NORTHROP

ACOUSTIC REPORT FOR REVIEW OF ENVIRONMENTAL FACTORS

Land and Housing Corporation – Residential Housing Redevelopment

67-69 Pioneer Road and 28-30 Bramsen Street Bellambi NSW 2518

PREPARED FOR
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Rev: 8
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Acoustic Report for Review of Environmental Factors

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
20.04.2021	1	Preliminary	I. Adlington	J. Ameli
26.04.2021	2	Updated for review	I. Adlington	J. Ameli
29.06.2021	3	Updated for review	I. Adlington	J. Ameli
5.10.2021	4	For issue	I. Adlington	J. Ameli
1.12.2021	5	For issue	I. Adlington	J. Ameli
6.12.2021	6	For issue	I. Adlington	J. Ameli
22.03.2022	7	For issue	I. Adlington	J. Ameli
6.05.2022	8	For issue	I. Adlington	J. Ameli

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1. Executive Summary

Northrop Consulting Engineers Pty Ltd (Northrop) Acoustics have been engaged by McIntosh & Phelps to provide an acoustic report for Review of Environmental Factors (REF) for an affordable residential housing development to be located at 67-69 Pioneer Road and 28-30 Bramsen Street Bellambi NSW 2518 (the Site).

A noise survey was conducted to measure the ambient noise at the most affected noise receivers in the vicinity of the development. Based on the ambient noise measurements and requirements of the EPA NSW Noise Policy for Industry, the noise criteria were established. Noise emission levels to the surrounding sensitive receivers from the development were assessed against the project criteria. This includes assessment of noise impact from the generated traffic. Where exceedances occurred, recommendations were provided for compliance.

Providing our recommendations are implemented, noise emissions from the subject development will comply with the acoustic requirements of Wollongong City Council, NSW EPA Noise Policy for Industry and relevant Australian standards and guidelines.

2. Referenced Documents

This assessment has been prepared considering the following documentation:

2.1 Project Documents:

- Architectural drawings issued by McIntosh & Phelps Architects – see Appendix A
- SY202330-CC03V3.4 Civil Engineering Report: Traffic Impact Assessment Report issued by Northrop 22nd March 2022

2.2 Consent Authority, Design Guidelines and Standards:

- Wollongong Development Control Plan (DCP), 2009
- Wollongong Local Environment Plan (LEP) Land Zoning Maps, 2009, issued by NSW Government
- NSW Noise Policy for Industry (NPfI), 2017, issued by NSW Environmental Protection Authority
- Noise Guide for Local Government, 2013, issued by NSW Environmental Protection Authority
- State Environmental Planning Policy "SEPP" (Transport and Infrastructure) 2021, issued by NSW Government
- Development near Rail Corridors and Busy Roads Interim Guideline, 2008, issued by NSW Government
- NSW Road Noise Policy, issued by the NSW Government Department of Environment, Climate Change & Water
- National Construction Code Building Code of Australia, (NCC), 2019, issued by Australian Building Codes Board
- Australian Standard 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors – issued by Standards Australia

3. Project and Site Description

3.1 Project Understanding

The development is proposed to comprise 18 affordable residential units over two levels. Northrop Acoustics have been engaged to undertake site monitoring and to provide an acoustic assessment for including into the Review of Environmental Factors (REF).

3.2 Site Description

The Site is located at 67-69 Pioneer Road and 28-30 Bramsen Street Bellambi NSW 2518 and is zoned R2 – Low Density Residential and is surrounded by other R2 zoned land. (Wollongong Local Environmental Plan 2009 Land Zoning Map). The residential receiver category would be classified as "suburban" with reference to Table 2.3 in the Noise Policy for Industry (2017) based on the Land Zoning and measured noise levels. The nearest affected residential receivers are as follows:

- 1 The Avenue
- 65 and 71 Pioneer Road
- 39-41 Bramsen Street
- 54-58 Lorking Street

Pioneer Road Long Day Care Centre is a potentially affected non-residential reciever located at 20 Pioneer Road.

Figure 1: Aerial view of Site with nearest affected receivers

4. Relevant Acoustic and Noise Criteria

4.1 Wollongong City Development Control Plan (2009)

The following are excerpts from Wollongong Development Control Plan (2009) (Chapter B01 – Residential Developments):

6.7 Acoustic privacy

6.7.1 General

1. This clause applies to proposals involving the erection of new residential flat buildings upon land directly adjoining or opposite a business or industrial zone or in cases where there is an existing nearby land use which generates external noise from either the land use activity itself or from patrons attending or leave the nearby premises.

2. Acoustic privacy is a measure of sound insulation between residential apartments and between external and internal spaces.

6.7.2 Objective

(a) To ensure a high level of amenity by protecting the privacy of occupants both within apartments and in private open space areas / balconies in the building.

6.7.3 Development Control

1. *Residential apartments and / or serviced apartments should be arranged in a building, to minimise noise transition between apartments by:*
    - *(a) Locating busy, noisy areas next to each other and quieter areas, next to other quieter areas (eg living rooms with living rooms and bedrooms with bedrooms);*
    - *(b) Using storage or circulation zones within an apartment to buffer noise from adjacent apartments, mechanical services or corridors and lobby areas; and*
    - *(c) Minimising the amount of party (shared) walls with other apartments.*
2. *All residential apartments and / or serviced apartments within a building should be designed and constructed with double-glazed windows and / or laminated windows, solid walls, sealing of air gaps around doors and windows as well as appropriate insulating building elements for doors, walls, roofs and ceilings etc; to provide satisfactory acoustic privacy and amenity levels for occupants within the residential and / or serviced apartment(s).*
3. *Appropriate sound attenuation measures should be considered between each floor in the development, to minimise potential sound transmission into any residential apartment below.*
4. *Any residential apartment which faces towards a major (busy) road must be designed in accordance with the requirements contained in Chapter E4: Development near Railway Corridors and Major (Busy) Roads in this DCP.*
5. *The Statement of Environmental Effects (SEE) accompanying the development must demonstrate what acoustic measures will be provided to windows of sleeping areas and living areas for each residential apartment or serviced apartment in the development. The proposed acoustic measures must also be shown on the required architectural floor layout and elevation plans for the development.*

    Alternatively, the Statement of Environmental Effects (SEE) may include an acoustical impact assessment study which outlines alternative acoustic treatment measures for residential apartment(s) and / or serviced apartment(s) in the development. The acoustic impact assessment study must be carried out by a suitably qualified and experienced acoustic consultant (ie a person who is a Member of the Australian Acoustical Society, the Institution of Engineers or the Association of Australian Acoustical Consultants).

4.2 NSW EPA Noise Policy for Industry (2017)

The NSW Environment Protection Authority (EPA) Noise Policy for Industry (2017) sets out noise criteria to control the noise emission from industrial noise sources. Mechanical, building services and operational noise from the development shall be addressed following the guideline in the NSW EPA Noise Policy for Industry.

