to the south of the site across Penny Road, as well as noise from vehicles manoeuvring within the site impacting the southern commercial receivers.

Noise emission criteria for the development will be based on the following documents

- Blacktown Council DCP
- The EPA Noise Policy for Industry
- The Protection of the Environment Operations Regulation Act 2000

5.1 BACKGROUND NOISE MONITORING

Measured background noise levels are presented below. Refer to Appendix 1 for noise logging data.

Table 16 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) L_{90}
170 Reservoir Road, Arndell Park	Day (7am-6pm)	54
	Evening(6pm-10pm)	54
	Night(10pm-7am)	51

5.2 BLACKTOWN COUNCIL DCP

Section 6.9.3 of the Part C of the Blacktown Council DCP states the following:

"No electrical, mechanical or hydraulic plant or equipment shall generate a noise level greater than 5dB(A) above the ambient L90 sound level at the boundaries of any allotment at any time of day."

5.3 NSW EPA NOISE POLICY FOR INDUSTRY 2017

The NSW EPA Noise Policy for Industry 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.

5.3.1 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 5.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 17 – Intrusiveness Noise Level Criteria

Location	Period/Time	Intrusiveness Noise Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences	Day (7am-6pm)	59
	Evening (6pm-10pm)	59
	Night (10pm-7am)	56

5.3.2 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 Noise Policy for Industry 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 criteria are presented in the table below.

Table 18 – Project Amenity Noise Level Criteria

Location	Period/Time	Project Amenity Noise Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences - Urban	Day (7am-6pm)	58
	Evening (6pm-10pm)	48
	Night (10pm-7am)	43
Commercial Receivers	When in use	63

5.3.3 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 19 – Project Noise Trigger Level Criteria

Location	Period/Time	Project Noise Trigger Level Criteria dB(A) $L_{eq(15min)}$
Nearby Residences	Day (7am-6pm)	58
	Evening (6pm-10pm)	48
	Night (10pm-7am)	43
Commercial Receivers	When in use	63

5.4 RESIDENTIAL AIR CONDITIONING CONDENSER NOISE (PROTECTION OF THE ENVIRONMENTAL OPERATION ACT REGULATION 2000)

Protection of the Environmental Operations regulation limits the noise levels associated within the operation of domestic air conditioning criteria during night time periods which is presented below:

Protection of the Environmental Operations (Noise Control) Regulation 2000-Sect 52

52 Air Conditioners

(1) A person must not cause or permit an air conditioner to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):

(a) before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or
(b) before 7 am or after 10 pm on any other day.

6 NOISE EMISSION ASSESSMENT

The following noise generating activities/sources from the site will be assessed:

- Noise from mechanical plant servicing the development;
- Noise from truck deliveries to the RACF loading dock.

In addition, a review will be conducted of speech noise from residents of the proposed development impacting the commercial development to the south of the site across Penny Road, as well as noise from vehicles manoeuvring within the site impacting the southern commercial receivers.

6.1 LOADING DOCK NOISE

The noise emissions from truck deliveries to the RACF loading dock have been predicted to the surrounding receivers.

As discussed in section 2, there are two potential locations for the loading dock: either in the basement carpark of the RACF, or along Penny Place (as indicated in figure 2). Truck movements to the basement car park of the RACF have a greater potential to impact the surrounding receivers. If noise emissions from the basement loading dock scenario comply with noise emission requirements, then noise emissions from the Penny Place scenario will also comply with the acoustic criteria.

The nearest receiver to be impacted by truck deliveries to the basement loading dock scenario are the senior living apartments of building L located to the immediate west of the RACF. If noise emissions are compliant at this receiver, they will be compliant at all receivers in the vicinity of the RACF.

Noise emissions at the nearest receivers will be assessed based on the assumptions presented below;

- 1 rigid truck will drive into the loading dock of the RACF at 10km/hour in a 15 minute period, with a typical sound power level 100dB(A)Leq (noise data from other projects by this office).
- Trucks only make deliveries during the day time period (7am-6pm).

Noise emissions will be assessed against the project noise trigger level criteria of the NSW EPA Noise Policy as outlined in section 5.3.3.

The predicted loading dock noise levels to the nearest receivers are presented in the table below.

Table 20 – Predicted Noise Level from Loading Dock Movements

Receiver	Time Period	Predicted Noise Level dB(A) L_{eq}	Noise Emission Criteria dB(A) $L_{eq(15min)}$	Complies
Building L Seniors Living Apartments to the West	Day Time Period (7am-6pm)	51	58	Yes

6.2 MECHANICAL PLANT AND EQUIPMENT

At the early stage of the project equipment items and their respective locations have not been determined, thus, detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the criteria levels set out in section 5 of this report.

6.3 RESIDENT SPEECH NOISE IMPACTING COMMERCIAL RECEIVERS TO THE SOUTH

Concern has been raised of impacts from residents' speech noise within the development (in particular residents talking on balconies near the southern boundary of the site) impacting the commercial development to the south of the site, across Penny Place. We make the following comments:

- There is approximately 30m distance separation between the proposed seniors living apartments and the nearest commercial receiver.

- Assuming a sound power level of 68dB(A)L_{eq} for a person speaking with an unraised voice (based on measurements conducted by this office), the predicted noise level from a person speaking on their balcony at the nearest commercial receiver to the south would be 30dB(A)L_{eq}.

- A noise source is generally considered inaudible if the noise level of the source is 10dB(A) less than the background noise level.

- Given that the background noise level measured at site during the day time period (when the commercial receivers would be occupied) is 54dB(A)L_{90}, it can be reasonably concluded that speech noise from the southern-most balconies of the development will be inaudible at the commercial receivers to south, resulting in no adverse noise impacts on these receivers.

6.4 NOISE FROM VEHICLES MANOEUVERING WITHIN THE SITE IMPACTING COMMERCIAL RECEIVERS TO THE SOUTH

Concerns have also been raised of noise from vehicles manoeuvring within the development impacting the commercial development to the south of the site, across Penny Place. We make the following comments:

- We note that there is limited access to the site from Penny Place. Vehicle access to the site will primarily be from the north of site, off from Reservoir Road.

