Acoustic Report for Development Application

Student Housing

13-23 Gibbons Street, Redfern NSW 2016

REPORT

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ACOUSTIC REPORT FOR DEVELOPMENT APPLICATION

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1. INTRODUCTION

Northrop Consulting Engineers Pty Ltd (Northrop) Acoustics have been engaged by The Trust Company (Australia) Limited ATF WH Gibbons Trust to provide an acoustic report for development application for Student Housing to be located at 13-23 Gibbons Street, Redfern NSW 2016.

This assessment discusses the potential noise impact from the development on the nearest most-affected receivers.

This assessment has been prepared considering the following documentation:

- Sydney City Council Development Control Plan (DCP) 2012
- Sydney City Council Development Guidelines: Boarding Houses (including student accommodation) 2013
- NSW EPA Noise Policy for Industry 2017
- State Environmental Planning Policy (Infrastructure) 2007
- Interim Construction Noise Guidelines" (published by the NSW Office of Environment and Heritage, 2009)
- Architectural Drawings provided by Allen Jack + Cottier

This report provides:

- A statement of compliance with the relevant statutory criteria for 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.

This report is based on our understanding of the proposed project, application of the relevant state guidelines and professional experience within the acoustic field.

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

- Site drawings presenting the location of the proposed development in relation to the nearest receivers
- Noise data collected on site through the use of long term noise loggers and a hand-held sound level meter for spectrum analysis
- Architectural drawings provided by Allen Jack + Cottier

2. SITE DESCRIPTION

The proposed site (outlined in red) in Figure 1 is located at 13-23 Gibbons Street, Redfern, NSW 2016. The nearest affected residential receivers are 1 Margaret St, Redfern, shown outlined in yellow in Figure 1. Gibbons Street and Regent Street are major roads located near the Development Site. Figure 1 also shows the locations of the long-term noise monitor, and the operator attended measurement performed on Thursday 27 September 2018.

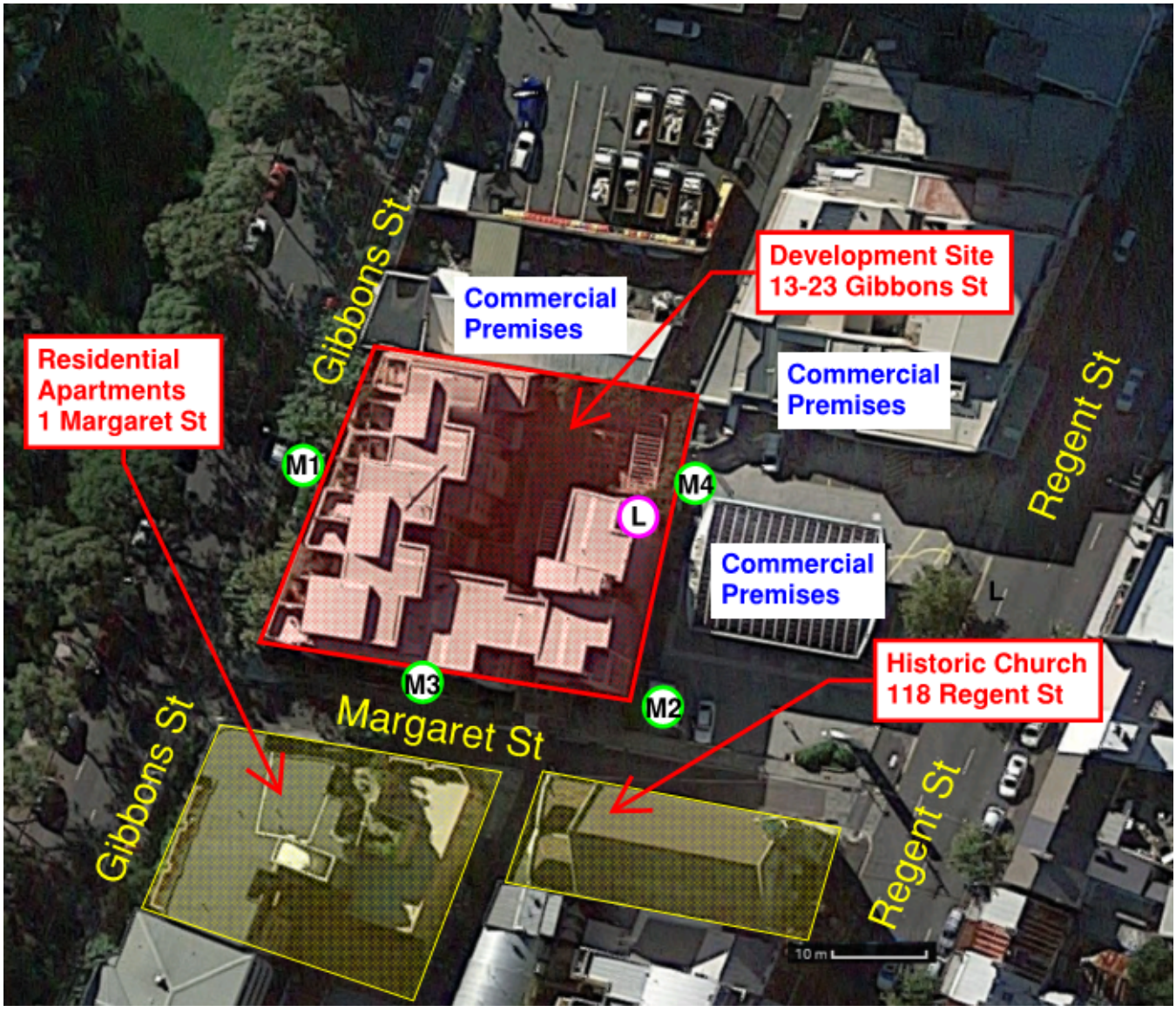


Figure 1: *Aerial view of site. The proposed development is outlined in red, and the nearest affected residence is outlined in yellow. Long term logger measurement location is marked as* L *in green, and operator attended measurements are marked as* M1, M2, M3 & M4 *in blue.*

3. SITE MEASUREMENTS

3.1 Instrumentation

The survey was conducted with the following instruments:

- Rion NL-52 Type 1 noise logging sound level meter
- NTI Precision Integrating Octave Band Sound Level Meter, Type XL2 with 1/3 Oct band filter unit, which conforms to applicable standards of IEC 61672 CLASS1.

All equipment was calibrated before and after the measurements using a Brüel & Kjær Acoustic Calibrator. No calibration deviations were recorded.

3.2 Operator attended measurements

Fifteen minute attended measurements were conducted to verify unattended background noise levels, to establish the octave band noise levels and to characterise the acoustic environment around the site. Operator attended noise measurement survey was conducted with an integrating Type 1 sound level meter and windshield. Measurements were taken continuously and the microphone was set to receive direct frontal sound and facing the direction of sound emission.

The operator attended noise measurements was performed on Monday 23rd July 2018 at locations *M1* and *M2,* marked in blue in Figure 1. Results are presented in Table 1 below.

Figure 2: *Operator attended measurement location* M1

Table 1: *Operator attended measurements 27/09/18*

Location	Measurement date and time	$L_{Aeq,\ 15\ minute}$ – dB(A)	$L_{A10,\ 15\ minute}$ – dB(A)	$L_{A90,\ 15\ minute}$ – dB(A)	Notes
M1	27/09/2018 4:05pm – 4:20pm	76	76	63	Traffic noise from Gibbons Street
M2	27/09/2018 4:22pm – 4:37pm	65	67	56	Traffic noise from Gibbons Street
M3	27/09/2018 4:38pm – 4:53pm	64	66	59	Traffic noise from Gibbons Street & Regent St
M3	27/09/2018 4:54pm – 5:09pm	62	65	55	Traffic noise from Gibbons Street & Regent St

3.3 Long term noise logging

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

Long term noise monitoring were conducted between Wednesday 3rd October 2018 and Wednesday 24th October 2018 at the logger “L” location shown in Figure 1 above. Detailed results of the logger measurements are shown in Appendix 1.

Figure 3: *Long term logger measurement location* L

The results of the automatic logging measurements are shown in Table 2 below.

Table 2: *Long term noise monitoring results*

Location	Equivalent Continuous Noise Level $L_{Aeq,15min}$ – dB(A)			Rating Background Noise Level RBL $L_{A90,15min}$ – dB(A)		
	Day	Evening	Night	Day	Evening	Night
L	62	61	58	57	54	49

The L_{A90} rating background noise levels were determined using the methodology as described in Section 3.1 of the NSW Noise Policy for Industry.

4. DEVELOPMENT NOISE CRITERIA

4.1 State Environmental Planning Policy (Infrastructure) 2007

4.1.1 Impact of rail noise or vibration on non-rail development

87 Impact of rail noise or vibration on non-rail development

(1) This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration:

(a) residential accommodation,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or centre-based child care facility.

(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.

(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

4.1.2 Impact of road noise or vibration on non-road development

102 Impact of road noise or vibration on non-road development

(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of RMS) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) residential accommodation,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or centre-based child care facility.

(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.

(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

(4) In this clause, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.

The following traffic volume maps on noise assessment for buildings on land adjacent to busy roads' published by the Roads and Maritime Services shows that the traffic volume on Gibbons Street and Regent Street exceed 40,000 vehicles per day.

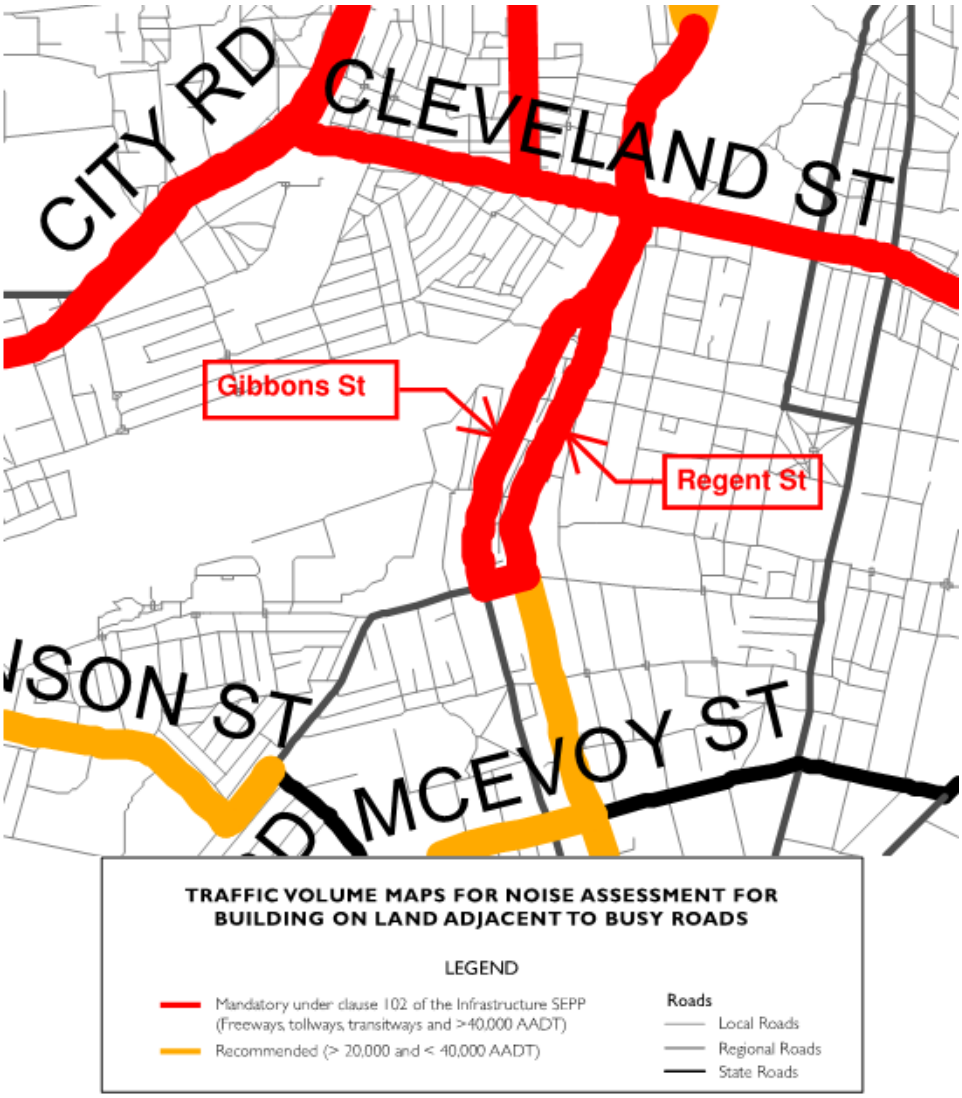


Figure 4: *Traffic Volume Map classifying Gibbons and Regent Streets as Mandatory under Clause 102 of the Infrastructure SEPP.*

4.1.3 State Environmental Planning Policy (Infrastructure) Amendment 2018

The State Environmental Planning Policy (Infrastructure) Amendment 2018 states the following.