The determination of the criteria is based on the results of the ambient and background noise unattended monitoring, addressing two components:

- Controlling intrusive noise into nearby residences (Intrusiveness Criteria)
- Maintaining noise level amenity for particular land uses (Amenity Criteria)

Once both criteria are established the most stringent for each considered assessment period (day, evening, night) is adopted as the Project Noise Trigger Level (PNTL). The project noise trigger level becomes the benchmark for assessing the noise impact from the proposed Site upon the surrounding noise-sensitive receivers for the external noise emissions from the development. The assessment periods are:

- Day: 7am – 6pm Monday – Saturday, 8am – 6pm Sunday
- Evening: 6pm – 10pm Monday – Sunday
- Night: 10pm – 7am Monday – Saturday, 10pm – 8am Sunday

The applicable parts of Table 2.2: Amenity noise levels from the Noise Policy for Industry which are relevant to the project are reproduced in Table 1 below:

Table 1: Amenity criteria for external noise levels

Receiver	Noise amenity area	Time of day	Recommended amenity noise level – L_{Aeq} (dB(A))
Residential	Suburban	Day	55
		Evening	45
		Night	40
School classroom – internal	All	Noisiest 1-hour when in use	35

4.3 NSW State Environmental Planning Policy SEPP – Developments Near Rail Corridors and Busy Roads

The SEPP (Transport and Infrastructure) 2021 internal noise criteria for buildings near rail corridors or busy roads are tabulated in Table 2 below.

Table 2: Developments near rail corridors and busy roads - Internal noise criteria

Type of Occupancy/Activity	Noise Level – dB(A)	Applicable Time Period
Residential Buildings:		
Sleeping areas (Bedrooms)	35	10 pm – 7 am
Other habitable rooms (Excl garages, kitchens, bathrooms, & hallways)	40	At any time

4.4 NSW Road Noise Policy

Noise from the vehicles associated with the development will be assessed using Road Noise Policy. Table 3 presents the noise assessment criteria for land use developments with potential to create additional traffic on existing local roads.

Table 3: Noise Criteria - Road Noise Policy

Road category	Type of project/Land use	Assessment criteria, dB(A)	
		Day	Night
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq\ (1hr)}$ 55 (External)	$L_{Aeq\ (1hr)}$ 50 (External)

RNP recommends that "Where feasible, existing noise levels should be mitigated to meet the noise criteria. In this regard, the RNP states that for existing roads there is limited potential for noise control as the development is not linked to road improvements. It does however advise that applicable strategies include appropriate location of private access roads, regulating time of use, using clustering, and using barriers and acoustic treatments".

Section 3.4.1 of the RNP specifies a limit of 2 dB for vehicular noise level increase over existing noise level of local roads for such developments/projects.

4.5 National Construction Code Building Code of Australia 2019

The development is classified as Class 2 under the Building Code of Australia (BCA):

"A building containing 2 or more sole-occupancy units each being a separate dwelling."

As such, Part F5 of the BCA (summarised in Table 5 below) applies to building elements for acoustic insulation. Recommended constructions to achieve these ratings will be provided at the detailed design stage.

Table 5: BCA required acoustic insulation performance

Building element separating:			Required acoustic performance
Floors	Sole-occupancy unit (including ensuite)	Sole-occupancy unit (SOU), plant room, lift shaft, stairway, public corridor, public lobby or the like; parts of a different classification.	Min. $R_w + C_{tr}$ 50 Max. $L_{n,w} + C_I$ 62
Walls	Sole-occupancy unit	Sole-occupancy unit	Min. $R_w + C_{tr}$ 50
		Stairway, public corridor, public lobby or the like; parts of a different classification.	Min. R_w 50, with min. R_w 30 door
		Plant room, lift shaft	Min. R_w 50 Discontinuous construction
	Habitable room (other than a kitchen)	Bathroom, sanitary compartment, laundry or kitchen in an adjoining unit	Min. $R_w + C_{tr}$ 50 Discontinuous construction

Services	Habitable room in a sole-occupancy unit	Duct, soil pipe, waste pipe, water supply pipe, storm water pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one SOU	Min. $R_w + C_{tr}$ 40
	Non-habitable room or kitchen in a sole-occupancy unit		Min. $R_w + C_{tr}$ 25

5. Site Measurements

5.1 Instrumentation

The survey was conducted with the following instruments:

- EL-215 noise logging sound level meter serial number 194525

Equipment was calibrated before and after the measurements. No calibration deviations were recorded.

5.2 Long-term Noise Logging

Automatic logging noise measurements were performed at the Site to document the existing acoustic environment.

Long-term noise monitoring was conducted between Thursday 10 December 2020 and Wednesday 16 December 2020 at Logger location shown in Figure 1 above. Detailed results of the logger measurements are shown in Appendix 1. Meteorological data was retrieved from a Bureau of Meteorology station located within 30km of the Site.

The results of the automatic logging measurements are shown in Table 4 below.

Table 4: Long-term noise monitoring results

Period	Equivalent Continuous Noise Level $L_{Aeq,15min}$ – dB(A)	Rating Background Noise Level RBL $L_{A90,15min}$ – dB(A)
Day	53	43
Evening	51	41
Night	45	37

The L_{A90} rating background noise levels were determined using the methodology as described in the Noise Policy for Industry.

6. Determination of Project Noise Criteria

6.1 Project Noise Trigger Levels – NPfI

The NSW EPA Noise Policy for Industry defines the following noise descriptors:

- The **Intrusiveness Criterion** states that the $L_{Aeq,\ 15\ minute}$ generated from the operation of the development cannot exceed the rating background noise level (RBL) plus 5 dB.
- The **Project Amenity Noise Level** is the ANL (Table 1) minus 5 dB, plus 3 dB to convert from a period level to a 15 minute level.
- The **Project Noise Trigger Level** (PNTL) is the more stringent (lowest) value of the intrusiveness and amenity noise levels, which becomes the benchmark for assessing the noise impact from the proposed Site upon the surrounding noise-sensitive receivers.

Table 5, below, shows the project specific noise levels that have been determined in accordance with the requirements of the NSW Noise Policy for Industry. The PNTL (in bold) shall be assessed at the boundary of the nearest affected receiver.

Table 5: EPA Noise Policy noise criteria for residential receivers

Period	Intrusiveness Criteria – $L_{Aeq,15min}$ dB(A)	Project Amenity Noise Level – $L_{Aeq,15min}$ dB(A)	Project Noise Trigger Level – $L_{Aeq,15min}$ dB(A)
Day	48 (43+5)	53 (55–5+3)	**48**
Evening	46 (41+5)	43 (45–5+3)	**43**
Night	42 (37+5)	38 (50–5+3)	**38**

7. Acoustic Assessment

7.1 Rail and Road Noise Intrusion

Minimum performance requirements for façade glazing have been provided for the project. The minimum acoustic rating has been calculated for each level and façade to achieve the internal noise criteria required by the SEPP (Transport and Infrastructure) 2021.

The development is located over 200m from the nearest railway line, so rail noise impact is not anticipated. Pioneer Road and Bramsen Streets are local roads with low-medium traffic volumes.