- The majority of the internal roads within the development are completely screened from the commercial receivers to the south by the buildings of the development.

- Given the limited access to the site from Penny Place and the shielding of the internal roads provided by the buildings of the proposed development, there will be no adverse noise impacts on the commercial development from vehicles manoeuvring within the site.

6.5 RECOMMENDATIONS

In order to ensure ongoing compliance with the noise emission requirements, we make the following recommendations:

- Truck deliveries to the RACF loading dock should take place between 7am-6pm.
- Trucks are to switch off their engines during idling.
- A detailed acoustic review of all plant/equipment should be conducted at Construction Certificate stage (once equipment selections and locations are finalised).

7 CONCLUSION

A noise assessment has been carried out for Masterplan seniors living apartments and residential aged care facility development to be located at 170 Reservoir Road, Arndell Park. The findings are below:

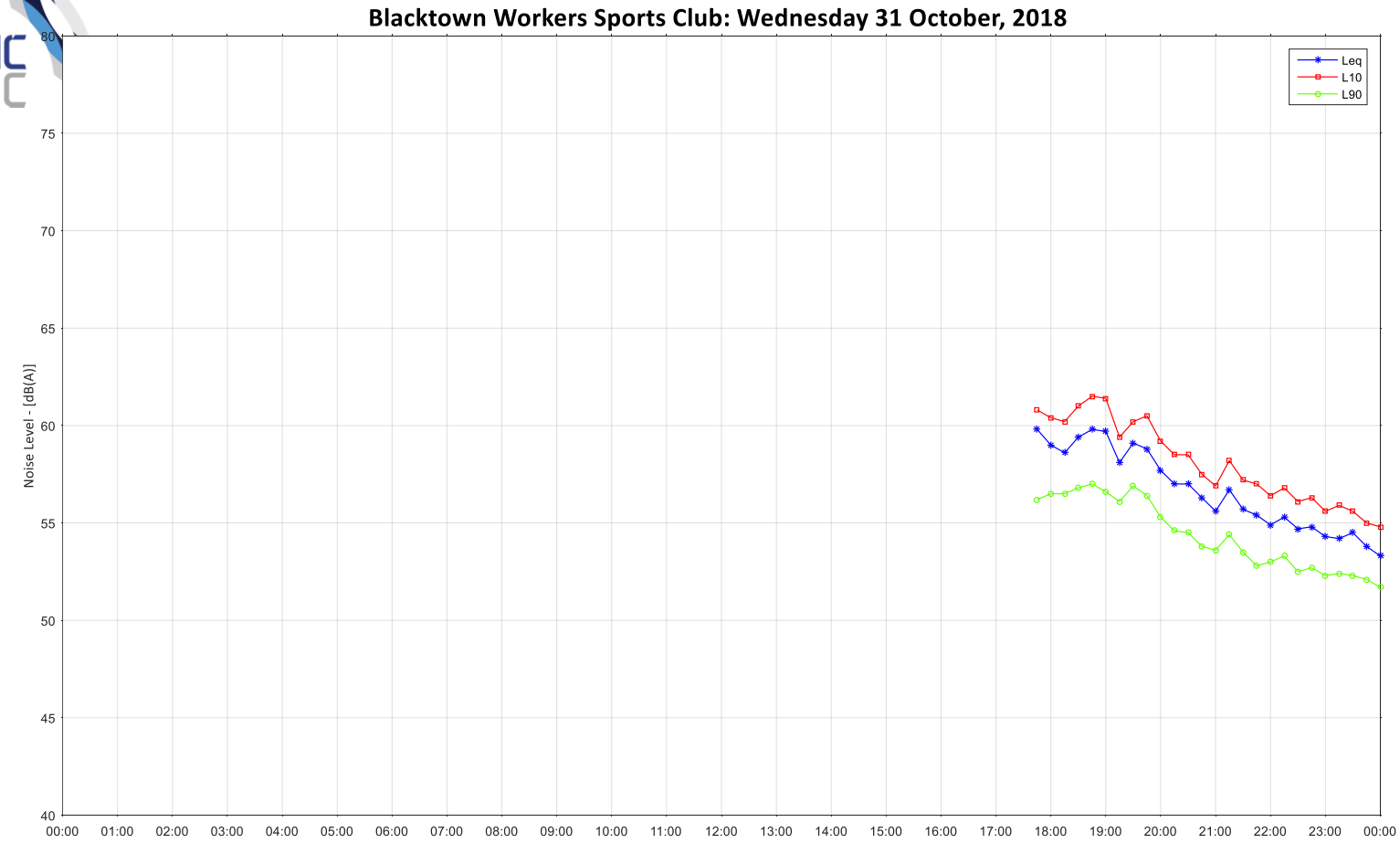
- External noise intrusion criteria for the proposed senior living apartments and RACF have been formulated with reference to the Blacktown City Council DCP, Department of Planning's *Development Near Rail Corridors and Busy Roads (Interim Guideline),* and Australian Standard AS2107:2016. The acoustic treatments in principle necessary to achieve these guidelines have been set presented in section 4.3 of this report.
- Noise emission criteria for the development have been formulated with reference to the Blacktown Council DCP, NSW EPA Noise Policy for Industry and the Protection of the Environmental Operation Act Regulation 2000, as presented in section 5.
- An assessment of noise emissions from the proposed loading dock locations for the RACF has been carried out and is presented in section 6. Recommendations have been presented to ensure compliance with the noise emission criteria.
- In addition, a review of noise impacts from residents' speech and vehicles manoeuvring within the site on the commercial receivers to the south of the site have been addressed in section 6. The results of the acoustic review conclude that there will be no adverse noise impacts on the commercial receivers from these activities.

