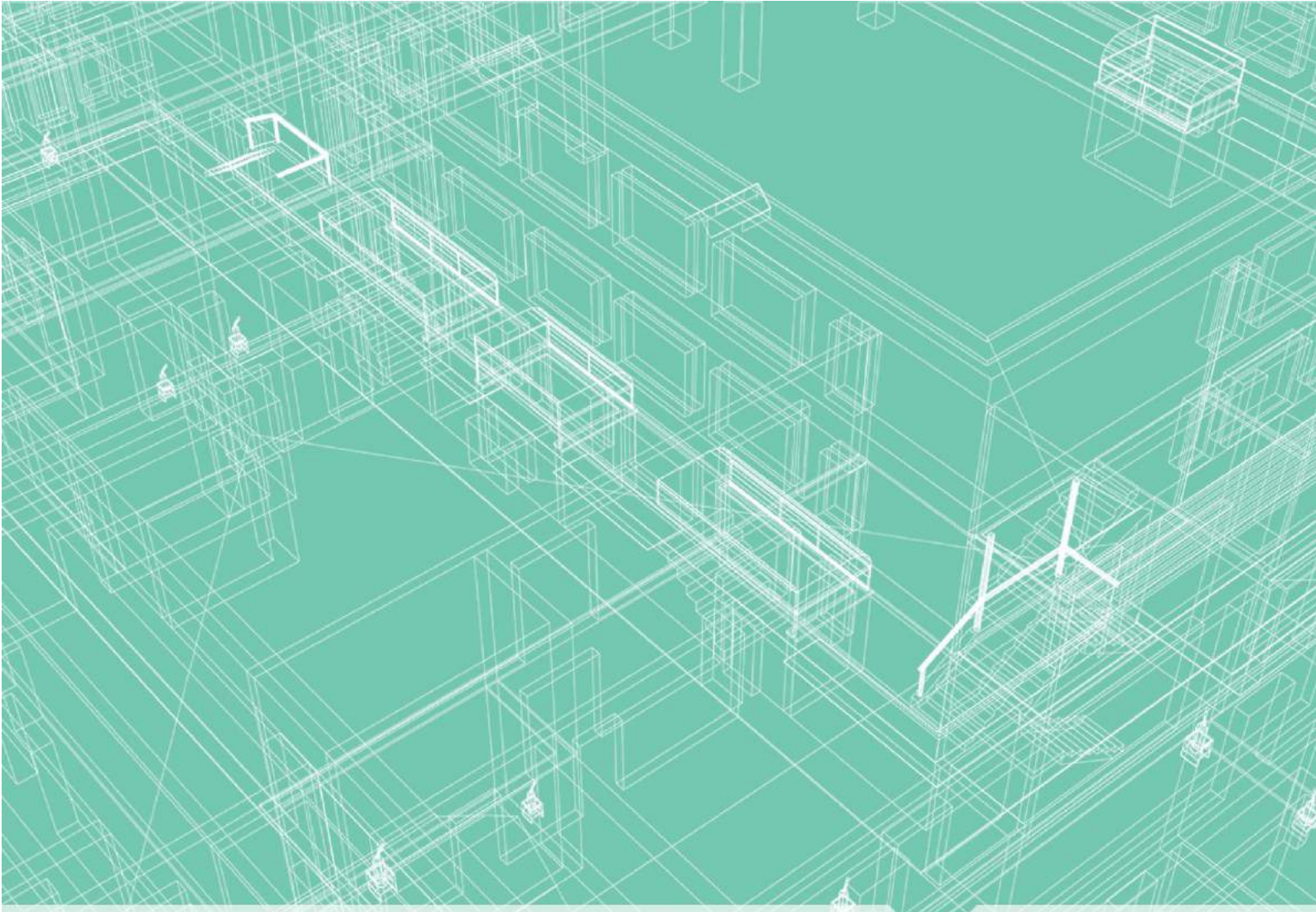

NOISE IMPACT ASSESSMENT FOR DEVELOPMENT APPLICATION

RIVERINA CONSERVATORIUM OF MUSIC

JHA

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CONTENTS

1 INTRODUCTION

The Riverina Conservatorium of Music (RCM) proposes a new development for Wagga Wagga and the Riverina Region in Wagga Wagga, NSW. The proposal involves a music educational facility within a former government office building.

JHA Consulting Engineers has been engaged by NSW Public Works to provide acoustic engineering services for the Development Application. Stanton Dahl is the Architect and NSW Public Works is the Project Manager.

An acoustic assessment has been undertaken and is detailed in this report along with the findings. It has been prepared as part of the Development Application to be submitted to the City of Wagga Wagga Council.

The objectives of this acoustic assessment are:

- Identify noise sensitive receivers that will potentially be affected by the operation of the proposed development.
- Carry out noise surveys to determine existing ambient and background noise levels on site.
- Establish the appropriate noise level and vibration criteria in accordance with the relevant standards, guidelines and legislation for the following noise emissions:
    - Mechanical plant from the development to the surrounding receivers.
    - Operational noise.
    - Traffic generation.
- Determine whether the relevant criteria can be achieved based on proposed operations. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure with the assessment criteria.

This report provides:

- A statement of compliance with the relevant statutory criteria for the use of the proposed development within the vicinity of the nearest potentially affected receivers.
- Recommendations for noise mitigation measures for the proposed development in order to meet the relevant criteria when compliance is not achieved.

The following documentation has been used for the preparation of this report:

- Architectural drawings of the proposed development prepared by Stanton Dahl Architects.
- Noise data collected on site through the use of noise loggers and a hand held spectrum analyser.

This document and related work has been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001:2016 and ISO 14001:2016 respectively.

2 DESCRIPTION OF THE PROPOSAL

The proposed site for the new RCM facility is located at 1 Simmons Street in Wagga Wagga. Wagga Wagga is a major regional city in the Riverina region of New South Wales, located 450 kilometres from Sydney and 250 kilometres from Canberra. It belongs to the Local Government Area of City of Wagga Wagga.

The proposed site for the new RCM facility is a recently decommissioned Roads and Maritime Services (RMS) facility. The existing building has two levels and it is intended to be retained (structure, façade and amenities). The proposal consists of the refurbishment and fit-out of the RMS building for the music educational facility.

The site is located within a residential environment, close to the city centre. It is surrounded by the Wagga Wagga Public School to the North, Wollundry Lagoon to the South, and residential and commercial receivers. Figure 1 shows the site location and nearest noise sensitive receivers.

Figure 1: Aerial view of site showing the location of the site (golden shadow), residential receivers (green shadow), commercial receivers (purple shadow), and Wagga Wagga Public School (red shadow).

The most sensitive worst-case noise receivers associated with external noise emissions are:

- Residential receiver at 2 Simmons Street to the West, approximately at 30m.
- Commercial receiver at 4 Simmons Street to the West, approximately at 40m.
- Educational receiver at 11 Simmons Street to the North, approximately at 35m.
- Residential receiver at 89 Johnston Street to the North, approximately at 45m.
- Residential receiver at 88 Johnston Street to the East, approximately at 50m.

There are other surrounding residential receivers and commercial properties. However, these are at greater distances from the site. The above noise sensitive receivers represent the worst-case scenario, therefore, compliance at these locations will result in compliance at all other affected receiver locations for external noise emissions.

The key spaces of the new music educational facility are:

- Administrative spaces,
- Teaching studios,
- Rehearsal spaces,
- Ancillary and circulation spaces.

The main pedestrian entrance to the building is via Simmons Street frontage. The existing adjoining on-grade carpark is accessed from Simmons Street and will be utilised by RCM.

Figure 2 shows the proposed development layouts of the Level 1 and Level 2 as per latest architectural drawings.

Figure 2: Level 1 and Level 2 of the proposed conservatorium.

The proposed opening hours of the educational facilities are 9.00am to 8.00pm from Monday to Friday, with possible additional teaching lessons during the weekends. Rehearsal and student performances will be held during weekdays and occasionally can extend to 10.00pm. All activity will cease by 10.00pm, therefore, noise impact assessment will be carried out for day-time and evening-time periods.

3 SITE MEASUREMENTS

3.1 GENERAL

Attended and unattended noise surveys were conducted at the locations shown in Figure 3 in order to establish the ambient and background noise levels of the site and surrounds.

Noise surveys have been carried out in accordance with the method described in the AS/NZS 1055:2018 *'Acoustics – Description and measurement of environmental noise'*.

The long term and short term monitoring locations are shown in Figure 3.

Figure 3: Aerial view of site showing the location of the measurements.

3.2 ATTENDED NOISE MONITORING

Short-term noise monitoring was carried out to obtain representative third-octave band noise levels of the site and close to the nearest noise sensitive receivers. Three short-term noise monitoring locations were chosen as representative locations as follows:

- Location S1: 2 Simmons Street.
- Location S2: 89 Johnston Street.
- Location S3: Opposite to 34 The Esplanade.

On Monday 20th January 2020, short-term noise measurements were carried out during day-time. Short-term noise measurements were carried out with a NTI XL-2 hand-held Sound Level Meter (SLM) (Serial Number A2A-13742-E0). The calibration of the SLM was checked before and after each use and no deviations were recorded.

The SLM microphone was mounted 1.5 metres above the ground and a windshield was used to protect the microphone. Measurements were undertaken in the free-field – i.e. more than 3 metres away from any building façade or vertical reflective surface.

From observations during the site visit, it is noted that ambient and background noise levels are dominated by local traffic and pedestrian pass-bys, plus bird noises. A summary of the results of the short-term noise monitoring are shown in Table 1.

Location	Date and Time	Parameter	Sound Pressure Level, dB re 20μPa							
			Overall dB(A)	Octave Band Centre Frequency, Hz						
				63	125	250	500	1k	2k	4k	8k
S1	20/01/2020 13.05 –13.20	$L_{90,15min}$	46	49	46	42	41	42	40	36	28
		$L_{eq,15min}$	57	56	51	48	45	48	53	51	38
		$L_{10,15min}$	58	58	53	50	47	50	54	52	39
S2	20/01/2020 13.22-13.37	$L_{90,15min}$	43	49	44	40	38	39	36	30	22
		$L_{eq,15min}$	56	60	56	51	50	52	49	43	37
		$L_{10,15min}$	58	61	56	53	51	54	51	45	37
S3	20/01/2020 14.00-14.15	$L_{90,15min}$	42	50	46	42	36	37	34	28	20
		$L_{eq,15min}$	56	60	56	52	49	51	49	46	33
		$L_{10,15min}$	59	62	58	56	53	55	52	48	36

Table 1: Results of the short-term noise monitoring.

3.3 UNATTENDED NOISE MONITORING

The noise logger was located on the existing site car park. The noise logger location was secure and considered to be representative of the typical ambient and background noise levels for the area.

Long-term noise monitoring was carried out from Thursday 9th January to Monday 20th January 2020 with a Rion NL-52 noise logger (Serial Number 00553892). The noise logger recorded L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise parameters at 15-minute intervals during the measurement period. The calibration of the noise logger was checked before and after use and no deviations were recorded. The noise logger microphone was mounted 1.5 meters above the ground and a windshield were used to protect the microphone.

The detailed results of the long-term noise monitoring are presented graphically in Appendix A. The results of the unattended noise monitoring are summarised in Table 2 as the Rating Background Level (RBL) and the Assessment Background Level (ABL) noise levels for day, evening and night-time periods – as per NSW NPI methodology.

Weather conditions were monitored for the duration of the noise surveys and were typically calm and dry with some wind events having been noted to occur during the measurement periods. As stated in the NSW NPI methodology, any data likely to be affected by rain, wind or other extraneous noise has been excluded from the calculations (shadowed in the Appendix A graphs).

Location	Assessment Background Levels (ABL), dB(A)			Rating Background Levels (RBL), dB(A)		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
L1 – Site Carpark	52	51	44	42	42	33

Table 2: Results of long-term noise monitoring.