Wollongong DCP recommends the use of laminated glass for residential uses with acoustically rated frames and seals. To this end, it is recommended that 6.38mm laminated glass with minimum R_w 33 is installed to all habitable rooms in accordance with Table 2.

The above glazing thicknesses are the minimum required for acoustics insulation. Glazing thicknesses can be increased to comply with Section J requirements etc.

Glazing is generally the weakest component of the façade, and if not designed or installed properly would be a major transmission path.

Sometimes different glass configurations have the same R_w rating but they have different sound transmission loss characteristics at each frequency band. Glazing recommendations have been based on glass performance across frequency spectrum. Alternative glazing selections should be approved by an Acoustic Consultant.

All windows / doors should be well sealed when closed with good seals such as Q-LON acoustic seals along the top and bottom sliders. Special attention should be given to balcony or slider doors to have good quality acoustic seals all around them. Any airgap will significantly reduce the acoustic performance or the ability to reduce noise. Mohair seals are not considered to be acoustic seals.

For service rooms such as toilets, kitchen or laundries where the glazing is not specified in the glazing schedule, a 5 mm standard glass and frame with R_w 25 is considered sufficient.

7.2 Mechanical and Building Services Noise

At this stage, the mechanical plant and equipment have not been finalised therefore a mechanical noise assessment is not possible.

The mechanical plant should be selected such that the total noise complies with the Council noise criteria presented in Table 5. It is anticipated that mechanical plant noise can be controlled using standard engineering control measures for this project.

General recommendations for attenuation of mechanical noise are as follows:

- Locating the equipment at the location away from the neighbouring sensitive receivers. If there is no direct line of site between the equipment and noise receivers, that will alleviate to further attenuate the noise
- Enclosures – housing of plant and equipment inside the plant room, typically 20 to 30 dB(A) reduction
- Acoustic louvers and acoustically treated intakes and discharges – to acoustically treat air intakes into plant rooms using acoustic louvers, lined intakes/discharges and attenuators
- Barriers – use of acoustic barriers or screens to shield sensitive receivers.

7.3 Noise Impact from Generated Traffic

The operation of the development will generate additional traffic on the surrounding road network and as such an assessment has been undertaken to quantify the noise impacts.

NSW Road Noise Policy (RNP) states that for surrounding local roads an increase in traffic noise up to 2 dB is permitted. This represents a minor impact that is considered barely perceptible to the average person.

Within the surrounding road network Bramsen Street and Pioneer Road are the closest to the development and will have the highest noise impact therefore is considered for the assessment. The operation of the development is expected to increase the background noise levels due to increased vehicle activity. The extent of the increase is dependent on the existing and generated traffic volume on the surrounding road network.

The following existing traffic volume data shown in Table 6 has been provided by the Northrop Traffic team in *SY202330-CC03V3.4 Civil Engineering Report: Traffic Impact Assessment Report*.

Table 6: Existing traffic volumes

Road	Direction	Average Weekday Daily	Average Weekday Morning Peak	Average Weekday Afternoon Peak	Average Weekday Evening Peak
Bramsen Street Between Pioneer Road and Lorking Street	Eastbound	345	44	31	22
	Westbound	345	40	28	25
Pioneer Road Between The Avenue and Bramsen Street	Northbound	4279	400	402	237
	Southbound	3534	245	301	271
Pioneer Road Between Bramsen Street and Owen Park Road	Northbound	4338	455	398	319
	Southbound	3500	256	299	271

The traffic report also provided the predicted traffic generation as shown in Table 7 below.

Table 7: Predicted traffic generation

Time	Generated Trips
AM Peak	13
PM Peak	4
Daily	86

In addition to the normal morning and afternoon/evening peak times, the traffic report identifies an additional afternoon peak time during school drop off. As the weekday PM peak traffic generation accounts for both the afternoon peak (3:00pm-4:00pm) and the evening peak (5:00pm-6:00pm). It has been assumed that 50% of the generated events during weekday PM peak times will be during the afternoon peak and 50% during the evening peak.

As the driveway to the Site is proposed to be located on Bramsen Street, it has been assumed that 100% of generated traffic will travel on Bramsen Street and distributed proportionally north- and southbound on Pioneer Road.

The estimated traffic noise from the development has been calculated using the above data and is shown in Table 8 and Table 9.

Table 8: Predicted noise level increase from generated traffic – Bramsen Street

	Weekday Daily	Weekday AM Peak	Weekday PM Peak	Weekday Evening Peak
Existing volumes	690	84	59	47
Generated volumes	776	97	61	49
Noise increase, dB	0.51	0.62	0.14	0.18

Table 9: Predicted noise level increase from generated traffic – Pioneer Road

	Weekday Daily	Weekday AM Peak	Weekday PM Peak	Weekday Evening Peak
Existing volumes	7838	711	697	590
Generated volumes	7924	724	699	592
Noise increase, dB	0.05	0.08	0.01	0.02

The above results indicate that the increase in traffic noise is less than 2dB hence will comply with the Road Noise Policy requirement.

8. Conclusion

This report forms part of the REF submission for the proposed development of LAHC Bellambi at 67-69 Pioneer Road and 28-30 Bramsen Street Bellambi NSW 2518.

A noise survey was conducted to measure the ambient noise at the most affected noise receivers in the vicinity of the proposed development site. Based on the ambient noise measurements and requirements of the EPA NSW Noise Policy for Industry, the noise criteria were established. Noise emission levels to the surrounding sensitive receivers from the development were assessed against the project criteria. This includes assessment of the noise from generated traffic. Where exceedances occurred, recommendations were provided for compliance.

Providing the recommendations are implemented, noise emissions from the subject development will comply with the acoustic requirements of Wollongong City Council, NSW EPA Noise Policy for Industry and relevant Australian standards and guidelines.

Appendix A: Drawings

The following drawings were used in the preparation of this report.

Architectural Drawings

Architectural drawings issued by McIntosh & Phelps

Drawing No.	Revision	Title	Date
A001	1	COVER SHEET & LOCATION PLAN	6.12.2021
A002	1	SITE ANALYSIS - BROAD SCALE CONTEXT	6.12.2021
A003	1	SITE ANALYSIS - IMMEDIATE CONTEXT	6.12.2021
A004	1	DEMOLITION PLAN	6.12.2021
A005	1	SITE PLAN	24.01.2022
A101	1	FLOOR PLAN - GROUND FLOOR	9.02.2022
A102	1	FLOOR PLAN - LEVEL 1	6.12.2021
A103	1	ROOF PLAN	6.12.2021
A201	1	ELEVATIONS - BRAMSEN STREET & PIONEER ROAD	6.12.2021
A202	1	ELEVATIONS & SECTIONS	6.12.2021
A203	1	ELEVATIONS & SECTIONS	6.12.2021
A204	1	STREETSCAPE ELEVATIONS	9.02.2022
A301	1	PHOTOMONTAGE 1	6.12.2021
A302	1	PHOTOMONTAGE 2	6.12.2021
A303	1	PHOTOMONTAGE 3	6.12.2021
A401	1	EXTERNAL FINISHES SELECTIONS	6.12.2021
A501	1	SHADOW DIAGRAM - 21 JUNE 09:00	6.12.2021
A502	1	SHADOW DIAGRAM - 21 JUNE 12:00	6.12.2021
A503	1	SHADOW DIAGRAM - 21 JUNE 15:00	6.12.2021
A504	1	SOLAR ACCESS PLANS - GROUND FLOOR	6.12.2021
A505	1	SOLAR ACCESS PLANS - LEVEL 1	6.12.2021
A506	1	VIEW FROM SUN	6.12.2021
A507	1	SOLAR ACCESS SUMMARY TABLE	6.12.2021
A601	1	LANDSCAPE PLAN	9.02.2022
A602	1	LANDSCAPE PLAN	9.02.2022
A603	1	PLANTING SCHEDULE	9.02.2022
A701	1	GROSS FLOOR AREA	6.12.2021
A702	1	DEEP SOIL ZONE / LANDSCAPED AREAS	9.02.2022
A703	1	COMMUNAL OPEN SPACE PLAN	24.01.2022