"Amendment 19 Clause 102 Impact of road noise or vibration on non-road development Omit "40,000" from clause 102 (1). Insert instead "20,000"."

Accordingly, all roads with traffic volumes in excess of 20,000 are now classified as Mandatory under Clause 102 of the Infrastructure SEPP.

4.1.4 Criteria of the State Environmental Planning Policy (Infrastructure) 2007 & Amendment 2018

As the site is near a railway tunnel and two mandated busy roads, the following are the applicable combined noise criteria as a result of airborne and structure-borne noise.

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time."

4.2 Sydney City Council Development Control Plan (DCP) 2012

4.2.1 Acoustic privacy - Sydney City Council DCP 2012

Part "4.2.3.11 Acoustic privacy" of the Sydney City Council Development Control Plan (DCP) 2012 requires the following:

(1) A Noise Impact Assessment prepared by a suitably qualified acoustic consultant may be required when submitting a development application for commercial and retail uses which may affect the acoustic privacy of the adjacent residential use.

(2) Where necessary, a residential development is to include acoustic measures to reduce the impact of noise from existing or planned external sources (for example busy roads, adjoining industries, live music venues and public parks and plazas in which people may congregate or host live music or events).

(3) Development is to incorporate measures that reduce the entry of noise from external sources into dwellings.

(4) Where possible, the attenuation of noise at its source is preferred. Where this option is adopted, the applicant will need to demonstrate that the measures to be undertaken:

(a) have the consent of relevant parties associated with that noise source; and

(b) last for the life of the development proposal.

(7) The repeatable maximum LAeq (1 hour) for residential buildings and serviced apartments must not exceed the following levels:

(a) for closed windows and doors:

(i) 35dB for bedrooms (10pm-7am); and

(ii) 45dB for main living areas (24 hours).

(b) for open windows and doors:

(i) 45dB for bedrooms (10pm-7am); and

(ii) 55dB for main living areas (24 hours).

(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum LAeq (1hour) level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:

(a) 38dB for bedrooms (10pm-7am); and

(b) 48dB for main living areas (24 hours).

(9) These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.

(10) To limit the transmission of noise to and between dwellings, all floors are to have a weighted standardised impact sound level ($L'_nT_{,w}$) less than or equal to 55 where the floor separates a habitable room and another habitable room, bathroom, toilet, laundry, kitchen, plant room, stairway, public corridor, hallway and the like.

(11) The overall design and layout of dwellings, where appropriate, is to include:

(a) a limit on window size and number where oriented towards an intrusive noise source;

(b) seals at entry doors to reduce noise transmission from common corridors or outside the building;

(c) minimisation of the number of shared walls with other dwelling units;

(d) storage, circulation areas, and non-habitable rooms to buffer noise from external sources;

(e) double or acoustic glazing; and

(f) operable acoustic screens to balconies.

(12) Mixed-use development which includes two or more dwellings is to provide separate lift access and a separate entrance for use exclusively for the dwellings.

The Sydney City Council Development Guidelines: Boarding Houses (including student accommodation) 2013 requires that the development meets the design requirements of the BCA "Class 3 – residential buildings" which is addressed in Section 5.1 below.

4.2.2 Development on busy roads - Sydney City Council DCP 2012

Part "4.2.5.3 Development on busy roads and active frontages" of the Sydney City Council Development Control Plan (DCP) 2012 requires the following:

The following provisions apply to, sensitive uses on sites that are to have an active frontage as shown on the Active frontages map, or sites with a frontage to a busy road that carries more than 20,000 vehicles a day. Sensitive uses include buildings for residential use (including mixed use buildings).

Applicants proposing development on busy roads should also refer to State Environment Planning Policy (Infrastructure) 2007 and the NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines which includes design guidelines and requirements to manage the impacts from road and rail noise and vibration.

4.3 NSW Noise Policy for Industry 2017

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

The calculation 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-specific noise level (PSNL).

4.3.1 Intrusiveness Criteria

The NSW EPA Noise Policy for Industry states the following:

The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted 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 measured in the absence of the source by more than 5 dB(A).

The intrusiveness criterion can be summarised as L_{Aeq}, 15 minute ≤ RBL background noise level plus 5 dB(A).

Table 3: *EPA Noise Policy for Industry intrusiveness criteria*

Period	Noise descriptor – dB(A)	Intrusiveness criteria – dB(A)
Daytime: 7am – 6pm (Monday – Saturday) 8am – 6pm (Sunday)	$L_{Aeq,15min}$ ≤ RBL + 5	56
Evening: 6pm – 10pm	$L_{Aeq,15min}$ ≤ RBL + 5	52
Night: 10pm – 7am (Monday – Saturday) 10pm – 8am (Sunday)	$L_{Aeq,15min}$ ≤ RBL + 5	42

4.3.2 Amenity Criteria

The NSW Noise Policy for Industry states the following:

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.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

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 4 below:

***Table 4:** Amenity criteria for external noise levels*

Type of Receiver	Time of Day	Recommended amenity noise level (ANL), L_{Aeq} in dB(A)	Project amenity noise levels, L_{Aeq} in dB(A)
Urban residential	Day	55	50
	Evening	45	40
	Night	40	35
Active Recreation Area	When in use	55	-

4.3.3 Project Trigger Noise Levels (PSNL)

The following Table 5 summarises the noise criteria determination as per NSW Noise Policy for Industry, for the following times of day:

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

The Project Noise Trigger Level is applicable for the external noise emissions from the development. These project specific noise levels shall be assessed to the most affected point on or within the nearest noise sensitive receiver.

***Table 5:** Project noise trigger levels determination*

Time of Day	L_{Aeq} in dB(A)						
	RBL (measured $L_{A90,\ 15minute}$)	Intrusiveness (RBL + 5)	ANL (from Table 4)	Project ANL (ANL - 5)	$L_{Aeq,15min}$ dBA	$L_{Aeq,15min}$ dBA minus 15	Project Noise Trigger Level
Day	57	62	55	50	62	47	**47**
Evening	54	59	45	40	61	45	**45**
Night	49	54	40	35	58	43	**43**

4.4 Building Services Compliance with the Noise Criteria

In accordance with the NSW EPA Noise Policy for Industry, the criteria for the project's noise trigger level criteria at the boundaries of the nearest affected have be determined. The mechanical, electrical and hydraulic services, equipment and plant rooms for the proposed development will be acoustically treated to achieve the noise criteria imposed determined by long-term sound logger measurements as per the Noise Policy for Industry.

The noise criteria for the development's building services, including air conditioning plant and ventilation, at the nearest residential properties as determined in Section 4.3 above are as follows.

Type of Receiver	Time of Day	Recommended amenity noise level (ANL), L_{Aeq} in dB(A)	Project amenity noise levels, L_{Aeq} in dB(A)
Urban residential	Day	55	50
	Evening	45	40
	Night	40	35

Accordingly, the target design noise levels of the development's building services at the nearest residential receiver during the night period is 35dB(A).

At this stage, the building services equipment selection has not been finalised. The necessary acoustic treatments of the building services and plants will be finalised in the detail design phase of the project, and will be specified in the project tender documents.

4.5 Compliance with vibration criteria

The Illawarra Relief rail tunnel passes to the west of the site, approximately parallel with Gibbons Street (in the vicinity of the site). It is understood that the closest edge of the tunnel lies approximately 9 to 10 m from the south-western boundary of the site. The proposed development is required to take this tunnel into consideration.

4.5.1 Construction Vibration Impact on the Illawarra Relief rail tunnel

Transport for NSW (TfNSW) protects rail tunnel infrastructure by defining rail protection reserves around the tunnel. The 'first reserve' comprises the immediate surrounds of the tunnel, and represents the area that shall not be encroached upon by any future construction or development. The 'second reserve' covers areas where future development works have the potential to impact on the performance of the tunnel support elements and operation of the tunnel.

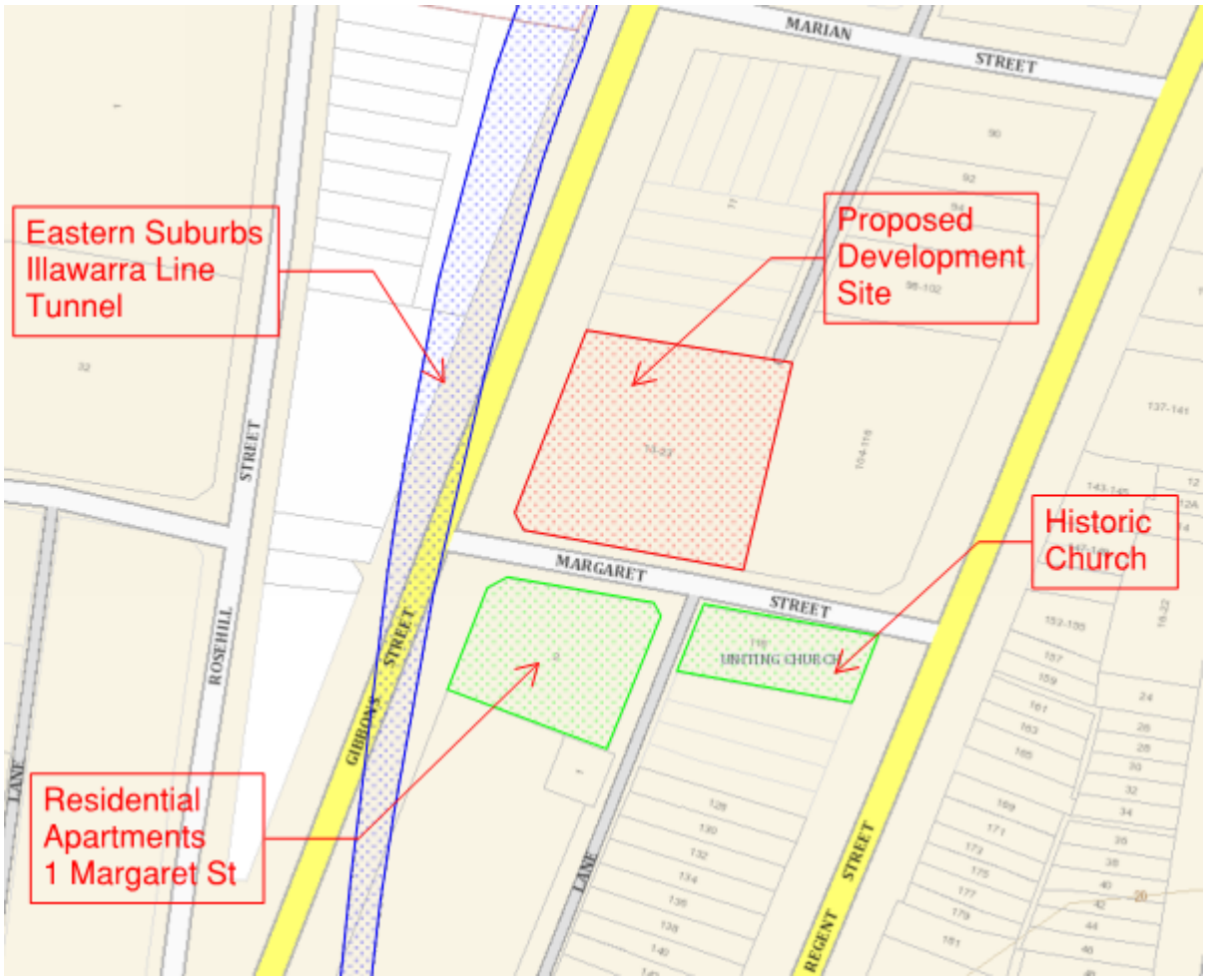


Figure 5: *Traffic Volume Map classifying Gibbons and Regent Streets as Mandatory under Clause 102 of the Infrastructure SEPP.*

Details regarding the rail reserves, along with general guidelines on allowed construction activities and required protection measures, are provided in TfNSW document T HR CI 12051 ST – "Development Near Rail Tunnels".

It is envisaged that TfNSW will require vibration monitoring before and during the construction phase of the proposed development of the tunnels to assess and monitor the impact of the proposed development on the surrounding tunnels. The extent of assessment and monitoring required is subject to discussion and agreement from TfNSW once final details of the proposed development are known.

4.5.2 Illawarra Relief rail tunnel Vibration & Ground-Borne Noise Impact on the Development

Due to the close proximity of the proposed development to the Illawarra Relief rail tunnel (less than 10 metres), it is recommended that the proposed building be structurally designed with building anti-vibration bearers so as to isolate the residential units from structural vibration and ground borne-noise from the building foundations induced by the rail tunnel. Rail tunnel induced vibration measurements should be undertaken after the basement concrete slab floor construction is completed and a final confirmation made whether the building anti-vibration bearers are necessary.

The vibration criteria in the unit residences is a shown in Table 6 below.