4 RELEVANT NOISE STANDARDS AND GUIDELINES

4.1 STANDARDS AND GUIDELINES

The following standards and guidelines are considered relevant to the project and have been referenced in developing the project noise level criteria.

Planning:

- City of Wagga Wagga Local Environment Plan 2010 (CWW-LEP 2010).
- City of Wagga Wagga Development Control Plan 2010 (CWW-DCP 2010).

Operational Noise:

- Environmental Planning and Assessment (EP&A) Act 1979.
- Protection of the Environmental Operations (POEO) Act 1997.
- NSW Department of Environment Climate Change and Water (DECCW) Noise Guideline for Local Government (NGLG) 2013.
- NSW Environmental Protection Authority (EPA) Noise Policy for Industry (NPI) 2017.
- NSW DECCW Road Noise Policy (RNP) 2011.

4.2 ENVIRONMENTAL PLANNING AND ASSESSMENT (EP&A) ACT 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevantly about planning matters and ensuring that "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria which may be defined in a Development Control Plan, or derived from principles using guidelines like NSW EPA Noise Policy for Industry (NPI 2017) or Noise Guide for Local Government (NGLG 2013).

4.3 PROTECTION OF THE ENVIRONMENTAL OPERATIONS (POEO) ACT 1997

The Protection of the Environment Operations (POEO) Act 1997 has the objective to protect, restore and enhance the quality of the NSW environment. Abatement of noise pollution is underpinned by the definition of "offensive noise" as follows:

"...

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

..."

Noise Guide for Local Government (NGLG) 2013, provides a consideration checklist to determine an "offensive noise".

4.4 NSW NOISE GUIDE FOR LOCAL GOVERNMENT

NGLG 2013 is as guideline that is aimed at councils and planners to provide guidance in the management of local noise problems and in the interpretation of existing policy and legislation.

Table 1.3 of NGLG 2013 contains the management for common neighbourhood noise issues and describes Council as the Appropriate Regulatory Authority (ARA) for the RCM.

The NGLG 2013 offensive noise test aids in making a systematic judgment about the offensive nature of the noise emissions, considering that noise may be offensive in three ways, according to its:

- Audibility,
- Duration,
- Inherently offensive characteristics.

4.5 CITY OF WAGGA WAGGA COUNCIL LEGISLATION

Relevant Planning Documents of City of Wagga Wagga Council Legislation have been reviewed for any noise requirement or criteria.

The City of Wagga Wagga Council Local Environmental Plan (CWW-LEP 2010) sets the Land Zoning as shown in Figure 4 as per information extracted from the CWW-LEP map 7750_COM_LZN_003C_020_20180822. The site is categorized as Commercial Core (B3).

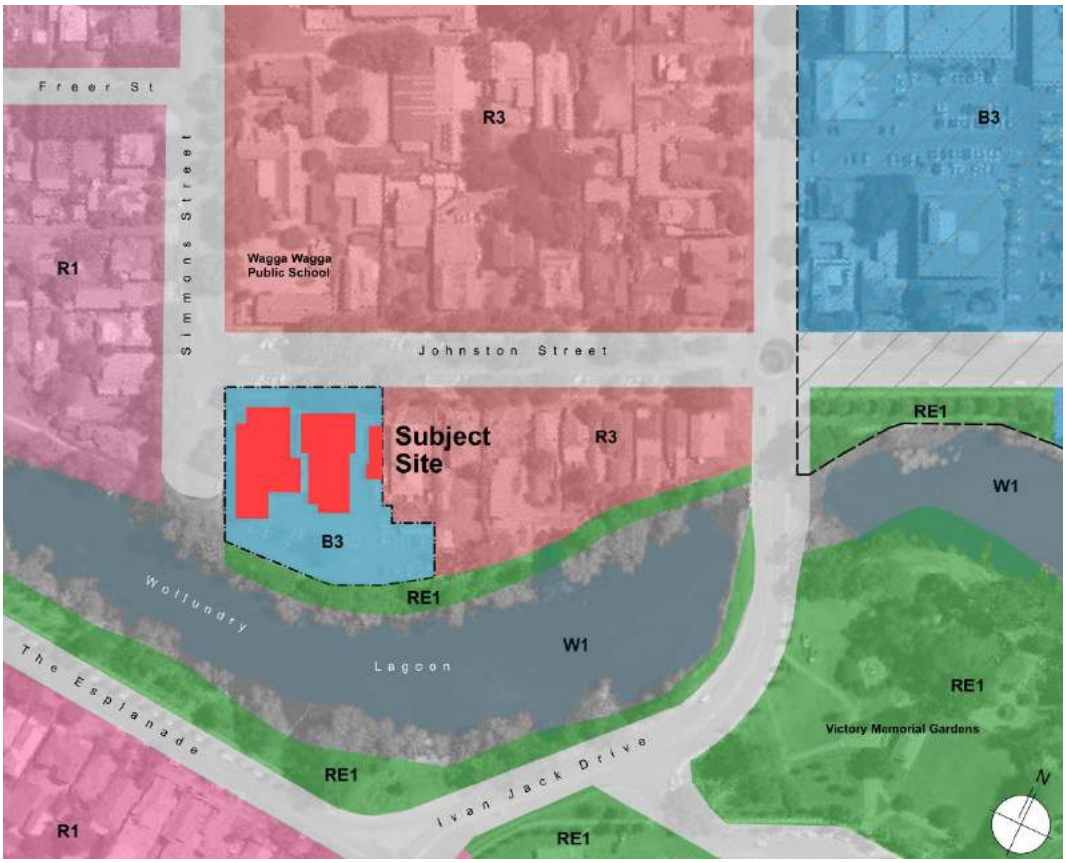


Figure 4: Land Zoning of the site and surroundings. *Source: Stanton Dahl Architects*.

City of Wagga Wagga Development Control Plan (CWW-DCP 2010) has been reviewed and no relevant requirements for noise have been found.

4.6 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry 2017 assesses noise from industrial noise sources - scheduled under the POEO. Mechanical noise from the development shall be addressed following the recommendations in the NSW NPI.

The assessment is carried out based on the existing ambient and background noise levels addressing the following:

- Intrusiveness Criteria, to control intrusive noise into nearby sensitive receivers.
- Amenity Criteria, to maintain the noise level amenity for particular land uses.

These criteria are established for each assessment period (day, evening and night) and the more stringent sets the Project Noise Trigger Level (PNTL's).

4.6.1 INTRUSIVENESS CRITERIA

The NSW NPI defines the intrusiveness criteria as follows:

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15 minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold."

Based on the intrusiveness criteria definition and the measured background noise levels on site, Table 3 shows the intrusiveness criteria for the residential noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Rating Background Level, dB(A)*	*Intrusiveness Criteria, $L_{Aeq,15min}$ dB(A)*
General Residential (R1) & Medium Density Residential (R3)	Day	42	47
	Evening	42	47
	Night	33	38

Table 3: Determination of the intrusiveness criterion for residential noise sensitive receivers.

4.6.2 AMENITY CRITERIA

The NSW NPI states the following to define the amenity criteria:

"To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance."

Based on the amenity criteria definition and the land zoning as per CWW-LEP 2010, Table 4 shows the amenity criteria for the noise sensitive receivers around site.

Indicative Noise Amenity Area	*Period*	*Recommended Amenity Noise Level (L_{Aeq}), dB(A)*	*Amenity Criterion, $L_{Aeq,15min}$ dB(A)*
General Residential (R1)	Day	60	58 (60-5+3)
	Evening	50	48 (50-5+3)
	Night	45	43 (45-5+3)
Medium Density Residential (R3)	Day	55	53 (55-5+3)
	Evening	45	43 (45-5+3)
	Night	40	38 (40-5+3)
Public Recreation (RE1)	When in use	50	48 (50-5+3)
Educational	Noisiest 1-hour period when in use	35 (Internal) 45 (External)[1]	43 (45-5+3) (External)

Table 4: Determination of the amenity criterion for noise sensitive receivers.

4.6.3 PROJECT NOISE TRIGGER LEVELS

The PNTL's are shown in Table 5 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point on or within the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criterion, $L_{Aeq,15min}$ dB(A)*	*Amenity Criterion, $L_{Aeq,15min}$ dB(A)*
General Residential (R1)	Day	47	58
	Evening	47	48
	Night	38	43
Medium Density Residential (R3)	Day	47	53
	Evening	47	43
	Night	38	38
Public Recreation (RE1)	When in use	---	48
Educational	Noisiest 1-hour period when in use	---	43

Table 5: Determination of PNTL's (light grey highlight) for noise sensitive receivers.

[1] It is generally accepted that internal noise levels with windows or doors open are 10dB(A) lower than external noise levels.

4.7 OPERATIONAL NOISE

There is no standard or guideline to establish the noise level criteria for operational noise break-out from the premises. A general noise criteria adopted for operational noise assessment is based on the premise that if intrusive noise is greater than the existing background noise level, there is a potential risk of disturbance and annoyance.

However, the noise impact is considered marginal if the difference between the existing background noise level and the intrusive noise is 5dB(A) or less. This concept has resulted in the commonly used criterion of "background noise level + 5dB" – applicable between 7.00am and 10.00pm – and "background noise level + 0dB" – applicable between 10.00pm and 7.00am. This noise level limit is assessed at the boundary of the neighbouring residential properties.

Based on the long-term unattended noise results – refer to Table 2 – following table shows the noise level criteria for operational noise.

Period	*Measured Background Noise Level, L_{A90} dB(A)*	*Operational Noise Level Criteria, L_{Aeq} dB(A)*
Day	42	47
Evening	42	47
Night	33	33

Table 6: Operational Noise Level Criteria.

4.8 TRAFFIC GENERATED NOISE

Road traffic noise impact is assessed in accordance with the NSW OEH Road Noise Policy (RNP) 2011. The NSW Road Noise Policy (RNP) establishes criteria for traffic noise from:

- Existing roads,
- New road projects,
- Road development projects,
- New traffic generated by developments.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2dB above the existing noise levels. An increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

In cases where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.

5 NOISE EMISSIONS ASSESSMENT

Noise break-out from the proposed new music educational RCM building has the potential to impact on existing noise sensitive receivers. For the purpose of this noise impact assessment, the noise sources are assumed as follows:

- Noise emissions from mechanical plant to the surrounding receivers.
- Noise emissions from musical / teaching activities.
- Noise emissions from traffic generated by the proposed development.

Each of these noise sources has been considered in the noise impact assessment. The acoustic assessment has considered the following:

- Noise levels have been considered as continuous over assessment time period to provide the worst-case scenario.
- Lowest background noise levels at the nearest noise sensitive receiver have been used to provide a worst-case scenario.
- Façade attenuation, distance attenuation, building reflections and directivity of noise sources.

5.1 EXTERNAL MECHANICAL PLANT

External mechanical plant noise should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of the noise sensitive receivers.

At this stage, a preliminary mechanical plant selection has been made; therefore it is not possible to undertake a detailed assessment. A preliminary noise assessment of the proposed mechanical services has been undertaken. Noise controls will need to be considered during the design process to ensure that the cumulative noise levels from plant to the nearest sensitive receivers meets the noise level criteria.

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Silencers on selected mechanical plant.

The preliminary mechanical noise sources for the proposed development includes air-conditioning equipment used to service the internal spaces. These noise sources have been used to predict the worst-case scenario noise impact of the proposed use of the site to the surrounding receivers. The main mechanical sources associated with the development will include the following:

- 8 Condenser Units.
- Air Handling Unit (AHU) for Outside Air Supply.

The preliminary mechanical plant and their associated sound power levels are listed in Table 7.