Appendix B: Glossary of Acoustic Terminology

Decibel – dB – Unit of Acoustic measurements for power, pressure and intensity. Expressed in dB relative to standard levels.

A-weighted decibel – dB(A) – Unit of acoustic measurement weighted approximately to human hearing to sound.

SPL – Sound Pressure Level – 20 times the logarithm to the base 10 of the ratio of r.m.s. sound pressure to the reference pressure of 20 micro Pascals, sound pressure level is measured using a microphone and a sound level meter and varies with distance from the source.

SWL – Sound Power Level – 10 times the logarithm to base 10 of the ratio of the sound power of the source to the reference sound power of 1 Pico Watt. Sound power level cannot be directly measured using a microphone and a sound level meter, and it does not change with distance. The sound power of a machine will vary depending on the operation conditions or load.

R_w – Weighted Sound Reduction Index – Measured sound reduction of a building element in a laboratory, corrected for room volume and reverberation time, the higher values correspond to better sound insulation. It describes the sound-proofing effectiveness of a partition or glazing depending on its material and construction. Each increasing increment in R_w is equivalent to 1 dB of noise reduction. R_w however, is a rating determined in a laboratory - a highly controlled environment - and should only be used as an indicative value for design purposes. Spectrum adaptation terms C and C_{tr} are often added to the measured R_w result to account for low frequency noise.

L_{nw} – Weighted Normalised Impact Sound Pressure Level – the design value of the achievable impact noise attenuation of a building element. L_{nw} measures the perceived impact noise in the receiver room, so maximum values are usually quoted, with lower values corresponding to lower levels of theoretical perceived impact noise. Each increasing increment in L_{nw} is equivalent to 1 dB of impact noise increase. Spectrum adaptation term CI is often added to the L_{nw} result to account for low frequency noise.

L_{Amax} – The Maximum Noise Level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A10} – The noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{Aeq} – The Equivalent Continuous Sound Level is the energy average of the varying noise over the sample period (often given in the subscript) and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise. L_{Aeq} is measured in dB(A).

L_{A90} – The noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level or RBL.

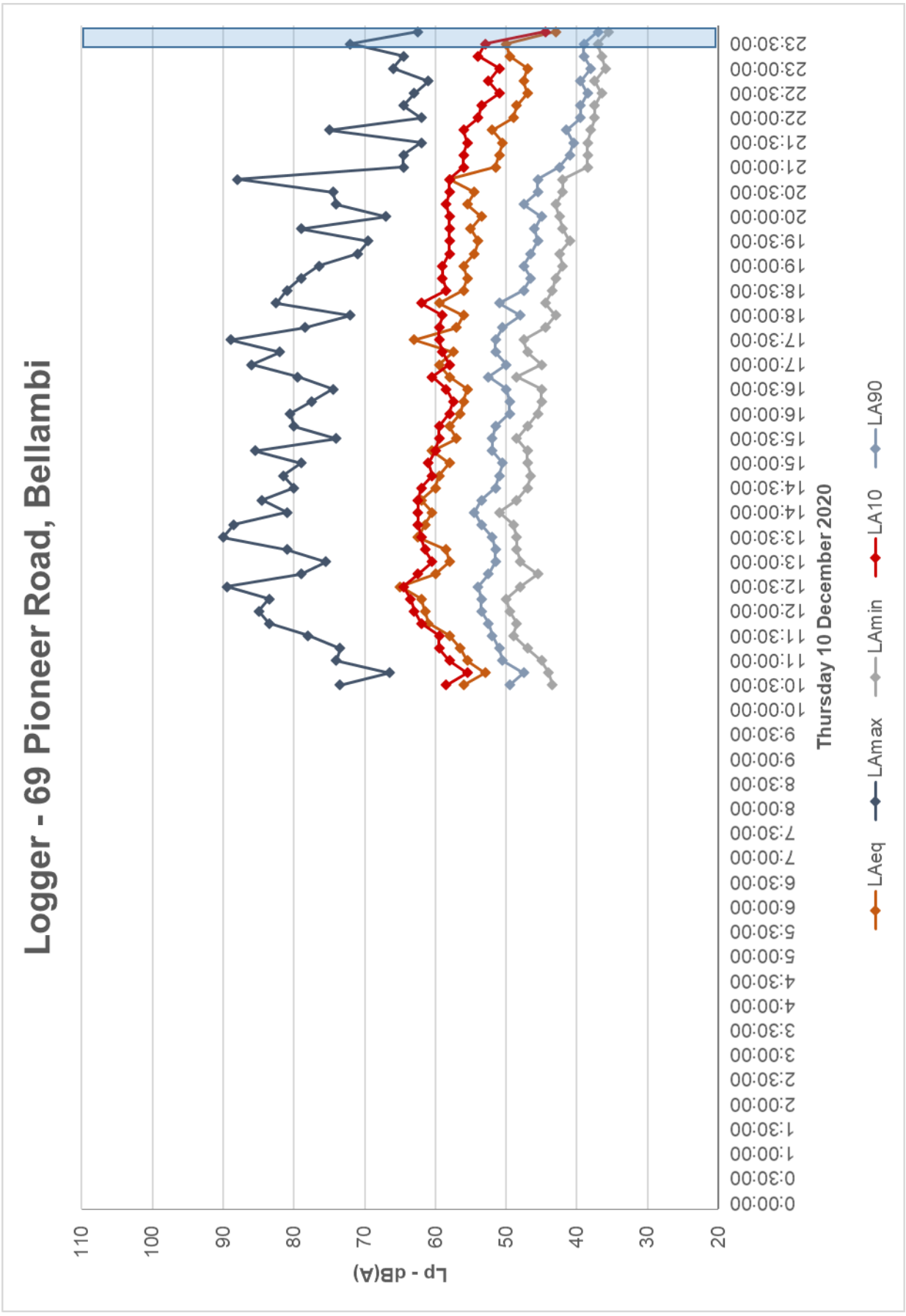
L_{Amin} – The Minimum Noise Level over a sample period is the minimum level, measured on fast response, during the sample period.

Appendix C: Long Term Noise Monitoring Results

The details are of the noise logging measurements are shown below. The measurements are in accordance with the NSW EPA Noise Policy for Industry (2017).

To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are plotted in the graphs below, are here defined.

The sections marked in blue have been omitted due to rain that may have affected the measurements.


Logger - 69 Pioneer Road, Bellambi
Lp - dB(A)
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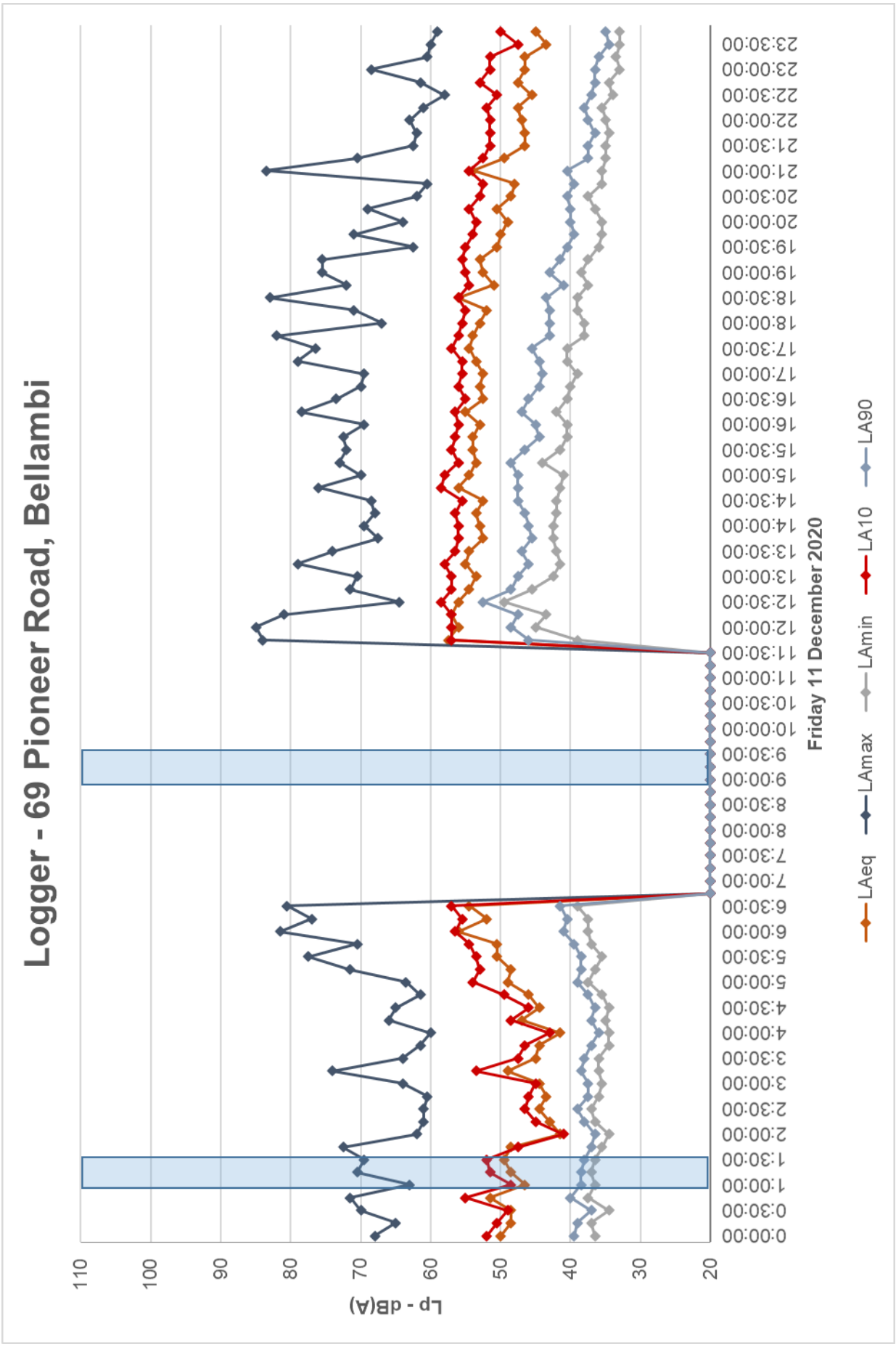
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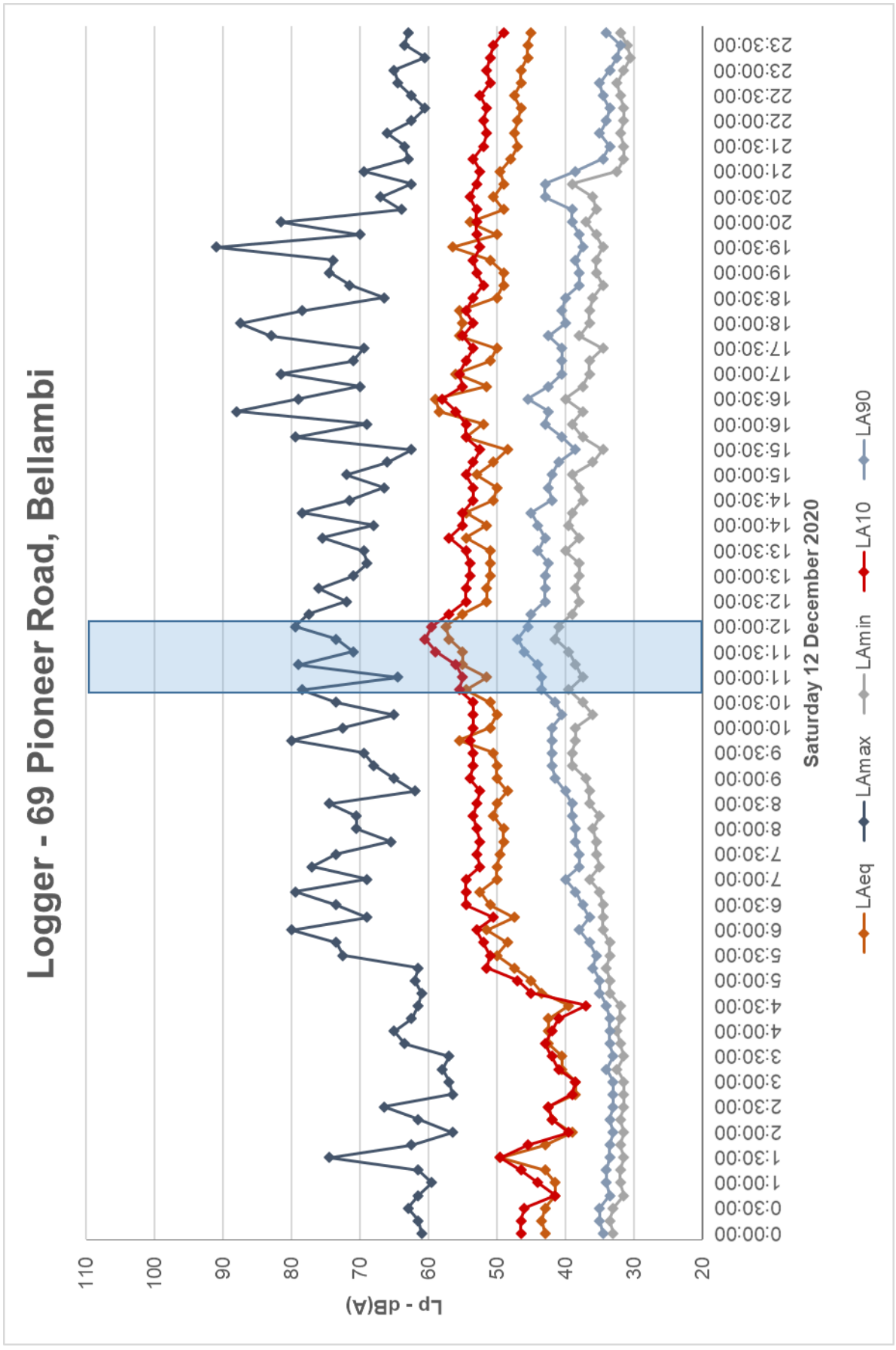
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Lp - dB(A)
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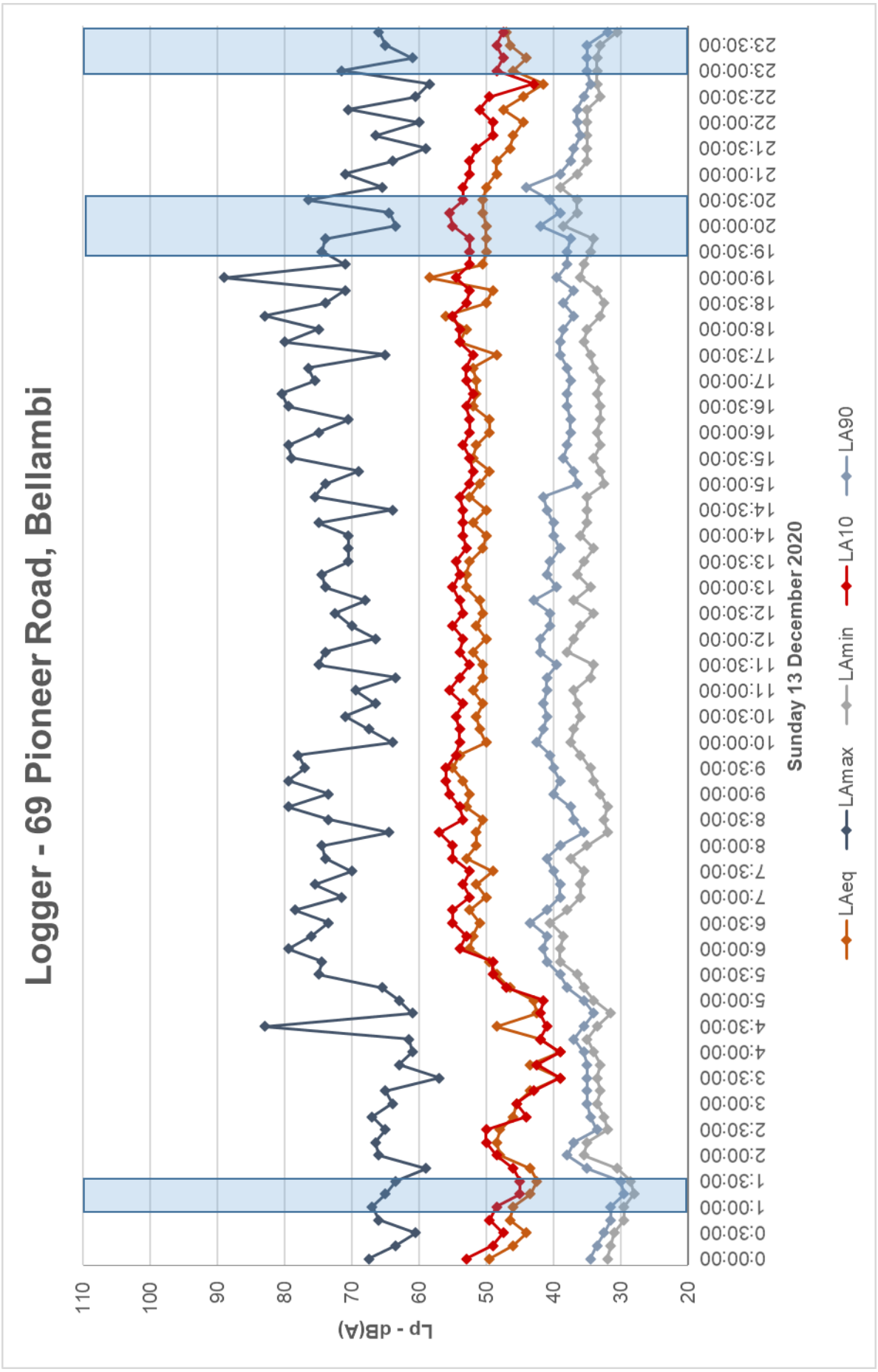