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

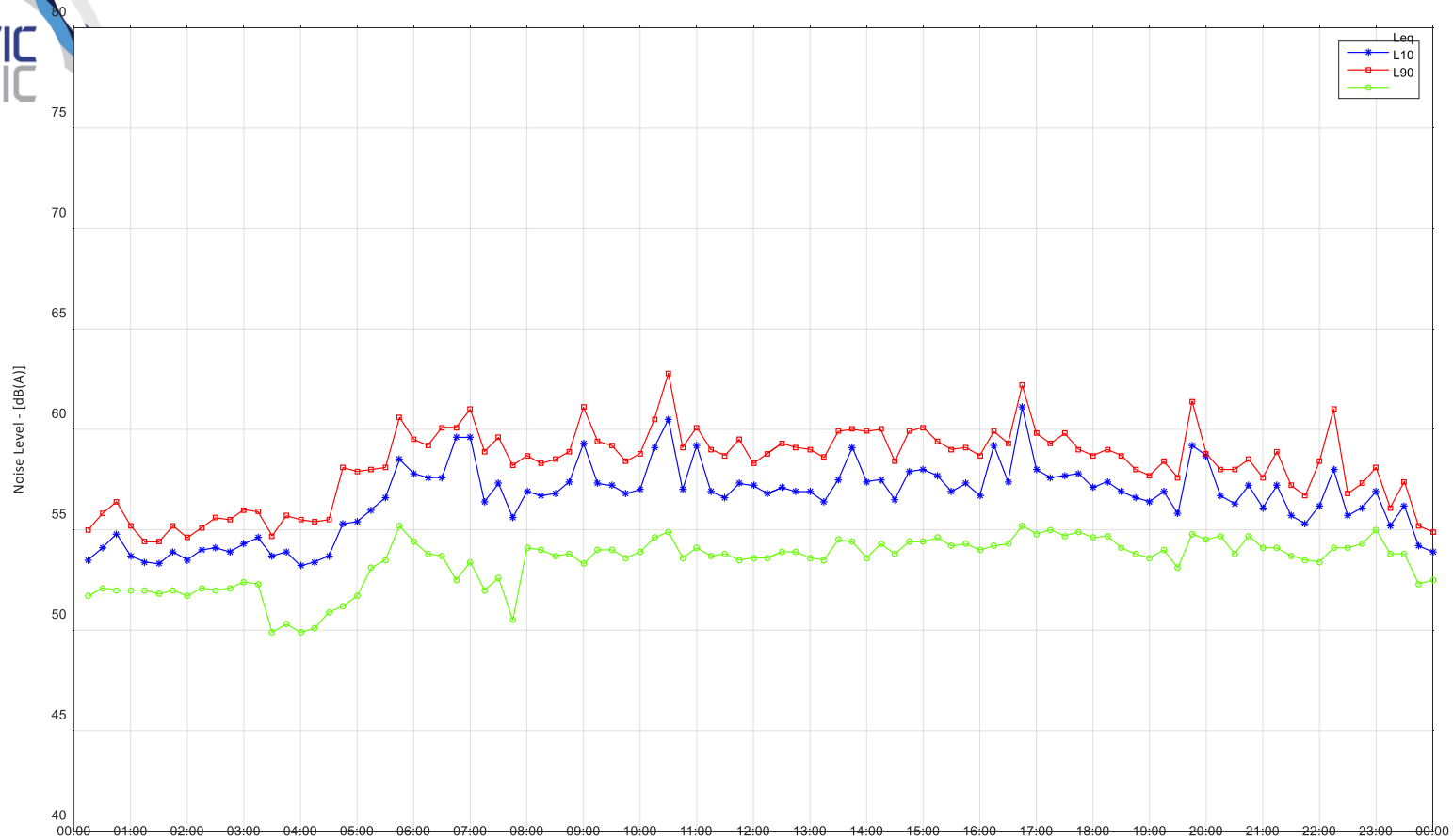
Yours faithfully,

Johan Davydov

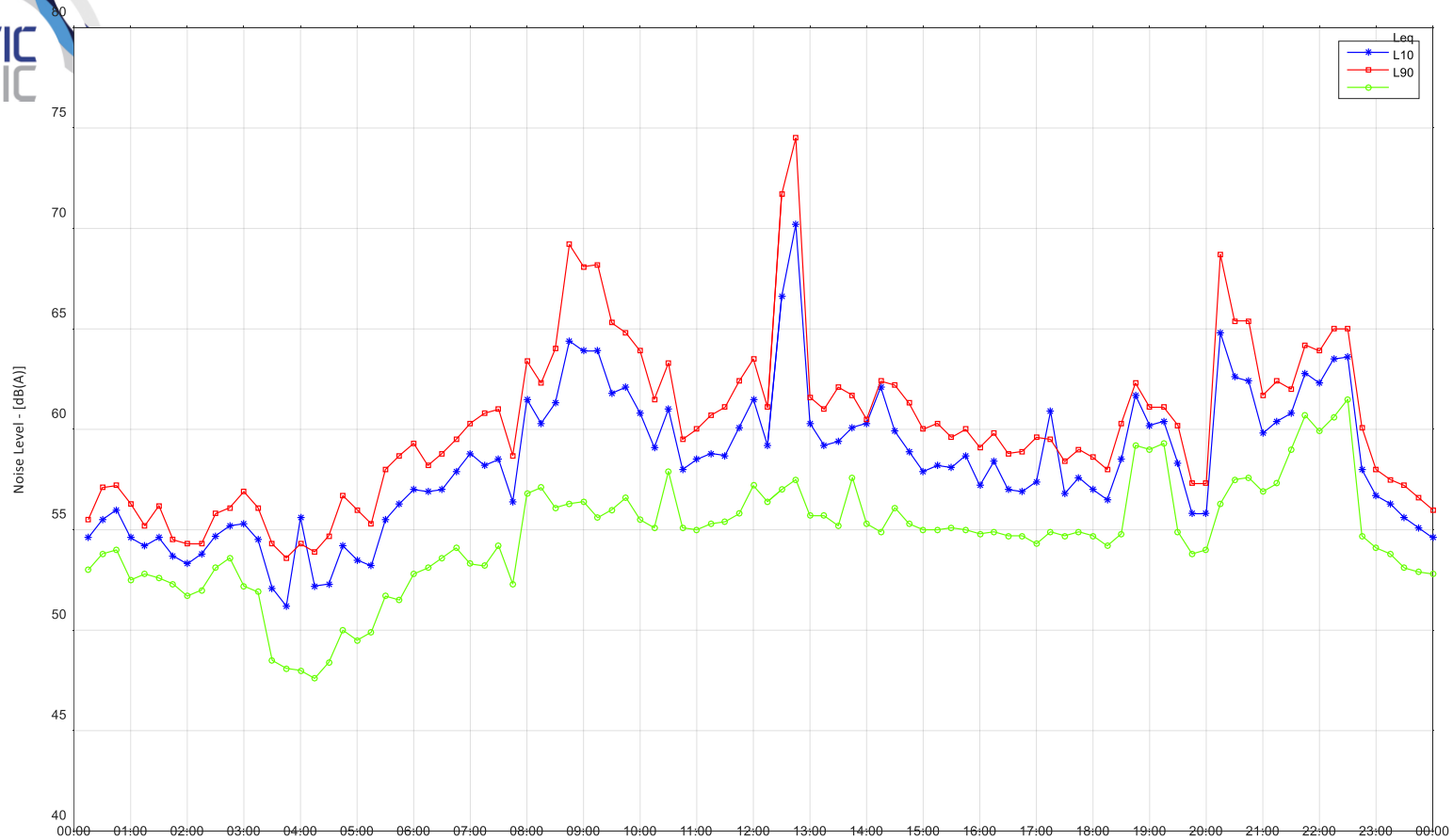
APPENDIX 1 – UNATTENDED NOISE MONITORING DATA