ID	Model	Sound Power Level, dB re 1pW							
		Overall dB(A)	Octave Band Centre Frequency, Hz						
			63	125	250	500	1k	2k	4k	8k
CU-2, CU-4	Daikin REYQ10TY1	78	81	83	79	77	71	66	62	53
CU-1, CU-5, CU-7, CU-8	Daikin REYQ14TY1	81	85	85	82	80	74	69	63	57
CU-3, CU-6	Daikin REYQ18TY1	83	86	84	85	81	77	71	69	63
Fan AHU	Fantech AP0502JP3/29	89	94	88	83	83	83	82	80	76

Table 7: Sound power levels of preliminary external mechanical plant.

The external mechanical plant will only operate between 7.00am and 10.00pm, therefore, night-time period has been excluded from the noise impact assessment. The proposed rooftop mechanical plant room location and distances to nearest noise sensitive receivers is shown in Figure 5.

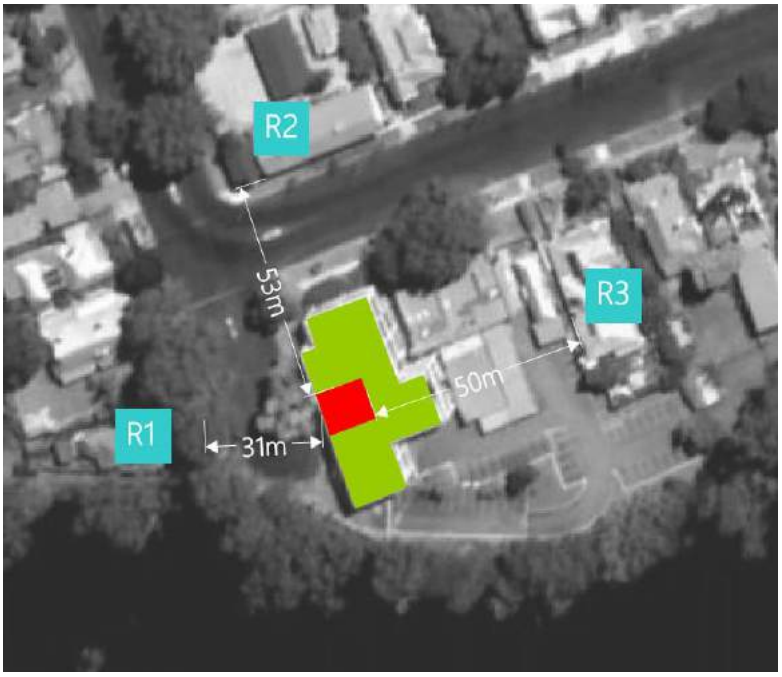


Figure 5: Rooftop external mechanical plant room (red), site building (green) with distances to nearest noise sensitive receivers.

The noise sensitive receivers shown in Figure 5 are located at 2 Simmons Street (R1 – residential), 11 Simmons Street (R2 – educational) and 88 Johnston Street (R3 – residential). There are other surrounding residential and commercial properties. However, these are at greater distances from the site. The aforementioned residential receivers represent the nearest and potentially worst-affected and, therefore, compliance at these locations results in compliance at all other affected receiver locations for mechanical noise emissions.

The following assumptions have been made for the assessment:

- The external mechanical plant will operate continuously between 7.00am to 10.00pm any day.
- Mechanical plant room is unroofed and walls are continuous with no gaps.
- Predicted noise levels at the noise sensitive receivers consider the cumulative noise from all mechanical plant.
- Distance attenuation, shielding, building reflections and directivity.

It is noted that a conservative shielding loss has been included in the assessment to account for the shielding between the rooftop mechanical plant to the nearest sensitive receivers, as the mechanical plant is approximately 8 meters higher than the sensitive receivers.

Calculation	*West (R1)*	*North (R2)*	*East (R3)*
Mechanical Plant Sound Pressure Level at 1m, $L_{Aeq,15min}$	89	89	89
Total Attenuation[2], dB	45	48	48
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	44	41	41
NSW NPI Noise Criteria Evening Time. Complies?	47 / Yes	43 / Yes	43 / Yes

Table 8: Noise impact assessment of rooftop mechanical plant.

The results show that NSW NPI criteria during evening-time will be meet for all noise sensitive receivers. Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
  - In-duct attenuation
  - Noise enclosures as required
  - Sound absorptive panels

Acoustic assessment of all mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

5.2 OPERATIONAL NOISE ASSESSMENT

5.2.1 GENERAL

Typical activities within the RCM will include music from acoustic and amplified instruments. These activities will have place in the studios and rehearsal spaces, being likely to impact to the nearest noise sensitive receivers for those spaces facing Simmons Street and Johnston Street.

The expected noise impacts from the teaching, rehearsal and performances have been assessed at the nearest noise sensitive receivers, using the methodology and assumptions given below. The assessment was made considering the proposed layout as shown on the architectural drawings.

The following assumptions have been made for the assessment:

- Music activities occurring generally during weekdays opening hours from 9.00am to 10.00pm – i.e. day-time and evening-time periods.
- Shortest distances from building façades and nearest noise sensitive receivers.
- Noise level criteria at the nearest noise sensitive receivers as shown in Section 4.7.

[2] Total attenuation considers distance loss, directivity, reflections and barrier shielding.

- Piano studios will be located at the Northern side of the building as per architectural layouts – refer Figure 2.
- Brass / vocal / amplified instruments – with controllable level output – will be located at the Western side of the building as per architectural layouts – refer to Figure 2.
- Space for rehearsal and performances is located at the Southern and Western sides of the building as per architectural layouts – refer to Figure 2.
- Activities could take place at the same time in several studios.
- Assumed overall sound power levels based at *fortissimo* (loud) for musical instruments.
- Windows are closed during lessons, music rehearsals and performances.
- Noise predictions at the nearest receivers consider the total noise contributions from all noise sources, included instruments and activities described above.
- Sound insulation performance of ground level façade is based on measured sound insulation rating of existing façade. The existing façade comprises a combination of double glazing in aluminium framing plus solid brickwork. Measured standardised level difference of the existing façade is shown in Appendix B.
- Sound insulation performance of upper level façade will be driven by predicted noise impact in the boundary of nearest residential receivers.

Noise impact assessments for the different instruments have been undertaken. These assessments have assumed the sound power level for instruments, the recommended reverberation times within the learning spaces, surface areas of façade for each space, their sound insulation performance and distance to nearest noise sensitive receivers.

The noise impact assessments have been based on the following methodology:

$$L_{ext} = L_{int} - R_{comp} + 10\log_{10}(S) - 20\log_{10}(r) - 14$$

where:

- L_{ext}: is the predicted sound pressure level at the receiver (dB(A)),
- L_{int}: is the internal noise level – instrument noise level (dB(A)),
- R_{comp}: is the composite sound reduction for the façade (dB),
- S: is the surface area of the façade (m^2),
- r: is the distance to the receiver's boundary from the façade (m).

5.2.2 NORTHERN STUDIOS FAÇADE

Noise break-out from the piano studios located in the Northern part of the building have the potential to impact the amenity of nearest noise sensitive receivers in Johnston Street. The noise impact assessment has considered a worst-case scenario of all piano studios concurrently with teaching activities. Figure 6 shows the labels of the piano studios.

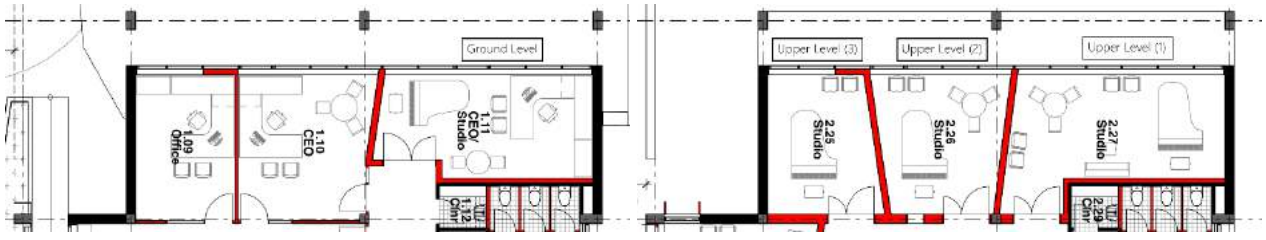


Figure 6: Northern studios labels.

Predicted noise impact assessment for all piano studios facing Johnston Street at the nearest residential receivers in 89 Johnston Street is summarised in Table 9.

Calculation	Ground Level	Upper Level (1)	Upper Level (2)	Upper Level (3)
Piano Sound Power Level at fortissimo	99	99	99	99
Reverberant Sound Pressure Level (L_{int})	91	92	90	89
Minimum Composite Sound Reduction of Façade (R_{comp})	40	40	40	40
Correction for Surface Area of Façade (S)	13	13	11	10
Correction for Distance to Receiver (r=45m)	33	33	33	33
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	**17**	**18**	**14**	**12**
Noise Criteria Evening Time. Cumulative Result. Complies?		**47 / 22 / Yes**		

Table 9: Noise impact assessment of northern studios at boundary of residential receiver at 89 Johnston Street.

Predicted noise impact assessment for all piano studios facing the public school in 11 Simmons Street is summarised in Table 10.

Calculation	Ground Level	Upper Level (1)	Upper Level (2)	Upper Level (3)
Piano Sound Power Level at fortissimo	99	99	99	99
Reverberant Sound Pressure Level (L_{int})	91	92	90	89
Minimum Composite Sound Reduction of Façade (R_{comp})	40	40	40	40
Correction for Surface Area of Façade (S)	13	13	11	10
Correction for Distance to Receiver (r=35m)	31	31	31	31
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	**19**	**20**	**16**	**14**
Noise Criteria Day Time. Cumulative Result. Complies?		**50 / 24 / Yes**		

Table 10: Noise impact assessment of northern studios at boundary of educational receiver at 11 Simmons Street.

The noise level criteria for evening-time period at noise sensitive receivers is met based on the cumulative predicted noise levels at the boundary of residential receiver at 89 Johnston Street and educational receiver at 11 Simmons Street, as per results of Table 9 and Table 10.

In order to achieve the cumulative noise level criteria at the noise sensitive receivers during evening-time, the façade, other external building elements and ventilation openings will need to be designed to provide the minimum composite sound insulation shown in Table 9 and Table 10.

5.2.3 WESTERN STUDIOS FAÇADE

Noise break-out from the western studios have the potential to impact the amenity of nearest noise residential receiver in 2 Simmons Street. The noise impact assessment has considered a worst-case scenario of different instruments concurrently being played within the studios. Figure 7 shows the labels of the studios used in Table 12 and Table 13.