Logger - 69 Pioneer Road, Bellambi
Lp - dB(A)
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Sunday 13 December 2020
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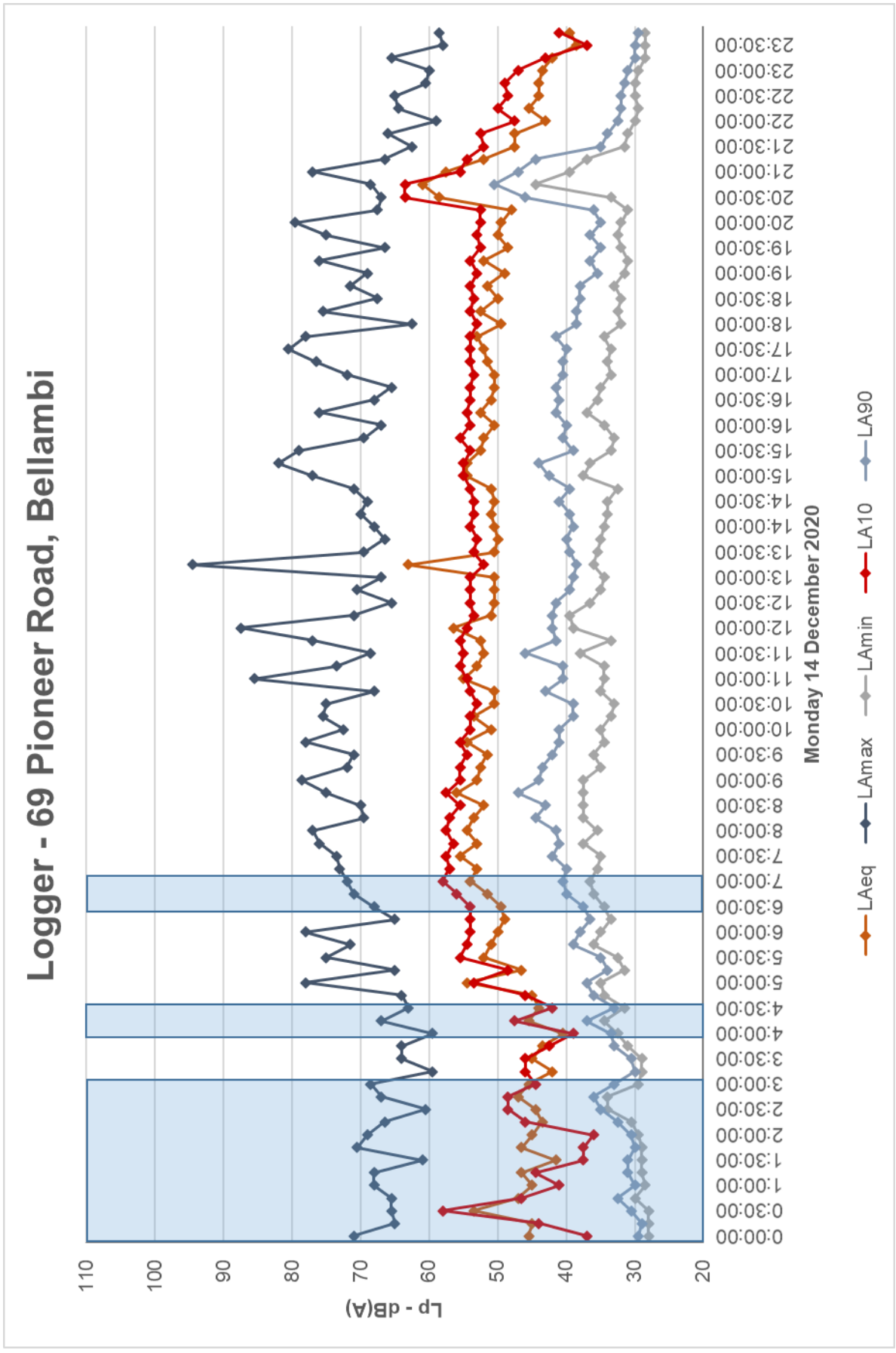
Logger - 69 Pioneer Road, Bellambi
Lp - dB(A)
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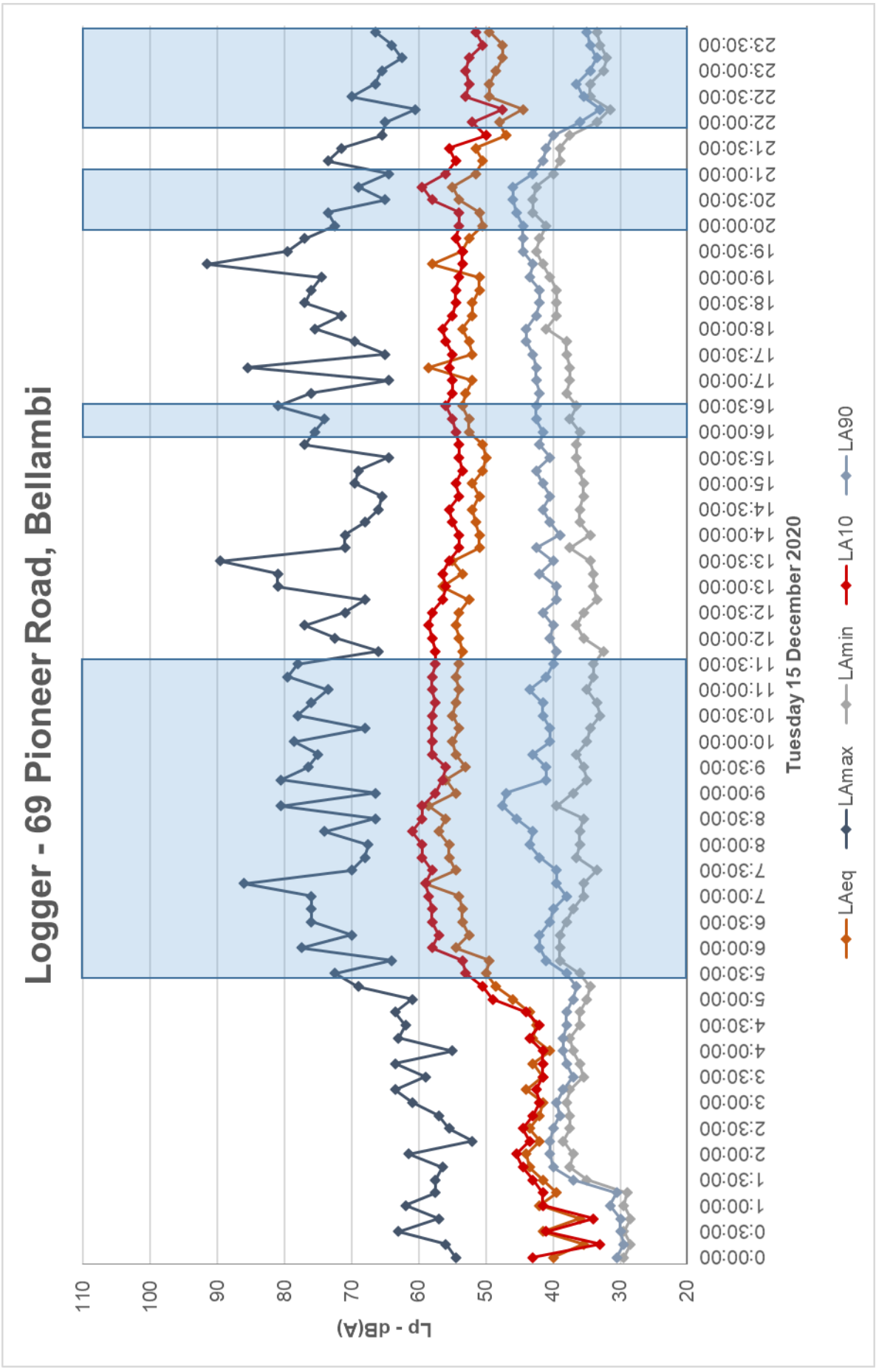