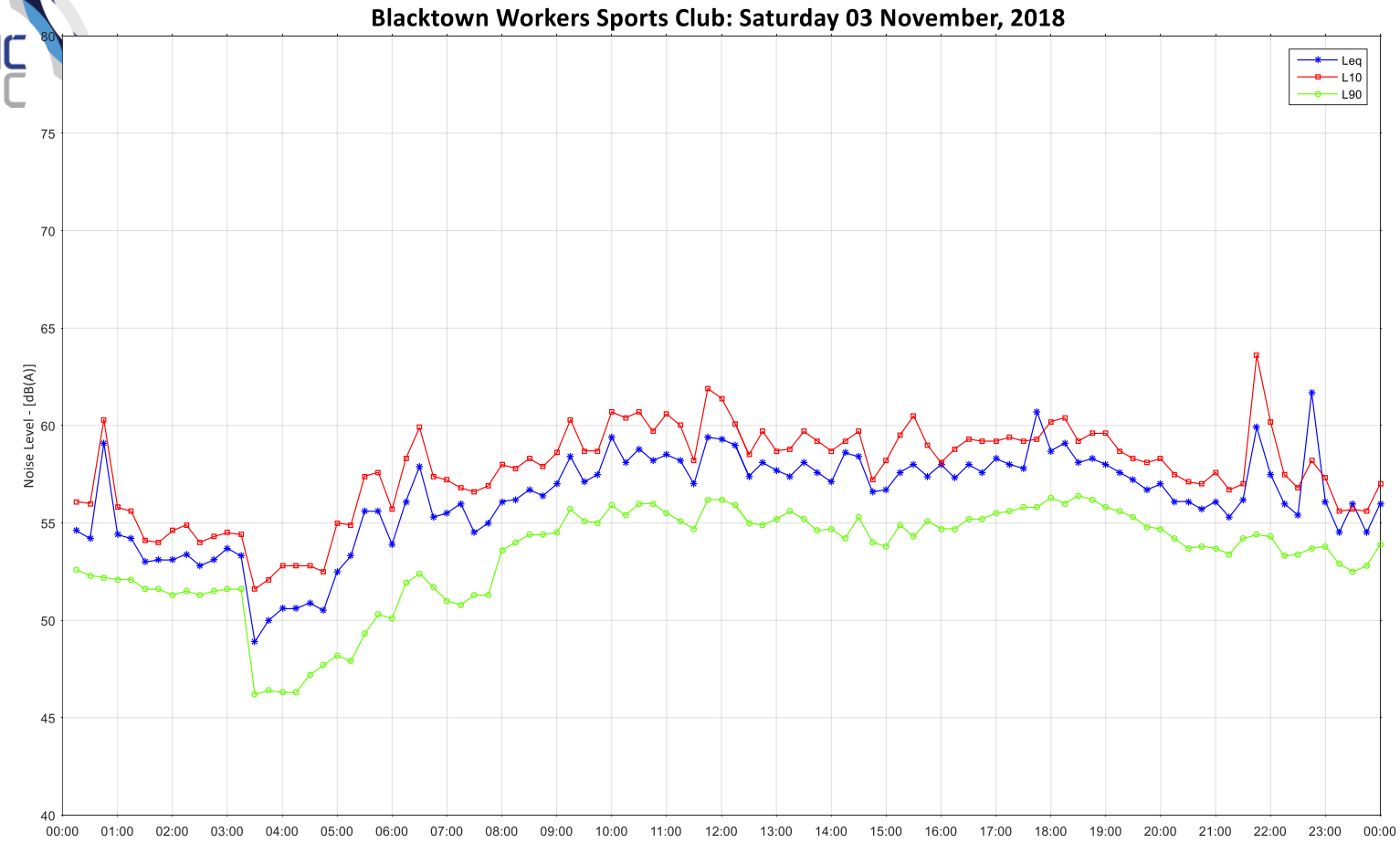

Blacktown Workers Sports Club: Wednesday 31 October, 2018
Leq
L10
L90
Noise Level - [dB(A)]
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

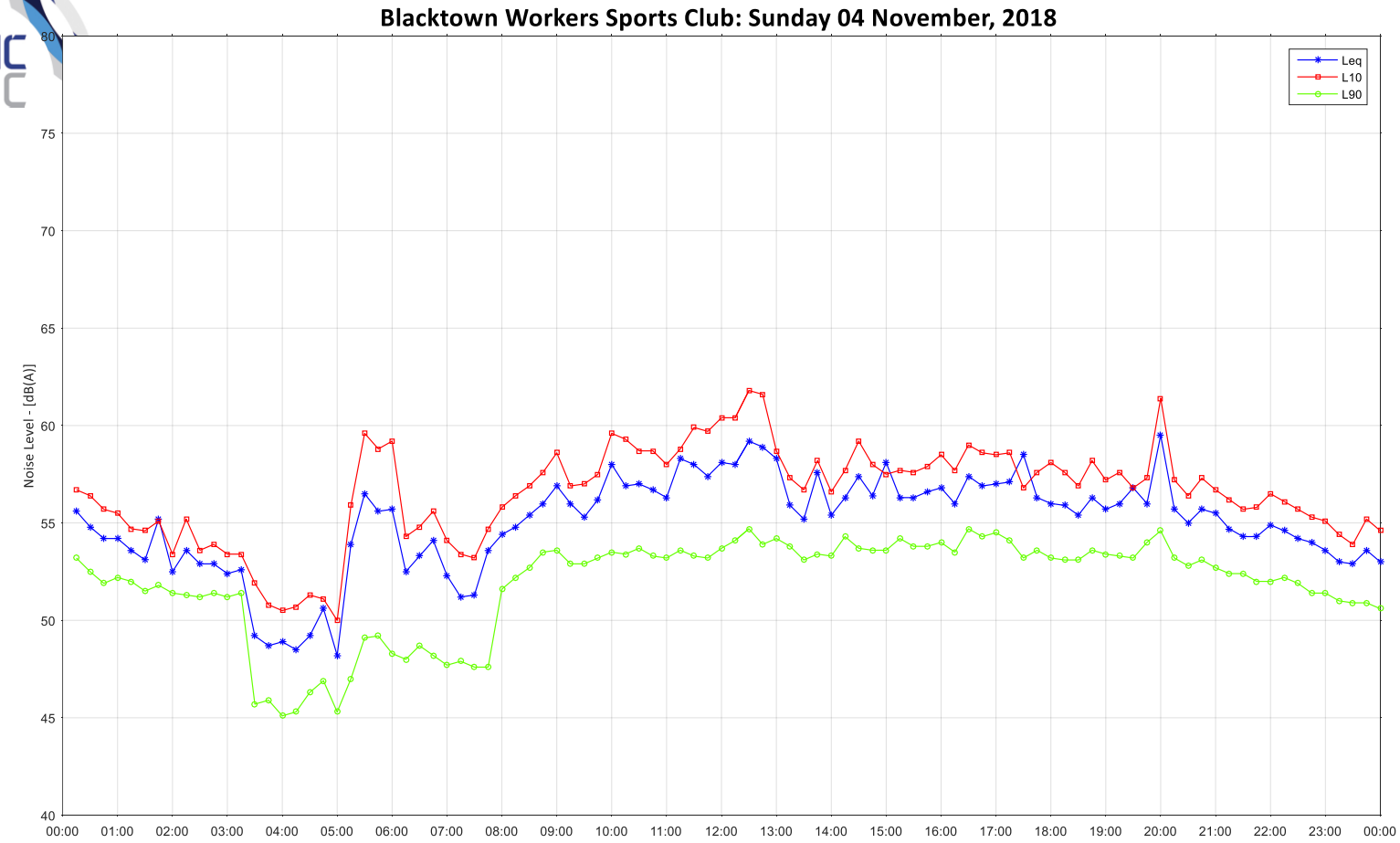
Blacktown Workers Sports Club: Thursday 01 November, 2018