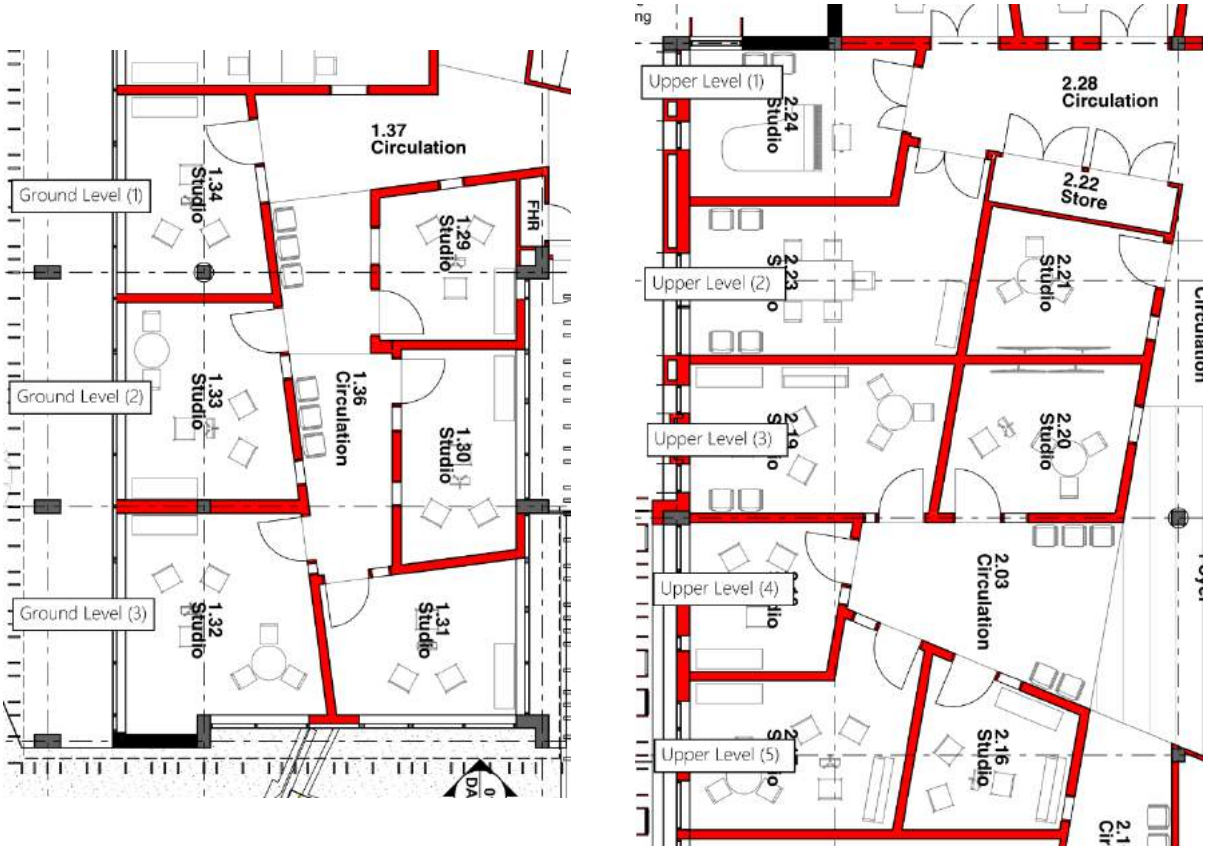


Figure 7: Western studios labels.

The assumed instruments being played within each studio and their associated sound power level at *fortissimo* are shown in Table 11.

Studio	*Instrument*	*Sound Power Level at fortissimo*	*Studio*	*Instrument*	*Sound Power Level at fortissimo*
Ground Level (1)	Trombone	111	Upper Level (2)	Violin	95
Ground Level (2)	Trombone	111	Upper Level (3)	Violin	95
Ground Level (3)	Flute	97	Upper Level (4)	Double Bass	98
Upper Level (1)	Piano	99	Upper Level (5)	Cello	98

Table 11: Assumed instruments in studios and their correspondent sound power level at *fortissimo*.

Table 12 and Table 13 show the predicted noise impact assessment for each studio facing Simmons Street at the nearest residential receiver in 2 Simmons Street.

Calculation	*Ground Level (1)*	*Ground Level (2)*	*Ground Level (3)*	*Upper Level (5)*
Instrument Sound Power Level at fortissimo	111	111	97	98
Reverberant Sound Pressure Level (L_{int})	105	104	89	89
Minimum Composite Sound Reduction of Façade (R_{comp})	40	40	40	40
Correction for Surface Area of Façade (S)	11	11	11	10
Correction for Distance to Receiver (r=30m)	30	30	16	12
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	**32**	**31**	**14**	**12**

Table 12: Noise impact assessment of western studios at boundary of residential receiver at 2 Simmons Street.

Calculation	*Upper Level (1)*	*Upper Level (2)*	*Upper Level (3)*	*Upper Level (4)*
Instrument Sound Power Level at fortissimo	99	95	95	98
Reverberant Sound Pressure Level (L_{int})	92	89	88	93
Minimum Composite Sound Reduction of Façade (R_{comp})	40	40	40	40
Correction for Surface Area of Façade (S)	10	10	10	10
Correction for Distance to Receiver (r=30m)	30	30	30	30
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	**18**	**15**	**14**	**19**

Table 13: Noise impact assessment of western studios at boundary of residential receiver at 2 Simmons Street.

The cumulative predicted noise level at the boundary of residential receiver at 2 Simmons Street, based on the results of Table 12 and Table 13 is 35 dB(A). This result meets the operational noise level criteria for evening-time period at residential receivers.

In order to achieve the cumulative noise level criteria at the noise sensitive receivers during evening-time, the façade, other external building elements and ventilation openings will need to be designed to provide the minimum composite sound insulation shown in Table 12 and Table 13.

5.2.4 REHEARSAL FAÇADES

Rehearsal spaces can be utilised for different activities like rehearsal of ensembles, small groups or solo; individual teaching and groups for performance. Due to their dimensions (Area ≥ 130m^2) the number of user can vary from one student to 65 students. Therefore, a full occupancy ensemble performance has been considered as a worst-case scenario.

Southern rehearsal space in upper level has been considered as worst-case scenario as western façade is facing the residential receiver at 2 Simmons Street.

Calculation	*Rehearsal Upper Level*
Ensemble Sound Power Level at fortissimo	118
Reverberant Sound Pressure Level (L_{int})	100
Minimum Composite Sound Reduction of Façade (R_{comp})	40
Correction for Surface Area of Façade (S)	20
Correction for Distance to Receiver (r=30m)	30
Resulting Sound Pressure Level at Residential Receiver (L_{ext})	36
Noise Criteria Evening Time. Complies?	47 / Yes

Table 14: Noise impact assessment of southern rehearsal space at boundary of residential receiver at 2 Simmons Street.

The cumulative noise level at the boundary of the residential receiver at 2 Simmons Street, based on the results of Table 14 meets the operational noise level criteria for evening-time period at residential receivers.

In order to achieve the cumulative noise level criteria at the noise sensitive receivers during evening-time, the façade, other external building elements and ventilation openings will need to be designed to provide the minimum composite sound insulation shown in Table 14.

5.3 TRAFFIC GENERATION

Traffic generated from the use of the proposed development during the operation hours will likely increase the current traffic noise around the site. The traffic impact report for the proposed development prepared by McLaren Traffic provides an analysis of the additional traffic from the proposed development.

As noted in Section 4.8, when considering land use redevelopment and the impact on sensitive land uses (residential / schools / hospitals / recreational) the NSW Road Noise Policy (RNP) states that an increase up to 2.0dB in relation to existing noise levels is anticipated to be insignificant.

As per information received, the increase of traffic noise levels due to the proposed development, is less than 2dB. Therefore, the traffic increase due to the proposed development will not result in any noticeable change in traffic noise levels and is expected to meet the NSW Road Noise Policy recommendations.

5.4 OFFENSIVE NOISE

From the acoustic assessment and details provided in the previous sections, we make the following comments with respect to offensive noise:

- The primary noise emissions from the proposal will be activities associated with the RCM and new rooftop mechanical plant.
- Design of the teaching and performance spaces requires a high sound insulation performance of façades to achieve the required low background noise levels. Therefore, the construction of the teaching and performance spaces will minimise also noise break-out from the premises.
- Final mechanical rooftop plant will be selected and installed to ensure that the noise emitted is not loud in an absolute sense and not loud relative to the pre-existing ambient and background noise levels that surround the site.
- Noise from mechanical plant is generally broadband, and will be controlled so that there are no characteristics that will make it particularly irritating.

- Activities within the RCM will require management controls to ensure noise emitted does not result in annoyance to, or impact on the amenity of surrounding receivers.

By controlling noise emissions (associated with the operation of the proposed development) in accordance with the relevant criteria, amenity of noise sensitive receivers will be maintained and noise emissions should not be intrusive, therefore it is not expected that people and noise sensitive receivers will be adversely affected by the development.

Based on the comments above, the development is able to satisfy the requirements of the POEO for "offensive noise" provided the relevant criteria outlined in Section 4 are achieved.

6 MANAGEMENT AND COMPLIANCE

Limiting noise nuisance from the RCM and new rooftop mechanical plant in the surrounding area generally will require management on an on-going basis. Appropriate strategies include:

- Staff to be briefed on the noise sensitivity of the neighbours and the need to manage the premises such that excessively noisy activities within the RCM (e.g. very loud amplified music) are restricted in the western studios.
- A policy of open communication with affected neighbours, including contact telephone numbers for use in the event of noise complaints.
- RCM activities and rooftop mechanical plant are to be restricted to operational hours between 7.00am and 10.00pm any day.
- Deliveries and waste disposal should be limited to less sensitive periods (i.e. day-time period) where possible and should be consistent with existing premises.

In terms of acoustic design and engineering controls associated with the RCM, it is noted that the current design (currently in schematic design phase) ensures that activities associated with the RCM comply with all relevant criteria, as is demonstrated in Section 5 above.

7 SUMMARY AND CONCLUSIONS

A noise assessment has been carried out for the proposed new location of the Riverina Conservatorium of Music located at 1 Simmons Street, Wagga Wagga. The proposal includes the refurbishment and fitout of an existing building to be used as a music education facility, plus installation of new rooftop mechanical plant to service the spaces.

This report forms part of the documentation package to be submitted to Wagga Wagga Council as part of the Development Application.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development.

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries, taking in account distance attenuation, building reflections and directivity.

At this stage, a preliminary mechanical plant selection has been made. Therefore, a detailed noise assessment has not been able to be carried out. However, a preliminary noise impact assessment has been carried out, based on the location of the mechanical plantroom on the roof of the building and the overall noise data provided.

The noise impact assessment concludes that noise emissions from the rooftop plantroom will meet the relevant noise criteria. Acoustic assessment of all mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

External noise emission impacts of the music activities within RCM have been predicted at the nearest noise sensitive receivers. Source noise levels have been based on worst-case scenarios associated with the music activities likely to occur within the RCM. A minimum composite sound insulation index of 40dB is required for the building façades in order to meet the established noise level criteria. In order to achieve the cumulative noise level criteria at the noise sensitive receivers during evening-time, the façade, other external building elements and ventilation openings will need to be designed to provide the minimum composite sound insulation.

Traffic noise impact due to the likely generated vehicle movements of the proposed development – based on the information provided in the traffic report – is anticipated to be insignificant, as the noise levels will not increase more than 2dB at the sensitive noise receivers.

An "offensive noise" assessment has been included and the outcome is that the proposed development is able to satisfy the requirements of the POEO and it shall not be considered as "offensive noise" provided that the relevant criterion outlined in Section 4 is achieved.

The information presented in this report shall be reviewed if any modifications to the features of the development specified in this report occur, including and not restricted to selection of mechanical plant, modifications to the building and introduction of any additional noise sources.

Based on the information presented in this report, relevant objectives will be satisfied and therefore approval is recommended to be granted.