Table 6: *Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s^2) 1-80Hz from the "Interim Construction Noise Guidelines" (published by the NSW Office of Environment and Heritage, 2009)"*

Location	Assessment period[1]	Preferred values		Maximum values	
		z axis	x & y axis	z axis	x & y axis
Continuous vibration					
Residences	Daytime (7am-10pm)	0.010	0.0071	0.020	0.014
Impulsive vibration					
Residences	Daytime (7am-10pm)	0.30	0.21	0.60	0.42

Notes: 1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am

The maximum internal noise criteria in the unit residences, including the rail regenerated noise, is shown in Table 7 below.

Table 7: *Maximum Internal Noise Criteria for Regenerated Rail*

Type of Occupancy	Period	L_{Amax} Noise Limit[1]
Sleeping areas (Bedrooms)	10pm – 7am	35 dB(A)
Other habitable rooms (excluding garages, kitchens, bathrooms and hallways)	7am – 10pm	40 dB(A)

Notes: 1. L_{Amax} – is a-weighted maximum sound pressure level measures using "Slow" response time

5. BUILDING ACOUSTIC REQUIREMENTS

5.1 NCC BCA Acoustic Requirements

5.1.1 Sound insulation rating of floors

(a) A floor in a Class 3 building must have an Rw + Ctr (airborne) not less than 50 and an Ln,w (impact) not more than 62 if it separates—

(i) sole-occupancy units; or

(ii) a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification.

5.1.2 Sound insulation rating of walls

(a) A wall in a Class 3 building must—

(i) have an Rw + Ctr (airborne) not less than 50, if it separates sole-occupancy units; and

(ii) have an Rw (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; and

(iii) comply with the BCA requirement of 'discontinuous construction' (see section 5.4 below) if it separates—

(A) a bathroom, sanitary compartment, laundry or kitchen in one sole-occupancy unit from a habitable room (other than a kitchen) in an adjoining unit; or

(B) a sole-occupancy unit from a plant room or lift shaft.

(b) A door may be incorporated in a wall in a Class 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an Rw not less than 30.

(e) Where a wall required to have sound insulation has a floor above, the wall must continue to—

(i) the underside of the floor above; or

(ii) a ceiling that provides the sound insulation required for the wall.

(f) Where a wall required to have sound insulation has a roof above, the wall must continue to—

(i) the underside of the roof above; or

(ii) a ceiling that provides the sound insulation required for the wall.

5.1.3 Sound insulation rating of internal services

(a) If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an Rw + Ctr (airborne) not less than—

(i) 40 if the adjacent room is a habitable room (other than a kitchen); or

(ii) 25 if the adjacent room is a kitchen or non-habitable room.

(b) If a storm water pipe passes through a sole-occupancy unit it must be separated in accordance with (a)(i) and (ii).

A flexible coupling must be used at the point of connection between the service pipes in a Building and any circulating or other pump.

5.1.4 Discontinuous construction

Discontinuous construction means a wall having a minimum 20 mm cavity between 2 separate leaves, and

(i) for masonry, where wall ties are required to connect leaves, the ties are of the resilient type: and
(ii) for other than masonry, there is no mechanical linkage between leaves except at the periphery.

5.2 Airborne Road Traffic and Rail Noise Criteria with Open Windows

The internal noise criteria for this development (new residential development) as per ISEPP 2007 with the windows open are as follows.

Type of Occupancy	Location & Window Status	Design Noise Level	
		Day, LAeq (15hour)	Night, LAeq (9hour)
Sleeping areas	Internal, Windows Closed	40dB(A)	35dB(A)
	Internal, Windows Open	50dB(A)	45dB(A)
	External free-field (allowing windows to remain open)	60dB(A)	55dB(A)
Living Rooms	Internal, Windows Closed	40dB(A)	40dB(A)
	Internal, Windows Open	50dB(A)	50dB(A)
	External free-field (allowing windows to remain open)	60dB(A)	60dB(A)

The results of the Noise Assessment to the ISEPP 2007 Windows Open Criteria for Bedrooms (Night Time Traffic) are as follows.

Façade Orientation	Type of Space	Level	Predicted Noise Level LAeq, 9hours in dB(A)	Inside Apartment with Windows Open 9hours in dB(A)	ISEPP Windows Open Noise Criteria LAeq, in dB(A)	Compliance (Yes/No)
Regent St (East)	Bedrooms	L1 to L4	67 to 68	53 to 54	45 or less	No
		L5 to L8	65 to 66	50 to 52	45 or less	No
		L9 to L17	62 to 64	46 to 49	45 or less	No
Margaret St (South)	Bedrooms	L1 to L4	65 to 66	51 to 52	45 or less	No
		L5 to L8	63 to 64	49 to 50	45 or less	No
		L9 to L17	58 to 62	45 to 48	45 or less	No
North Facade	Bedrooms	L1 to L4	65 to 66	51 to 52	45 or less	No
		L5 to L8	63 to 64	49 to 50	45 or less	No
		L9 to L17	58 to 62	45 to 48	45 or less	No
Gibbons St (West)	Bedrooms	L1 to L4	69 to 70	55 to 56	45 or less	No
		L5 to L8	67 to 68	53 to 54	45 or less	No
		L9 to L17	63 to 66	49 to 52	45 or less	No

Note: Furnished rooms with typical reverberation time of no greater than 0.4seconds and opening area of window is no greater than 5% of floor area

Based on the results of the table above, it is recommended that the bedrooms be mechanically ventilated when the bedrooms are occupied and allow the windows to be openable when the bedroom occupant choose to during periods of low traffic noise.

5.3 Building Envelope

External noise levels were measured at the proposed development site (results shown in Table 1) and shall be taken into account when designing the façade and glazing for airborne acoustic insulation, to ensure that the following L_{Aeq} levels do not exceed the following as specified in the "NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines":

I. in any bedroom in the building: 35dB(A) at any time 10pm – 7am
II. anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time.

The following are the minimum acoustic requirements for the for the building external elements.

5.3.1 Units External Glazing

The following Table 8 shows the **minimum** installed glazing acoustic requirements (including window frames and acoustic sealing) for the units in the development.

Space Description	Orientation	Glazing Type (Viridian equivalent)	Rw	Rw+Ctr
Units L1 to L4	North	12.5mmVLam Hush	40	37
Units L1 to L4	East	12.5mmVLam Hush	40	37
Units L1 to L4	South	12.5mmVLam Hush	40	37
Units L1 to L4	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
Units L5 to L8	North	10.5mmVLam Hush	39	36
Units L5 to L8	East	12.5mmVLam Hush	40	37
Units L5 to L8	South	10.5mmVLam Hush	39	36
Units L5 to L8	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
Units L9 to L17	North	10.38 Laminated	36	33
Units L9 to L17	East	10.5mmVLam Hush	39	36
Units L9 to L17	South	10.38 Laminated	36	33
Units L9 to L17	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
Units L12 to L17	North	10.38 Laminated	36	33
Units L12 to L17	East	10.5mmVLam Hush	39	36
Units L12 to L17	South	10.38 Laminated	36	33
Units L12 to L17	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
L02-L03 Dinning	North	10.38 Laminated	36	33
L02-L03 Terrace	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
L04 Study	West	10mmVFloat-16mm air gap-12.5mmVLam Hush	45	39
L18 Common area	West	10.38 Laminated	36	33
Retail	North	10.38 Laminated	36	33
Retail	West	10.38 Laminated	36	33
Office	West	12.5mmVLam Hush	40	37
Meeting	West	12.5mmVLam Hush	40	37
Entrance	West	10.38 Laminated	36	33
Games	West	10.38 Laminated	36	33
Games	East	10.38 Laminated	36	33
Quiet area	South	10.38 Laminated	36	33
Lounge	South	10.38 Laminated	36	33
Lounge	East	10.38 Laminated	36	33

Where double glazing is required for thermal performance requirements, the Viridian “10mmVFloat-16mm air gap-12.5mmVLam Hush” is recommended.

5.3.2 External walls and envelope

The **minimum** acoustic performance requirements of the external walls for the units is Rw50. The proposed external walls will be Precast Concrete panels of 200mm minimum thickness which meets the Rw50 criteria.

5.4 Noise from Student Activities and Impact on Neighbouring Residences

The main potential source of noise generated by the occupants and visitors at the proposed development are activities held in the outdoor balconies and similar areas, with the noise resulting from loud conversations, shouting and loud music.

5.4.1 Office of Environment & Heritage restrictions on Loud Music and noisy activities

The Office of Environment & Heritage defines offensive noise in the POEO Act is noise:

(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.

In NSW, there are restrictions on noise from musical instruments and sound systems which are commonly used at parties. Noise from music that can be heard in any habitable rooms of a neighbouring residence must cease during certain times: midnight to 8am on Friday, Saturday or any day preceding a public holiday and 10pm to 8am on any other day. An offence occurs if the noise continues after a warning has been given by a council or police officer.

5.4.2 Noise from Student’s Bedrooms

The students’ rooms facing 1 Margaret Street residences will have a minimum of Rw36 sound insulation between the rooms and the outside when the windows are closed. Loud music within the students’ bedrooms with the windows closed are not likely to impacts on the neighbouring residences at 1 Margaret Street due to the high traffic background noise levels. Very loud music levels of 100dB(A) in a student’s bedroom would translate to a noise level of 42dB(A) outside the window of a residence at 1 Margaret St, which is significantly lower than the background traffic noise om Margaret St.

It is recommended that students should close their windows when playing loud music. This requirement should be included in the building’s house rules for tenants and visitors.

5.4.3 Noise from Open Balconies in the Development

The Sydney City Council restricts the use of musical instruments, radios, sound systems and public address systems at a residential premise where the noise can be heard in the living area of neighbouring properties between the following periods

i. 10pm to 8am Sunday to Thursday, &
ii. 12 midnight to 8am Friday, Saturday and any day immediately before a public holiday.

Large outdoor gatherings, with or without music, on the external common area on Levels 2 and 3, landscaped zones on Level 1 and the balconies on Level 4 shall be managed such that the noise from such activities do not disrupt the quiet enjoyment of the residences in the living area of the neighbouring properties.

5.4.4 Noise management requirements

The requirements outlined in Section 5.4.2 and 5.4.3 shall be included in the building's house rules issued to tenants and visitors to the building.

6. CONCLUSION

This report forms part of the development application submission for the proposed development of Student Housing to be located at 13-23 Gibbons Street, Redfern NSW 2016. Operator attended and long-term noise measurements were conducted at the site. The results of the measurements are presented in this report, and initial acoustic designs have been specified. The noise criteria derived from the measurements using NSW Noise Policy for Industry (2017) methodology at the nearest affected receiver is quantified. Acoustic compliance with the State Environmental Planning Policy (Infrastructure) 2007, Sydney City Council DCP, the NSW Noise Policy for Industry and the NSW Government's Development near Rail Corridors and Busy Roads – Interim Guidelines can be achieved when the recommendations in this report are implemented.

The guidelines of use of outdoor areas to control noise by tenants and visitors impacting on the residences at 1 Margaret Street and the future building at 11 Gibbons Street shall be included in the building's house rules issued to tenants and visitors to the building.

Requirements of the Transport for NSW (TfNSW) document T HR CI 12051 ST – "Development Near Rail Tunnels" are assessed and it is recommended building vibration isolation bearer pads be provided, where required, so that the resultant vibration levels at the residence units do not exceed the vibration levels specified in the "Interim Construction Noise Guidelines" (published by the NSW Office of Environment and Heritage, 2009)".