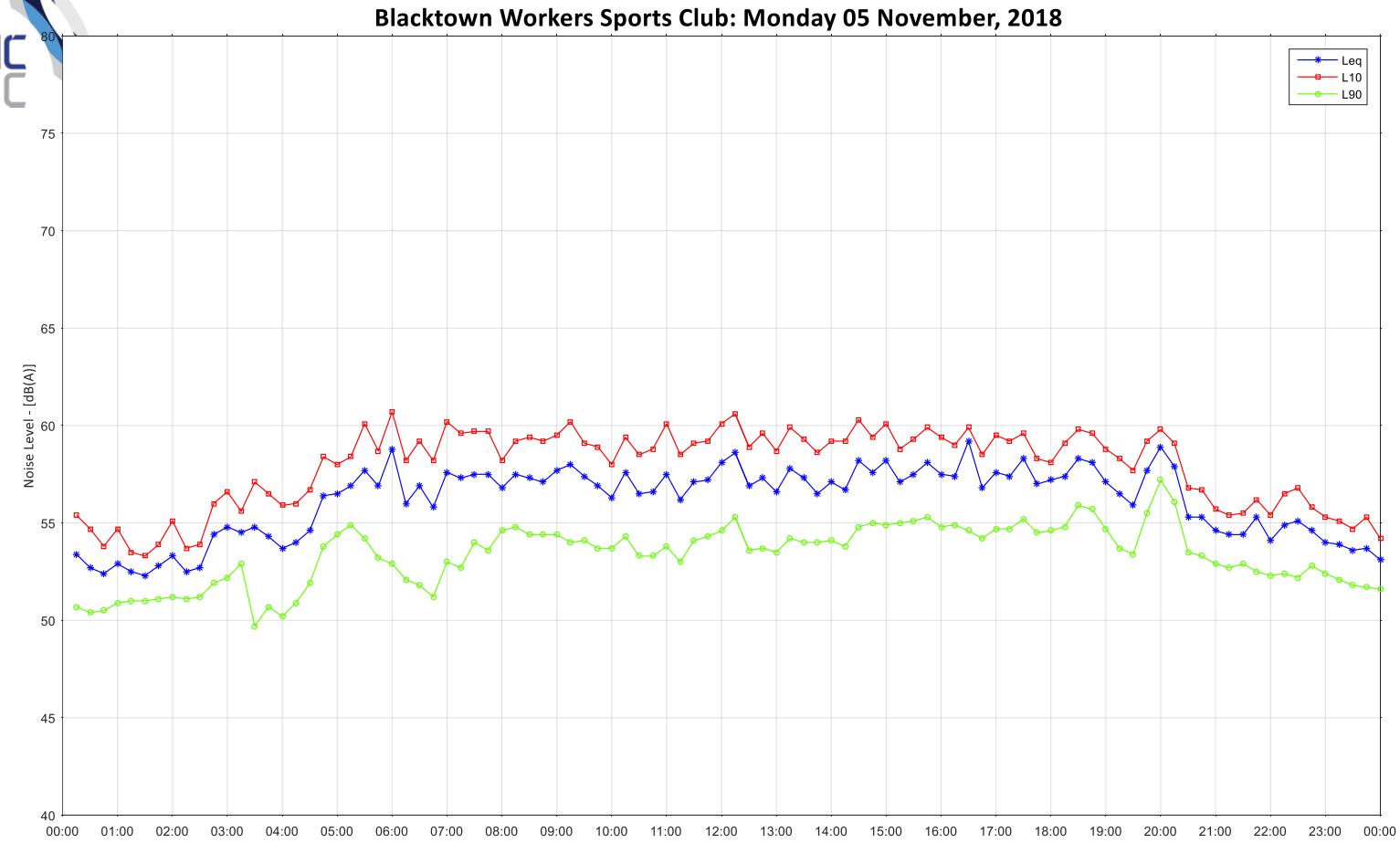


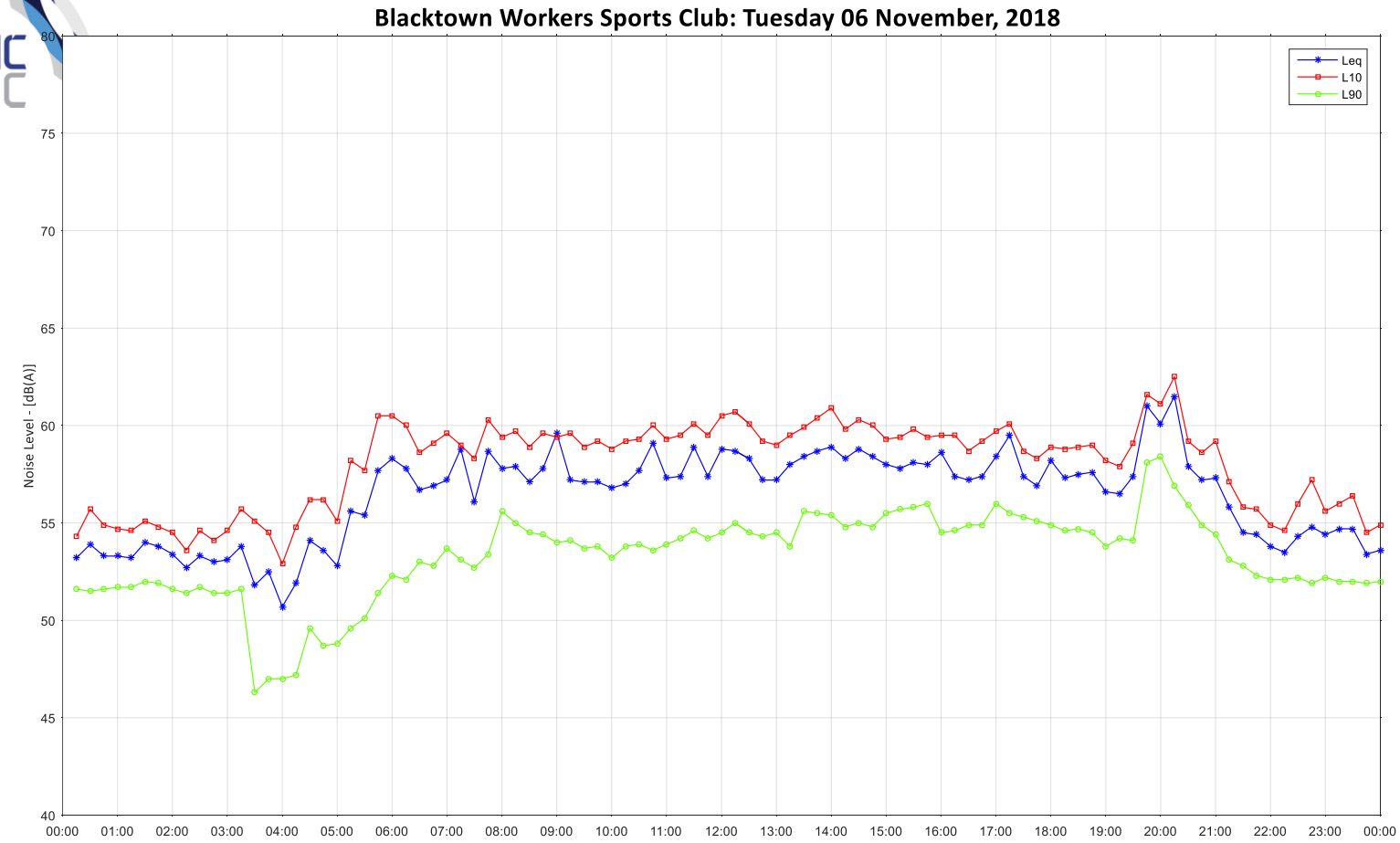
Blacktown Workers Sports Club: Friday 02 November, 2018