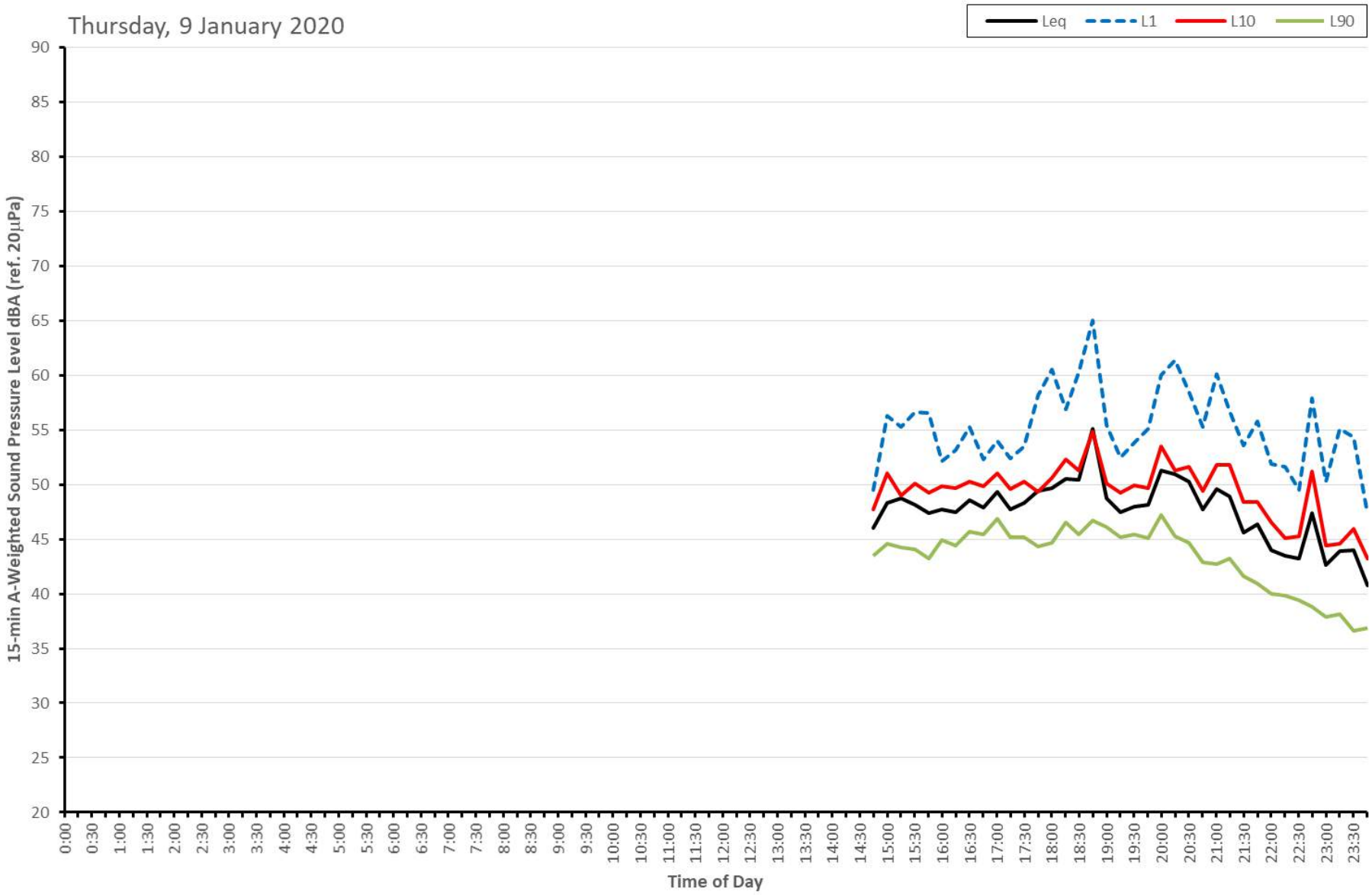
APPENDIX A: LONG TERM NOISE MONITORING

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time. This measure is commonly referred to as the maximum noise level.

L_{A10} – The L_{A10} level is 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. This measure is commonly referred to as the average maximum noise level.