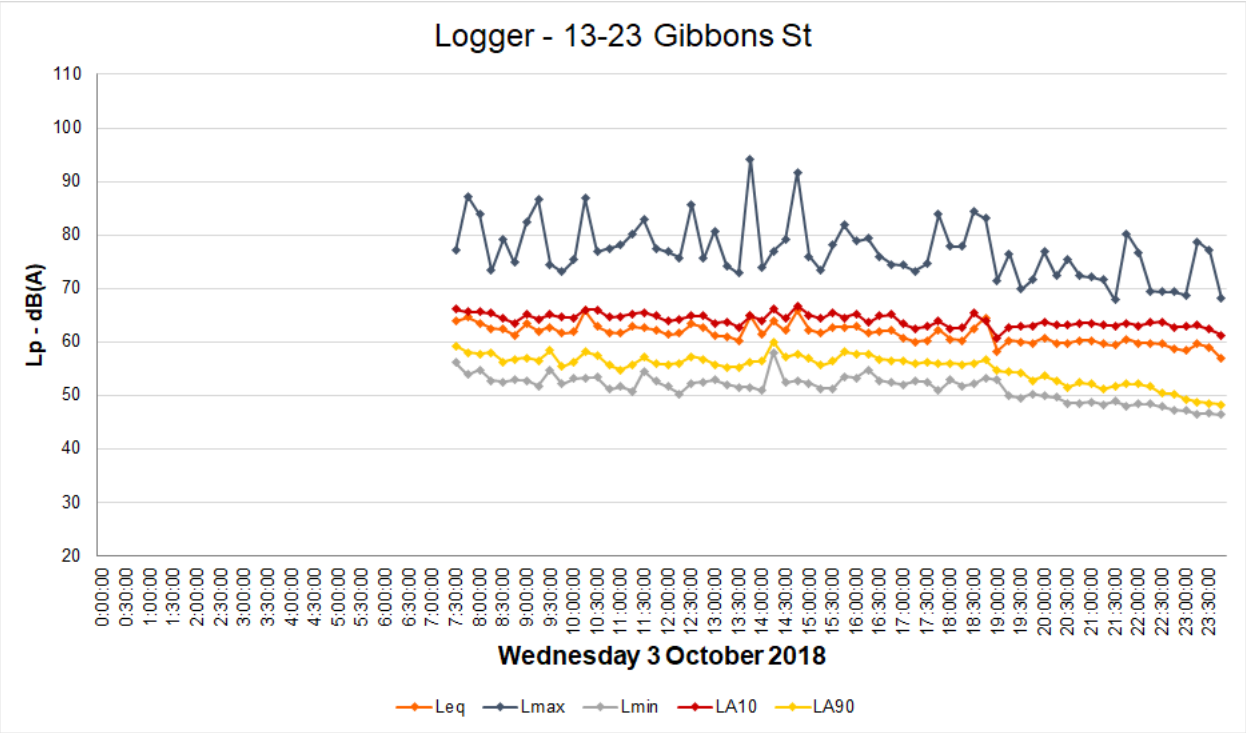
APPENDIX A – LONG TERM NOISE MONITORING

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.