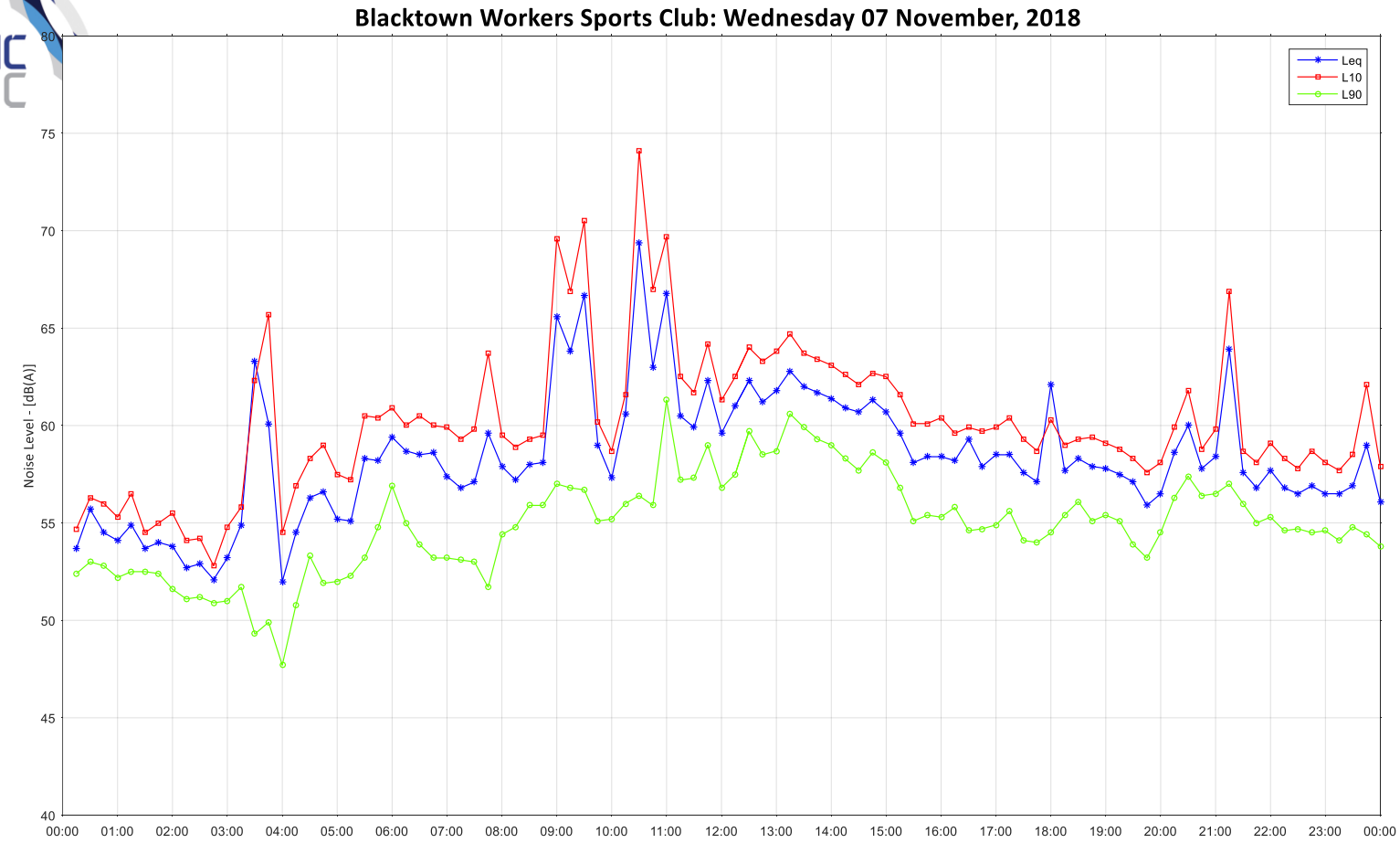


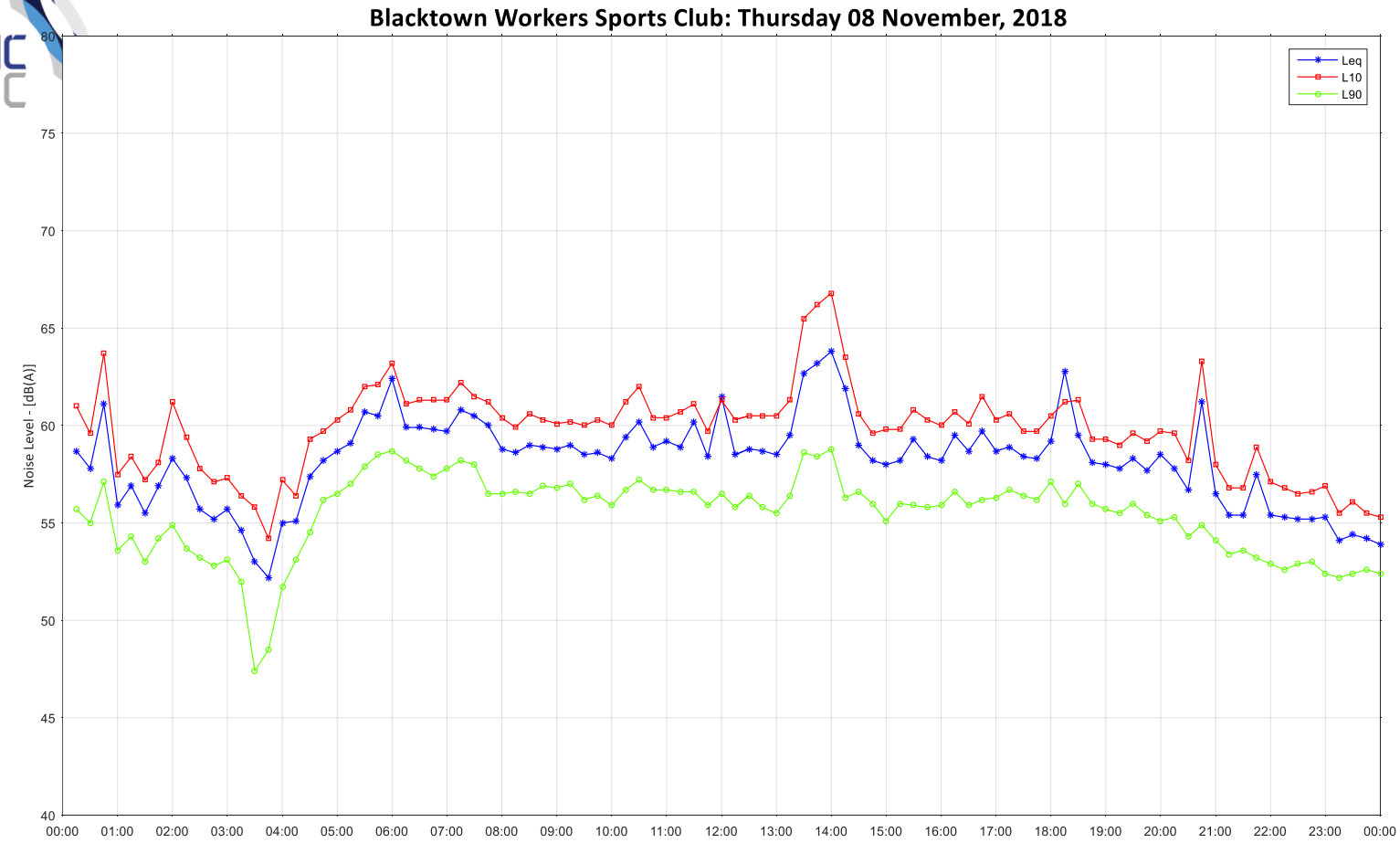

Blacktown Workers Sports Club: Saturday 03 November, 2018
Leq
L10
L90
Noise Level - [dB(A)]
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

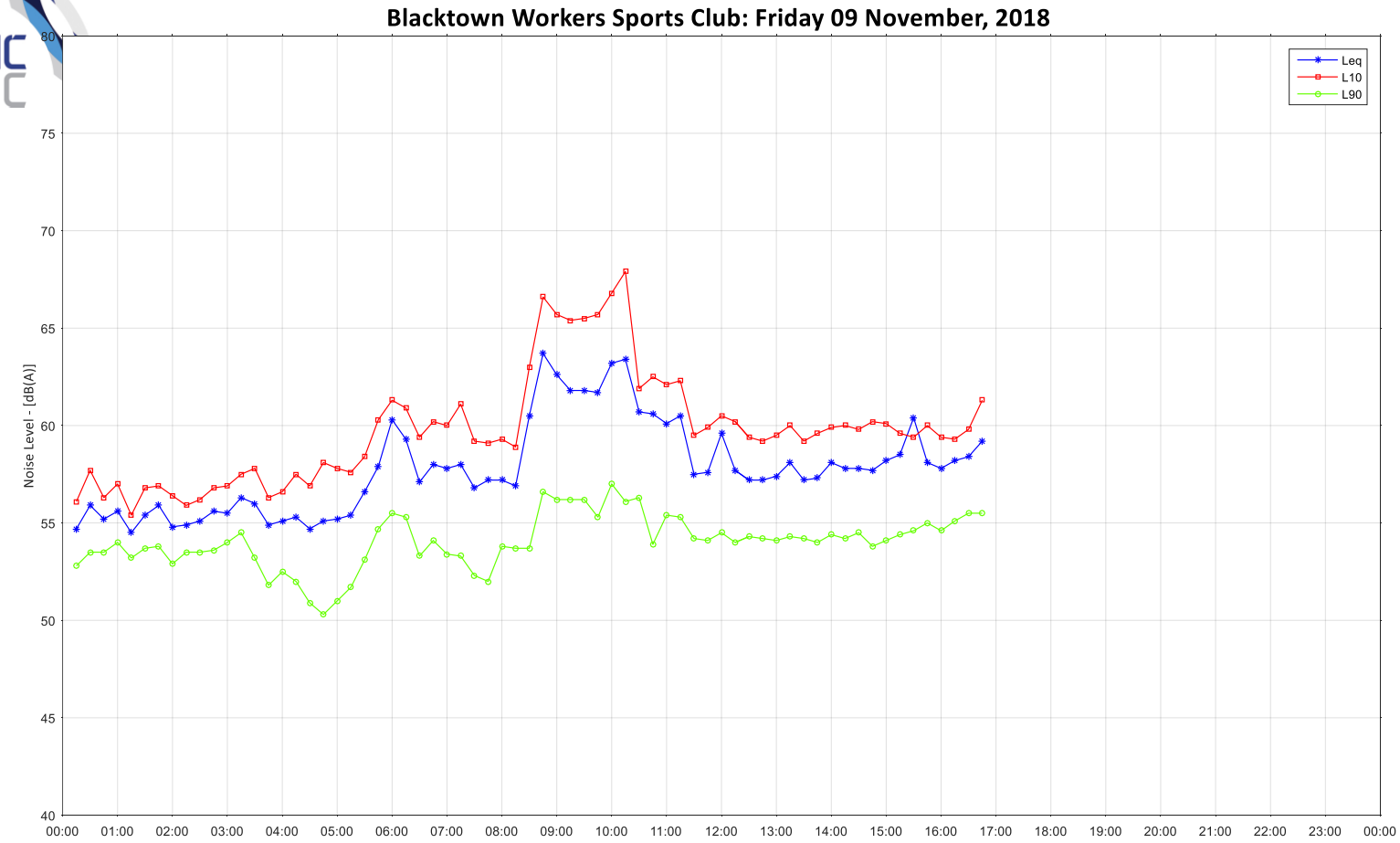

Blacktown Workers Sports Club: Sunday 04 November, 2018
Leq
L10
L90
Noise Level - [dB(A)]
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Blacktown Workers Sports Club: Monday 05 November, 2018
Leq
L10
L90
Noise Level - [dB(A)]
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Blacktown Workers Sports Club: Tuesday 06 November, 2018
Leq
L10
L90
Noise Level - [dB(A)]
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Blacktown Workers Sports Club: Wednesday 07 November, 2018
Noise Level - [dB(A)]
Leq
L10
L90
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Blacktown Workers Sports Club: Thursday 08 November, 2018
Noise Level - [dB(A)]
Leq
L10
L90
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00


Blacktown Workers Sports Club: Friday 09 November, 2018
Noise Level - [dB(A)]
Leq
L10
L90
80
75
70
65
60
55
50
45
40
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00