L_{A90} – The L_{A90} level is 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.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period 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.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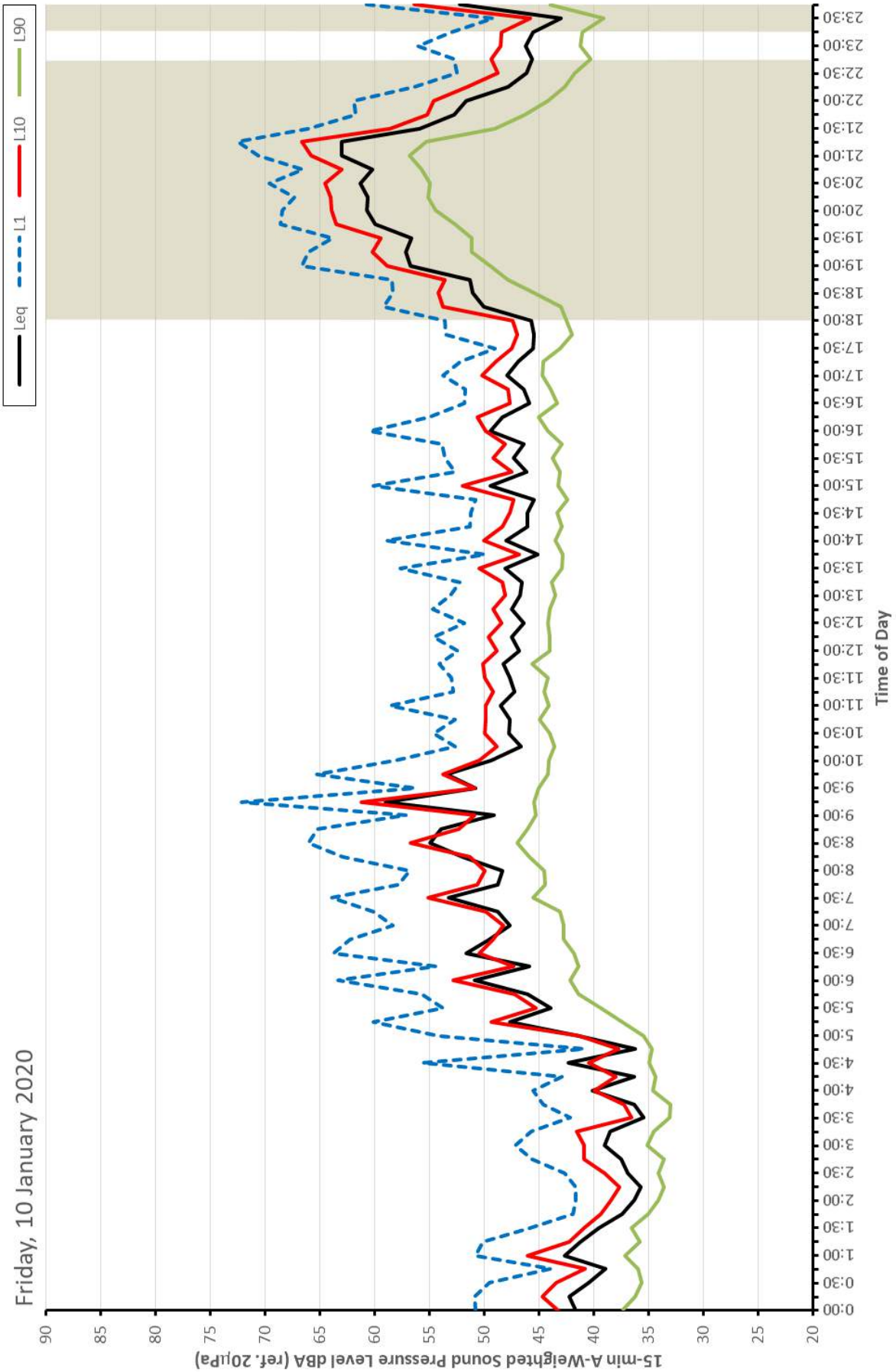
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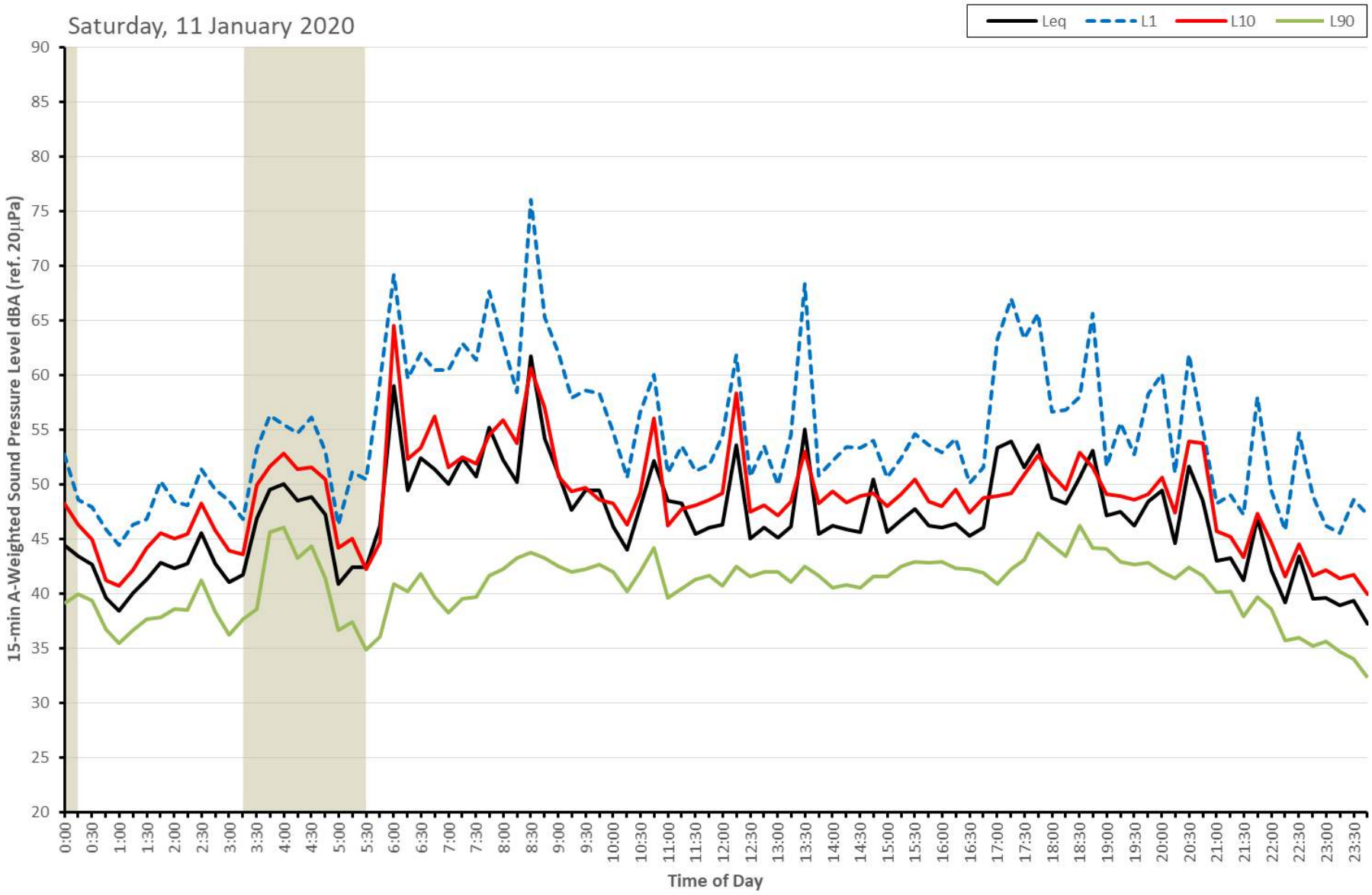
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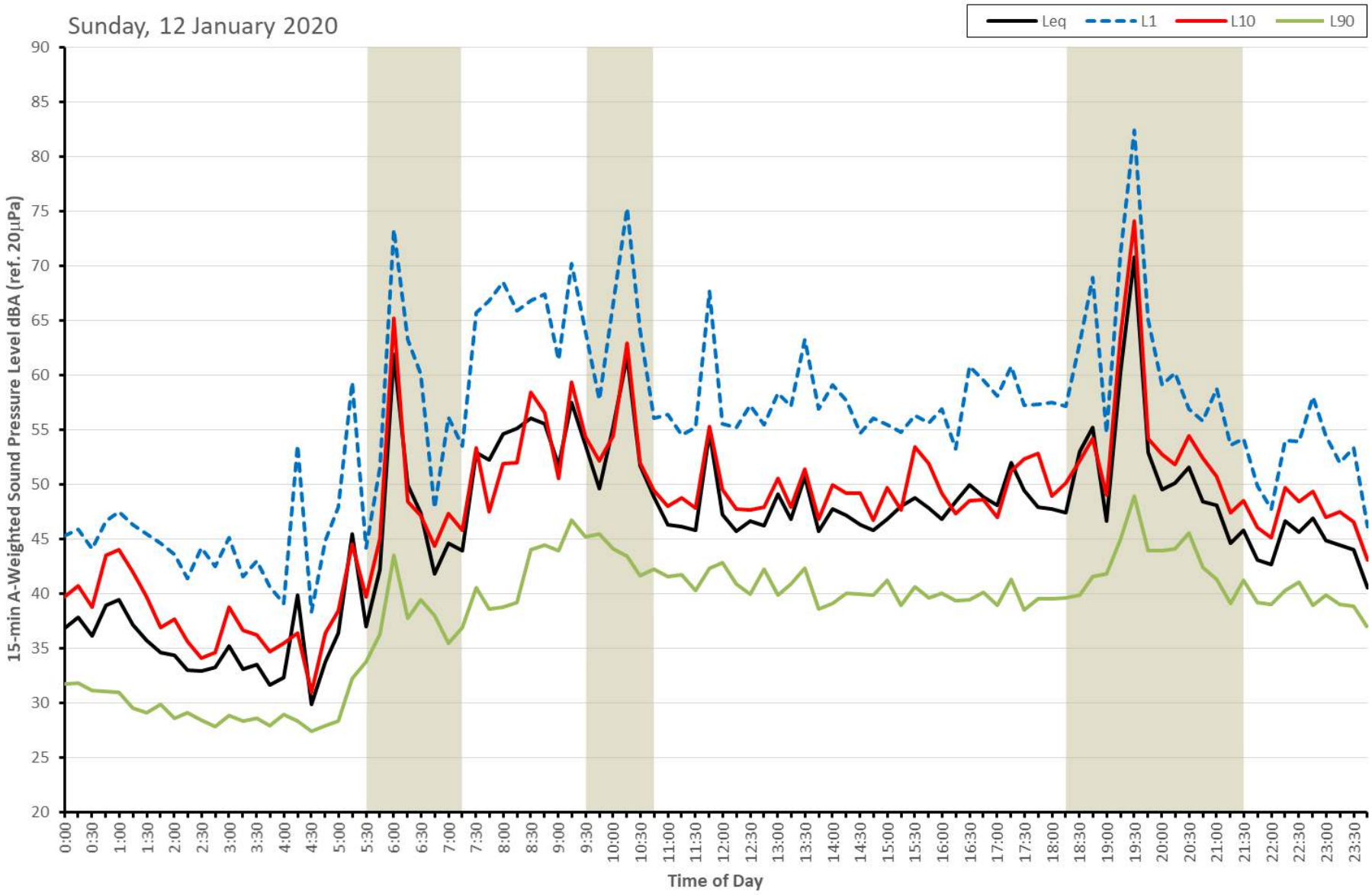
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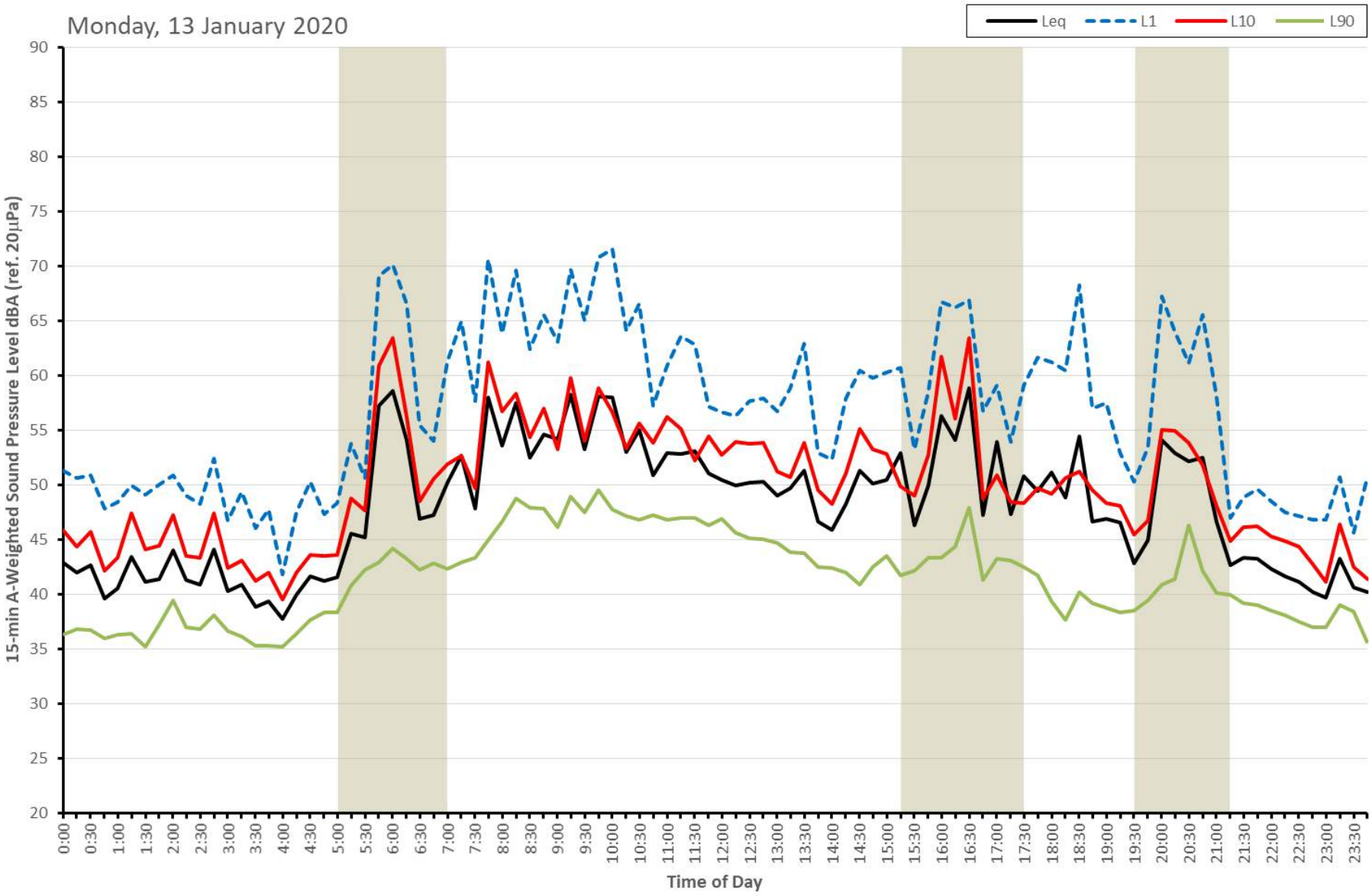
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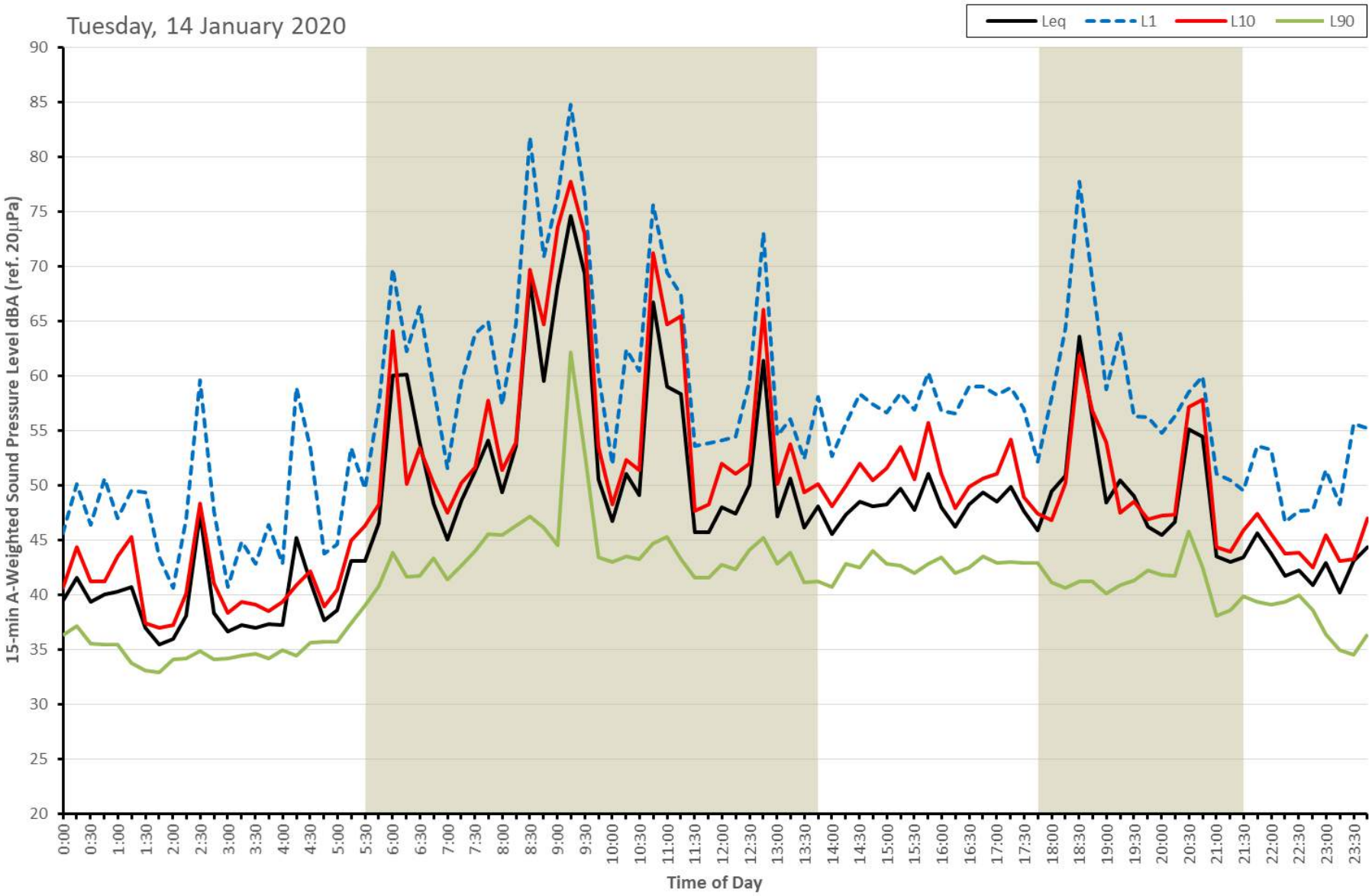