- Maximum Noise Level (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 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.
- 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.
- Minimum Noise Level (L_{Amin}) – The minimum noise level over a sample period is the minimum level, measured on fast response, during the sample period.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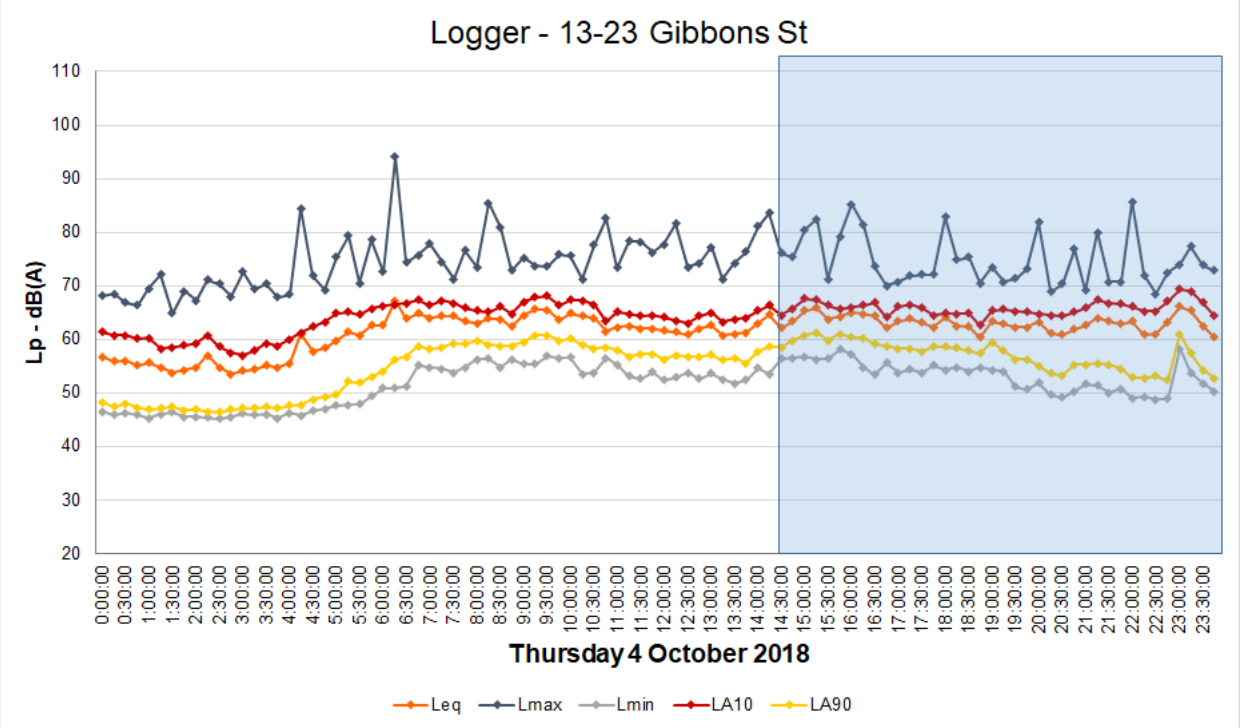
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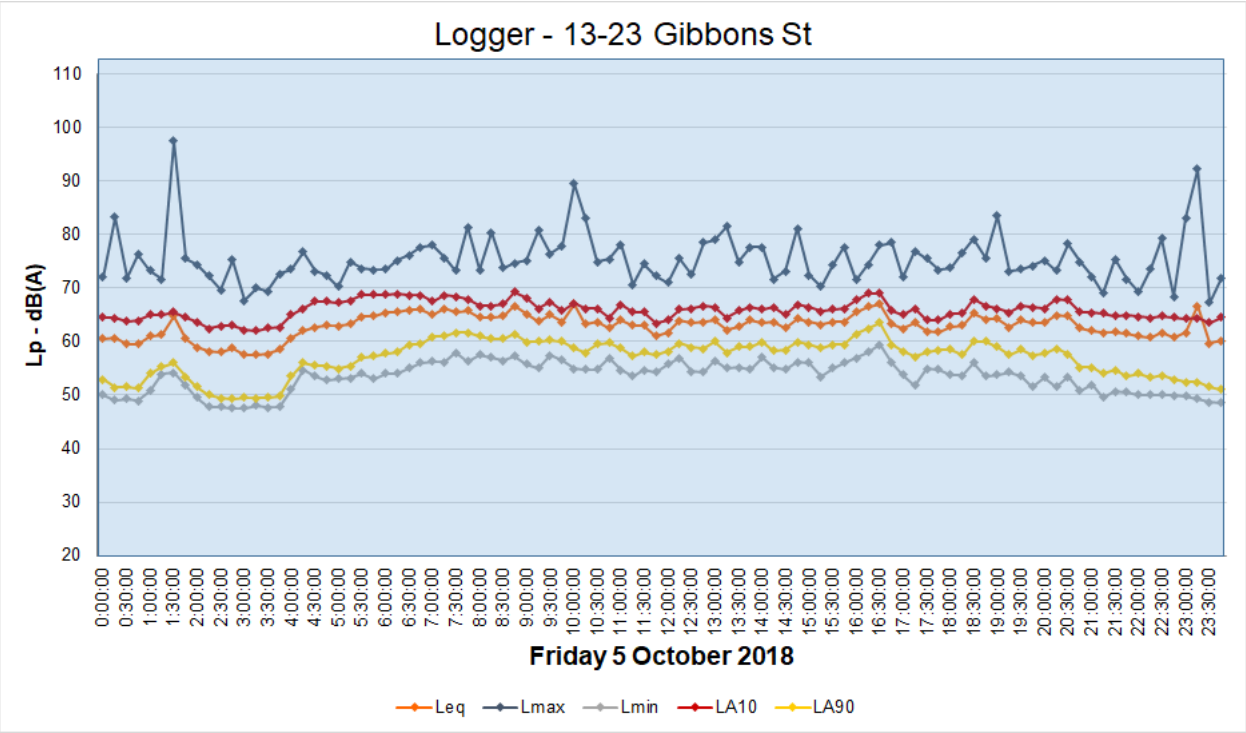
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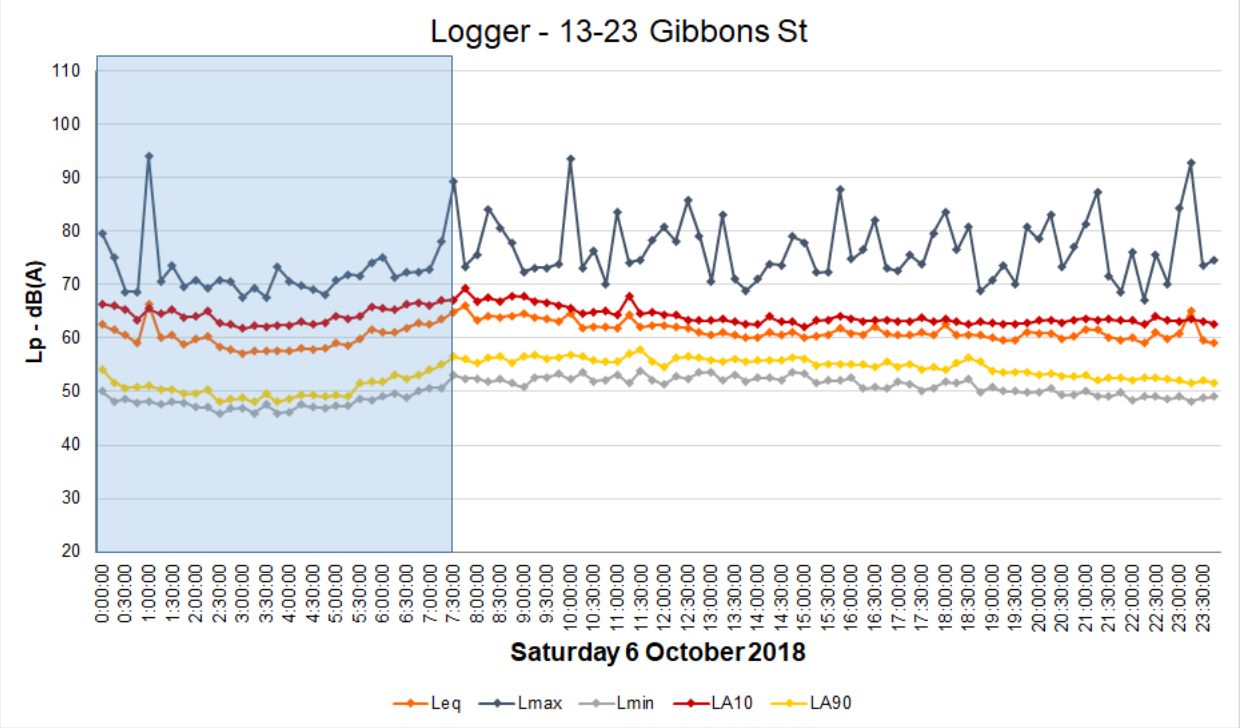
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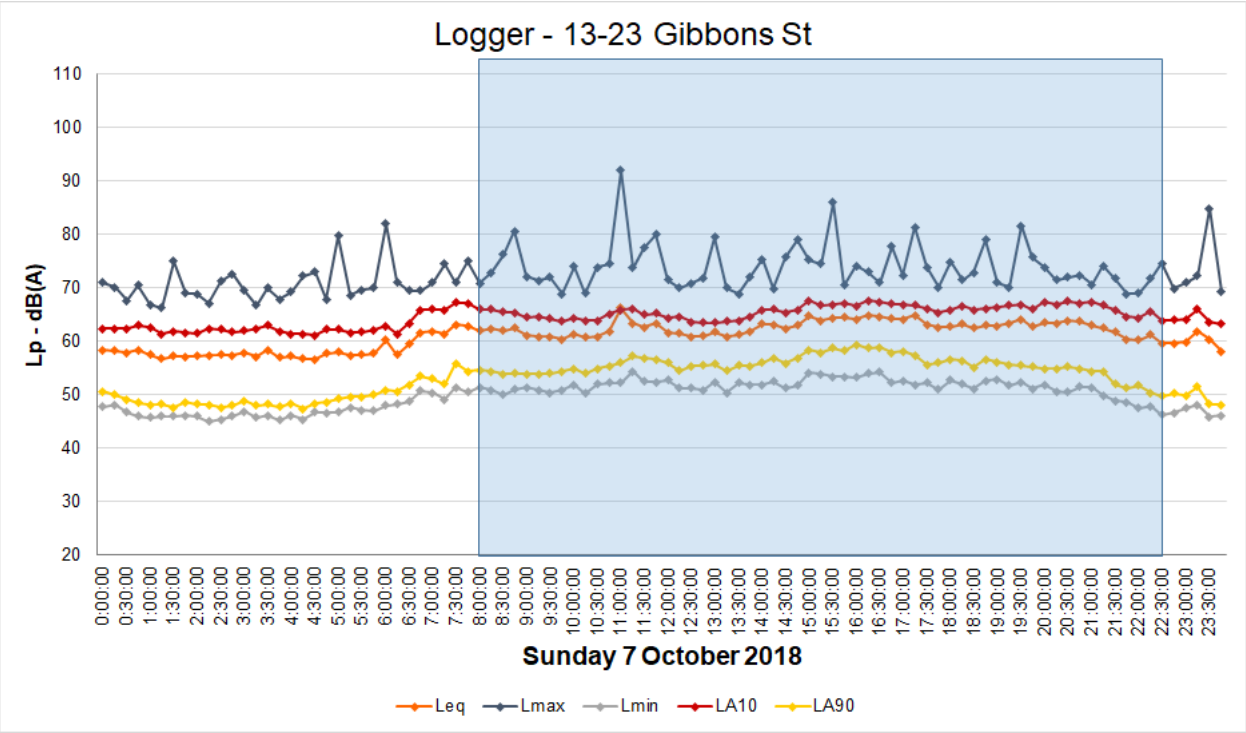
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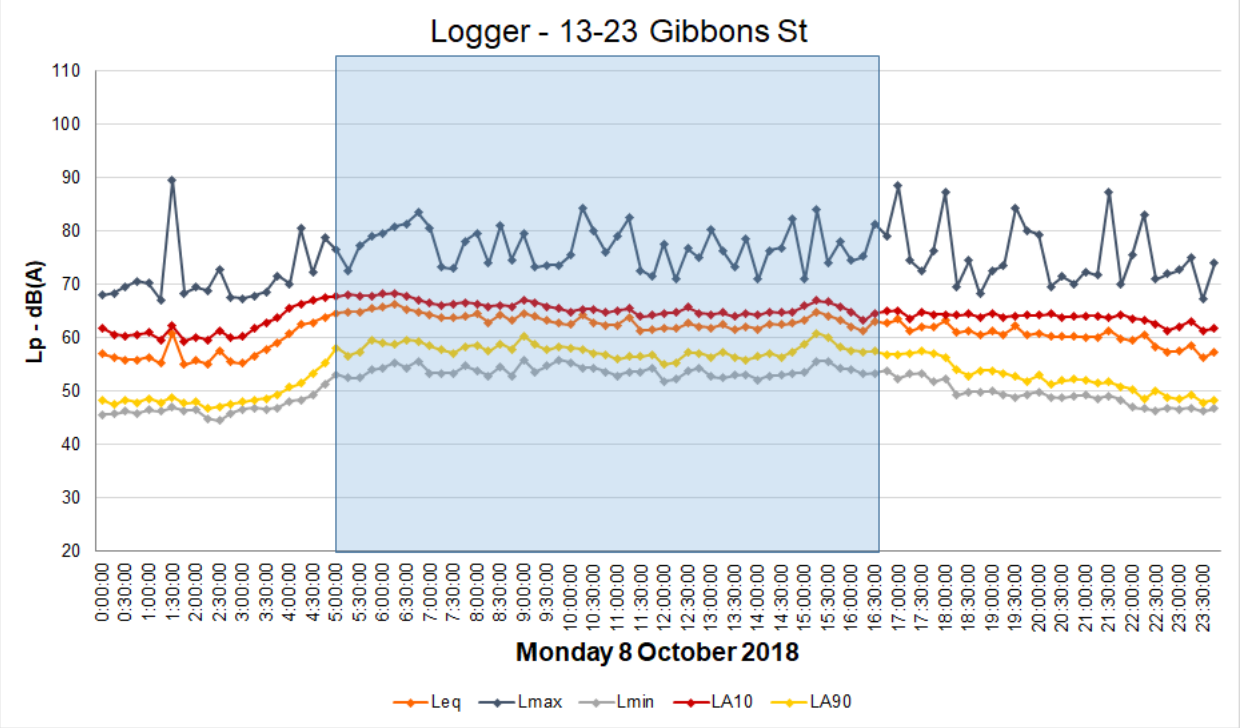
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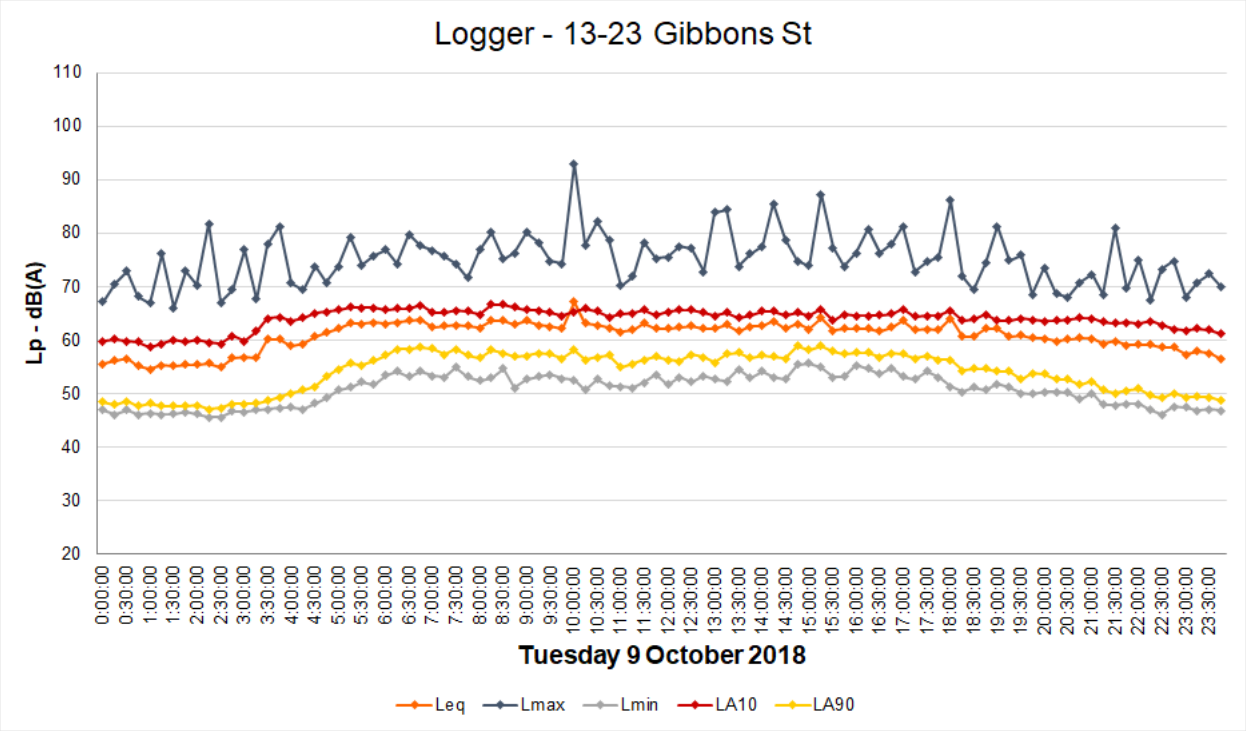
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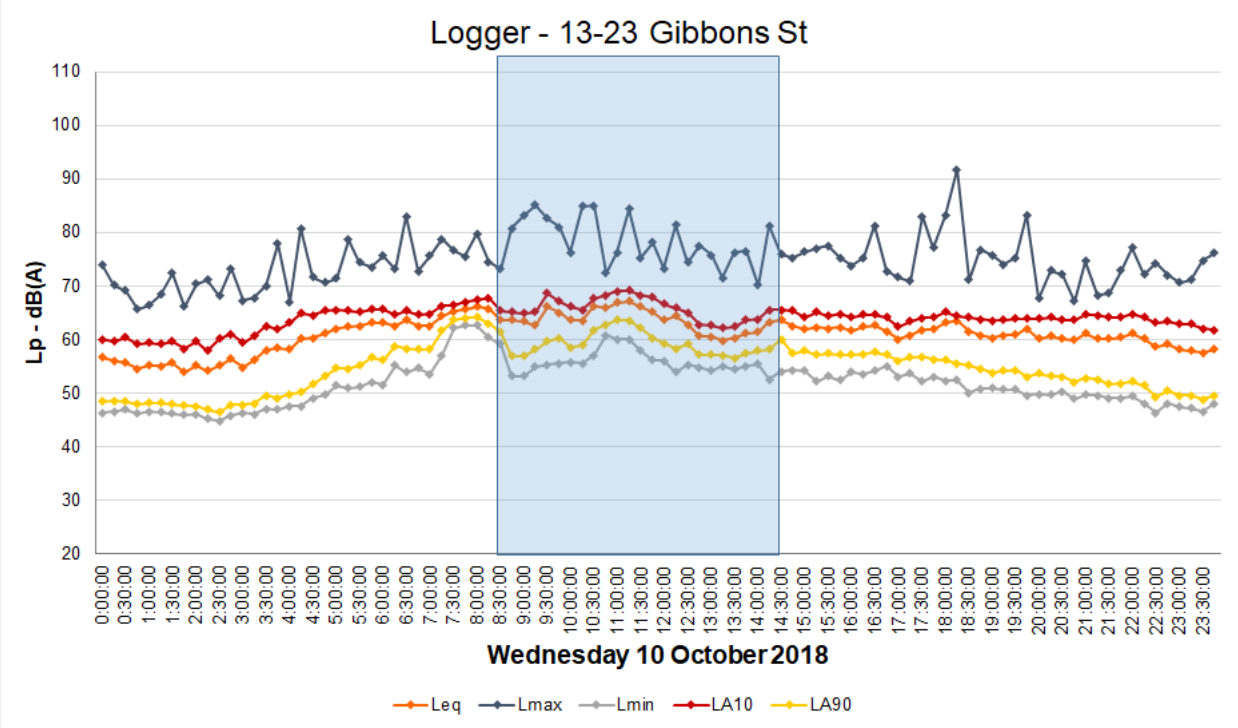
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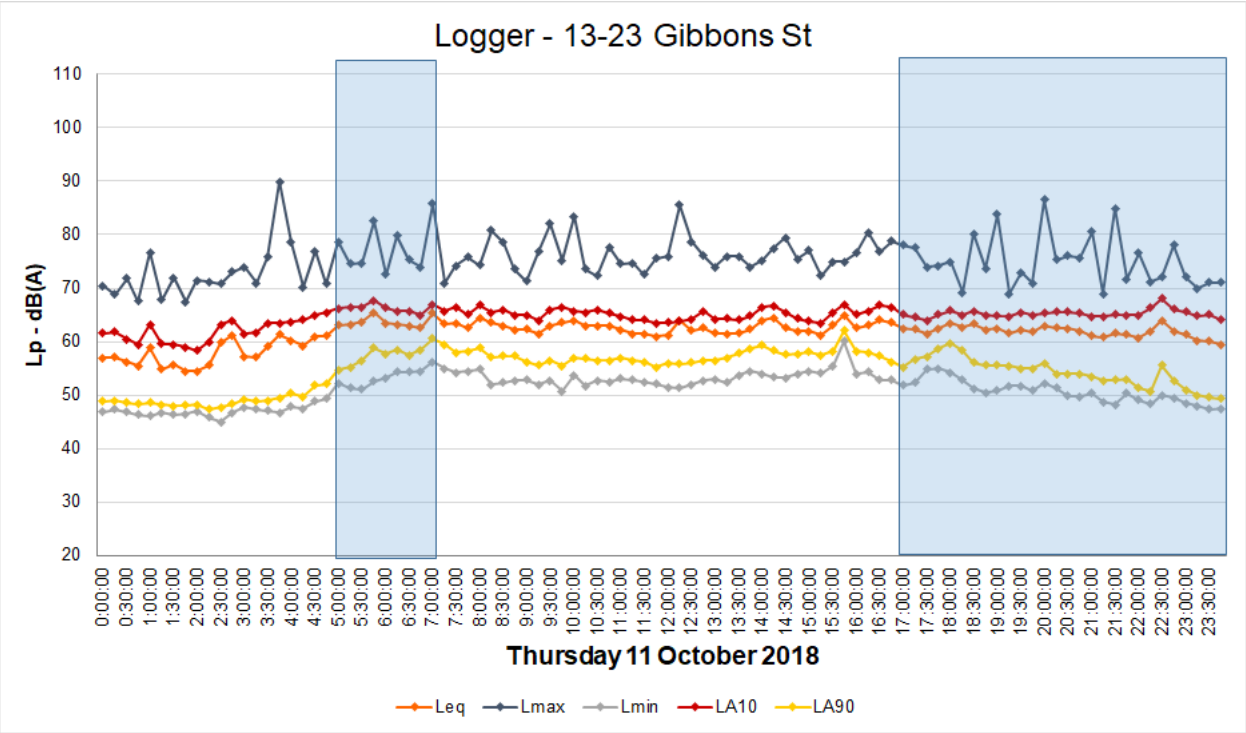
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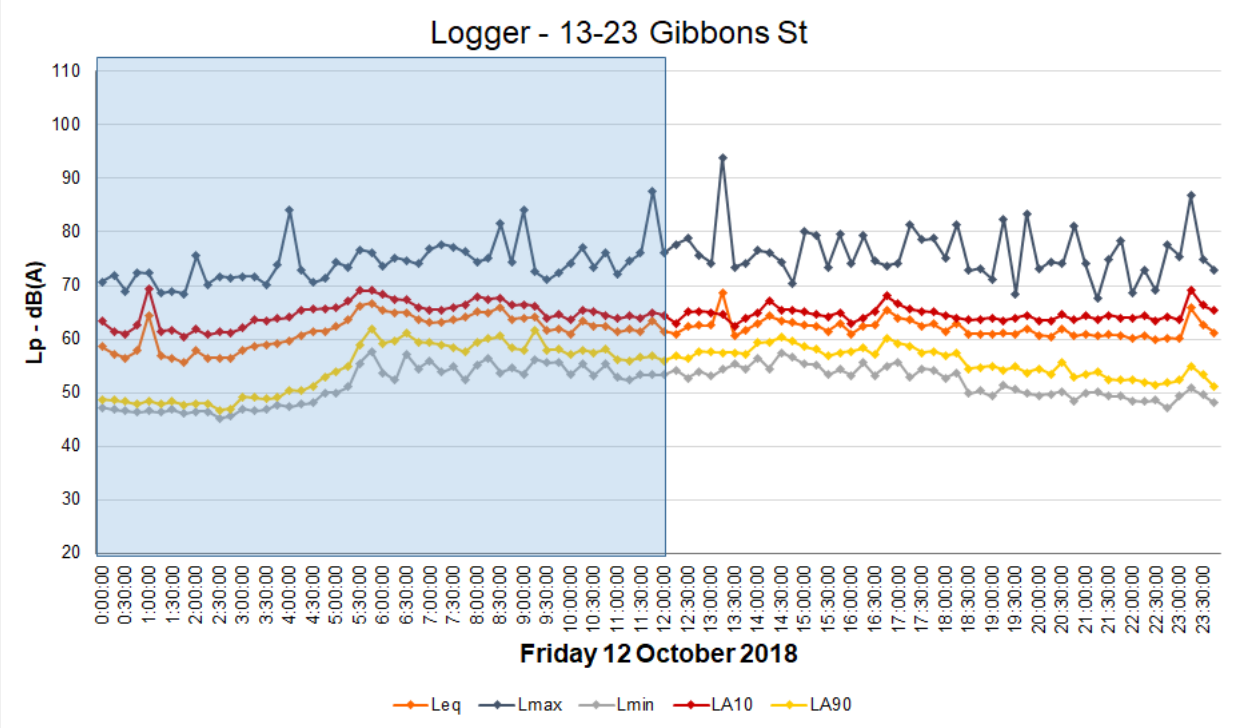
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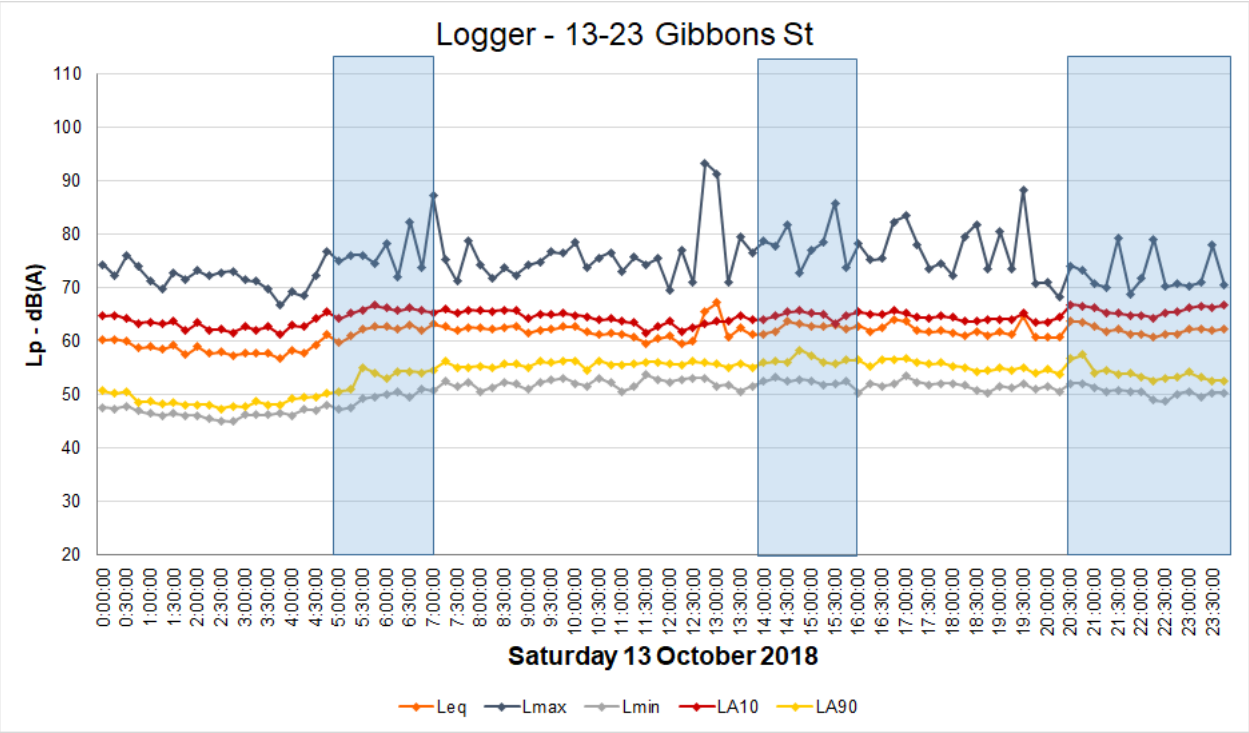
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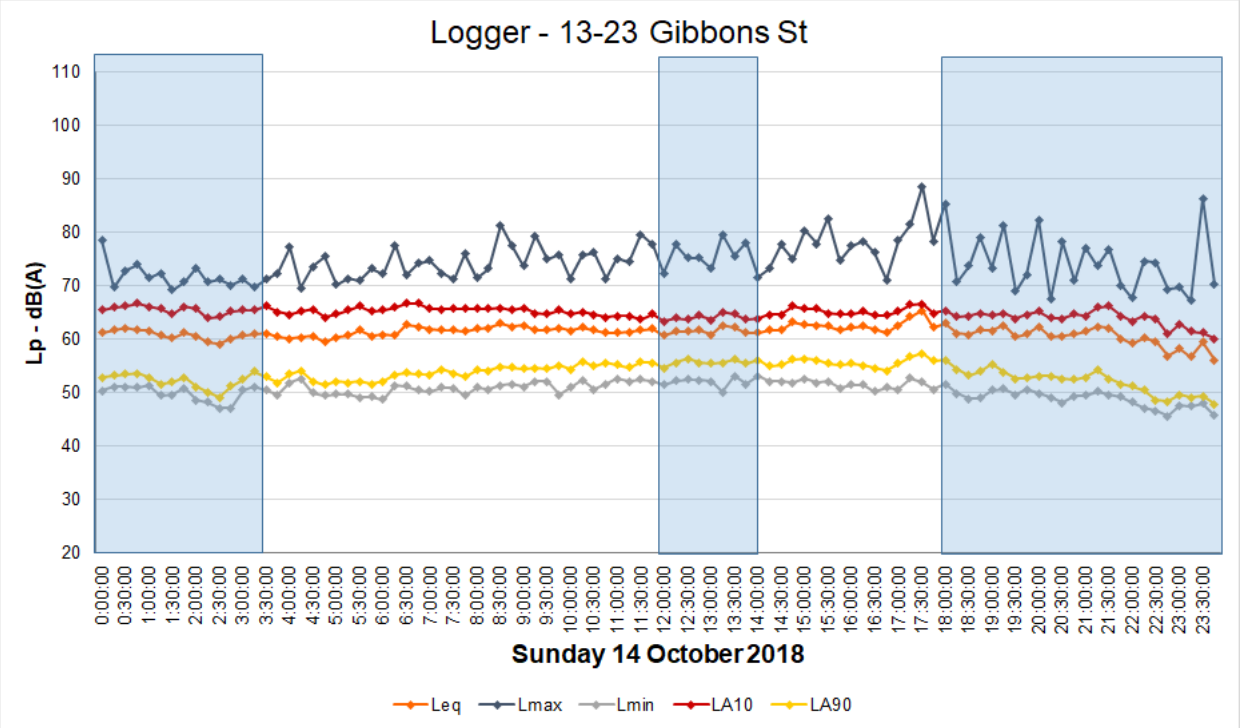
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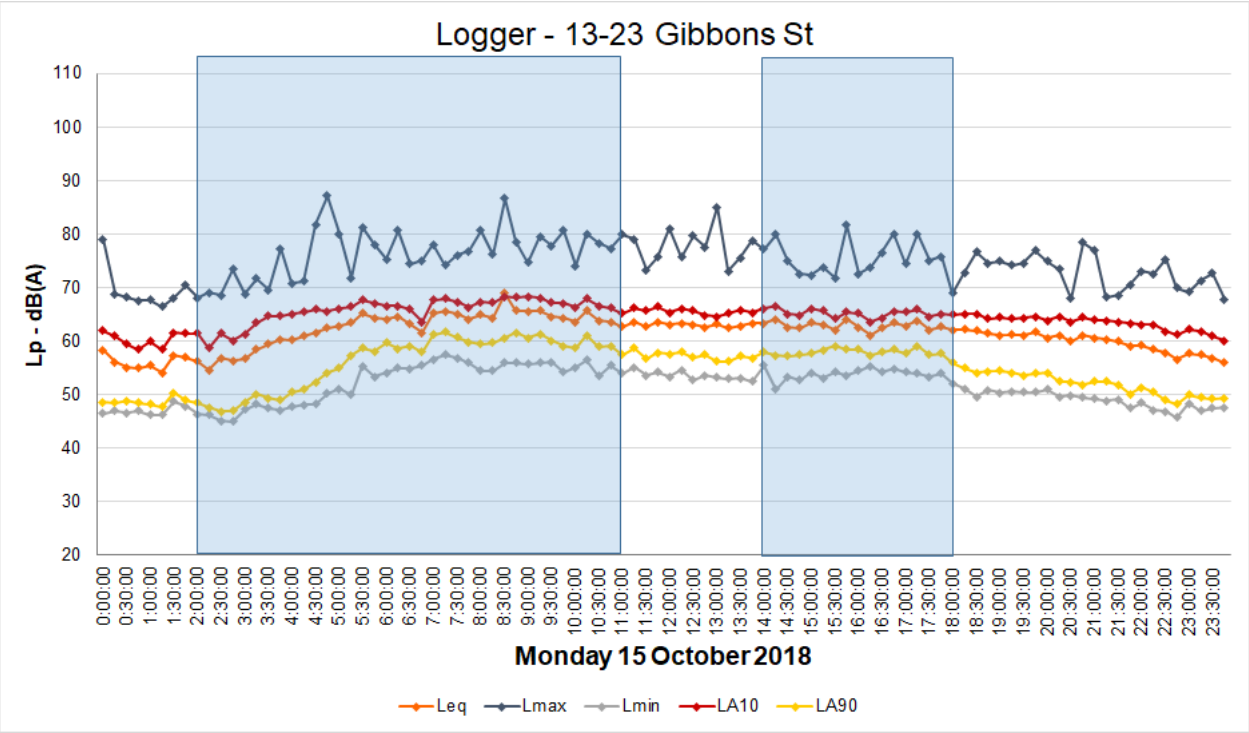
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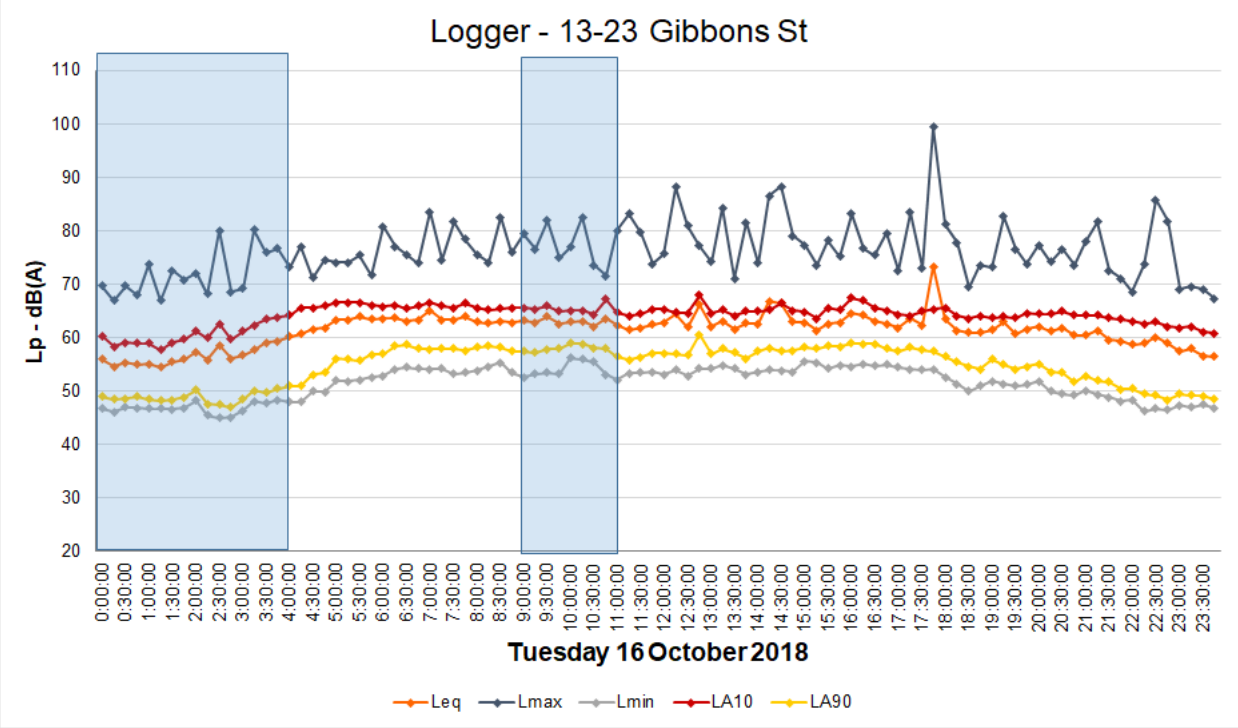
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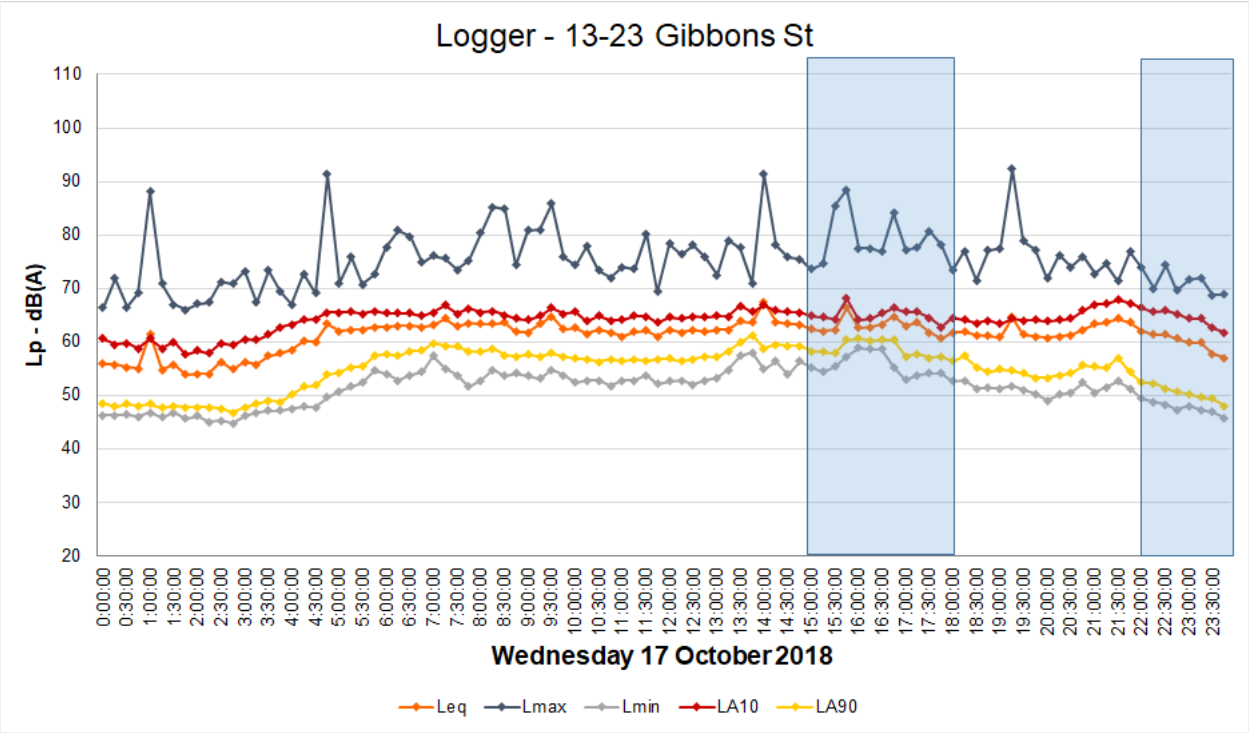
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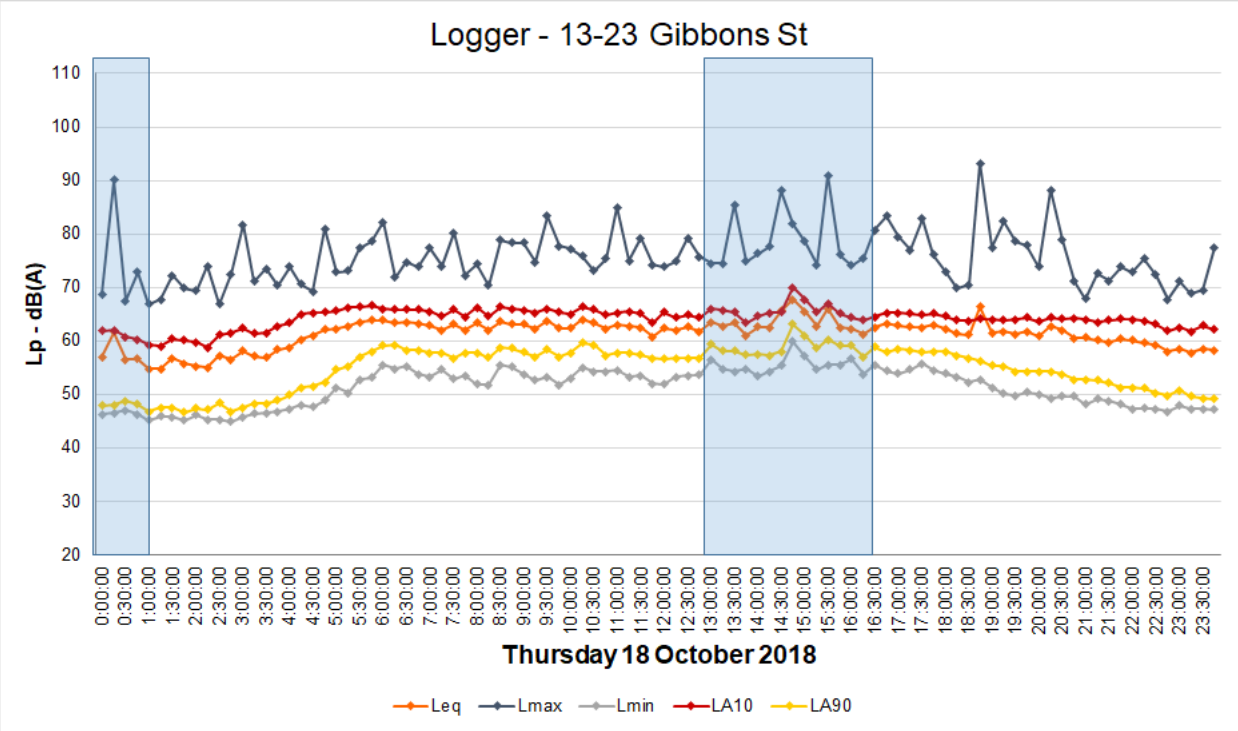
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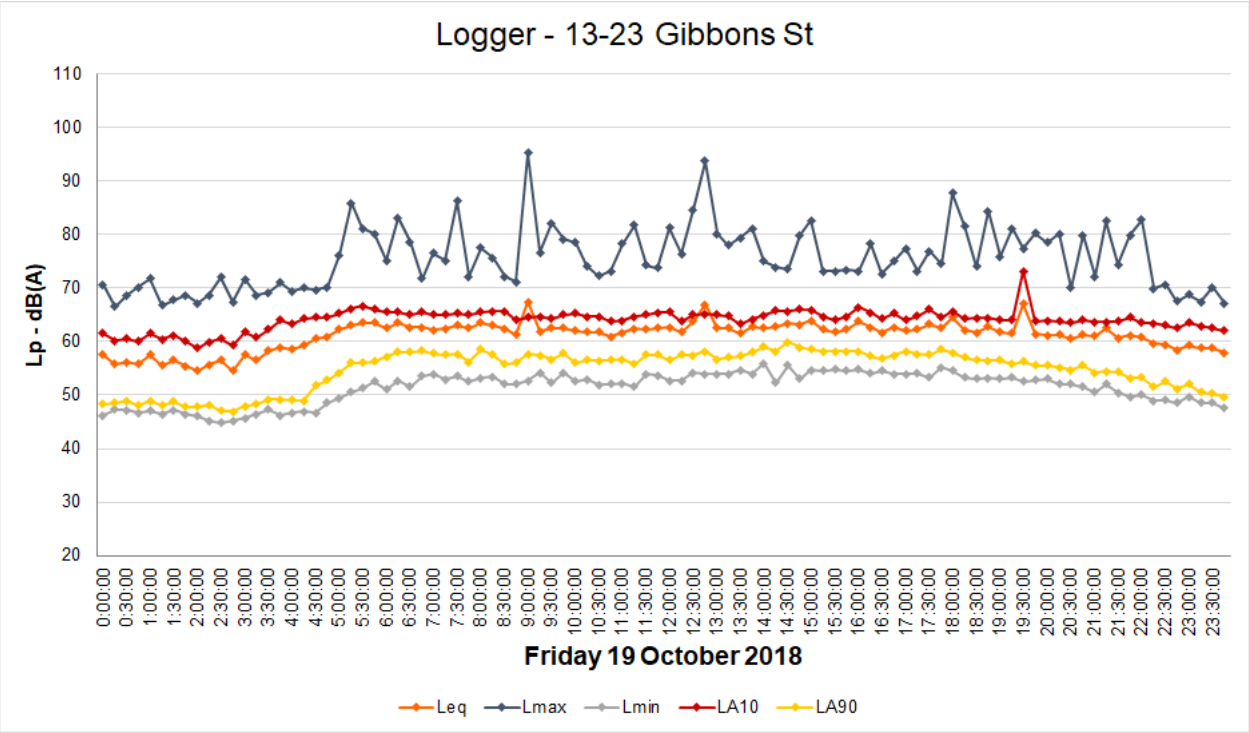
Logger - 13-23 Gibbons St
Lp - dB(A)
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Friday 19 October 2018
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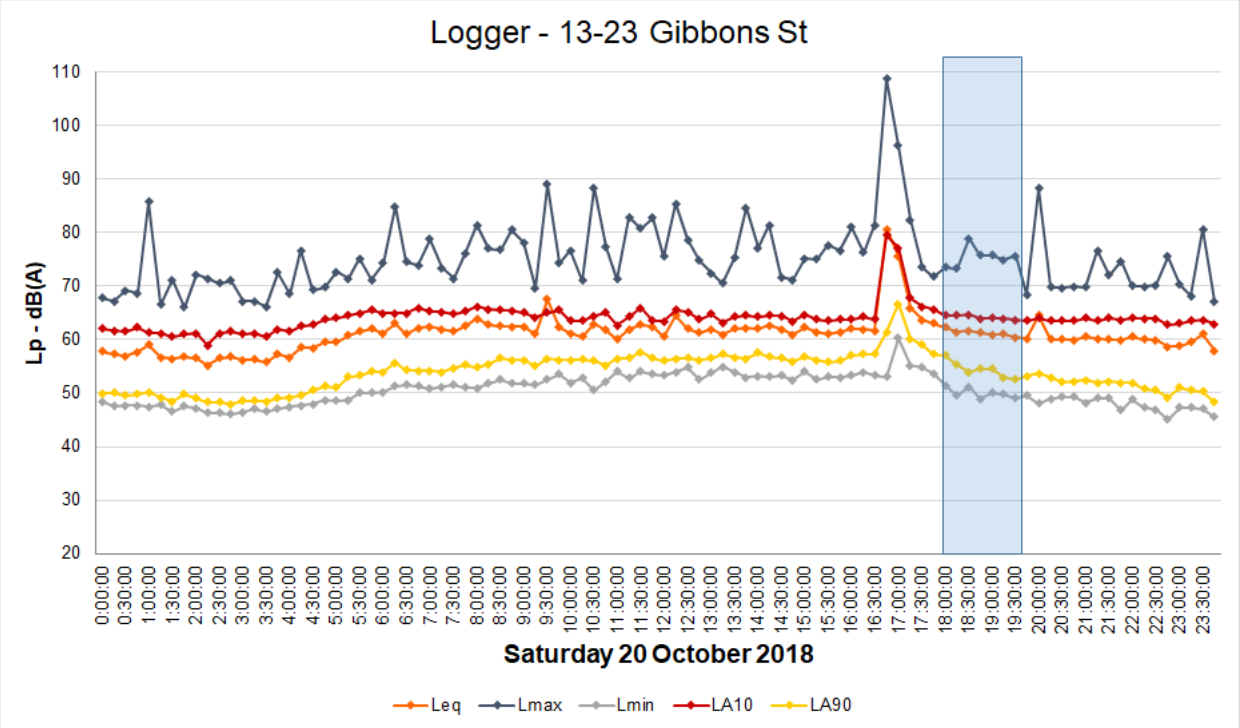
Logger - 13-23 Gibbons St
Lp - dB(A)
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Saturday 20 October 2018
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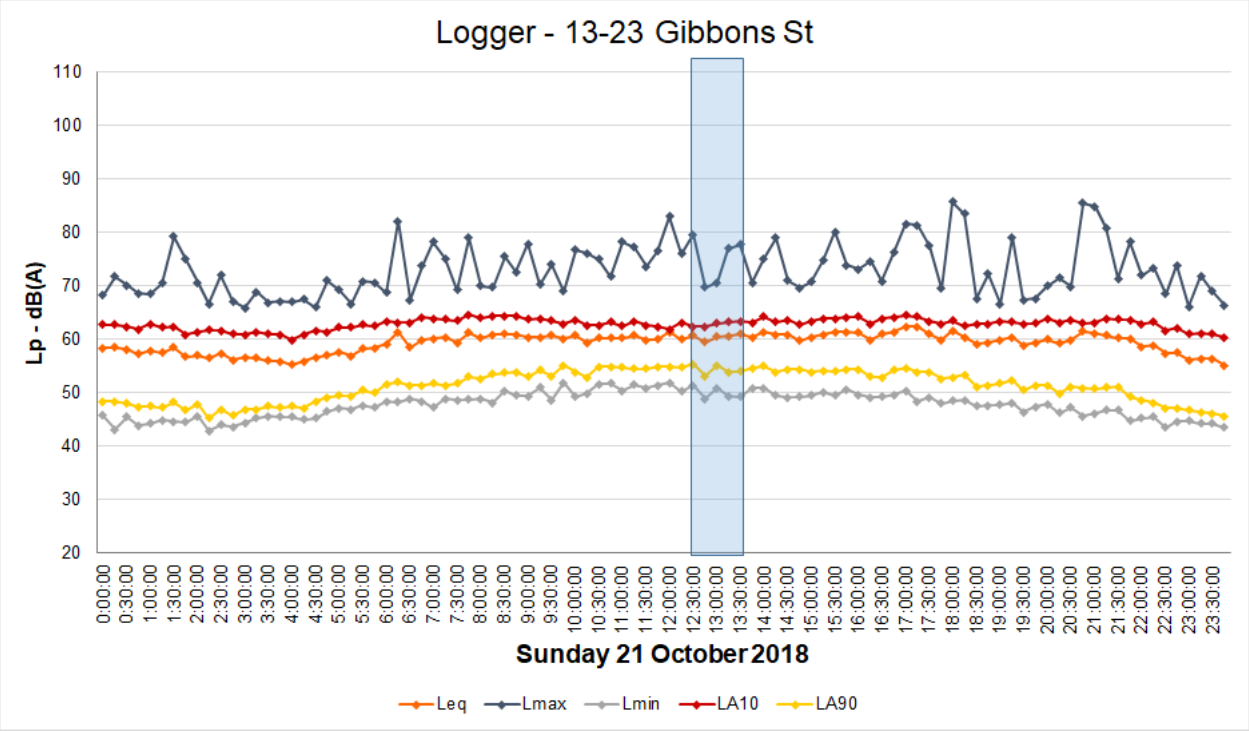
Logger - 13-23 Gibbons St
Lp - dB(A)
Sunday 21 October 2018
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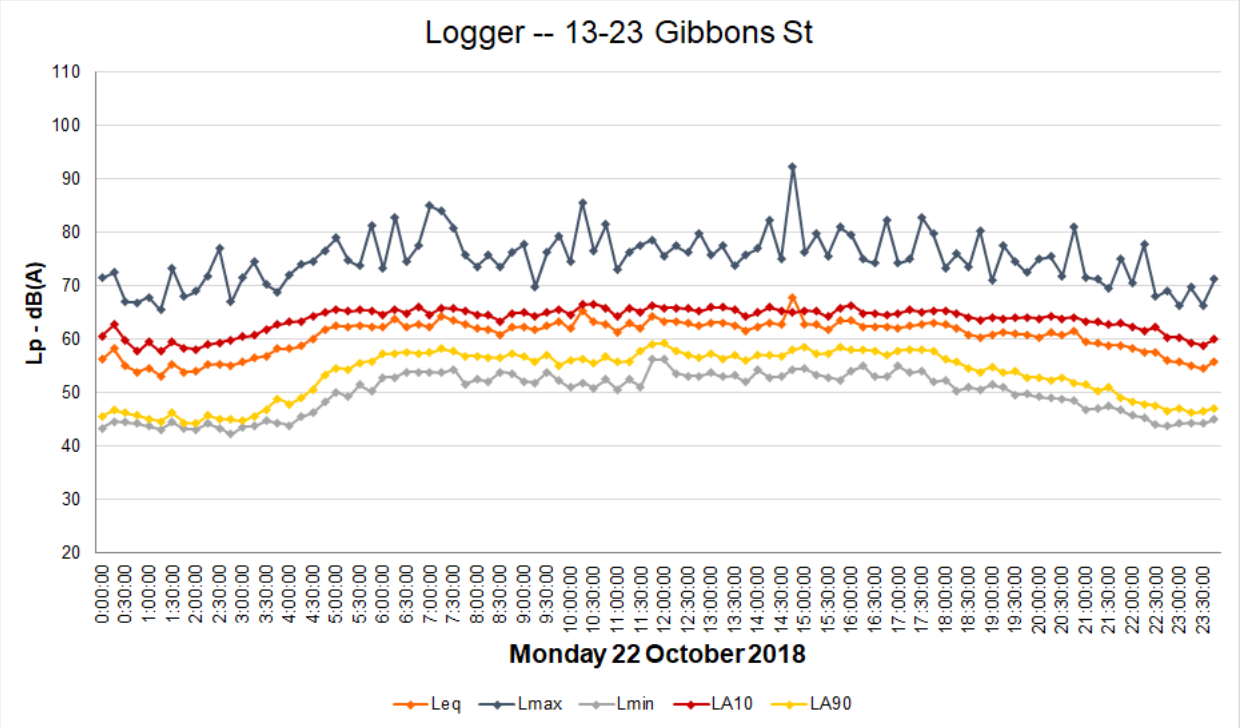
Logger -- 13-23 Gibbons St
Lp - dB(A)
Monday 22 October 2018
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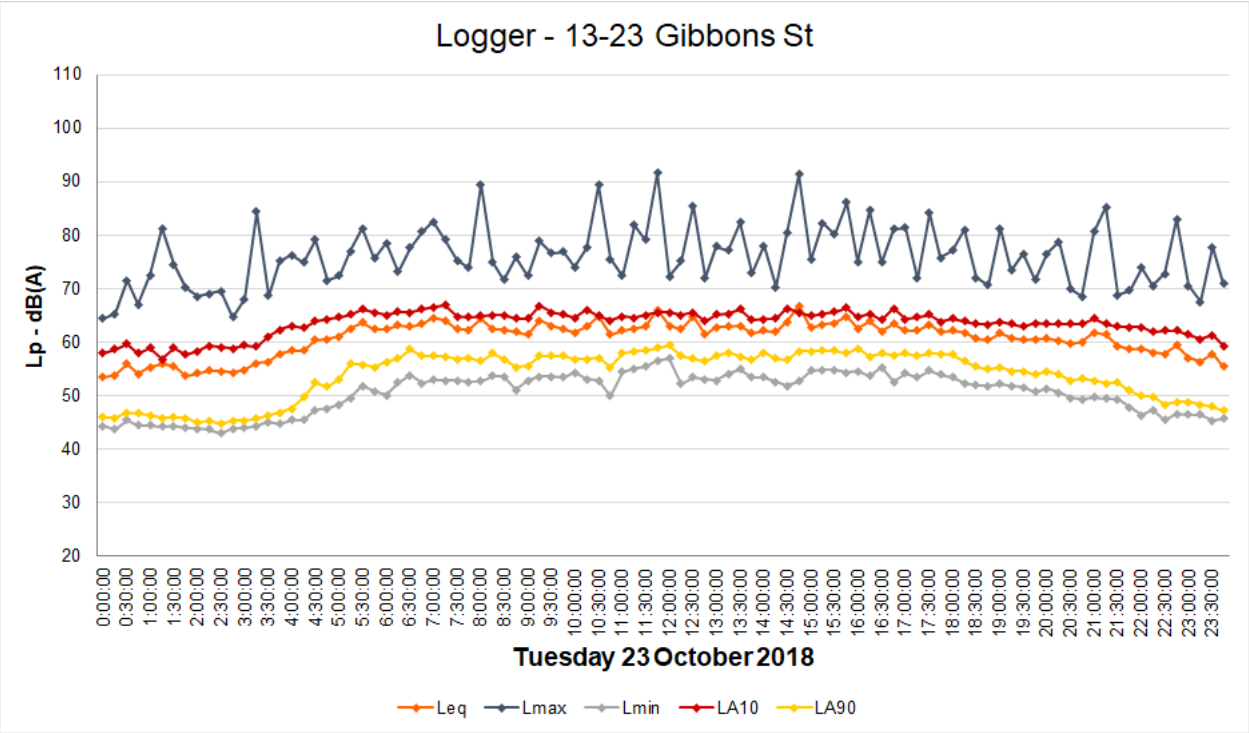
Logger - 13-23 Gibbons St
Lp - dB(A)
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Tuesday 23 October 2018
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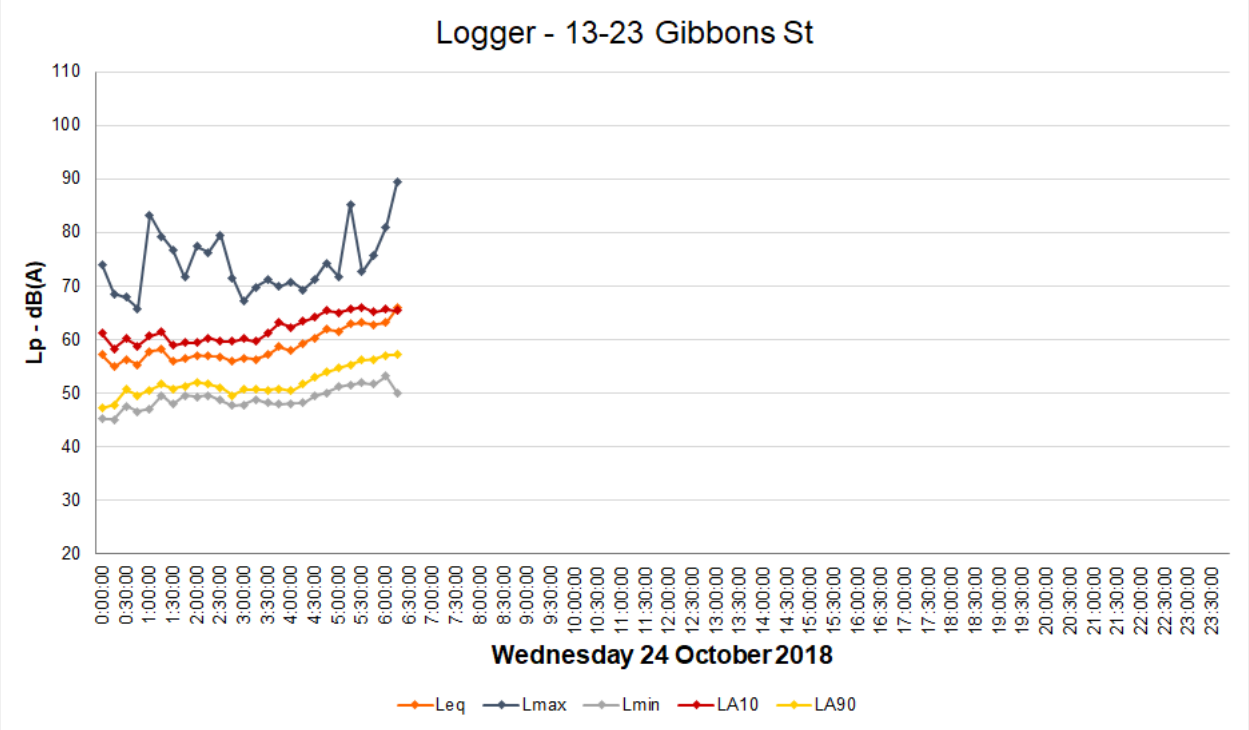
Logger - 13-23 Gibbons St
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Wednesday 24 October 2018
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