Logger - 69 Pioneer Road, Bellambi
Tuesday 15 December 2020
Lp - dB(A)
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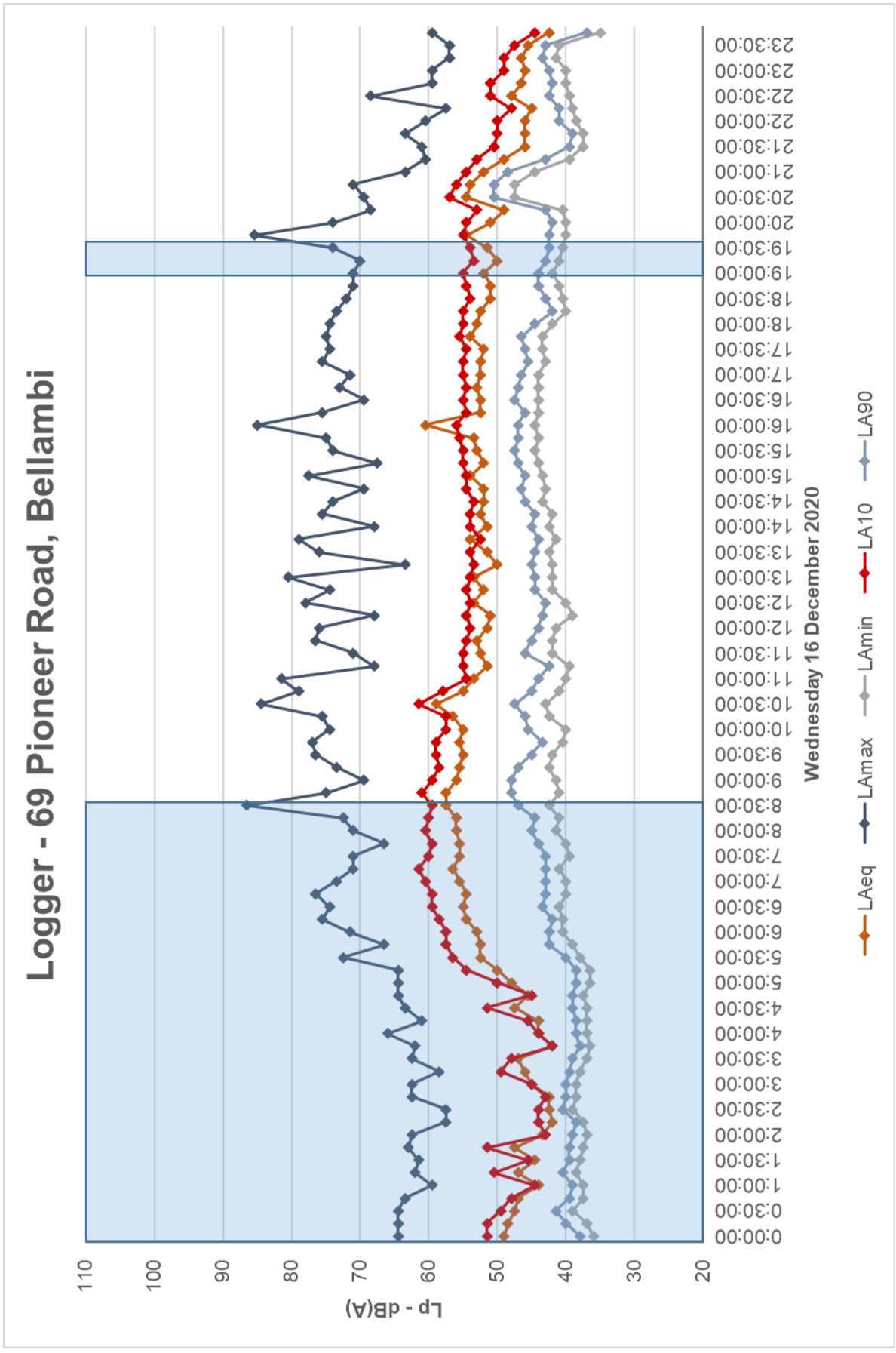
Logger - 69 Pioneer Road, Bellambi
Lp - dB(A)
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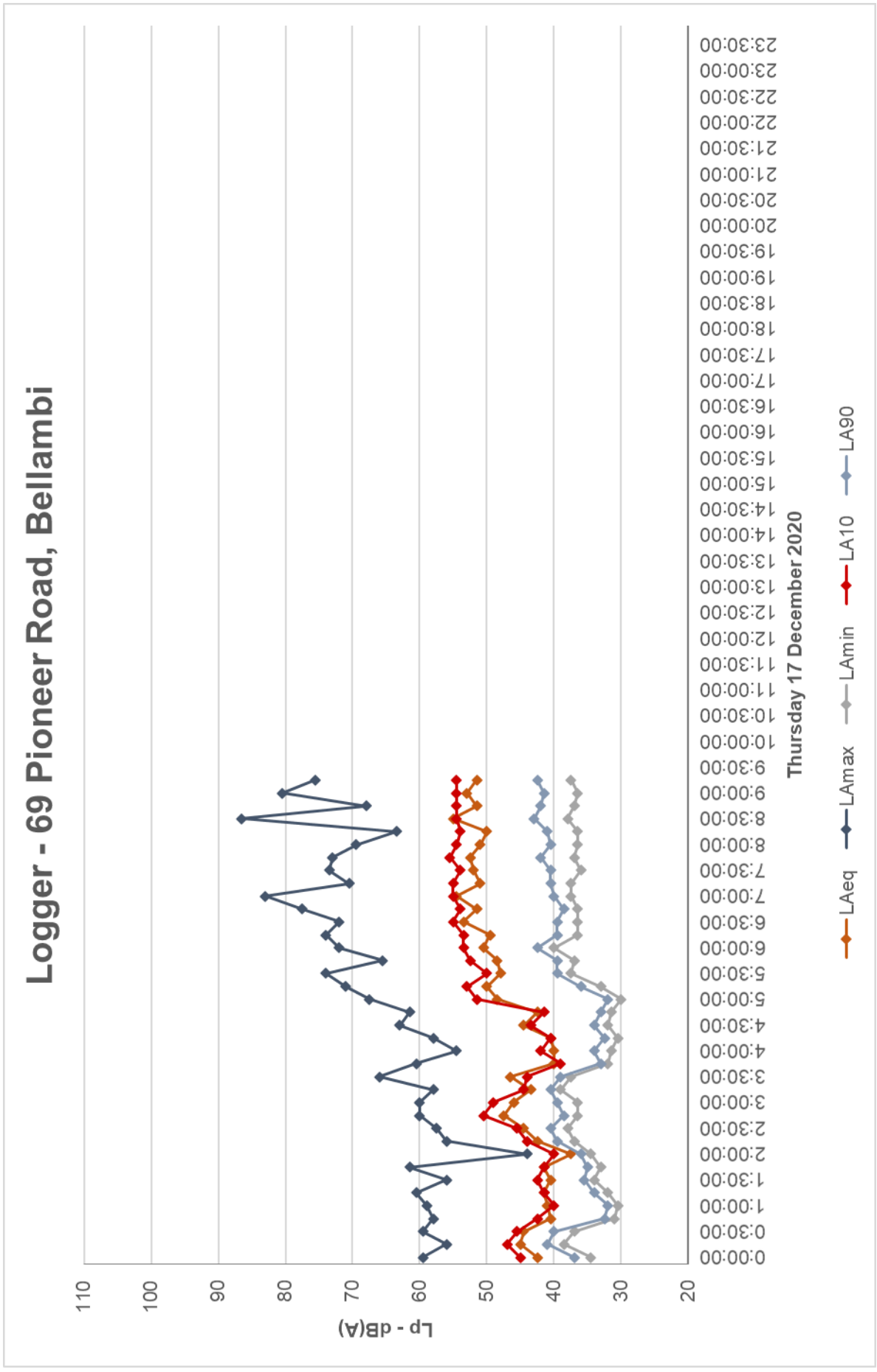
Logger - 69 Pioneer Road, Bellambi
Lp - dB(A)
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