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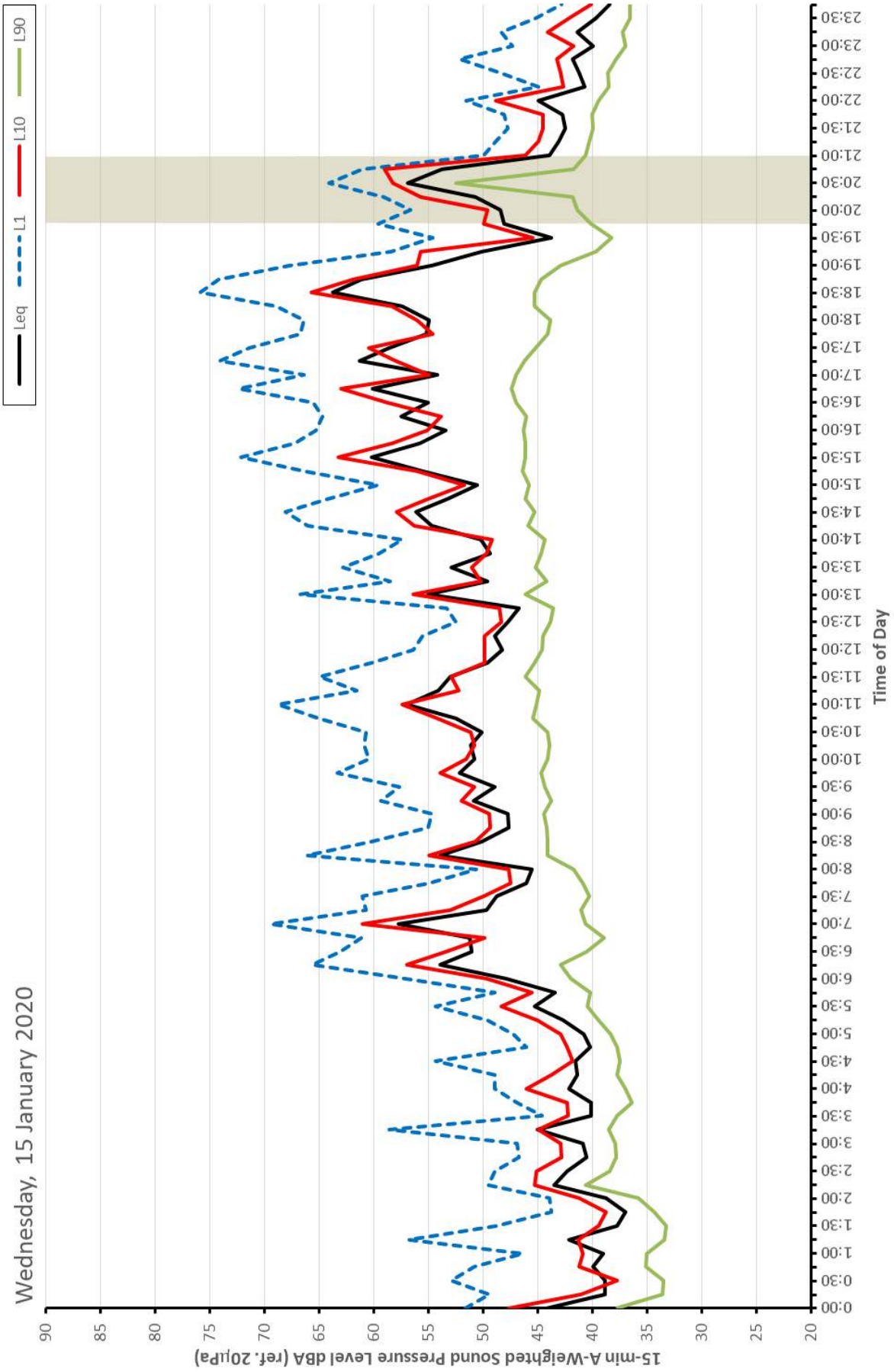
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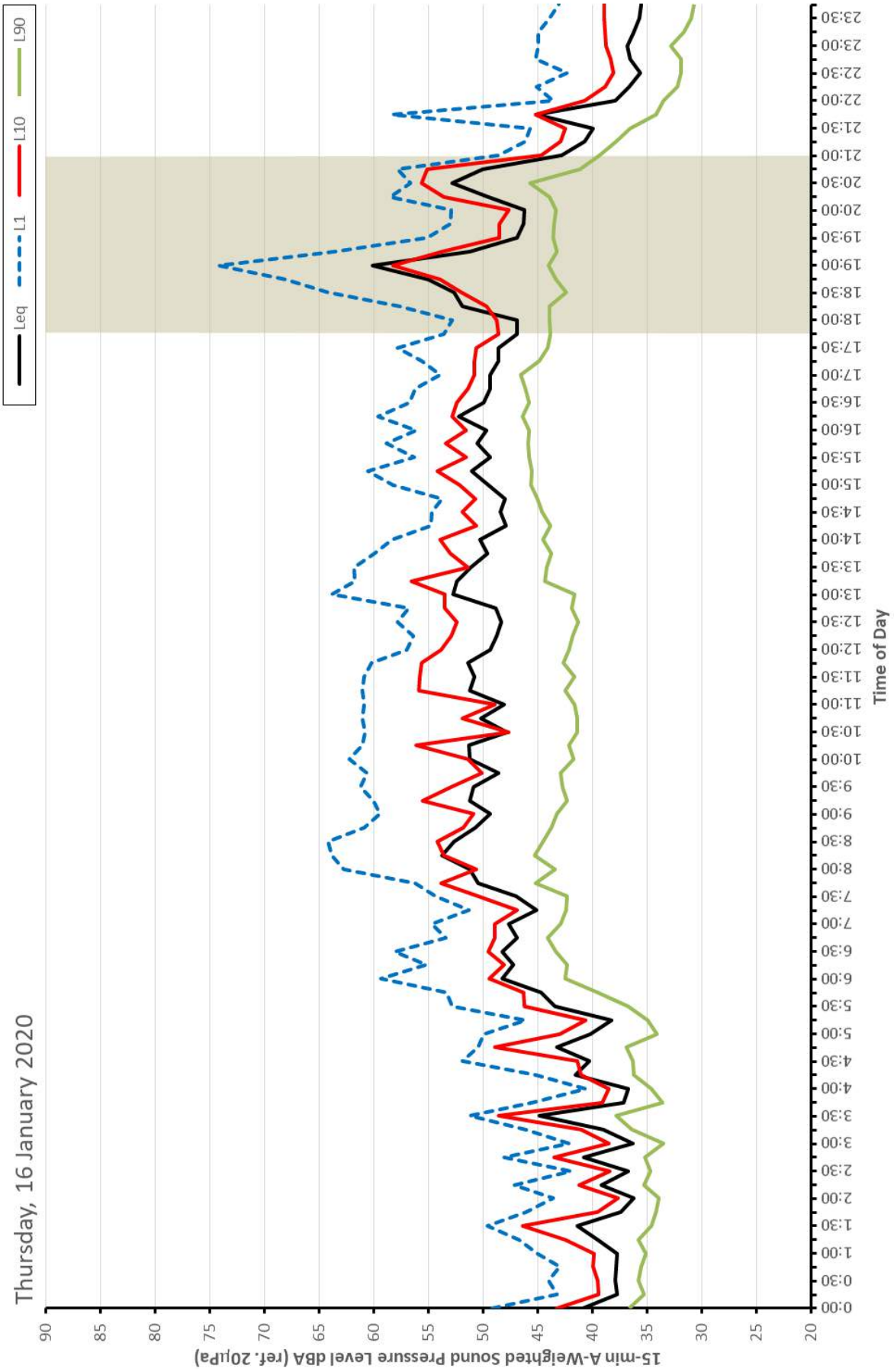
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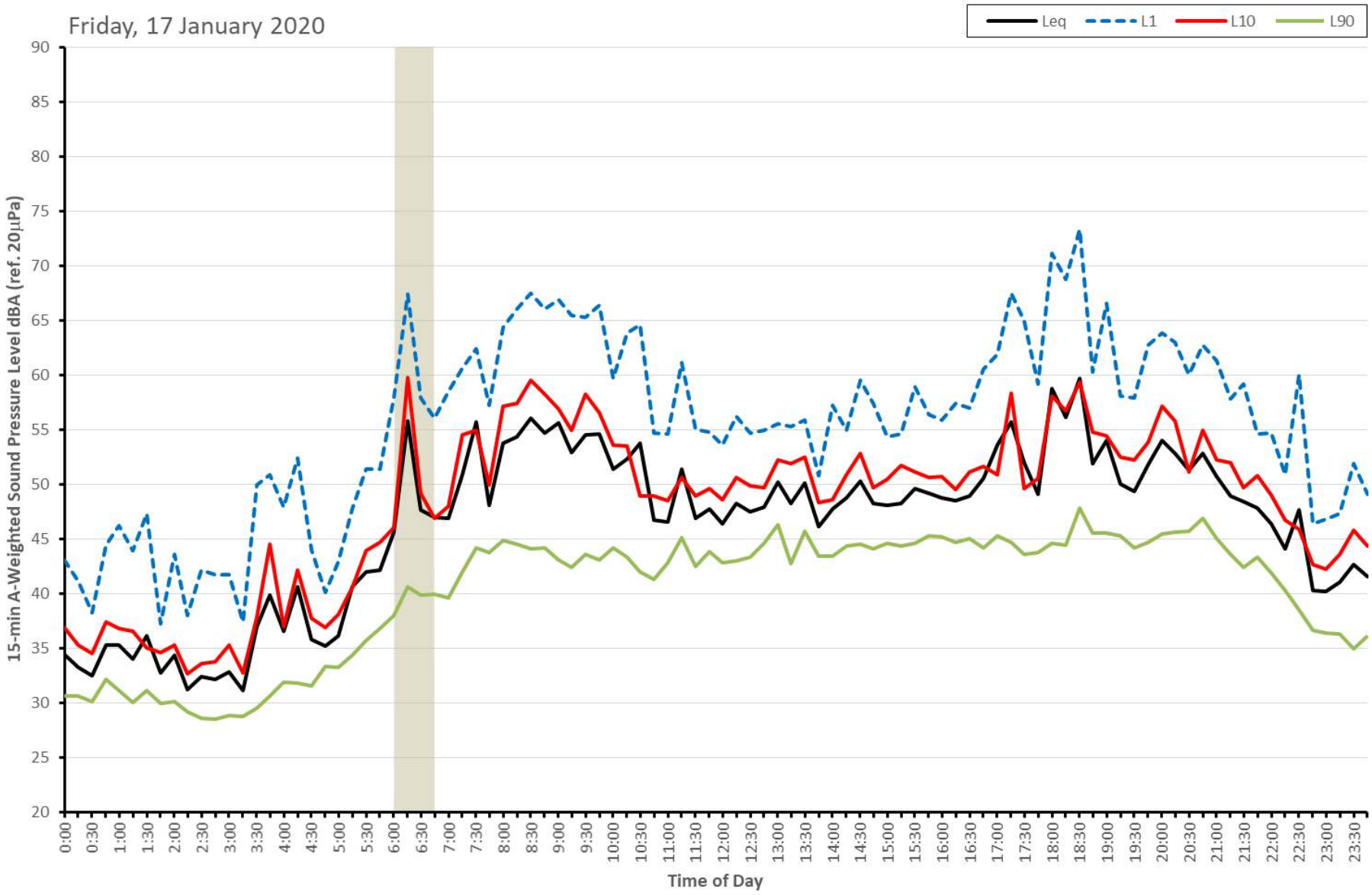
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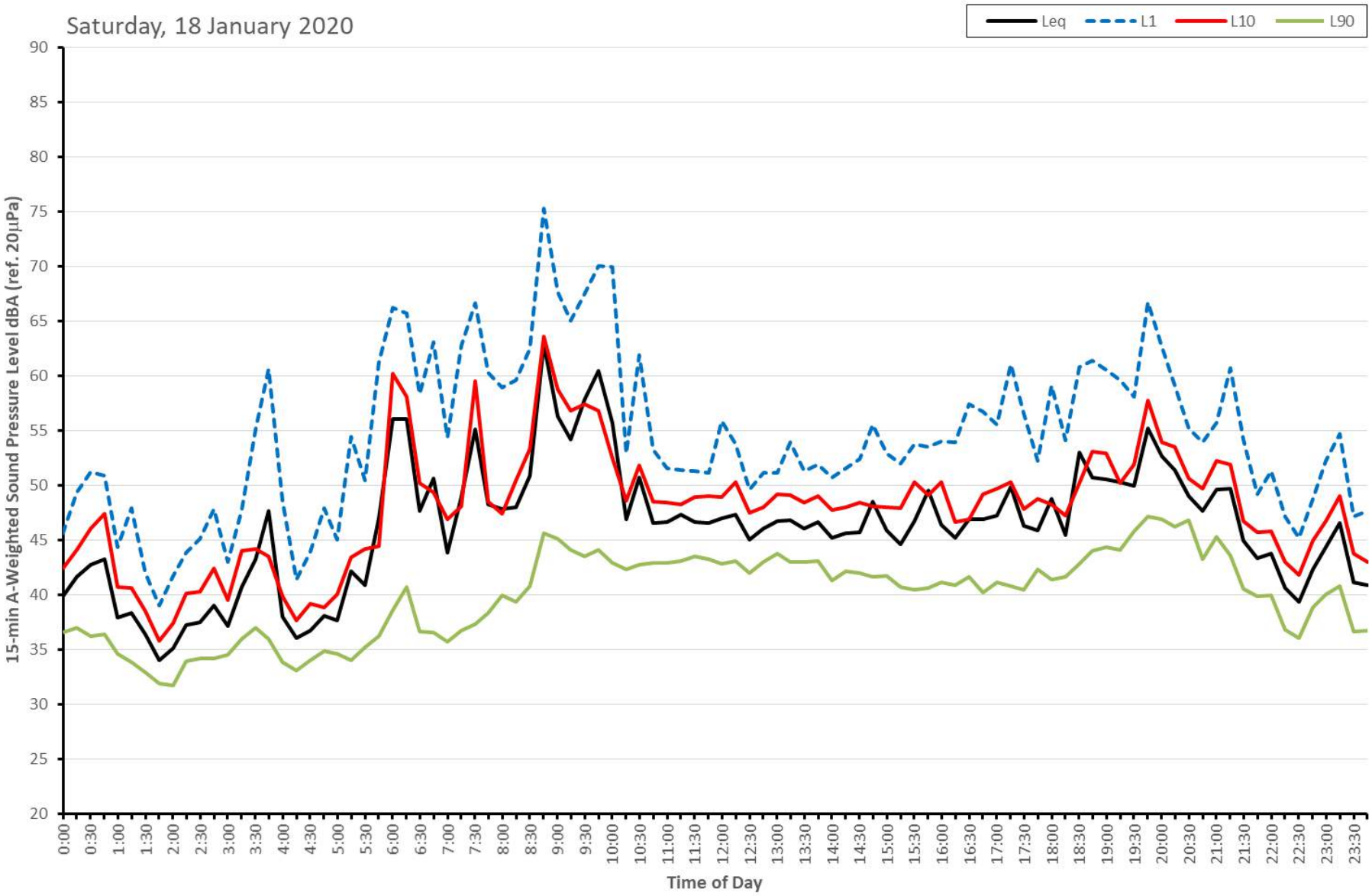
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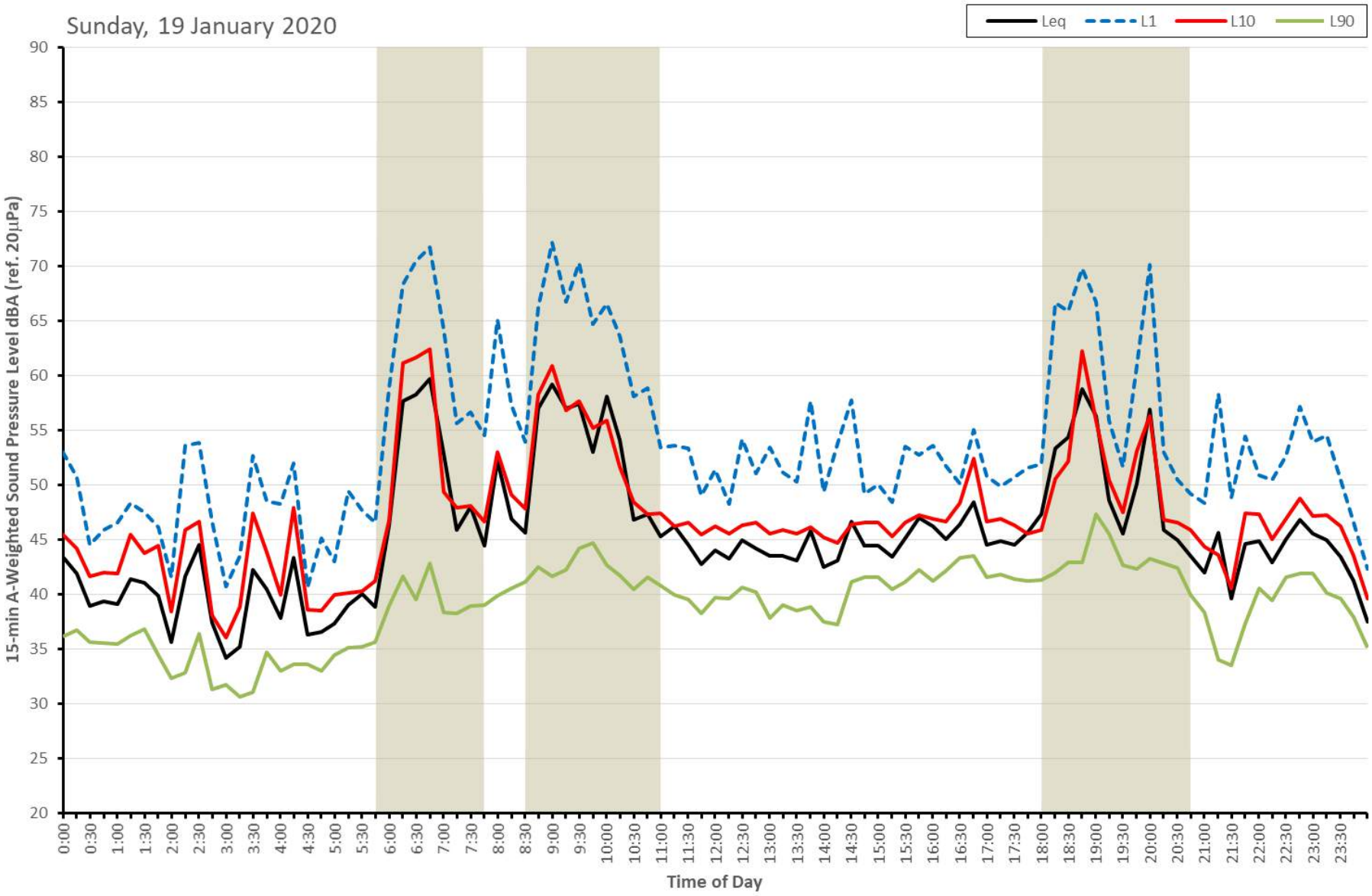
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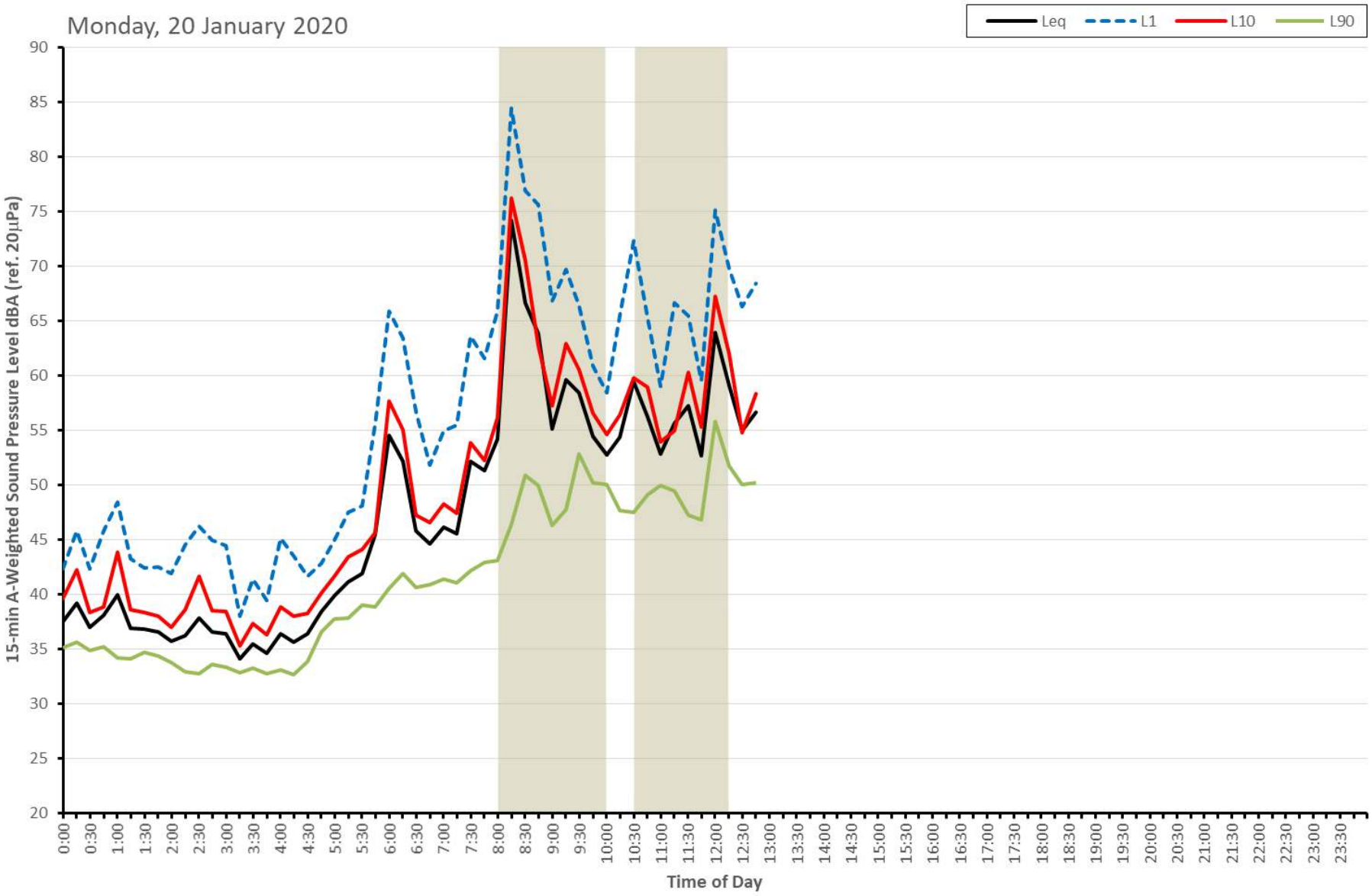
Monday, 20 January 2020
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
90
85
80
75
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APPENDIX B: SOUND INSULATION OF EXISTING FAÇADE

Level difference
Field measurement of airborne sound insulation of façade elements and façades

Client: *RCM* Date of test: *9/01/2020*

Description and identification of the building construction and test arrangement, direction of measurement:

Ground Level Façade. Double glazing in aluminium framing and brickwork

Frequency *f* Hz	$D_{ls,2m,nT}$ (one-third octave band) dB
50	29.9
63	31.8
80	24.3
100	22.4
125	31.2
160	33.5
200	36.4
250	37.4
315	39.0
400	44.4
500	47.8
630	47.9
800	49.5
1000	50.5
1250	50.6
1600	49.2
2000	48.9
2500	47.9
3150	51.3
4000	50.2
5000	55.5

Rating according to ISO 717-1

$D_{ls,2m,nT,w}$ $(C;C_{tr})$ = **47** (-1 ; -7) dB; $C_{50\text{-}3150}$ = -2 dB; $C_{50\text{-}5000}$ = -1 dB; $C_{100\text{-}5000}$ = -1 dB

Evaluation based on field measurement results obtained by an engineering method

$C_{tr,50\text{-}3150}$ = -8 dB; $C_{tr,50\text{-}5000}$ = -8 dB; $C_{tr,100\text{-}5000}$ = -7 dB

No. of test report: *D-001* Name of engineer: *Jorge Reverter*

Date: *10/01/2020* Signature: