Paediatric Services Building, The Children's Hospital at Westmead

Acoustic Report

Development Application

Prepared for: Health Infrastructure c/- PwC

Attention: Hanan Husani

Date: 30th September 2021

Prepared by: Mia Strembickyj | Julia Knight

Ref: 44311-1

Stantec Australia Pty Ltd
Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
Tel: +61 2 8484 7000 Web: www.stantec.com

Stantec

Revision

Revision	Date	Comment	Prepared By	Approved By
001	01/11/2020	Draft Issue	MIS	ORFG
002	25/11/2020	Updated with Comments	MIS	ORFG
003	21/01/2021	Updated with SEARs requirements	MIS	ORFG
004	22/01/2021	Updated with Construction Assessment	MIS	ORFG
005	05/03/2021	Updated with DPIE Comments	MIS	ORFG
006	16/03/2021	Updated for work outside of standard hours	ORFG	ORFG
007	16/03/2021	Updated OOHW Comments	ORFG	ORFG
008	17/03/2021	Minor changes with PwC Comments	MIS	ORFG
009	04/06/2021	Updated for Response to Submissions	JUK	MST
010	26/08/2021	Update section 11 Construction Noise and Vibration mitigation minimum requirements	MST	MST
011	24/09/2021	RtS clarifications included in body	MST	MST
012	30/09/2021	Update of construction dates 9.1.5	MST	MST

Stantec is a proud member of the Association of Australian Acoustical Consultants (AAAC).

AAAC members are competent and capable in the acoustic field. Members of the AAAC provide professional unbiased advices and recommendations in order to deliver practical innovative and cost effective solutions to their clients.

AAAC members are bind to a specific code of professional conduct which can be consulted on the AAAC website: http://www.aaac.org.au/au/aaac/ethics.aspx

Contents

Contents

Contents

List of Figures

Contents

List of Tables

Contents

1. Executive Summary

Based on the findings and recommendations of this noise and vibration impact assessment, the following measures are suggested to mitigate the identified impacts of the development:

Table 1: Summary of suggested mitigation measures

Mitigation Measures
Construction Noise – Section 11.1.1 Monitoring and hoarding mitigation measures have been outlined in this section
Construction Vibration – Section 11.1.2 Monitoring is to be conducted during the entire construction program
Emergency Generator Noise Emissions – Section 8.3 Acoustic attenuators to be installed as outlined in Section 8.3 with the required insertion losses
Helicopter Noise Emissions No additional mitigation measures are required
Loading Dock Noise Emissions No additional mitigation measures are required
Mechanical Noise Emissions – Section 8.2 Acoustic louvres to be installed as outlined in Section 8.2 with the required insertion losses.
External Noise Intrusion – Section 8.6 Façade of the proposed development to meet the minimum acoustic demand requirements outlined in Section 10.1 and Appendix D

2. Introduction

The purpose of this report is to provide an environmental noise impact assessment as part of the State Significant Development Application (SSDA) for the new PSB Building located within The Children's Hospital at Westmead. The proposed work will involve the construction of a new medical facility.

The proposal seeks consent for the construction of a new Paediatric Services Building (PSB) to be located adjacent to the CASB, and on the site of the decommissioned P17 car park, including development of the Hawkesbury Road forecourt and access links. This includes works associated with CHW forecourt on Hawkesbury Road to provide improved community amenity in the form of a new front entry, improved street frontage and enable a more cohesive main entrance connecting existing CHW, adjoining research facilities, and the PSB.

The scope of proposed works includes:

- Construction of the main PSB:
  - The main PSB may contain the following uses: perioperative and interventional services, neonatal and paediatric intensive care units, cancer centre, acute inpatient beds, back of house and parent facilities; and
  - Alterations and additions to existing CHW KR and CASB buildings adjoining PSB site area to accommodate floor realignment and movement corridors
  - Construction of a new pedestrian canopy link through KR, connecting the main PSB with the CHW forecourt and existing hospital entrance
- The canopy link is to be lifted 2 storeys above the CHW forecourt
  - A new ground plane / forecourt landscaped area extending from Hawkesbury Road to the proposed PSB
  - Tree removal to accommodate the construction of the PSB

This assessment discusses the likely noise impact on the potentially nearest most-affected receivers (residential and surrounding Hospital buildings) of the proposed development.

This assessment has been prepared considering the documents listed in Section 3.2.

The report provides:

- A statement of compliance with the Parramatta Development Control Plan (DCP) 2011 criteria for the proposed hospital development within the vicinity of the nearest potentially affected residential receivers.
- A compliance with Secretary's Environmental Assessment Requirements for proposed development of Paediatric Services Building (PSB) Westmead Children Hospital (SSD-10349252)
- Recommendations for noise mitigation measures for the proposed development in order to meet the City of Parramatta Council criteria when compliance is not achieved.
- Traffic noise impact assessment associated with the proposed Hospital development.
- Construction noise and vibration criteria.

This noise assessment is based on noise data collected by noise loggers located at representative locations close to the site, shown in Figure 1.

This report is based on our understanding of the proposed project, application of the relevant state guidelines and professional experience within the acoustic field. Therefore, this report shall not be relied upon as providing any warranties or guarantees.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 20 November 2020 and issued for the detailed SSD DA. Specifically, this report has been prepared to respond to the SEARs requirements summarised below.

Item	Description of requirement	Section reference
10	**Noise and Vibration** Provide a noise and vibration impact assessment that: • considers potential impacts of all stages of the development on all potentially impacted environments, sensitive receivers, stakeholders and future developments.	Section 9
	• includes a quantitative assessment of the main noise and vibration generating sources during demolition, site preparation, bulk excavation and construction.	Section 9.1.5
	• details the proposed construction hours and provide details of, and justification for, instances where it is expected that works would be carried out outside standard construction hours.	Section 9.1.1
	• includes a quantitative assessment of the main sources of operational noise, including consideration of any mechanical services (e.g., air conditioning plant).	Section 8.2
	• outlines measure to minimise and mitigate the potential noise impacts on nearby sensitive receivers.	Section 1
	• considers sources of external noise intrusion in proximity to the site (including, road rail and aviation operations) and identifies building performance requirements for the proposed development to achieve appropriate internal amenity standards.	Section 8.6
	• demonstrates that the assessment has been prepared in accordance with polices and guidelines relevant to the context of the site and the nature of the proposed development.	Section 3.2

3. Background

3.1 Information Sources

- This assessment was based on the concept design architectural drawings provided by Billard Leece dated 16 November 2020.
- Noise data collected on site using noise loggers and a Type 1 handheld sound level meter.
- Generic noise data of mechanical plant based on manufacturers catalogues.

3.2 Reference Documents

- City of Parramatta Council Development Control Plan 2011.
- New South Wales Environment Protection Authority (NSW EPA), Noise Policy for Industry (NPI) 2017.
- New South Wales (NSW) Department of Environment Climate Change and Water (DECCW) Interim Construction Noise Guideline July 2009.
- Australian Standard, AS 2436-1981, “Guide to Noise Control on Construction, Maintenance and Demolition Sites”.
- Australian Standard, AS 2021-2000 Acoustics - Aircraft noise intrusion - Building siting and construction.
- Australian Standard, AS 2822 – 1985 Acoustics – Methods for assessing and predicting speech privacy and speech intelligibility.
- Air Services Australia, “Environmental principles and procedures for minimizing the impact of aircraft noise”.
- “Fly neighborly guide”, produced by the Helicopter Association International.
- NSW Health Infrastructure - Engineering Services Guidelines (GL2016_020 dated 26 August 2016), including Design Guidance note no. 13 rev A July 2017 issued 19/07/2017 with Section 13 Acoustics July 2017 update
- Development Near Rail Corridors and Busy Roads – Interim Guideline (Department of Planning 2008).
- Secretary’s Environmental Assessment Requirements for proposed development of Paediatric Services Building (PSB) Westmead Children Hospital (SSD-10349252).

4. Project Overview

4.1 Site Description

The proposed site for the Paediatric Services Building at the Children's Hospital at Westmead is located along Redbank Rd, between the Central Acute Services Building (CASB) and existing Block 3, 4 & 5 within the Children's Hospital buildings (KRI and Diagnostics).

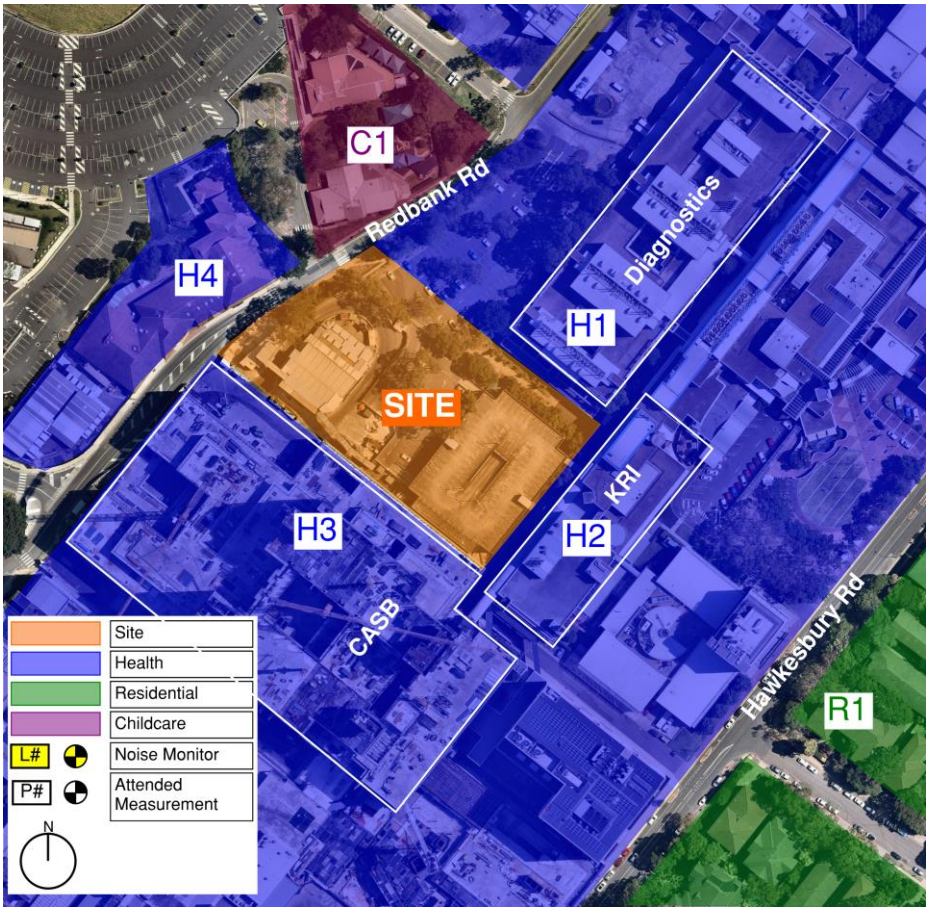
The acoustic issues relating to the development are as follows:

- Noise intrusion from vehicle movements on Redbank and Hawkesbury Rd into the development's habitable areas.
- Noise emissions from mechanical plant from the development to the surrounding receivers.
- Noise emissions from proposed helicopter pad from the development rooftop to the surrounding receivers.

The nearest potentially affected noise receivers (shown in Figure 1) have been identified as follows:

- Receiver North, Childcare premises across Redbank Road.
- Receiver East, Hospital Building (Diagnostics/Block 5 CHW) directly adjacent.
- Receiver West, Hospital Building (CASB) directly adjacent.
- Receiver South, Hospital Building (KRI) directly adjacent and Residential properties across Hawkesbury Road.

Figure 1: Overview of the Site



Source: nearmap.com

5. Site Noise Investigations

The Environment Protection Authority Noise Policy for Industry (EPA NPI, 2017) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods.

The NPI defines these periods as follows:

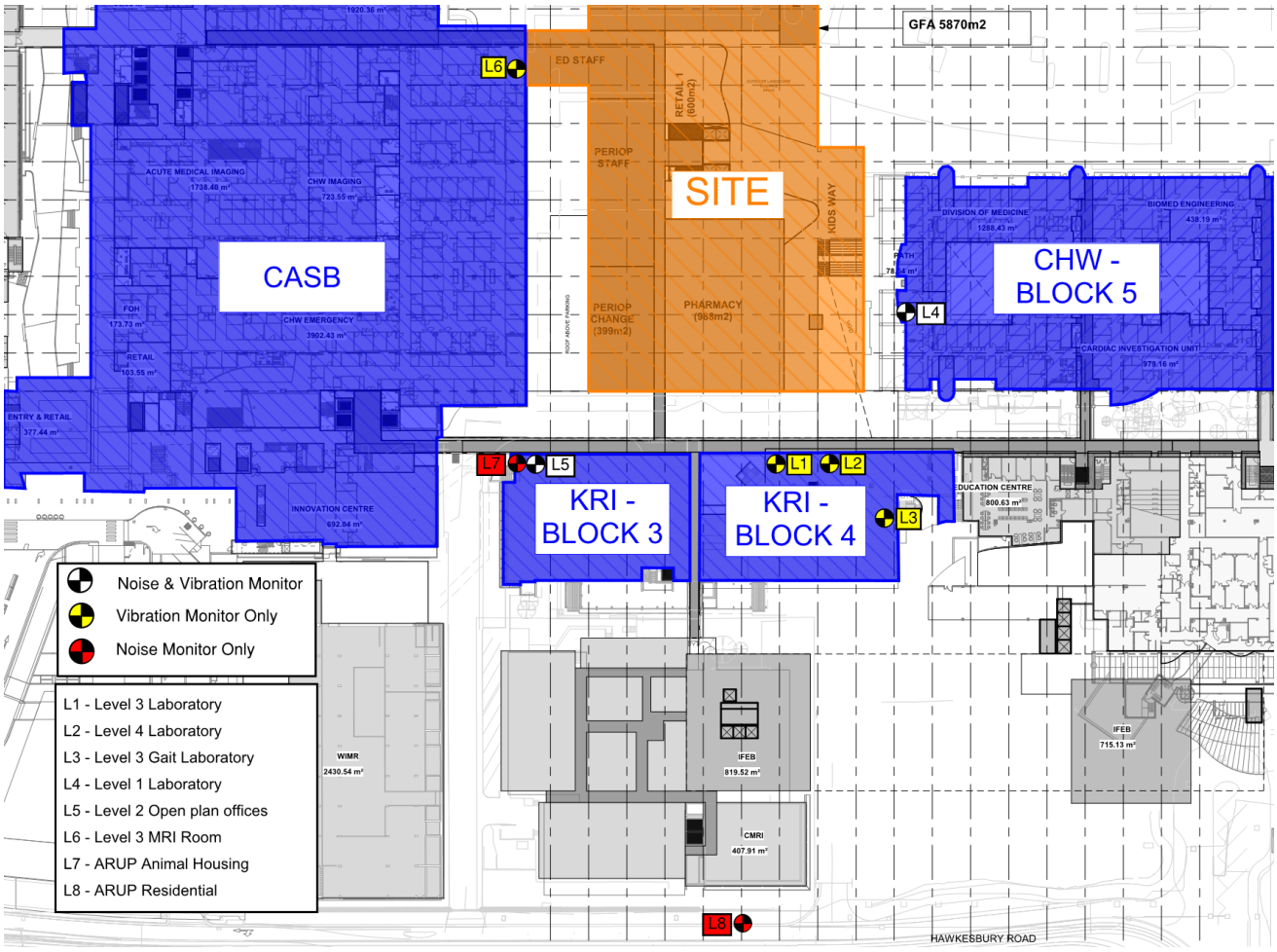
- Day is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- Night is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

Previous noise monitoring was undertaken at locations illustrated in Figure 2 below during the early works of the Children's Hospital Westmead Stage 2 development by Stantec Australia.

Results from monitoring for nearby residential receiver and animal housing facility located in Block 3 of KRI have been conducted previously by ARUP. These results of the monitoring were obtained prior to the COVID-19 pandemic and prior to major construction works. Please refer to Section 5.1 for further information.

The existing background noise of the site is typical for a suburban area that has characteristically intermittent local traffic flows with some limited commerce or industry.

Figure 2: Overview of Internal Site and Measurement Locations



In addition to the internal noise monitoring, external noise monitoring was also conducted to the closest residential receivers.

The existing background noise of the site is typical for a suburban area that has characteristically intermittent local traffic flows with some limited commerce or industry.

Figure 3: Overview of the External Site and Measurement Locations

Source: nearmap.com

5.1 COVID-19 Pandemic and Effects on Noise Surveys

Site noise surveys have been previously conducted by Stantec Australia during the early stage works of the project to gain an understanding of the internal background levels within the surrounding buildings.

The surrounding receivers within the hospital precinct have various machinery and activities creating noise emissions internally within each space. Noise monitoring was conducted within a variety of different spaces, including labs and offices, to understand typical internal noise levels for the end users. Internal noise monitoring for the health receivers (H1, H2, H3 & H4) shown in Figure 2 was considered to be more representative of the ambient noise levels over external due to nearby major construction works.

Internal noise monitoring results are not considered to be impacted by the COVID-19 pandemic as activities within the hospital areas were carried out as usual.

Previous noise monitoring conducted by ARUP for the nearby residents have also been used for the nearby residential receiver and animal housing facility located in Block 3 of KRI. This is important because the results of the monitoring were obtained prior to the COVID-19 pandemic and prior to major construction works, including the widening of Hawkesbury Road project. The results of the monitoring conducted will be more relevant to typical background noise and traffic noise characteristic of the area under typical conditions.

5.2 Instrumentation

The equipment used for the noise survey was the following:

- NTi XL2 Sound Level Meter, S/N A2A-11555-E0
- Brüel & Kjær Sound Calibrator, S/N 2709826
- ARL Environmental Noise Logger, NL-42EX, S/N 1173759
- Casella Environmental Noise Logger CEL-63X. S/N 1488204
- AVA Monitoring, AvaTrace M80 Vibration Monitor S/N 3019
- Sound spectrum analyser Brüel & Kjær Type 2250, S/N 3011850
- Profound Vibra, Vibration Monitor, S/N VIB0374
- Profound Vibra, Vibration Monitor, S/N VIB0814
- 01 dB ORION, Vibration Monitoring Station with integrated triaxial accelerometer, S/N 10204
- 01 dB ORION, Vibration Monitoring Station with integrated triaxial accelerometer, S/N 10341
- 01 dB ORION, Vibration Monitoring Station with integrated triaxial accelerometer, S/N 10261

All Stantec equipment was calibrated before and after the measurements and no significant drift was found. All equipment carries current traceable calibration certificates that can be provided upon request.

5.3 Short-term (Attended) Survey Results

An attended noise measurement of 15-minute duration was conducted on site by Stantec Australia to characterise the noise intruding into the development and to validate the results of the unattended noise monitoring. A summary of the attended noise measurement taken in the vicinity of the proposed development site and site measurements locations are shown in Figure 3.

Table 2 below displays the summary of the unattended noise measurements.

Table 2: Summary of attended noise measurements

Measurement Location	Measurement Time	L_{Aeq} dB(A)	L_{Amax} dB(A)	Comments
L5	07/04/20 2:18pm	44.3	59.0	No construction works were in operation during this measurement.

5.4 Long-term (Unattended) Survey Results

5.4.1 Background Noise Monitoring

Noise monitors were placed at position L4, L5 & L7 as shown in Figure 3 to measure the background and ambient noise that is representative of the surrounding noise-sensitive receivers. Noise monitor L4 and L5 were installed from the 28th of March 2020 to the 7th of April 2020. The results of the unattended background and ambient noise survey is shown in Table 3 below (for the day, evening and night periods).

Table 3: Unattended noise measurements of L4 and L5

Location	Equivalent Continuous Noise Level $L_{Aeq,period}$ - dB(A)			Background Noise Level RBL - dB(A)		
	Day	Evening	Night	Day	Evening	Night
L4	55	52	52	52	52	52
L5	42	40	32	31	40	31
L7	51	52	48	43	44	42

The local ambient noise environment for L4 included the operation of noisy medical equipment throughout the majority of the day, evening and night periods. The local ambient noise environment for L5 included nearby construction noise and general day-to-day office activities throughout the majority of the day, evening and night periods. Note that any rain affected data during the period of logging has been excluded from the calculations.

Refer to Figure 4, Figure 5 and Figure 6 for the noise data.

Figure 4: Unattended background and ambient noise monitoring data – L4

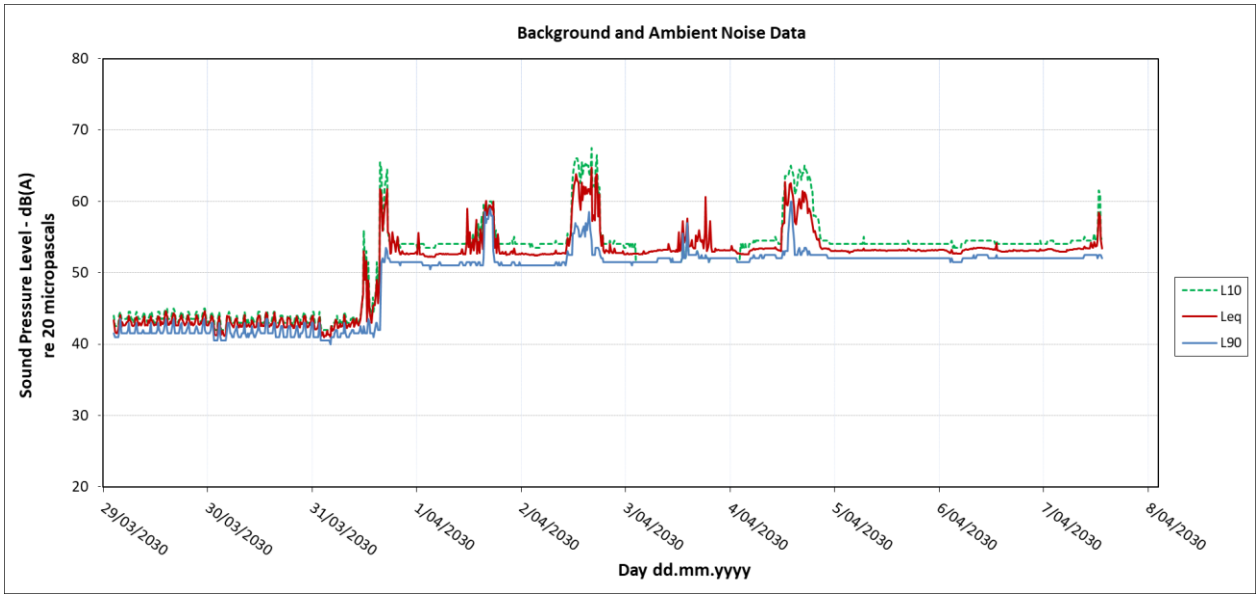


Figure 5: Unattended background and ambient noise monitoring data – L5

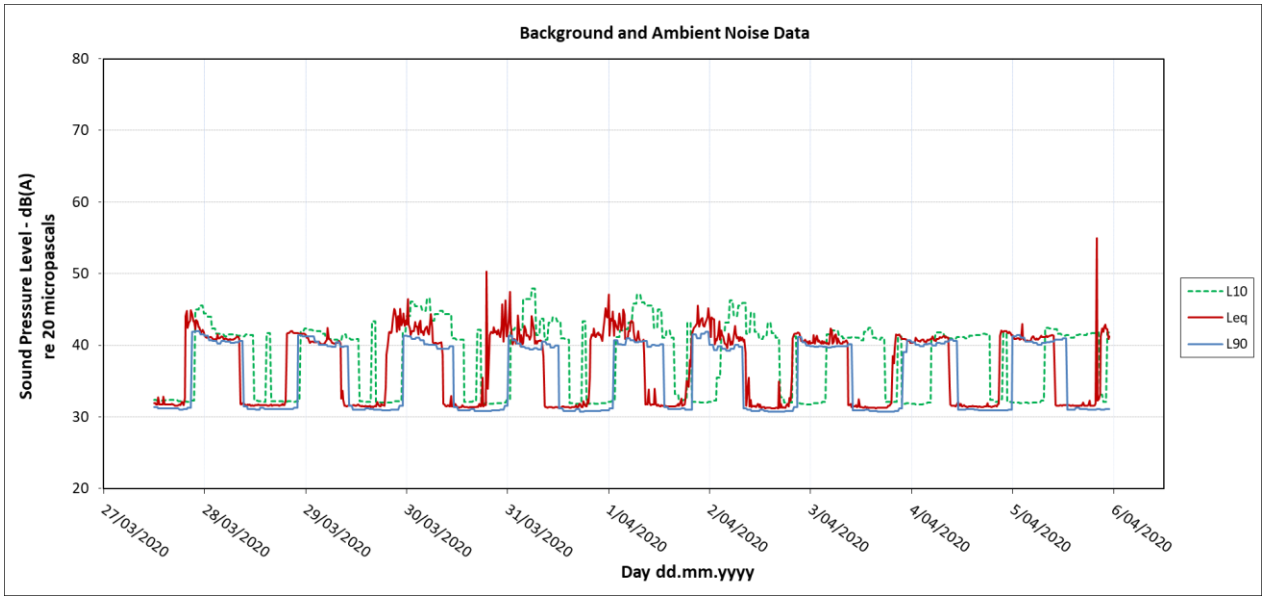
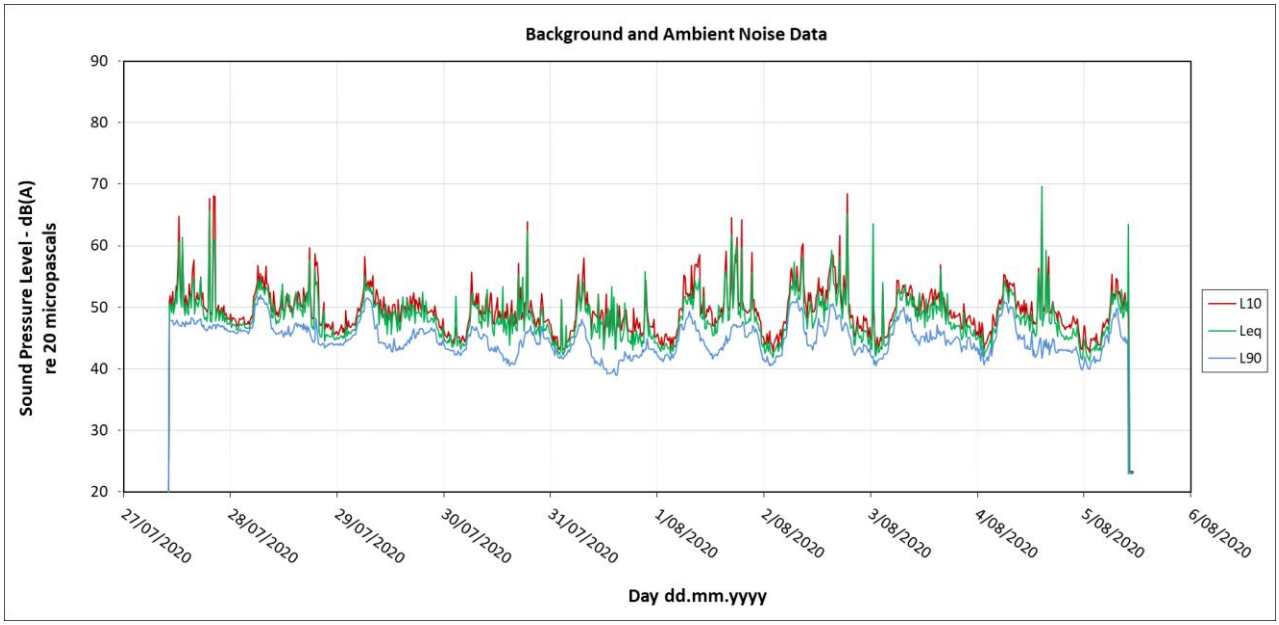


Figure 6: Unattended background and ambient noise monitoring data – L7



ARUP has previously conducted long-term unattended (baseline) measurements during the EIS in October 2016, which is presented in the noise monitoring report "Ford Civil Contractor (FCC) Hawkesbury Road Widening Works - Noise Monitoring Noise monitoring report - 2019-10-16 to 2019-11-15" report AC09 Issue 1, 11 December 2019.

This is important because the results of the monitoring were obtained prior to the COVID-19 pandemic and prior to major construction works, including the widening of Hawkesbury Road project. The results of the monitoring conducted will be more relevant to typical background noise and traffic noise characteristic of the area under typical conditions.

Please refer to Table 4 for the long-term unattended (baseline) measurements reported by ARUP dated 11 December 2019 and Figure 3 for the location of these monitors.

Table 4: Arup Unattended Noise Survey Results

Location	Equivalent Continuous Noise Level $L_{Aeq,period}$ - dB(A)			Background Noise Level RBL - dB(A)		
	Day	Evening	Night	Day	Evening	Night
L8	60	60	55	49	48	47

5.4.2 Baseline Vibration Monitoring

Vibration monitors were placed at positions L1, L2, L3, L4, L5 & L6 as shown in Figure 2 to measure the current vibration impact affecting the surrounding vibration sensitive receivers and equipment. All vibration monitors were installed from the 28th of March 2020 to the 7th of April 2020. The results of the unattended baseline vibration survey are shown in Table 5 below.

Table 5: Baseline vibration measurements

Location	Velocity (mm/s)		
	Average	Max	Criteria (ASHRAE 2011)
L1	-	-	0.05
L2	0.11	0.20	0.05
L3	0.03	0.21	0.05
L4	0.04	0.66	0.05
L5	0.03	0.54	0.4
L6	0.06	0.79	0.05

5.5 Summary of Noise Investigations

The site noise investigations are a key piece of information when understanding the existing ambient noise environment characteristic of the surrounding receivers to the proposed development. For the nominated criteria outlined in Section 6 where the measured results are required as the basis of the criteria, historical site noise investigation results, have been used because this more accurately reflects the ambient noise level for each noise catchment area (historical site noise investigation results were not affected by COVID-19 pandemic).

In Figure 7 we have identified the nearby receivers as outlined below. Within each labelled receiver we have outlined the mixed types of receivers. In Section 8, assessments have been conducted to the receiver with the most stringent criteria listed below.

- R1
  - Residential
- R2
  - Residential
- H1
  - Critical lab areas
  - Medical exam rooms
  - Office areas
- H2
  - Critical lab areas
  - Medical exam rooms
  - Office areas
- H3
  - Critical lab areas
  - Medical exam rooms
- H4
  - Office areas
- C1
  - Childcare

Figure 7: Overview of the Site and Receivers

Source: nearmap.com

6. Operational Noise and Vibration Criteria

6.1 Internal Noise Levels

6.1.1 Engineering Health Services Guidelines

Environmental noise intrusion to the Children's Hospital Westmead is to comply with the satisfactory internal noise level targets listed in Table 6.

Table 6: Acoustic Requirements

Area Designation	A		B	F
	Continuous Internal Noise Levels, L_{Aeq} dB		Intermittent Internal Noise Level L_{Amax} dB [9]	Emergency Generator Noise Limit L_{Amax}, dB [11]
	Satisfactory	Maximum		
Clinical				
Operating Theatre	40	45	55	+5
Birthing Room or Delivery Suite	45	50	65	+5
Intensive Care	40	45	60	+5
Patient Room / Single Bed Ward	35	40	55[10]	+5
Multi Bed Ward	35	40	55[10]	+5
Toilet / Ensuite	50	55	-	+10
Patient Corridor	40	50	-	+10
Counselling/ Bereavement / Interview Room	40	45	60	+5
Consult Room	40	45	60	+5
Speech and Language Therapy	35	40	60[6]	+5
Treatment / Medication/ Examination Room	40	45	60[6]	+5
Public Areas				
Corridors and Lobby Space	40	50	-	+10
Cafeterias / Dinning	45	50	-	+10
Toilets	45	55		+10
Waiting Rooms, Reception Areas	40	50	-	+10

Area Designation	A		B	F
	Continuous Internal Noise Levels, L_{Aeq} dB		Intermittent Internal Noise Level L_{Amax} dB (9)	Emergency Generator Noise Limit L_{Amax}, dB (11)
	Satisfactory	Maximum		
Multi Faith / Chapel	30	35	-	+5
Staff / Back of House Areas				
Meeting Room	35	40	-	+5
Board / Conference Room (Large)	30	35	-	+5
Open Plan Offices	40	45	-	+5
Private Offices	35	40	-	+5
Multi Person Offices	40	45	-	+5
Locker Room	50	55	-	+10
Rest Room	40	45	-	+5
Classrooms, Training Rooms	35	40	-	+5
Lecture Theatre	30	35	-	+5
Library	40	45	-	+5
Workshops	45	50	-	+10
Plant Rooms	N/A	<85	-	-
Laboratory	45	50	-	+10

Notes:

1. All sound pressure levels referenced to 20 micro-Pascals (dB re 20 µPa).

2. For Column A, Leq noise levels should be measured over a repeatable, worst-case one hour period. A one hour averaging period has been selected to best represent impacts from continuous noise sources, and any frequently occurring intermittent noise sources.

9. The acceptability of any intrusive noise depends on the frequency of occurrence, the intrusive noise level and character, plus the sensitivity of the space. The intermittent internal noise levels shown are intended to apply to any frequently occurring intermittent noise sources including rail, internal and external driveways, loading docks, nearby industry, etc. and where the frequency of occurrence of the noise source is sufficiently high or low that adequate control of the intrusive noise level is not achieved via the Column A, Leq noise levels. The project acoustic engineer is required to apply professional judgement in assessing the frequency of occurrence of the intrusive noise, the intrusive noise level and character, plus the sensitivity of the space in order to apply the intrusive noise limits in Column B. Justification of the basis of the design needs to be reported for HI review. The intrusive noise limits in Column B do not apply to noise from commercial aircraft (which is to be assessed in accordance with AS2021).

10. Where a significant, intermittent and intrusive noise source is prevalent, a sleep disturbance assessment is required. The outcome of this assessment shall be included with the acoustic design.

11. Noise levels are set relative to the 'Maximum' continuous internal noise levels from Column A.

6.2 External Noise Emissions

6.2.1 New South Wales (NSW) Noise Policy for Industry (NPI)

The NSW Noise Policy for Industry has been applied to address the noise emissions from the development to the surrounding noise-sensitive receivers. The NSW NPI sets out noise criteria to control the noise emission from industrial noise sources generated by the proposed development. Operational noise emissions from the development shall be addressed following the guideline in the NSW NPI.

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 noise trigger level (PNTL).

Intrusiveness Criteria

The NSW NPI states the following:

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

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

Table 7: NSW NPI Rating background noise levels (RBLs)

Period	Noise Descriptor – dB(A)	Noise Criteria – dB(A)
Residential – R1		
Daytime 7am – 6pm	$L_{Aeq,15min}$ ≤ RBL + 5	54
Evening 6pm – 10pm	$L_{Aeq,15min}$ ≤ RBL + 5	53
Night 10pm – 7am	$L_{Aeq,15min}$ ≤ RBL + 5	52
Residential –R2		
Daytime 7am – 6pm	$L_{Aeq,15min}$ ≤ RBL + 5	48
Evening 6pm – 10pm	$L_{Aeq,15min}$ ≤ RBL + 5	49
Night 10pm – 7am	$L_{Aeq,15min}$ ≤ RBL + 5	47

Amenity Criteria

The NSW NPI 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 have been selected on the basis of studies that relate industrial noise to annoyance in communities (Miedema and Voss, 2004).*

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, +3 dB(A) to convert from a period level to a 15 minute level"

The applicable parts of Table 2.2: Amenity noise levels from Industrial Noise Sources – L_{Aeq}, dB(A) which are relevant to the project are reproduced below:

Table 8: NSW NPI amenity criteria for external noise levels

Type of Receiver	Noise amenity area	Time of Day	L_{Aeq}, dB(A) Recommended amenity noise level	Project amenity noise level $L_{Aeq, 15min}$
Residential	Suburban	Day	55	53
		Evening	45	43
		Night	40	38
Commercial premises	All	When in use	65	63
Childcare (Internal)	All	Noisiest 1hr period when in use	35	33

*Suburban area as defined in EPA NPI Table 2.2.

Note that where the resultant project amenity noise level is 10dB or more lower than the existing industrial noise level the project amenity noise levels can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

'Modifying Factor' Adjustments

The NSW NPI also states:

> *"Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level."*

In order to take into account the potential annoying character of the noise an adjustment of 5 dB(A) for each annoying character aspect and cumulative of up to a total of 10 dB(A), is to be added to the measured value to penalise the noise for its potentially greater annoyance aspect.

Table C1 of Fact Sheet C of the NSW NPI (see Table 9 below) provides procedures for determining whether an adjustment should be applied for greater annoyance aspect.

Table 9: Table C1 from the NSW NPI – Modifying factor corrections

Factor	Assessment / Measurement	When to Apply	Correction[1]	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method *(ISO1996.2-2007 – Annex D)*.	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note**: Narrow-band analysis using the reference method in *ISO1996-2:2007, Annex C* may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted $L_{eq,T}$ levels over same time period. Correction to be applied where the C minus A level is 15dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

Factor	Assessment / Measurement	When to Apply	Correction[1]	Comments
Intermittent Noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only.**
Duration	Single-event noise duration may range from 1.5 min to 2.5 h	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum Adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10dB(A)[2] (excluding duration correction)	

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Sleep Disturbance

The NPI establishes sleep disturbance criteria for residential receivers in close proximity to industrial noise sources during the night-time period, such as vehicle movements and car door slams on private roads. The criteria for protecting the amenity of surrounding residential receivers in regard to sleep disturbance is:

- $L_{Aeq,15min}$ 40 dB(A) or prevailing RBL plus 5dB, whichever is greater, and/or
- L_{AFmax} 52 dB(A) or prevailing RBL plus 15dB, whichever is greater

Table 10 summarises the sleep disturbance criteria for the proposed development.

Table 10: Sleep Disturbance Criteria

Period	Sleep Disturbance Criteria	
	L_{AFmax} – dB(A)	$L_{Aeq,15min}$ – dB(A)
Residential – R1		
Night (10:00pm to 7:00am)	62	52
Residential – R2		
Night (10:00pm to 7:00am)	57	47

6.2.2 Project Target Noise Level

Refer to Table 11 for the NSW NPI criteria applicable to the mechanical noise emissions from the plant rooms and louvres. These project specific noise levels are in accordance with the requirements of the NSW NPI and shall be assessed to the most affected point on or within the receiver's boundary.

Table 11: Project Target Noise Levels

Receiver ID	Receiver Category	Period	Descriptor	PTNL dB(A)
R1	Residential	Day	$L_{Aeq,15min}$	53
		Evening	$L_{Aeq,15min}$	43
		Night	$L_{Aeq,15min}$	38
			L_{AFmax}	62
R2	Residential	Day	$L_{Aeq,15min}$	48
		Evening	$L_{Aeq,15min}$	46
		Night	$L_{Aeq,15min}$	41
			L_{AFmax}	57
C1	Childcare	When in use	$L_{Aeq,15min}$	35 (Internal)
H1	Critical lab areas	When in use	$L_{Aeq,15min}$	35 (Internal)
	Medical exam rooms	When in use	$L_{Aeq,15min}$	35 (Internal)
	Office areas	When in use	$L_{Aeq,15min}$	63
H2	Critical lab areas	When in use	$L_{Aeq,15min}$	35 (Internal)
	Medical exam rooms	When in use	$L_{Aeq,15min}$	35 (Internal)
	Office areas	When in use	$L_{Aeq,15min}$	63
H3	Critical lab areas	When in use	$L_{Aeq,15min}$	35 (Internal)
	Medical exam rooms	When in use	$L_{Aeq,15min}$	35 (Internal)
H4	Office areas	When in use	$L_{Aeq,15min}$	63

6.2.3 Aircraft Noise Criteria

Schedule 1 of the Protection of the Environment Operations Act 1997 reads as follows:

> ***20 Helicopter-related activities***
>
> *This clause applies to a "helicopter-related activity" but not including an activity that is carried out exclusively for the purposes of emergency aeromedical evacuation, retrieval or rescue.*

On this basis there are no mandatory noise emission criteria resulting from helicopter noise operations from the Westmead Children's Hospital. In addition, there are no current NSW EPA criteria for aircraft noise that are available to assess helicopter noise from a development. Previous assessments in the Land and Environmental Court NSW have applied noise criteria obtained from Airservices Australia.

Airservices Australia Principles and Procedures for minimising the impact of aircraft noise 'Fly Neighborly Guide' are as follows:

- No overflight of residential areas, if this can't be achieved then;
- No overflight of residential area below 1,500 ft AGL, if this can't be achieved then;
- Minimisation of incidence of helicopters flying below 1,500 ft AGL, if this can't be achieved then;
- Minimisation of noise impact on residential areas by helicopters below 1,500 ft AGL,
- Minimisation of noise impacts on residential areas by hovering/circling helicopters
- Implement Fly Neighbourly procedures

Helicopter Noise Criteria

No further assessment is considered for the current Environmental Acoustic Assessment on the basis that there is no proposed change to the helicopter pad location or helicopter movements.

6.3 Operational Vibration Criteria

6.3.1 Human Comfort – Continuous and Impulsive Vibration Criteria

Structural vibration in buildings can be detected by occupants and can affect them in many ways including reducing their quality of life and also their working efficiency. Complaint levels from occupants of buildings subject to vibration depend upon their use of the building and the time of the day. The vibration emitted from construction works should be such that it does not exceed the maximum limits set out in the criteria presented in Table 12 to Table 18. The guide on preferred values for human comfort have been extracted from the NSW DEC *Assessing Vibration: A Technical Guideline* (2006). The criteria for continuous and impulsive vibration are summarized in Table 12.

Table 12: Criteria for Exposure to Continuous and Impulsive Vibration

Place	Time	Vibration Acceleration (mm/s^2)			
		Preferred		Maximum	
Continuous Vibration		z axis	x and y axis	z axis	x and y axis
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Offices	Day or night time	0.020	0.014	0.040	0.028
Workshops	Day or night time	0.040	0.029	0.080	0.058
Impulsive Vibration		z axis	x and y axis	z axis	x and y axis
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night time	0.10	0.071	0.20	0.14
Offices	Day or night time	0.64	0.46	1.28	0.92
Workshops	Day or night time	0.64	0.46	1.28	0.92

Disturbance caused by vibration will depend on its duration and its magnitude. This methodology of assessing intermittent vibration levels involves the calculation of a parameter called the Vibration Dose Value (VDV) which is used to evaluate the cumulative effects of intermittent vibration. The criteria applicable when considering periods of intermittent vibration are presented in Table 13.

Table 13: Acceptable Vibration Dose Values for Intermittent Vibration (1.75 m/s)

Location	Daytime		Night time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

6.3.2 Structural Damage

Ground vibration criteria are defined in terms of levels of vibration emission from construction activities that will not damage surrounding buildings or structures. It should be noted that human comfort criteria are normally expressed in terms of acceleration whereas structural damage criteria are normally expressed in terms of velocity. The human comfort criteria are also often exceeded before a risk of structural damage.

Most commonly specified structural vibration levels are defined to minimize the risk of cosmetic surface cracks and are set below the levels that have the potential to cause damage to the main structure. Structural damage criteria are presented in German Standard DIN4150-Part 3 “Structural vibration in buildings – Effects on structures” and British Standard BS7385-Part 2: 1993 “Evaluation and Measurement for Vibration in Buildings”. Table 14 indicates the vibration limits presented in DIN4150-Part 3 to ensure structural damage doesn’t occur.

Table 14: Guideline value of vibration velocity, vi, for evaluating the effects of short-term vibration

Line	Type of Structure	Vibration velocity, vi, in mm/s			
		Foundation			Plane of floor of uppermost full storey
		At a frequency of			
		Less than 10Hz	10 to 50Hz	50 to 100*Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

*For frequencies above 100Hz, at least the values specified in this column shall be applied

6.3.3 Sensitive Equipment

Kid's Research (KR) Building have provided a list of a number of sensitive equipment have been identified within the building. The vibration limits for the sensitive equipment shown in Table 15. The vibration criteria for all the identified equipment has been assessed to the ASHRAE Handbook – Chapter 48, Figure 40 and Table 45 criteria for Human Comfort and Equipment Vibration due to the lack of vibration threshold for all equipment listed. The most suitable criterion has been applied due to the nature of the equipment.

Table 15: Maximum Vibration to Sensitive Equipment

Location	Vibration-sensitive Equipment	Vibration-sensitive Category	Vibration guideline target (magnitude of peak 1/3 octave band, RMS)
Block 3 Level 3 (Surgical Room & Lab)	Faxitron	VC-A Curve	50µm/sec
	Piximus (DEXA)	VC-A Curve	50µm/sec
	Skyscan 1272	VC-A Curve	50µm/sec
	Skyscan 1174	VC-A Curve	50µm/sec
	Microtome	VC-C Curve	12.5µm/sec
Block 4 Level 3 (Human Applications Lab)	Liquid Nitrogen storage tank and dewar	Hospital Operating Rooms & Critical Areas	100µm/sec
	Centrifuges	VC-A Curve	50µm/sec
	Microscope	VC-A Curve	50µm/sec
	HEPA filters	Hospital Operating Rooms & Critical Areas	100µm/sec
	Incubators	VC-A Curve	50µm/sec
Block 4 Level 3 (Tissue Culture Room)	Incubators	VC-A Curve	50µm/sec
Block 4 Level 3 (Microscope Laboratory)	Spot microscope	VC-A Curve	50µm/sec
	DC500 microscpe	VC-A Curve	50µm/sec
	Jenoptik brightfield microscope	VC-A Curve	50µm/sec
	Dissecting microscope	VC-A Curve	50µm/sec
Block 3 Level 3 (Laboratory)	Instron mechanical tester	VC-A Curve	50µm/sec
	Mecmesin torsional mechanical tester	VC-B Curve	25µm/sec
	Form 1+ 3D printer	VC-A Curve	50µm/sec
	Form 2 3D printer	VC-A Curve	50µm/sec
	Mankati FullScale XT (3D Printer)	VC-A Curve	50µm/sec
	Mankati Fullscale (3D Printer)	VC-A Curve	50µm/sec
Block 4 Level 4 (Lab 7)	Virtual Microscopy Suite (Aperio)	VC-A Curve	50µm/sec
	Automatic Coverslipper (DAKO)	VC-A Curve	50µm/sec

Location	Vibration-sensitive Equipment	Vibration-sensitive Category	Vibration guideline target (magnitude of peak 1/3 octave band, RMS)
Block 4 Level 4 (Level 4, microscope/store rm)	Live Cell Imaging Microscopy Suite	VC-D Curve	6µm/sec
	TIRF Fluroescent Microscopy Suite	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, TC Room 2)	JULI Stage	VC-C Curve	12.5µm/sec
	4X CO_2 Incubators	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, TC Room 1)	4X CO2 Incubators	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, Communal Equipment Room 1)	QIACUBE ROBOTIC WORKSTATION FOR AUTO PURIFICATION OF DNA RNA KIT	VC-C Curve	12.5µm/sec
Block 5 Level 1 (Endocrinology Lab)	Analyser (Immulite 1000)	VC-C Curve	12.5µm/sec
	Tandem Mass Spectrometer (TQ-S)	VC-A Curve	50µm/sec
	Tandem Mass Spectrometer (TQ-XS)	VC-A Curve	50µm/sec
	Analyser (iSYS)	VC-C Curve	12.5µm/sec
	Gamma Counter (Wizard 2470)	VC-B Curve	25µm/sec
All	Typical Equipment	Hospital Operating Rooms & Critical Areas	100µm/sec

6.3.4 Animal Facilities

There is an Animal Housing Facility located on Level 1 of Block 3 in the KR Building. The rodents that are housed in the facility are particularly sensitive to vibration, with potential negative side effects should the rodents be exposed to excessive and prolonged vibration. Arup have previously provided a construction vibration criterion in their Construction Vibration Assessment report which outlined a limit for the KR Animal Housing for the Westmead Hospital Redevelopment project. This was based off their previous measurements of the project site and the US guideline National Institutes of Health Guideline "Design requirements manual for NIH Biomedical and Animal Research Facilities" 2010.

Due to the lack of published vibration criteria by Australian code for the care and use of animals for scientific purposes, Stantec propose to the same criteria set by ARUP as we see this criterion to be appropriate, which is outlined below:

Table 16: Proposed Animal House Vibration Criteria

Location	Criteria
Animal House	Curve 1 Australia AS2670.2 (3rd octave band RMS Velocity < 0.1mm/s)
	Transient Peak Velocity to be below 1.0mm/s

Table 17: Transient Vibration Guide Values for Cosmetic Damage – BS 7385-2:1993

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial or light commercial type buildings	50mm/s	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s	20mm/s (50mm/s at 40Hz and above)

Table 18 indicates the vibration limits presented in DIN 4150-Part 3 to ensure structural damage does not occur.

Table 18: Guideline Value of Vibration Velocity (v_i) for Evaluating the Effects of Short-Term Vibration – DIN 4150-Part 3

Line	Type of Structure	Vibration velocity, v_i, in mm/s			
		Foundation At a frequency of			Plane of floor of uppermost full storey
		Less than 10Hz	10 to 50Hz	50 to 100Hz *	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
*For frequencies above 100Hz, at least the values specified in this column shall be applied.					

7. Construction Noise and Vibration Criteria

7.1 Construction Noise

7.1.1 External Noise Criteria

We understand the proposed hours of construction are outlined below:

- Mon to Fri: 7am to 6pm
- Saturday – 8am to 5pm

In this report, it is assumed that all works are performed during these proposed hours.

Works are not usually permitted outside of the standard hours outlined in the ICNG, however as per the NSW DEC Interim Construction Noise Guideline section 2.3 (Construction outside the recommended standard hours), there are five categories of works that might be undertaken outside the recommended standard hours, which are:

- The **delivery of oversized plant or structures** that police or other authorities determine require special arrangements to transport along public roads
- **Emergency works** to avoid the loss of life or damage to property, or to prevent environmental harm
- **Maintenance and repair of public infrastructure** where disruption to essential services and/or considerations of worker safety do not allow work within standard hours
- **Public infrastructure works** that shorten the length of the project and are supported by the affected community
- Works where a proponent demonstrates and justifies **a need to operate outside the recommended standard hours**

In the case of the project, the PSB can be assimilated to a public infrastructure works further to this the following can be considered as a justification as to why the works could be permitted outside of the recommended standard hours (Saturday 8am-5pm):

- The quantitative results of the noise and vibration impact assessment presented in Section 9 of this report demonstrates that none of the four main construction phases of the proposed PSB exceeds the established noise criteria during standard hours of construction, in fact the results shows that all activities conservatively comply with the established criteria. If we are assuming that outside of standard hours construction have the potential to greater impact the surrounding community or occupants of adjacent buildings to the construction site, the results presented in Section 9 shows that lower noise levels will be achieved. Indeed the ICNG recommends a more stringent criteria for construction works conducted outside standard working hours for residential receivers. The nearest external resident receiver (R1) has been assessed in Section 9.1 against both the standard hours and the OOHW and no exceedances are predicted.
- The surrounding residential receivers respectively R1 and R2 are located approximately 140m and 500m from the construction site. These distances eliminate the risk for any vibration impact. In terms of noise the closest receiver R1 is also shielded by the Kids Research institute for all the early works period which will be typically the noisiest construction activities including the piling of the foundations and all inground services set out.
- The newly completed Central Acute Services Building located adjacent to the proposed PSB Building was constructed with allowances for work to be conducted outside of Standard hours (similar to the requested hours for the PSB) which was successfully delivered and completed
- The demolition of the P17 carpark (although approved under a REF) located at the same site as the proposed development and within close proximity to buildings with animal shelter, sensitive equipment and people was also considered work out of standard hours and together with the implementation of noise and vibration mitigation measures combined with a strict regime of noise and vibration monitoring was delivered successfully with minimal noise and vibration impact.

All these factors considered, clearly indicate that the risks for noise and vibration impact associated with conducting construction works outside of standard hours (nominally on Saturdays between 8am and 5pm) on the surrounding community and adjacent occupant of surrounding buildings are minimal.

Further to the above, previous works within the precinct and within close proximity to the PSB were successfully conducted under the Environmental Planning and Assessment (COVID Development - Construction work days) 2020 Ministerial Order, works are permitted under the outlined following conditions:

> *"(2) The conditions specified for the development are that the development must-*
>
> *(a) Be the subject of a development consent, and*
>
> *(b) Comply with all conditions of the consent other than any condition that restricts the hours of work or operation on a Saturday, Sunday or public holidays, and*
>
> *(i) Comply with the conditions of the consent that restrict the house of work or operation on any other days as if the conditions applied to work or operation on a Saturday, Sunday or public holiday, and*
>
> *(ii) Not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this Order, and*
>
> *(iii) Take all feasible and reasonable measures to minimise noise."*

The assessment undertaken in Section 9.1, demonstrates compliance with the Ministerial Order, following conditions set, and criteria outlined by the ICNG during the out of hours works (OOHW).

The Parramatta Council DCP (2011) also requires a Construction Noise and Vibration Management Plan to be prepared, which will outline the exact procedures and processes required to properly manage the process. This should be prepared prior to the commencement of construction of the proposed development.

The previous building structure (P17 carpark) located at the same site the proposed development was demolished following the strict CNVMP and the noise and vibration monitoring program successfully, demonstrating that a comprehensive CNVMP can ensure amenity of the nearby receivers is achieved.

The noise criteria associated with construction and its related activities are shown in Table 19, as presented in Section 4.1.1 Table 2 of the ICNG.

Table 19: Construction Noise Criteria at Residences

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours:	Noise Affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured **$L_{Aeq,15min}$** is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residences of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
	Highly Noise Affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur in, taking into account: - Times identified by the community when they are less sensitive to noise (such as before and after school, for works near schools, or mid-morning or mid-afternoon for works near residences) - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise Affected RBL + 5dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see Section 7.2.2. of the ICNG

Note: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30m away from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 20 below (Section 4.1.2 and 4.1.3 of the ICNG) sets out the noise management levels for other land uses, including commercial premises. The external noise levels should be assessed at the most affected point within 50 m of the area boundary for recreation areas and at the most affected occupied point for commercial and industrial uses. In general, the internal criteria can be converted to external criteria by adding 10 dB as advised in the ICNG.

Table 20: Construction Noise Criteria for Other Land Uses

Land Use	Management Level, $L_{Aeq,15min}$ – applies when land use is being utilised
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas	External noise level 65 dB(A)
Passive recreation areas	External noise level 60 dB(A)
Community centres, childcare, etc.	Depends on the intended use. Refer to recommended maximum internal levels in AS/NZS 2107.
Industrial premises	External noise level 75 dB(A)
Offices, retail outlets	External noise level 70 dB(A)

Based on the criteria in the tables above, the following noise management levels in Table 21 should be applied to all receivers outlined in Figure 7. Construction during standard hours and outside of standard hours have been assumed.

Table 21: Project Specific Construction Noise Management Levels (External)

Receiver Space	Location of Receiver(s)	Management Level, $L_{Aeq,15min}$
Offices, retail outlets	C1 H1 (Level 3 offices) H2 (Level 2 offices)	External noise level **70 dB(A)**
Hospital wards and operating theatres (including Labs)	H1, H2, H3, H4	External noise level **55 dB(A)**
Residential (Standard Hours)	R1	RBL +10dB = **59 dB(A)**
	R2	RBL +10dB = **53 dB(A)**
Residential (Outside Standard Hours)	R1	RBL +5dB = **54 dB(A)**
	R2	RBL +5dB = **49 dB(A)**

7.1.2 Internal Noise Criteria

Due to the existing internal noise level already exceeding the internal criteria outlined by the ICNG, Stantec propose the below criteria for the internal noise criteria for sensitive spaces within the hospital buildings.

There is an Animal Housing facility located on Level 1 of Block 3 in the KR Building. There is a lack of published criteria by Australian code (including AS/NZS2107:2016) for the care and use of animals for scientific purposes.

Arup have previously provided a construction noise criterion in their Construction Noise Assessment report which outlined a Management Level for the KR Animal Housing for the Westmead Hospital Redevelopment project. This was based off Acoustics Logic's previous advice and Arup's experience. Stantec propose to the same criteria set by Acoustic Logic and Arup which is defined in Table 22, as we see this as appropriate.

Table 22: Project Specific Construction Noise Management Levels (Internal)

Receiver Space	Location of Receiver(s)	Management Level, $L_{Aeq,15min}$
Offices	C1 H1 (Level 3 offices) H2 (Level 2 offices)	RBL + 10dB = **62 dB(A)**
Hospital wards and operating theatres (including Labs)	H1, H2, H3, H4	RBL + 10dB **= 62 dB(A)**
Animal House	Level 1 – KR Building	**50 dB(A)** L_{amax} 65dB(A)

7.2 Construction Vibration

7.2.1 Human Comfort – Continuous and Impulsive Vibration Criteria

Structural vibration in buildings can be detected by occupants and can affect them in many ways including reducing their quality of life and also their working efficiency. Complaint levels from occupants of buildings subject to vibration depend upon their use of the building and the time of the day. The vibration emitted from construction works should be such that it does not exceed the maximum limits set out in the criteria presented in Table 12 to Table 18. The guide on preferred values for human comfort have been extracted from the NSW DEC *Assessing Vibration: A Technical Guideline* (2006). The criteria for continuous and impulsive vibration are summarized in Table 23.

Table 23: Criteria for Exposure to Continuous and Impulsive Vibration

Place	Time	Vibration Acceleration (mm/s^2)			
		Preferred		Maximum	
Continuous Vibration		z axis	x and y axis	z axis	x and y axis
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Offices	Day or night time	0.020	0.014	0.040	0.028
Workshops	Day or night time	0.040	0.029	0.080	0.058
Impulsive Vibration		z axis	x and y axis	z axis	x and y axis
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night time	0.10	0.071	0.20	0.14
Offices	Day or night time	0.64	0.46	1.28	0.92
Workshops	Day or night time	0.64	0.46	1.28	0.92

Disturbance caused by vibration will depend on its duration and its magnitude. This methodology of assessing intermittent vibration levels involves the calculation of a parameter called the Vibration Dose Value (VDV) which is used to evaluate the cumulative effects of intermittent vibration. The criteria applicable when considering periods of intermittent vibration are presented in Table 13.

Table 24: Acceptable Vibration Dose Values for Intermittent Vibration (1.75 m/s)

Location	Daytime		Night time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

7.2.2 Structural Damage

Ground vibration criteria are defined in terms of levels of vibration emission from construction activities that will not damage surrounding buildings or structures. It should be noted that human comfort criteria are normally expressed in terms of acceleration whereas structural damage criteria are normally expressed in terms of velocity. The human comfort criteria are also often exceeded before a risk of structural damage.

Structural damage criteria are presented in German Standard DIN 4150-Part 3 *Structural vibration in buildings – Effects on structures* and British Standard BS 7385-2:1993 *Evaluation and Measurement for Vibration in Buildings*. The British Standard BS 7385-2:1993 establishes vibration values for buildings based on the lowest vibration levels above which damage has been credibly demonstrated. These values are evaluated to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as 95% probability of no effect. The aforementioned values are summarised in Table 25.

Table 25: Transient Vibration Guide Values for Cosmetic Damage – BS 7385-2:1993

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial or light commercial type buildings	50mm/s	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s	20mm/s (50mm/s at 40Hz and above)

Table 26 indicates the vibration limits presented in DIN 4150-Part 3 to ensure structural damage does not occur.

Table 26: Guideline Value of Vibration Velocity (v_i) for Evaluating the Effects of Short-Term Vibration – DIN 4150-Part 3

Line	Type of Structure	Vibration velocity, v_i, in mm/s			
		Foundation At a frequency of			Plane of floor of uppermost full storey
		Less than 10Hz	10 to 50Hz	50 to 100Hz *	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40

2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
*For frequencies above 100Hz, at least the values specified in this column shall be applied.					

There are four (4) types of sensitives receivers that need to be considered during the construction phase of the proposed development. The human comfort criteria can be found in Table 23 which is for the people working in the surround buildings Table 8 outlines the criteria needed for the structure of the surrounding buildings. There is many sensitive equipment located in close proximity and the set criteria can be found in Table 27. KR Building has an animal housing facility with rodent that are sensitive to vibration and to ensure comfort for the rodents, criteria set in Section 6.3.4 should be followed.

7.2.3 Sensitive Equipment

Kid's Research (KR) Building have provided a list of a number of sensitive equipment have been identified within the building. The vibration limits for the sensitive equipment shown in Table 27. The vibration criteria for all the identified equipment has been assessed to the ASHRAE Handbook – Chapter 48, Figure 40 and Table 45 criteria for Human Comfort and Equipment Vibration due to the lack of vibration threshold for all equipment listed. The most suitable criterion has been applied due to the nature of the equipment.

Table 27: Maximum Vibration to Sensitive Equipment

Location	Vibration-sensitive Equipment	Vibration-sensitive Category	Vibration guideline target (magnitude of peak 1/3 octave band, RMS)
Block 3 Level 3 (Surgical Room & Lab)	Faxitron	VC-A Curve	50µm/sec
	Piximus (DEXA)	VC-A Curve	50µm/sec
	Skyscan 1272	VC-A Curve	50µm/sec
	Skyscan 1174	VC-A Curve	50µm/sec
	Microtome	VC-C Curve	12.5µm/sec
Block 4 Level 3 (Human Applications Lab)	Liquid Nitrogen storage tank and dewar	Hospital Operating Rooms & Critical Areas	100µm/sec
	Centrifuges	VC-A Curve	50µm/sec
	Microscope	VC-A Curve	50µm/sec
	HEPA filters	Hospital Operating Rooms & Critical Areas	100µm/sec
	Incubators	VC-A Curve	50µm/sec
Block 4 Level 3 (Tissue Culture Room)	Incubators	VC-A Curve	50µm/sec
Block 4 Level 3 (Microscope Laboratory)	Spot microscope	VC-A Curve	50µm/sec
	DC500 microscpe	VC-A Curve	50µm/sec
	Jenoptik brightfield microscope	VC-A Curve	50µm/sec
	Dissecting microscope	VC-A Curve	50µm/sec
Block 3 Level 3 (Laboratory)	Instron mechanical tester	VC-A Curve	50µm/sec
	Mecmesin torsional mechanical tester	VC-B Curve	25µm/sec
	Form 1+ 3D printer	VC-A Curve	50µm/sec
	Form 2 3D printer	VC-A Curve	50µm/sec
	Mankati FullScale XT (3D Printer)	VC-A Curve	50µm/sec
	Mankati Fullscale (3D Printer)	VC-A Curve	50µm/sec
Block 4 Level 4 (Lab 7)	Virtual Microscopy Suite (Aperio)	VC-A Curve	50µm/sec
	Automatic Coverslipper (DAKO)	VC-A Curve	50µm/sec

Location	Vibration-sensitive Equipment	Vibration-sensitive Category	Vibration guideline target (magnitude of peak 1/3 octave band, RMS)
Block 4 Level 4 (Level 4, microscope/store rm)	Live Cell Imaging Microscopy Suite	VC-D Curve	6µm/sec
	TIRF Fluroescent Microscopy Suite	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, TC Room 2)	JULI Stage	VC-C Curve	12.5µm/sec
	4X CO_2 Incubators	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, TC Room 1)	4X CO2 Incubators	VC-A Curve	50µm/sec
Block 4 Level 4 (Level 4, Communal Equipment Room 1)	QIACUBE ROBOTIC WORKSTATION FOR AUTO PURIFICATION OF DNA RNA KIT	VC-C Curve	12.5µm/sec
Block 5 Level 1 (Endocrinology Lab)	Analyser (Immulite 1000)	VC-C Curve	12.5µm/sec
	Tandem Mass Spectrometer (TQ-S)	VC-A Curve	50µm/sec
	Tandem Mass Spectrometer (TQ-XS)	VC-A Curve	50µm/sec
	Analyser (iSYS)	VC-C Curve	12.5µm/sec
	Gamma Counter (Wizard 2470)	VC-B Curve	25µm/sec
All	Typical Equipment	Hospital Operating Rooms & Critical Areas	100µm/sec

7.2.4 Animal Facilities

There is an Animal Housing Facility located on Level 1 of Block 3 in the KR Building. The rodents that are housed in the facility are particularly sensitive to vibration, with potential negative side effects should the rodents be exposed to excessive and prolonged vibration. Arup have previously provided a construction vibration criterion in their Construction Vibration Assessment report which outlined a limit for the KR Animal Housing for the Westmead Hospital Redevelopment project. This was based off their previous measurements of the project site and the US guideline National Institutes of Health Guideline "Design requirements manual for NIH Biomedical and Animal Research Facilities" 2010.

Due to the lack of published vibration criteria by Australian code for the care and use of animals for scientific purposes, WGE propose to the same criteria set by ARUP as we see this criterion to be appropriate, which is outlined below:

Table 28: Proposed Animal House Vibration Criteria

Location	Criteria
Animal House	Curve 1 Australia AS2670.2 (3rd octave band RMS Velocity < 0.1mm/s)
	Transient Peak Velocity to be below 1.0mm/s

7.2.5 Project Construction Vibration Limits

Table 29 indicates the vibration criteria for the surrounding sensitive receivers to the proposed development.

Table 29: Project construction vibration limits at each sensitive receiver

Receiver	Period	Human Comfort Vibration Objectives			Building Damage Objectives (mm/s)
		Continuous mm/s^2 (RMS)		Intermittent m/s$^{1.75}$ (VDV)	
		z-axis	x- and y-axis		
R1	Daytime	10 - 20	7 - 14	0.20 - 0.40	5
	Night-time	7 - 14	5 - 10	0.13 - 0.26	5
R2	Daytime	10 - 20	7 - 14	0.20 - 0.40	5
	Night-time	7 - 14	5 - 10	0.13 - 0.26	5
H1	At any time	5 - 10	3.6 – 7.2	0.10 -0.20	5
H2	At any time	5 - 10	3.6 – 7.2	0.10 -0.20	5
H3	At any time	5 - 10	3.6 – 7.2	0.10 -0.20	5
H4	At any time	5 - 10	3.6 – 7.2	0.10 -0.20	5
C1	At any time	20 - 40	14 - 28	0.40 – 0.80	5

8. Operational Noise and Vibration Assessment

8.1 Noise Considerations

The following activities have been identified as being likely to generate noise with the potential to impact the surrounding environment. These noise sources include:

- Continuous noise from mechanical plant such as cooling towers, air handler units (AHU), chillers, condenser units and fans.
- Noise associated with back-up electrical system such as emergency diesel generators.
- Intermittent traffic noise from light weight trucks entering the loading dock delivering various type of goods.
- Intermittent traffic noise from car movement entering and exiting the carparks located on site.
- Intermittent noise from ambulances accessing the emergency department unit.
- Intermittent noise from operational filling of the bulk oxygen tank and associated enclosure.

Equipment selections are yet to be finalised; therefore, an indicative assessment has been conducted.

8.2 Mechanical Plant and Equipment Impact Assessment

The proposed development will include typical building services plant and equipment including chillers, boilers, compressors and cooling towers. This assessment has considered the noise emissions from the mechanical plant serving the internal spaces of the development. These noise sources have been used to predict the worst-case scenario noise impact of the proposed use of the site to the nearby sensitive receivers. The assessment has been conducted to achieve noise levels as per the NSW NPI. Both have been assessed at the most affected external point at the surrounding residential and commercial receivers.

In order to assess the worst-case scenario, it was assumed that the mechanical services associated with the development are running at any time throughout the daytime. While exact equipment has not been selected for the project, the sound power levels provided in Table 30 have been assigned to each significant plant and equipment item, based on typical noise emissions data for plant and equipment of the sizes indicated.

For this assessment, it has been assumed that the only openings in the Level 5 and Level 14 are as outlined in Figure 8 and Figure 9

Figure 8: Location of open louvre for mechanical assessment – Level 5

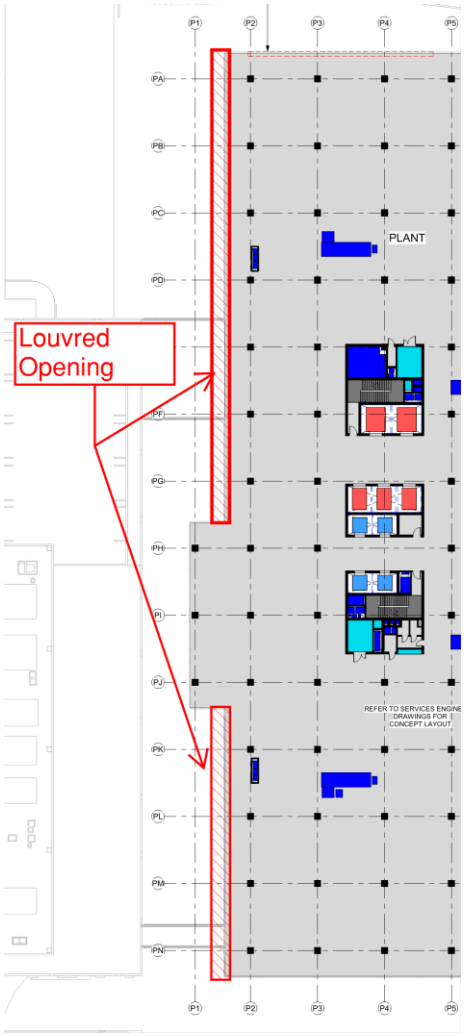
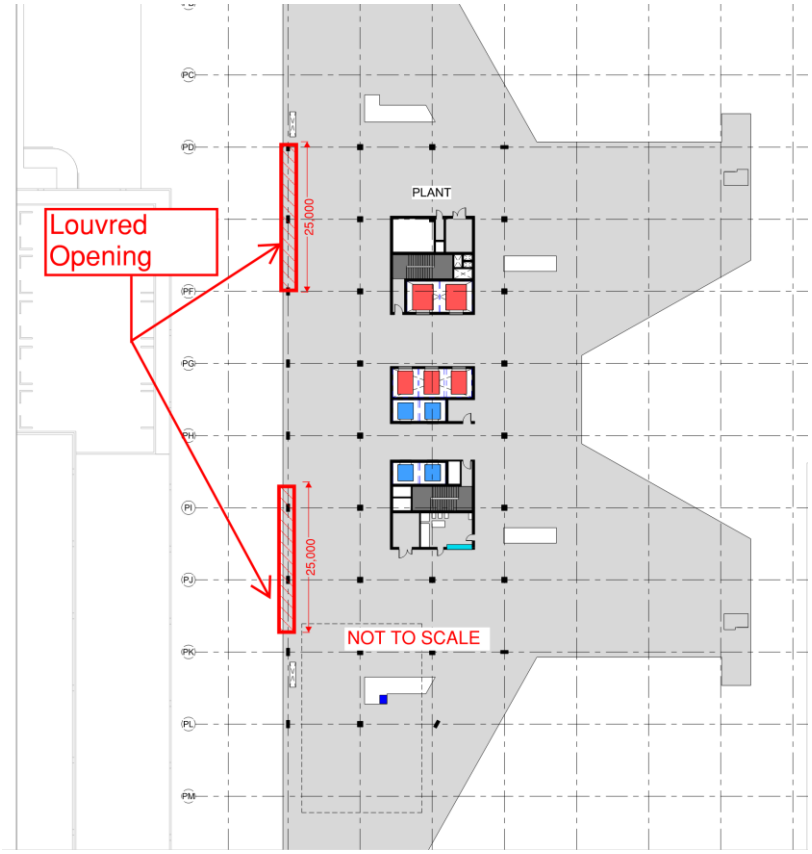


Figure 9: Location of open louvre for mechanical assessment – Level 14



For our assessment we have assumed the following mechanical plant and equipment is located within development will include:

- Level 5
  - 30x Air handling units (Level 5)
  - 3 x Chillers (Level 5)
  - 6x Water pumps (Level 5)
- Level 14
  - 29x Air handling units (Level 14)
  - 3x Cooling towers (Level 14)
  - 3x Hot water boilers (Level 14)
- Level 15 (Rooftop)
  - 6 x Kitchen Exhaust Fans (Level 15)
  - 16 Cytotoxic and Fume Cupboard Exhaust Fans (Level 15)

Table 30: Sound Power Levels of Mechanical Plant dB(A) re 1 pW

Plant Item	SWL – dB(A)
Air handling units	90
Cooling Tower	89
Hot Water Boiler	80
Water Pumps	80
Exhaust Fans	100

The noise generated by the mechanical plant and equipment within the rooftop plantroom has been assessed to the noise-sensitive receivers surrounding the proposed development with consideration given to the following assumptions:

- The mechanical plant and equipment will be operating during all periods in any given day

Table 31 provides a summary of the results of the noise impact assessment of the mechanical plant and equipment.

Table 31: Summary of results of mechanical noise impact assessment (with and without mitigation)

Receiver	Period	Predicted Noise Level LAeq,15min - dB(A) Without Mitigation	Predicted Noise Level LAeq,15min - dB(A) With Mitigation	Most Stringent PNTL LAeq,15min - dB(A)	Compliance (Yes/No)
R2	Day	52	37	48	Yes, with mitigation
	Evening			46	Yes, with mitigation
	Night			41	Yes, with mitigation
C1	When in use	55	30[1]	35 (Internal)	Yes, with mitigation
H1	When in use	37	29[1]	35 (Internal)	Yes, with mitigation
H3	When in use	40	24[1]	35 (Internal)	Yes, with mitigation
H4	When in use	56	32[1]	35 (Internal)	Yes, with mitigation

Based on the results of the assessment of the noise generated by the mechanical plant and equipment, the predicted noise levels at the surrounding noise-sensitive receivers are expected to comply with the project noise trigger levels established in Section 6.2 with the assumptions listed above.

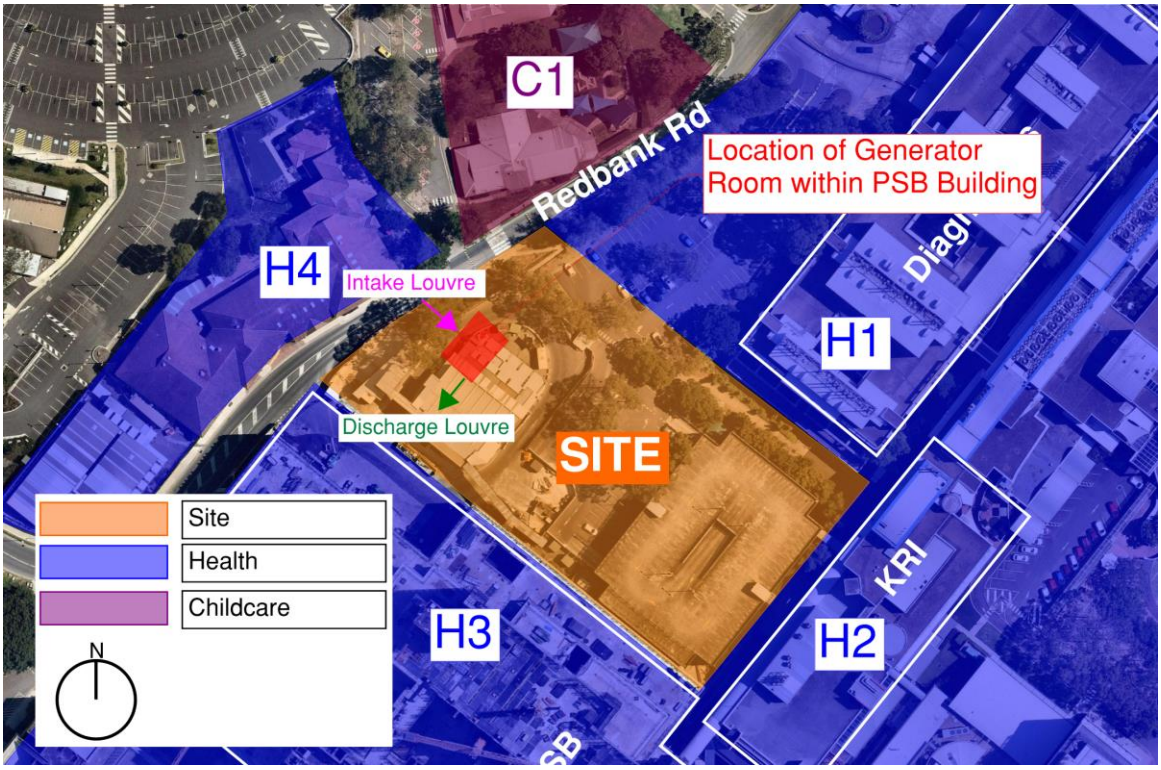
Mechanical plant equipment have been assessed for external noise emissions, including the partially open level 14 plant enclosure, as well as the noise breakout from the louvres provided to the mechanical plant. The design and selections of the current design have demonstrated no adverse or intrusive noise to nearby receivers and are all in compliance with the project noise trigger levels set out for the project.

8.3 Emergency Generator Noise Impact Assessment

The emergency generator is to be located in on Level 2 of the new proposed PSB Building. The emergency generator will only operate during emergency operation or during planned maintenance.

Based on the current location of the proposed three emergency generators plantroom and the surrounding environment including carpark and the childcare centre located nearby to the air intake and discharge louvres. The target was set at 70dB(A) at the discharge louvre on the loading dock side and 70dB(A) at the air discharge louvre on the carpark side. Below in Figure 10 the locations of the intake and discharge louvres are outlined to the nearest receivers.

Figure 10: Location of generator room within PSB Building and nearby receivers



A preliminary assessment has been conducted for the proposed (3x) generators using worse-case noise levels from the nominated equipment. From our assessment, it is expected that acoustic silencers will be required to meet external noise emissions established in the NSW EPA Noise Policy for Industry (2017).

In order to assess the worst-case scenario, it was assumed that the generators associated with the development are able to run at any time throughout the daytime.

Where louvres are required for ventilation, it is recommended acoustic silencers are used to achieve the required insertion loss for the equipment is outlined below in Table 34.

The Sound Power Levels (SWL) used for the preliminary assessment has been outlined in Table 32 below.

Table 32: Sound power level of Cummins 2500kVA D5 LV Generator

	Sound Power Level re 10^{-12} W, dB – Octave Band Centre Frequency								
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Overall dB(A)
1 x Generator (110% Load)	113	126	125	122	118	115	113	114	124

8.3.1 Predicted Results

Table 33 provides a summary of the results of the noise impact assessment of the generators. The noise generated by the plant and equipment has been assessed with acoustic attenuators outlines in Table 34 and Figure 11.

Table 33: Summary of results of generator noise impact assessment

Receiver	Period	Predicted Noise Level LAeq,15min - dB(A)	Criteria LAeq,15min - dB(A)	Compliance (Yes/No)
Loading Dock	When in use	70	70	Yes
Carpark	When in use	65	70	Yes
Childcare Centre (C1)	Noisiest 1hr when in use (internally)	14 (internally)	35	Yes
Hospital Building (H4)	Noisiest 1hr (externally)	28 (externally)	50	Yes

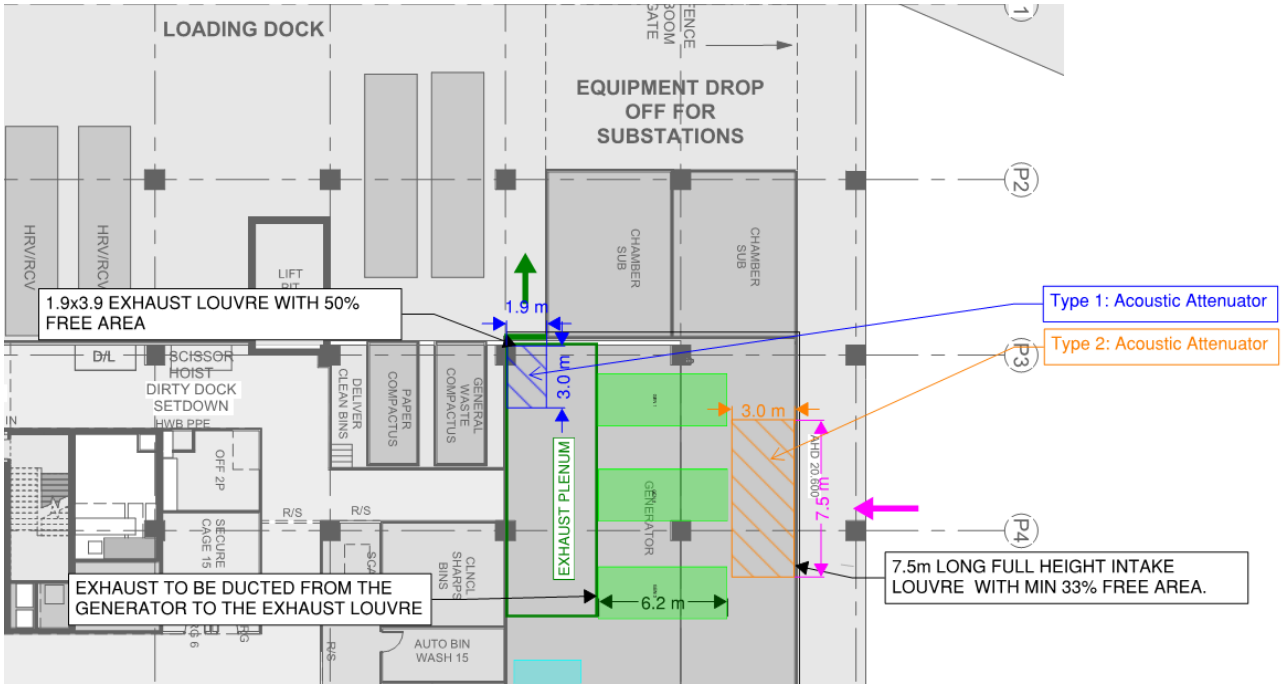
8.3.2 Recommended Mitigation Measures

The recommended insertion losses are based on a conservative scenario where all 3 generators are running at 100% load for the surrounding noise-sensitive receivers.

Table 34: Acoustic attenuator required insertion loss

	SWL re 10^{-12} W, dB(A)							
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Type 1: Discharge NAP SilentFlo H50/300	12	19	36	43	47	28	18	16
Type 2: Intake NAP SilentFlo H33/300	18	29	52	59	60	56	44	31

Figure 11: Locations of proposed silencers



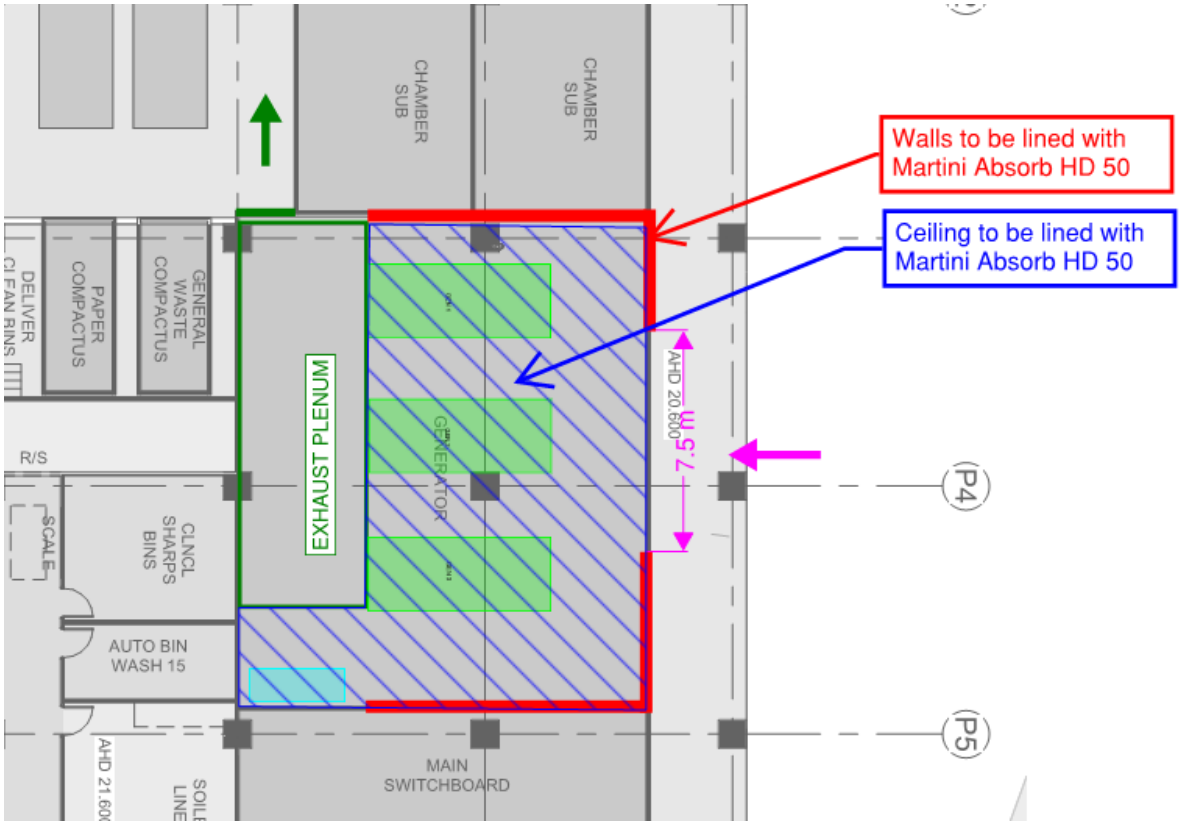
In addition to the acoustic attenuators proposed above, the reverberation time within the generator room should be kept to a minimum. The recommended time is 0.5 RT60seconds. It is proposed that min. 240m^2 is to be lined within the space (wall and/or ceiling). The absorption coefficient and NRC value of the product is outlined below.

Table 35: Required acoustic absorption coefficient

Material	Absorption Coefficient Octave Bands						NRC
	125 Hz	250 Hz	500 Hz	1K Hz	2K Hz	4K Hz	
Martini Absorb HD50 (50mm)	0.22	0.54	0.99	0.99	0.99	0.99	0.95

Figure 12 below outlines indicative locations of where acoustic absorption should be installed within the generator room.

Figure 12: Recommended location of acoustic absorption



8.4 Loading Dock & Waste Collection Noise Emissions

An assessment of the noise generated by activities within the loading dock (such as garbage collections and deliveries) has been conducted to determine the impacts on the surrounding noise-sensitive receivers. Table 36 outlines the sound power level (SWL) and typical duration (minutes) associated with each of the standard loading dock activities.

Table 36: Typical sound power levels and duration of loading dock activities

Loading Dock Activity	Typical Duration of Activity	Sound Power Level (LAeq, 15min)
Garbage truck unloading bins	2 minutes	88
Medium rigid truck accelerating	1 minute	72
Loading and unloading activities	10 minutes	88
Medium rigid truck idling on turntable	5 minutes	69

The noise generated by the activities during a 15-minute period have been predicted to the facades of the nearest surrounding noise-sensitive receivers. Using the assessment methods outlined above, the predicted noise levels at the nearest noise-affected premises are summarised below in Table 37. The following assumptions have been made for the assessment:

- Service vehicles are assumed to be either medium rigid trucks or garbage trucks;
- Two (2) service vehicle entering and exiting within a 15-minute period; and
- Loading and unloading activities will take place outdoors.

Table 37: Predicted noise levels at surrounding receivers

Most Affected Receiver	Predicted Noise Level, without Mitigation LAeq,15min - dB(A)	Project Noise Trigger Level (Evening) LAeq,15min - dB(A)	Compliance (Yes/No)
H4	31	63	Yes
C1	22 (Internal[1])	35 (Internal)	Yes

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade.

The predicted noise levels of the loading dock activities at the surrounding noise-sensitive receivers are expected to comply with the project noise trigger levels established in Section 6.2 with the mitigation measures outlined below.

It is recommended that the activities shall be conducted with the implementation of the following management practices:

- Not operating before 7am or after 10pm (7 days per week)
- Maintaining rubbish trucks and braking materials to minimize or eliminate noise such as squeaky brakes
- Educating drivers and collectors to be careful and to implement quiet work practices

8.5 Helicopter Noise Impact Assessment

As the helipad will remain in its current location, the helicopter noise impact onto the surrounding residential receivers will not change as a result of the proposed refurbishment and new development. On this basis, no further assessment has been conducted for this Environmental Acoustic Assessment.

8.6 External Noise Intrusion Impact Assessment

8.6.1 Noise Modelling and Assumptions

In order to provide acoustic amenity to occupants of the proposed development and comply with the project specific internal noise limits, the noise impacts of surrounding roads were assessed at the façade of the health and office spaces within the proposed development in accordance with the SEPP (Infrastructure) 2007.

3D acoustic modelling for noise emissions from the surrounding roads was conducted using the software SoundPlan (Version 8.2). Noise emissions and impacts from vehicle movements on the surrounding roads (including Redbank Road) and mechanical plant and equipment on the surrounding buildings, were modelled in accordance with the CoRTN prediction techniques and calibrated to measurements and logger data from around the site.

This model is recognised by regulatory authorities around Australia and is endorsed by the NSW DPIE for use in projects of this scale. The acoustic modelling was undertaken considering specific meteorological characteristics such as wind speeds, prevailing wind directions and temperature in accordance with the hourly weather data for a full calendar year described in the Test Reference Year for Mascot 1987 (94767 Mascot (Syd AMO) 1978-87 1987).

3D modelling was implemented in this specific situation because of the complexity of integrating all noise sources and types of noise sources to develop an overall incident façade noise level. Attenuation due to distances, building shielding and environmental absorption, together with additional noise incident on the façade due to façade reflections are taken into account within the 3D model.

8.6.2 Closed Windows Assessment

The general limiting factor of the performance of a building façade in term of noise attenuation is the glazing. In the case of the proposed development, the mechanical plant and equipment from the surrounding buildings, places the largest acoustic demand on the facades of the sensitive spaces within the development.

In order to achieve the project internal noise limits established in Section 6.1, noise mitigation measures have been provided in Section 10.1.

9. Construction Noise & Vibration Assessment

9.1 Construction Noise Assessment

9.1.1 Proposed Construction Activities

In this assessment, the noise impact from the construction works is considered. The construction works are expected to occur during the following hours:

- Mon to Fri: 7am to 6pm
- Saturday – 8am to 5pm
- Sundays or Public Holidays – 8am to 5pm (excluding rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation)
- Safety inspections are permitted from 7:00am

Works are not usually permitted under the standard hours outlined in the ICNG, however with the Environmental Planning and Assessment (COVID Development - Construction work days) 2020 Ministerial Order (Refer to Section 7.1.1), works are permitted under the outlined following conditions:

> *"(2) The conditions specified for the development are that the development must-*
>
> *(c) Be the subject of a development consent, and*
>
> *(d) Comply with all conditions of the consent other than any condition that restricts the hours of work or operation on a Saturday, Sunday or public holidays, and*
>
> *(iv) Comply with the conditions of the consent that restrict the house of work or operation on any other days as if the conditions applied to work or operation on a Saturday, Sunday or public holiday, and*
>
> *(v) Not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this Order, and*
>
> *(vi) Take all feasible and reasonable measures to minimise noise."*

The hours for construction are consistent with the Environmental Planning and Assessment (COVID Development - Construction workdays) 2020 Ministerial Order. The assessment undertaken in Section 9.1, demonstrates compliance with the Ministerial Order, following conditions set, and criteria outlined by the ICNG during the out of hours works (OOHW).

9.1.2 Expected Construction Equipment

The noise sources likely to be associated with the works listed in the previous section of this report are presented in Table 38. The equipment noise levels have been extracted from AS 2436:2010 Guide to *Noise and Vibration Control on Construction, Demolition and Maintenance Sites.*

Table 38: Cumulative impact - Construction equipment noise levels

Phases	Equipment	Quantity	Sound Power Level – dB(A)	Usage Factor (%)	Usage in 15-minute period (minutes)	Time Corrected Sound Power Level ($L_{Aeq,15min}$)
Excavation, Retention and Foundation	Excavator 30 tonne	1	110	40	6	106
	Jackhammer	1	113	20	3	106
	Powered hand tool	4	102	50	7.5	99
	Concrete pump	1	109	50	7.5	106
	Mobile crane	2	110	16	2.4	102
	Bored piling	1	110	16	2.4	102
	Generator	1	104	20	3	97
	Truck	2	108	40	6	104
Structural Works	Powered hand tool	4	102	50	7.5	99
	Concrete pump	1	109	50	7.5	106
	Mobile crane	2	110	16	2.4	102
	Bored piling	1	110	16	2.4	102
	Generator	1	104	20	3	97
	Truck	2	108	40	6	104
Structural Works & Façade and Finishes	Powered hand tool	11	102	50	7.5	99
	Concrete pump	1	109	50	7.5	106
	Mobile crane	2	110	16	2.4	102

Table 39 Construction equipment for Forecourt works

Phases	Equipment	Quantity	Sound Power Level – dB(A)	Usage Factor (%)	Usage in 15-minute period (minutes)	Time Corrected Sound Power Level ($L_{Aeq,15min}$)
Excavation, Retention and Foundation	Jackhammer	2	113	20	3	106
	Powered hand tool	3	102	50	7.5	99
	Truck	2	108	40	6	104

9.1.3 Noise Modelling and Assumptions

In order to assess the noise impact from the site during the various construction stages, a noise model was prepared using commercial software SoundPLAN v8.2, which is a comprehensive software package for conducting three-dimensional complex noise propagation modelling. Using the software, a 3D model of the site and its surroundings was constructed including the nearby buildings, and the construction plant and equipment were positioned as noise sources. Within the model, the effects of the environment (built and natural) on propagation of sound were considered to reliably estimate the resulting noise effects on the surrounding noise sensitive receivers.

The assumptions that were made within the assessment include the following:

- The mitigation measures outlined in Section 11 are implemented; and
- Neutral weather conditions.

9.1.4 Predicted Noise Levels

The maximum predicted noise levels have been presented in Table 40, Table 41, Table 42, Table 43 and Table 44 have been assessed to the construction noise criteria established in Section 7.1. The noise contour maps produced by the three-dimensional noise propagation modelling are provided in Appendix C.

Table 40: Predicted noise levels – Scenario 1: Excavation, Retention and Foundation

Receiver	Predicted Worst-Case Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Worst-Case Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	45 – 62[1]	44 – 60[1]	62 (Internal)[1]	-	No
H1	51 – 61[1]	48 – 57[1]	62 (Internal)[1]	-	No
H2	49 – 66[1]	43 – 58[1]	62 (Internal)[1]	-	No
H3	49 – 65[1]	44 – 65[1]	62 (Internal)[1]	3	No
H4	46 – 61[1]	44 – 60[1]	62 (Internal)[1]	-	No
R1	38 – 40	38 – 40	59 (Standard Hours)	-	No
			54 (Outside Standard Hours)	-	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade (open window)

Table 41: Predicted noise levels – Scenario 2: Structural Works

Receiver	Predicted Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	44 – 58[1]	43 – 56[1]	62 (Internal)[1]	-	No
H1	48 – 58[1]	45 – 55[1]	62 (Internal)[1]	-	No
H2	47 – 62[1]	42 – 56[1]	62 (Internal)[1]	-	No
H3	45 – 64[1]	41 – 63[1]	62 (Internal)[1]	1	No
H4	44 – 58[1]	42 – 57[1]	62 (Internal)[1]	-	No
R1	37 – 38	35 – 37	59 (Standard Hours)	-	No
			54 (Outside Standard Hours)	-	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade (open window).

Table 42: Predicted noise levels – Scenario 3: Façade and Finishes (GF – L5)

Receiver	Predicted Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	58 – 73[1]	55 – 63[1]	62 (Internal)[1]	1	No
H1	49 – 58[1]	46 – 58[1]	62 (Internal)[1]	-	No
H2	45 – 59[1]	43 – 59[1]	62 (Internal)[1]	-	No
H3	46 – 64[1]	44 – 64[1]	62 (Internal)[1]	2	No
H4	61 – 63[1]	60 – 63[1]	62 (Internal)[1]	1	No
R1	42 – 43	40 – 42	59 (Standard Hours)	-	No
			54 (Outside Standard Hours)	-	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade (open window)

Table 43: Predicted noise levels – Scenario 4: Façade and Finishes (L6 – L10)

Receiver	Predicted Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	50 - 65	49 – 60	62 (Internal)[1]	-	No
H1	51 - 62	49 - 59	62 (Internal)[1]	-	No
H2	50 - 65	49 – 62	62 (Internal)[1]	-	No
H3	50 - 64	48 – 61	62 (Internal)[1]	-	No
H4	50 - 65	50 – 63	62 (Internal)[1]	1	No
R1	39 - 42	39 - 40	59 (Standard Hours)	-	No
			54 (Outside Standard Hours)	-	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade.

Table 44: Predicted noise levels – Scenario 5: Façade and Finishes (L11 – L15)

Receiver	Predicted Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	51 – 63	43 – 58	62 (Internal)[1]	-	No
H1	52 – 62	46 – 55	62 (Internal)[1]	-	No
H2	52 – 64	42 – 56	62 (Internal)[1]	-	No
H3	52 – 63	41 – 64	62 (Internal)[1]	2	No
H4	51 – 63	43 – 58	62 (Internal)[1]	-	No
R1	44 - 48	36 – 38	59 (Standard Hours)	-	No
			54 (Outside Standard Hours)	-	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade.

Given there is no exceedance in the highly noise noise-affected level (75 dB(A) at any receivers surrounding the proposed construction works (upon implementation of the mitigation measures outlined in Section 10) it is not expected there will be significant construction noise impacts on the surrounding noise-sensitive receivers.

Table 45: Predicted noise levels – Scenario 6: Forecourt Works

Receiver	Predicted Noise Level - Without Mitigation $L_{Aeq,15min}$	Predicted Noise Level - With Mitigation $L_{Aeq,15min}$	Noise Management Level $L_{Aeq,15min}$	Noise Management Level Exceedance (dB)	Exceeds Highly Noise Affected Level? (> 75dBA)
C1	32 - 44	32 - 44	62 (Internal)[1]	-	No
H1	36 - 44	36 - 44	62 (Internal)[1]	-	No
H2	56 – 80	56 - 80	62 (Internal)[1]	8	Yes
H3	32 - 44	32 - 44	62 (Internal)[1]	-	No
H4	32 - 44	32 - 44	62 (Internal)[1]	-	No
R1	60 - 66	56 - 60	59 (Standard Hours)	1	No
			54 (Outside Standard Hours)	6	No

Note 1: For the internal predicted noise levels presented in the table, it has been assumed that there is a 10dB loss through the receiver's façade.

There is an exceedance at the Highly Noise Effected level for the receiver H2, directly adjacent to the works. The building is multiple levels, and as such will be difficult to manage noise by blocking line of sight with hoarding or barriers to the works on ground level. The construction noise will be dominated by jackhammering during the demolition of the driveway and during these times the predicted noise level will be greater than 75 dB(A) at the façade. Some options for managing the impacts include, keeping windows and doors on that façade closed during construction, and negotiating breaks or respite periods during jack hammering works.

For the R1 receiver, even with mitigation, the construction to this area is 6 dB (A) above the recommended noise management level at the nearest most affected receiver, however not outside of the highly noise affected level. This is very typical in construction works and is considered manageable when below this threshold with proper community consult. We look at the worst case/ worst affected, construction works for each phase, where these levels are at their maximum on site they are likely to be in shorter periods or events with respite between as per out section 11.1 and are considered acceptable provided all measures used to mitigate are undertaken.

9.1.5 Cumulative noise impact from construction works

The construction program indicates the following timing for construction:

- The MSCP construction will be occurring for the duration of the PSB construction
- The structure and façade works for the MSCP are proposed to occur from July 2022 to March 2023
- The PSB is proposed to occur from Q1 2022 to Q4 2024

Given that the MSCP and PSB are 250m apart and buildings that separate them provide acoustic shielding between the sites, the cumulative noise impact during simultaneous construction is negligible. During a worst-case scenario without mitigation, the MSCP construction noise would be less than 30 dB(A) at the site of the PSB and would not contribute to the noise level at receivers adjacent to the PSB.

It is also noted there would be a short period of time that the PCPLR construction nearby would overlap with the early civil works. At this time it is expected to be in the commissioning and final stages of the PCPLR works, and therefore a very minimal over lap, and not any works that would accumulate to a significant impact of noise to our development or any neighboring receivers.

9.2 Construction Vibration Assessment

The vibration associated with construction is dependent on a number of variables including the types of machinery, the proximity to the nearby receivers as well as the ground type.

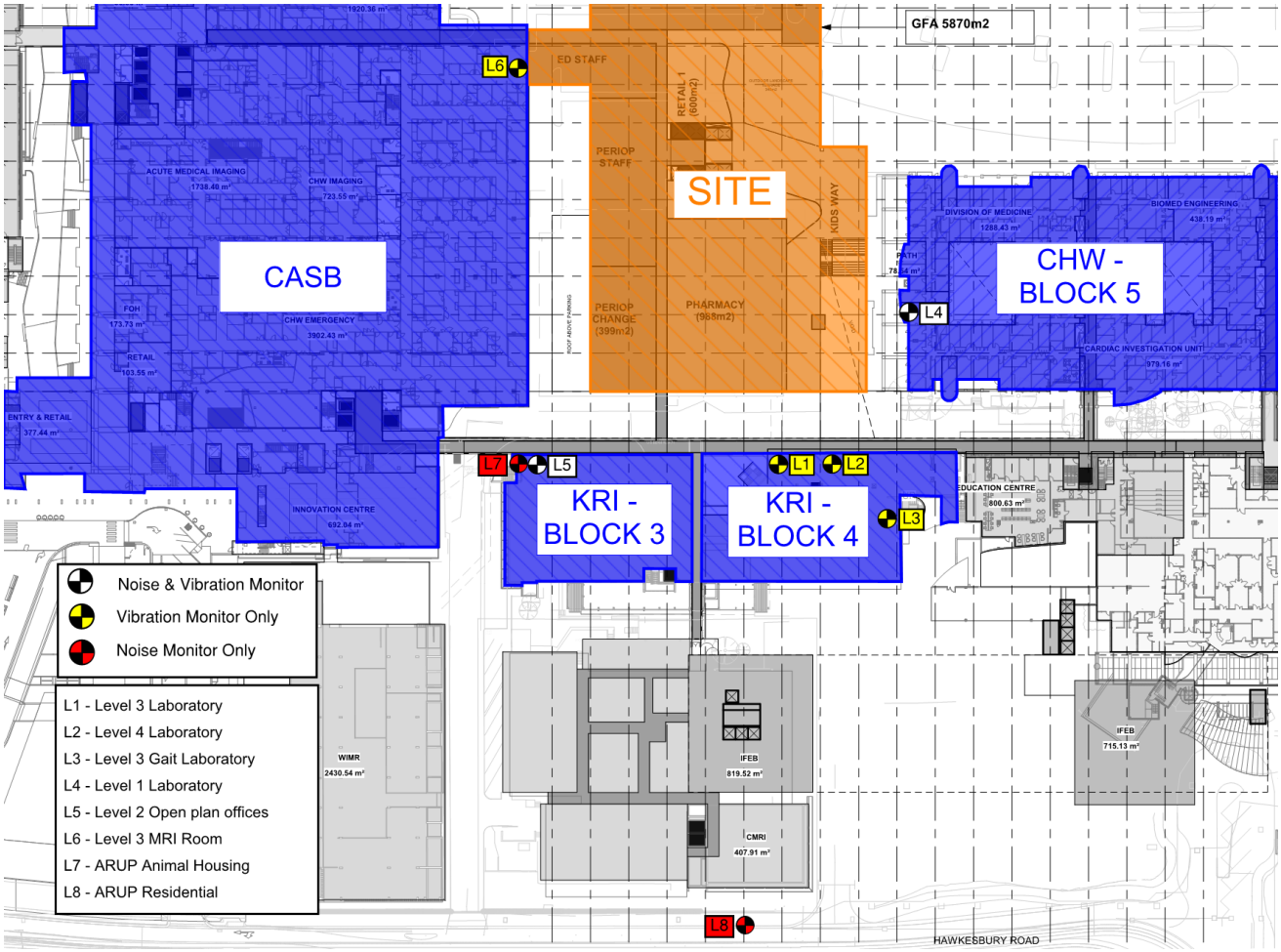
Generic safe working distances for vibration impacts associated with various types of machinery at given distances are presented within the transport for NSW 'Construction Noise Strategy' document. This document presents the safe construction working limits for Cosmetic Damage to adjacent structures (in accordance with BS 7385) and Human Comfort (OH&E).

Table 46: Working Distances for Vibration Intensive Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (OH&E Vibration Guideline)
Concrete Vibrator	<50 kN (Typically 1-2 tonnes)	5m	15m to 20m
CFA Piling Rig	≤ 800mm	2m (nominal)	N/A
Excavator with hydraulic hammer (15t)	(900kg – 12 to 18t excavator)	7m	23m

Concrete vibrators & excavators are expected be used in close proximity to the hospital receivers. Mitigation measures to ensure vibration generated on the structure of the sensitive receivers and equipment locations, outlined in Figure 13, and does not exceed the project vibration requirements are provided in Section 7.2.

Figure 13: Proposed internal vibration monitoring during construction stages



10. Operational Mitigation Measures

10.1 External Noise Intrusion Mitigation

In order to achieve the project internal noise limits established in Section 6.1, the glazing components of the façade of the proposed development must meet the acoustic demand ratings presented in Table 47 below. The designations of acoustic demand ratings on the façade are indicated on the drawings provided in Appendix D.

The double-glazed acoustic rating (R_w) is higher than the single-glazed acoustic rating is because of the reduction in acoustic performance double-glazed units (with 12-20mm cavities) experience at lower frequencies (63 Hz to 125 Hz), which are the peak frequencies typically characteristic of traffic noise emissions.

Table 47: Acoustic demand ratings for façade of proposed development

Acoustic Demand Rating	Single-Glazed Acoustic Performance (Weighted Sound Reduction Index, Rw)	Double-Glazed Acoustic Performance (Weighted Sound Reduction Index, Rw)
1	32	34
2	34	36
3	36	38
4	40	42

In addition to the required glazing systems outlined in Table 47 and indicated in in Appendix D the solid/non-glazed elements of the façade shall have an acoustic performance of no less than Rw55 to ensure the resulting internal noise levels within each space in the proposed development do not exceed the project internal noise limits outlined in Section 6.1.

The acoustic demand ratings proposed above has been provided as a high-level analysis only. The acoustic performance of the glazing facade may be reduced at certain locations within the development during the detailed design phase of the project.

11. Construction Mitigation Measures

11.1 General Acoustic Recommendations for Construction

According to AS 2436 – 2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* the following techniques could be applied to minimize the spread of noise and vibrations to the potential receivers.

11.1.1 Noise

Figure 14 demonstrates the preferred order of actions taken to mitigate excessive construction noise emissions. If a process that generates significant noise levels cannot be avoided, the amount of noise reaching the receiver should be minimized. Two ways of achieving this are to either increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens. Practices that will reduce noise from the site include:

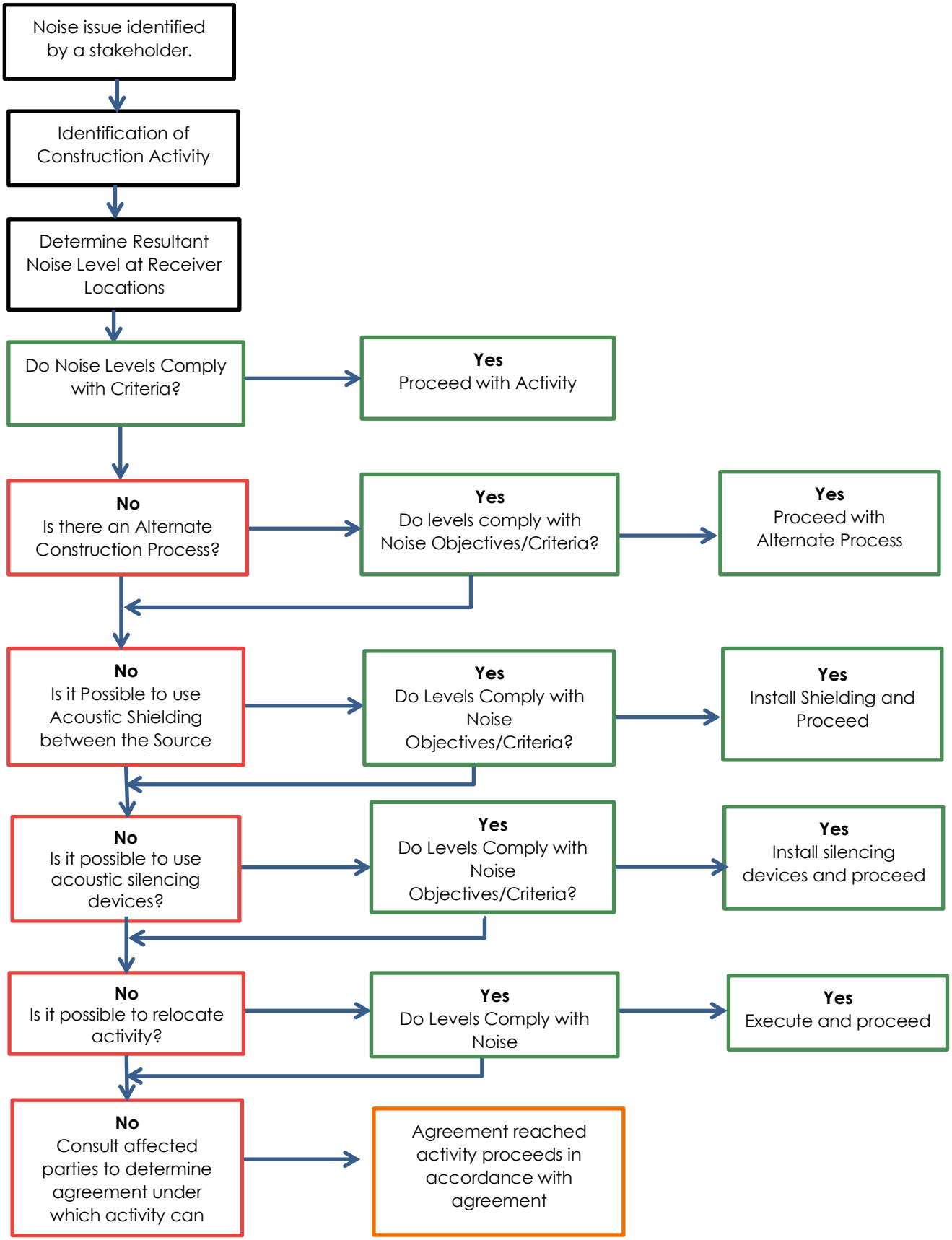
- Increasing the distance between noise sources and sensitive receivers.
- Reducing the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers (stockpiles, shipping containers and site office transportables can be effective barriers).
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise.
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

Physical methods to reduce the transmission of noise between the site works and residences, or other sensitive land uses, are generally suited to works where there is longer-term exposure to the noise. A few of these methods have been introduced below.

The assessment has assumed a minimum of moveable acoustic barriers such as Flexsheild Sonic Curtain or equivalent propriety product to provide acoustic attenuation at the construction noise source. The flexible barriers have been assumed in the acoustic modelling and predictions to be set up in close proximity to any noise generating equipment (ie around concrete pump, or jackhammering etc) controlling the noise at the source. When selecting a Flexible acoustic screen such as a Sonic Curtain, a minimum NRC of 0.7 should be met, and a minimum Rw 27. The 6kg Flexshield Sonic Curtain is a product that meets this requirement, while others that have demonstrated test data to meet the minimum requires would also be acceptable.

As an alternate, it is also possible to erect a more permanent hoarding (ie ply) at 2.1m high to shield the areas where construction activities are to take place, with the barriers closer to the noise source providing the best results. Because the a hoarding made of ply has a reflective characteristic, the hoarding should also be lined on the construction facing side with a high NRC material to absorb some of the reflected sound controlling noise at the source. Recommended acoustic absorption product for outdoors is Stratocell Whisper – which has an NRC of 1 at 50mm. The product comes in a UV protective option, and is water resistant, providing optimate acoustic absorption even whilst wet. Alternate weather proof product with an NRC 0.7 or greater would also be acceptable.

Figure 14: Noise Mitigation Management Flow Chart



Screening

On sites where distance is limited, screening of noise may be beneficial or even the only way to reduce construction noise impacts on the nearby receivers. Below, screening options for various situations have been introduced. Constructing and utilising these screening methods should be taken into account already during the planning stages.

Temporary buildings: One option to introduce screening is to position structures such as stores, storage piles, site offices and other temporary buildings between the noisiest part of the site and the nearest dwellings. Due to shielding provided by these buildings, some of the noise emission from the site can be reduced. If the buildings are occupied, however, sound insulation measures may be necessary to protect site workers inside the buildings.

Hoarding: Another way of implementing screening is to build hoarding that includes a site office on an elevated structure. This option offers superior noise reduction when compared with a standard, simple hoarding. The acoustic performance is further enhanced when the hoarding is a continuous barrier.

Partial building structures: On some sites, partially completed or demolished buildings can be used as noise shields for certain equipment. A noisy, stationary plant can be placed in a basement, the shell of which has been completed, provided reverberant noise can be controlled. Where compressors or generators are used in closed areas, it is also necessary to ensure that the exhaust gases are discharged directly to the outside air and that there is good cross-ventilation to prevent the build-up of poisonous carbon monoxide fumes and to allow an adequate air supply to maintain efficiency when operating the equipment.

Earth mounds and embankments: Where constructing noise barriers and using partial building shells is not practical, a worthwhile reduction in noise can be obtained by siting the plant behind and as close as possible to mounds of earth, which may effectively screen any noise sensitive areas from the plant. These mounds can often be designed into the construction schedule or site arrangement for future landscaping.

Long, temporary earth embankments can provide quite an effective noise screen for mobile equipment moving, for example, on a haulage road. When the earthworks are complete, the earth mounds should be removed, if possible, with smaller quieter excavators. A noise barrier like this may be a more reliable method of noise control than the imposition of restrictions on throttle settings.

Where earth noise barriers are not practical due to lack of space, consideration should be given to the possibility of constructing temporary screens from wood or any equivalent material in surface density.

Equipment operating 24h: When it comes to water pumps, fans and other plant equipment that operate on a 24-hour basis, they may not be an irritating source of noise during the day but can be problematic at night. They should therefore be effectively screened by either situating them behind a noise barrier or by being positioned in a trench or a hollow in the ground. Again, generated reverberant noise must be minimised and adequate ventilation should be ensured.

General remarks:

In many cases, it is not practical to screen earthmoving operations effectively, but it may be possible to partially shield a construction plant at the early stages of the project with protective features required to screen traffic noise.

The usefulness of a noise barrier will depend upon its length, its height, its position relative to the source and the receiver, and the material of which it is made. A barrier designed to reduce noise from a moving source should extend beyond the last property to be protected by at least ten times the shortest distance from the said property to the barrier. A barrier designed to reduce noise from a stationary source should, where possible, extend beyond the direct line of sight between the noise source and the receiver by a distance equal to ten times the effective barrier height, which is the height above the direct line between source and receiver.

If the works are already predominantly located within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

Crane (diesel operated)

An appropriate silencer on the muffler and acoustic screen around the engine bay are recommended to attenuate the noise from the machine.

Reversing and Warning Alarms

Community complaints often involve the intrusive noise of alarms commonly used to provide a safe system of work for vehicles operating on a site. Beeper reversing alarm noise is generally tonal and may cause annoyance at significant distances from the work site.

There are alternative warning alarms capable of providing a safe system of work that are equal to or better than the traditional "beeper", while also reducing environmental noise impacts. The following alternatives should be considered for use on construction sites as appropriate:

- Broadband audible alarms incorporating a wide range of sound frequencies (as opposed to the tonal-frequency 'beep') are less intrusive when heard in the neighbourhood.
- Variable-level alarms reduce the emitted noise levels by detecting the background noise level and adjusting the alarm level accordingly.
- Non-audible warning systems (e.g. flashing lights, reversing cameras) may also be employed, provided that safety considerations are not compromised.
- Proximity alarms that use sensors to determine the distance from objects, such as people or structures, and generate an audible alarm in cabin for the driver.
- Spotters or observers.

The above methods should be combined, where appropriate.

11.1.2 Vibration

Vibration can be more difficult to control than noise, and there are few generalisations that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement. Impulsive vibration can, in some cases, provide a trigger mechanism that could result in the failure of building components that had previously been in a stable state.

During the demolition works and the erection of new structures, some vibrations (transmitted through the structure from the demolition sites) are expected, being more of a concern for the surrounding sensitive receivers. Vibrations can also trigger annoyance, which might get elevated into action by occupants of exposed buildings and should therefore be included in the planning of communication with impacted communities.

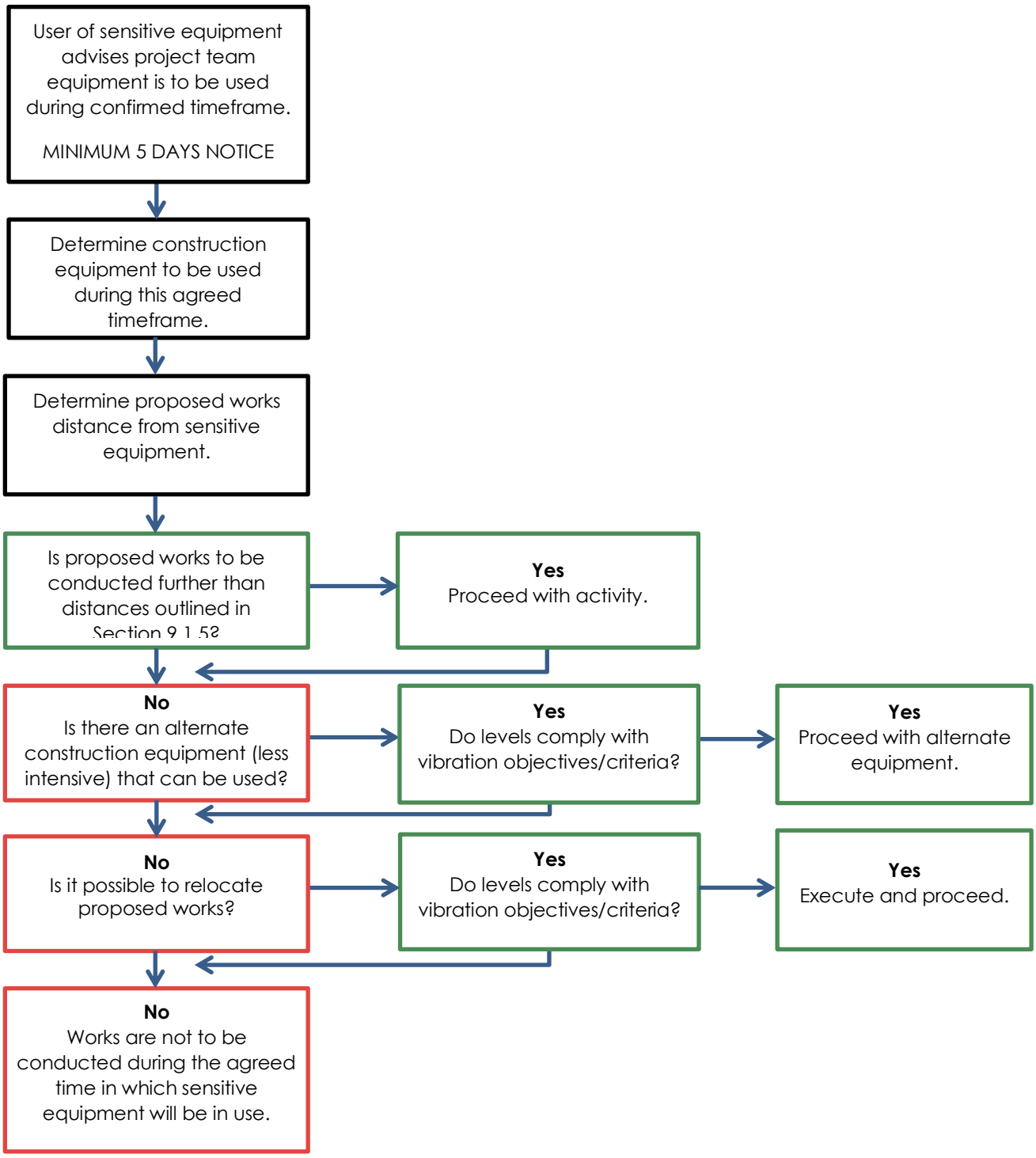
It should be remembered that failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access. BS 7385-2 provides more information on managing ground-borne vibration and its potential effects on buildings. Where site activities may affect existing structures, a thorough engineering appraisal should be made at the planning stage.

General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers are recommended when they are relatively close, depending on the magnitude of the source of the vibration or the distance associated. Relatively simple prediction methods are available in textbooks, codes of practice and standards, however, it is preferable to assess site transmission and propagation characteristics between source and receiver locations through measurements.

Guidance for measures available for the mitigation of vibration transmitted can be sought in more detailed standards, such as BS 5228-2 or policy documents, such as the NSW DEC *Assessing Vibration: A technical guideline*. Identifying the strategy best suited to the control of vibration follows a similar approach to that of noise: avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plants (pumps and compressors), portable plants (jackhammers and pavement vibrators), mobile plants, pile-drivers, tunnelling machines and activities, and blasting, amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference to be expected or predicted results, especially when considering the noise propagated from piling.

The proposed monitoring program should be closely followed to monitor if exceedances are regularly occurring. In the event that a portion of works is exceeding the vibration criteria and triggering the monitors, alternate means should be pursued, including the use of smaller equipment such as smaller excavators when in use in close proximity to the affected buildings. Screw piling is also advised to minimise ground borne vibration from piling rigs.

Figure 15: Vibration Mitigation Management Flow Chart



11.2 Complaint Handling Procedures and Community Liaison

It is recommended that the directly contractor contact adjacent noise sensitive receivers and provide them with the following information:

- The contact details for a nominated representative in order to make noise / vibration complaints.
- Explain the timeframe for the construction works and the proposed activities, i.e. the proposed start / stop dates of work and a description of the noise producing equipment that will be used.
- Notify the noise sensitive receivers and Health Infrastructure in a timely manner should there be any need for an extension to the proposed arrangements.
- Provide them with a copy of this report as approved by PwC/Health Infrastructure.
- PwC/Health Infrastructure should be notified of the nature and details of complaints received (time, complainant etc.) and what remedial action has taken place, if any.
- Where noise is demonstrated as being compliant with criteria, this should not limit the proponent in undertaking further additional reasonable and feasible steps to reduce noise emissions.

To assist in the management of noise and vibration complaints various procedures are to be followed. These include:

- Clearly visible signage identifying any key personnel along with their contact details to be erected along the perimeter of the building site including:
    - A 24-hour contact name, phone number and email address provided for the resident to address any complaint. The signage will declare; “For any enquiry, complaint or emergency relating to this site at any time please contact…”
- Give complaints a fair hearing.
- Have a documented complaints process, including an escalation procedure so that if a complaint is not satisfied there is a clear path to follow.
- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night-time only if requested by the complainant to avoid further disturbance.
- Implement all feasible and reasonable measures to address the source of the complaint.
- A register is to be kept by the contractor to keep a record of complaints and detail any information associated with them. The contents of the register will include:
    - The name and the address of the complainant
    - Time and date of the complaint
    - The nature of the complaint (Noise/Vibration)
    - Subsequent details
    - Remedial action undertaken

The contents of the register will be maintained and updated with any new complaint without delay. The complaints will be reported to both PwC/Health Infrastructure and the Contractor. The investigation of the complaint and any remedial actions will be performed by the builder and/or client representative.

In the event of noisy works scheduled, the builder will notify residents 5 business days in advance.

11.3 Noise & Vibration Monitoring Strategy

11.3.1 General Methodology

Noise and vibration levels should be monitored from time to time to ensure that noise generated as a result of remediation and construction activities does not disturb local businesses and residents.

Monitoring may be in the form of regular checks by the contractor or indirectly by an acoustic consultant is engaged by the Client and in response to any noise or vibration complaints. Where noise and vibration criteria are being exceeded or in response to valid complaints, noise and / or vibration monitoring should be undertaken. This would be performed inside the premises of the affected property and on site adjacent to the affected receivers.

Monitoring is to be undertaken by an experienced noise and vibration monitoring professional or an acoustic consultant. The results of any noise or vibration monitoring are to be provided to the relevant party or person in a timely manner allowing the builder to address the issue and respond to the complaints.

Noise and vibration monitoring can take two forms:

- Short-term monitoring
- Long-term monitoring

Both of these approaches are elaborated below.

11.3.2 Short-term monitoring

Short-term monitoring consists of attended monitoring when critical stages of the construction are occurring. This normally provides real-time assistance and guidance to the subcontractor on site, telling them when the noise and vibration criteria are exceeded. Thus, the selection of alternative method on construction or equipment selection is allowed in order to minimise noise and vibration impacts.

11.3.3 Long-term monitoring

Similarly, to short-term monitoring, long-term monitoring provides real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded. Instead of someone being on site measuring, noise and vibration loggers are used.

Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project. Sometimes the period of construction noise and vibration monitoring is dictated by the local authorities through the DA conditions.

Both methodologies are complementary and normally used simultaneously providing a significant amount of data via the long-term monitoring, but also providing information on the sources of noise and vibration generating exceedances via the short-term or attended monitoring.

11.3.4 Noise & Vibration Monitoring Program

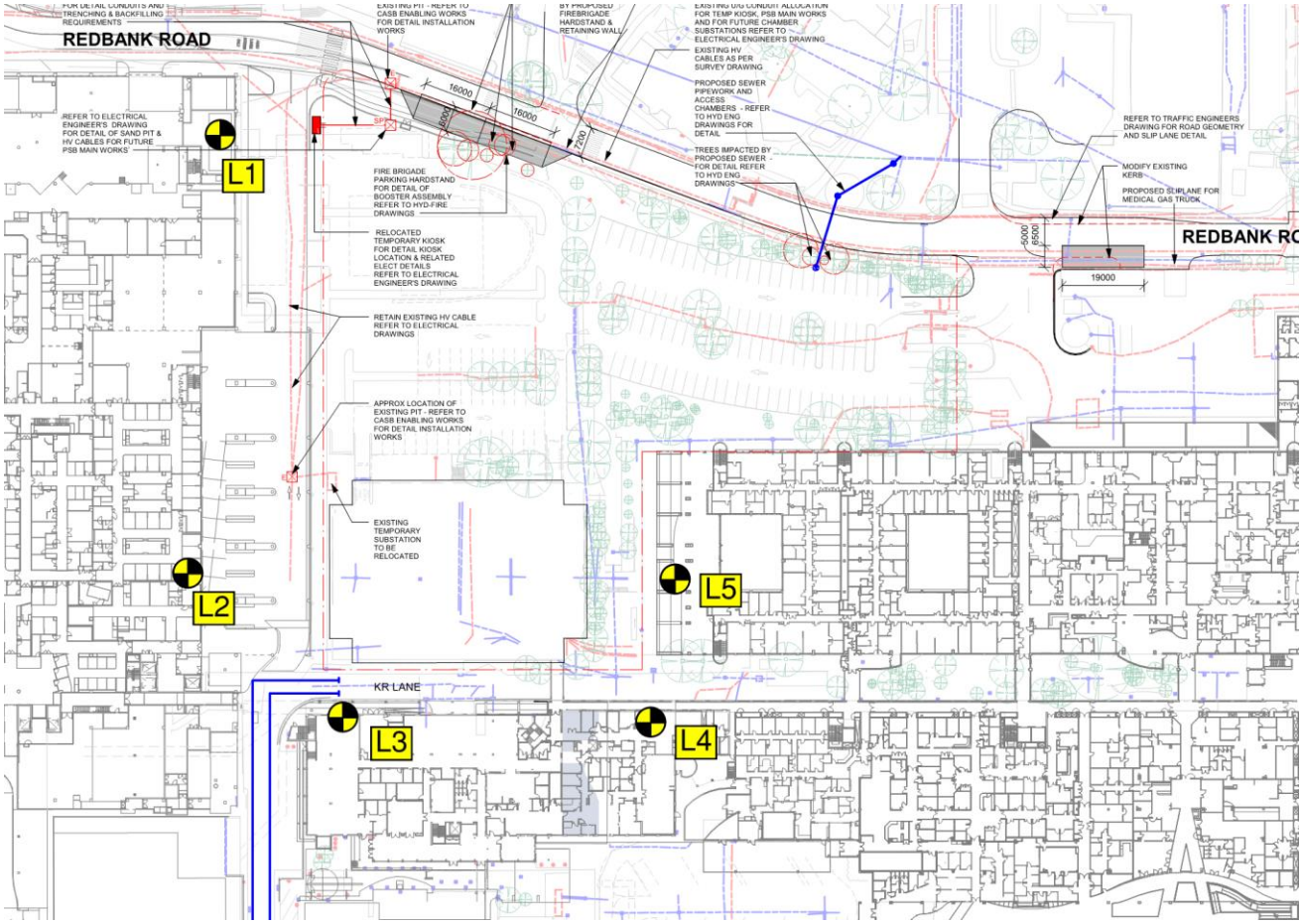
The following monitoring program is proposed for this project. Refer to Figure 16 for the approximate monitoring locations:

- Unattended noise monitor installed at L1 – L5 during the entire construction stage
- Unattended vibration monitor installed at L1 – L5 during the entire demolition stage

The monitoring programme as shown above is to be carried out as agreed with the Acoustic engineer and Contractor.

It should be noted that the works for the Campus Infrastructure Improvement project will be happening concurrently with the Demolition of the P17 Demolition, and therefore Noise and Vibration Monitors used for the P17 Demolition can be used for these works.

Figure 16: Proposed Monitoring Locations



12. Conclusion

A noise and vibration impact assessment for the new PSB Building Development located within the Children's hospital of Westmead, NSW has been conducted. This document forms part of the documentation package to be submitted to relevant authorities as part of the Stage Significant Development Application process.

This report has provided criteria, in-principle treatment and design requirements which aim to achieve the statutory criteria discussed in Section 6. In terms of noise and vibration criteria, we have provided the following:

- Noise criteria for internal noise levels according to the DPIE's Development near Rail Corridors and Busy Roads – Interim Guideline, provided in Section 6.1;
- Noise criteria for noise emissions from the proposed expansion and redevelopment to noise-sensitive receivers in accordance with the NSW NPI Section 6.2;
- Operational vibration criteria for human comfort and structural damage, provided in Section 6.3;
- Construction noise criteria provided in Section 7.1; and
- Construction vibration criteria for human comfort and structural damage, provided in Section 7.2.

Having given regard to the analysis conducted within this report, it is the finding of this noise and vibration impact assessment that the proposed development is compliant with the relevant noise and vibration criteria controls for this type of development (and as outlined in the SEARs), and it is expected to comply with the applicable regulations with regards to noise and vibration, particularly those listed above.

It is recommended the state significant development application for the proposed development is not rejected on the basis of noise and vibration, given the implementation of the mitigation measures outlined within this report.

Appendix A – Glossary of Acoustic Terms

NOISE	
Acceptable Noise Level:	The acceptable LAeq noise level from industrial sources, recommended by the EPA (Table 2.1, INP). Note that this noise level refers to all industrial sources at the receiver location, and not only noise due to a specific project under consideration.
Adverse Weather:	Weather conditions that affect noise (wind and temperature inversions) that occur at a particular site for a significant period of time. The previous conditions are for wind occurring more than 30% of the time in any assessment period in any season and/or for temperature inversions occurring more than 30% of the nights in winter).
Acoustic Barrier:	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ambient Noise:	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment Period:	The period in a day over which assessments are made.
Assessment Location	The position at which noise measurements are undertaken or estimated.
Background Noise:	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level.
Decibel [dB]:	The units of sound pressure level.
dB(A):	A-weighted decibels. Noise measured using the A filter.
Extraneous Noise:	Noise resulting from activities that are not typical of the area. Atypical activities include construction, and traffic generated by holidays period and by special events such as concert or sporting events. Normal daily traffic is not considered to be extraneous.
Free Field:	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground
Frequency:	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz).
Impulsive Noise:	Noise having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent Noise:	Level that drops to the background noise level several times during the period of observation.
LAmax	The maximum A-weighted sound pressure level measured over a period.
LAmin	The minimum A-weighted sound pressure level measured over a period.
LA1	The A-weighted sound pressure level that is exceeded for 1% of the time for which the sound is measured.
LA10	The A-weighted sound pressure level that is exceeded for 10% of the time for which the sound is measured.
LA90	The A-weighted level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq	The A-weighted “equivalent noise level” is the summation of noise events and integrated over a selected period of time.

LAeqT	The constant A-weighted sound which has the same energy as the fluctuating sound of the traffic, averaged over time T.
Reflection:	Sound wave changed in direction of propagation due to a solid object met on its path.
R-w:	The Sound Insulation Rating R-w is a measure of the noise reduction performance of the partition.
SEL:	Sound Exposure Level is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Absorption:	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Level Meter:	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Pressure Level:	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level:	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise:	Containing a prominent frequency and characterised by a definite pitch.

Appendix B – ARUP Noise Monitoring Report

Ford Civil Contractor (FCC)

Hawkesbury Road Widening Works - Noise Monitoring

Noise monitoring report - 2019-10-16 to 2019-11-15

AC09

Issue 1 | 11 December 2019

Job number 268283-01

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 5 151 Clarence Street
Sydney NSW 2000
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		Hawkesbury Road Widening Works - Noise Monitoring			**Job number** 268283-01
Document title		Noise monitoring report - 2019-10-16 to 2019-11-15			**File reference**
Document ref		AC09			
Revision	**Date**	**Filename**	AC09_v1_Noise monitoring 1901016-191115.docx		
Issue 1	11 Dec 2019	**Filename**	AC09_v1_Noise monitoring 191016-191115.docx		
		Description	First Issue		
			Prepared by	Checked by	Approved by
		Name	Kim Jones	Clemence Terraz	
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

Tables

Figures

Appendices

Appendix A

Baseline Data (EIS)

Appendix B

Land Use Survey

Appendix C

Noise Monitoring Daily Results

Appendix D

Noise & Vibration Impact Protocol

Appendix E

NATA Certificates for Noise Loggers

1 Introduction

Arup has been commissioned by Ford Civil Contractors (FCC) to monitor construction noise from the Hawkesbury Road Widening Works and associated minor works prior to the Main Infrastructure Works for the Parramatta Light Rail (PLR) in the Westmead Precinct. This report is in accordance with the Construction Monitoring Plan included in the approved Construction Noise and Vibration Management Plan (CNVMP) (PLR-HAC-HRW-NV-PLN-000001_Rev_3 dated July 2019) and addresses all relevant conditional requirements.

Major works commenced on 16 August 2019. This report details noise measurement results from 16 October 2019 to 15 November 2019 inclusive.

2 Construction hours

2.1 Period definitions

Construction work hours are defined in condition of approval and OOHW protocol and are summarised below in Table 1.

Table 1: CoA and OOHW Protocol Works Periods

CoA Number	Period	Day and times
Standard hours	Day	Monday to Friday – 7:00 am to 7:00 pm Saturdays – 8:00 am to 6:00 pm
OOHW Period 1	Day	Sundays and public holidays – 8:00 am to 6:00 pm Saturday – 7:00 am to 8:00 am
	Evening	Monday to Friday – 7:00 pm to 10:00 pm Saturday - 6:00 pm to 10:00 pm
OOHW Period 2	Evening	Sunday and public holidays - 6:00 pm to 10:00 pm
	Night	Monday to Saturday – 10:00 pm to 7:00 am Saturday to Sunday – 10:00 pm to 8:00 am

2.2 Works during monitoring period

Construction works during the period of monitoring (16 October 2019 to 15 November 2019) were conducted as follows.

Table 2 FCC work schedule

Works Period	Date	Time	Activities
Standard hours	16 October 2019 to 15 November 2019	Full period	Major Works
OOHW Period 1	N/A	N/A	N/A
OOHW Period 2	N/A	N/A	N/A

3 Baseline data

Baseline data was conducted as part of the EIS in October 2016 and is detailed in Appendix A.

No additional baseline was conducted for this project.

4 Monitoring undertaken

4.1 Short-term monitoring

Short-term monitoring has not been conducted for this monitoring period. A review of proposed construction works for the monitoring period did not trigger any specific requirements to conduct short-term monitoring (refer to CNVMP Section 10.3.1 Table 10-1 When to monitor).

4.2 Long-term monitoring

Long-term unattended monitoring or continuous noise monitoring (24/7 monitoring) was nominated for critical locations within the Health Precinct. Long-term monitoring at those critical locations is to be conducted for the entire duration of Hawkesbury Road Widening Works and associated minor works.

The unattended noise measurements at identified critical locations within the Health Precinct were carried out using ARL Ngaras noise loggers. All microphones were set up a minimum of 1.2 m above ground. $L_{Aeq(15\ minutes)}$ and L_{Amax} noise levels were recorded as well as audio.

The noise loggers operate continuously during construction works and are setup to send email and SMS notifications to stakeholders when construction noise management levels (NMLs) are exceeded.

Noise loggers carry current National Association of Testing Authorities (NATA) calibration certificates dated 20 and 21 May 2019 (Attached in Appendix E). Noise loggers used for the noise survey are listed in Table 3.

4.2.1 Monitoring locations

Critical locations within the Health precinct where long-term noise monitoring has been conducted are described in Table 3 and shown graphically in Figure 1 below.

Table 3: Critical locations within the Health precinct where long-term noise monitoring is conducted

Building	Level	Room	Type of room/logger location	Equipment Serial Number
WIMR	Level 2	R2.04	South East corner within Brain Dynamics centre (on Hawkesbury Road Façade)	878183
	Level 2	L2.11	Sample prep pre-pcr room	878180
	Level 1	I.19	Biological Science Facility (BSF)	878176
CMRI	Level 0	G65	Biological Science Facility (BSF)	87819B
	Level 2	1-209B	on Hawkesbury Road Façade	87818B
Westmead Adults Hospital	Level 2	Nuclear medicine and ultrasound	Nuclear Medical Facility Imaging Suite	87818F

The calibration of the loggers is conducted regularly. No significant drift in calibration was observed.

Note: All noise loggers are located internally within the hospital buildings.

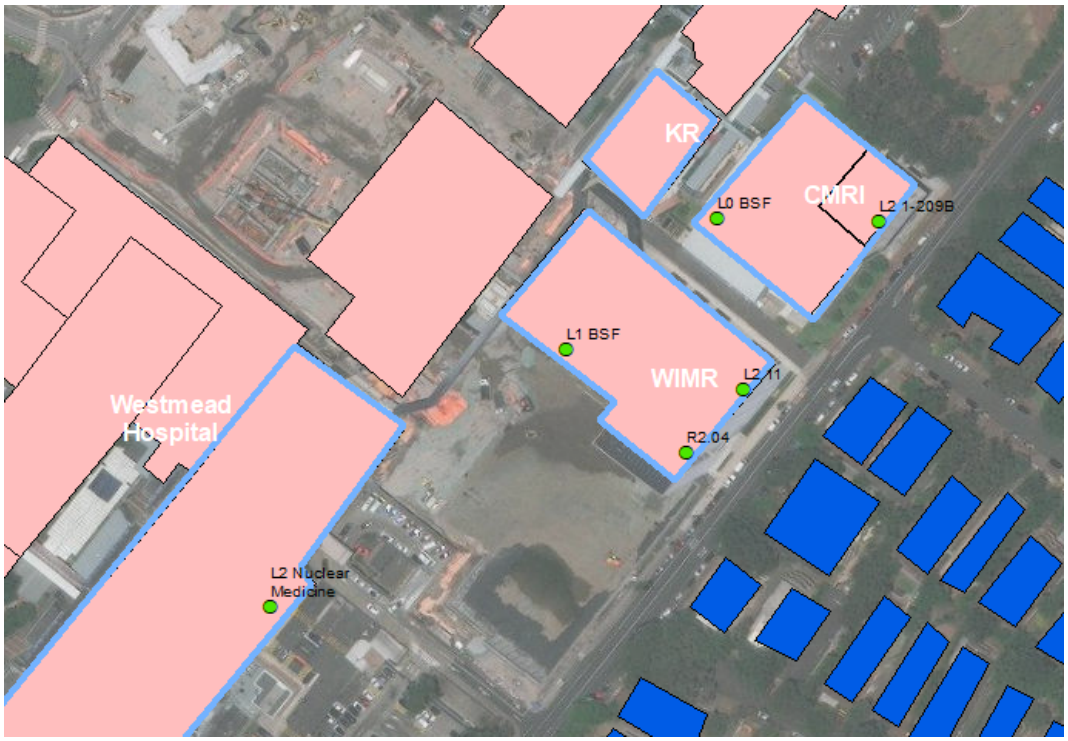


Figure 1: Noise monitoring locations

5 Noise Management levels

Table 4, Table 5 and Table 6 summarise the Noise Management Levels (NMLs) applicable for the project.

Table 4: Project NMLs – residential receivers

NCA	Logger ID	Standard Hours[1]		Out of Hours Work Periods[1]				Sleep Disturbance Night
		Noise Affected	Highly Noise Affected	Noise Affected Day[1]	Noise Affected Evening[1]	Noise Affected Night[1]	Trigger for respite periods Day / Evening / Night[1]	
		$L_{Aeq15min}$ > RBL+10 dB	$L_{Aeq15min}$ >	$L_{Aeq15min}$ > RBL +5 dB	$L_{Aeq15min}$ > RBL +5 dB	$L_{Aeq15min}$ > RBL +5 dB	$L_{Aeq15min}$ >	L_{Amax} > RBL+15 dB
NCA02	BG02	61	75	56	53	48	65	58
NCA03	BG02	61	75	56	53	48	65	58
NCA04	BG03	59	75	54	53	52	65	62
NCA05	BG03	59	75	54	53	52	65	62
Mons Road	BG03	59	75	54	53	52	65	62

Note 1 – Refer to Table 1

Note 2 – Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 5: Project NMLs – other sensitive receivers (when in use)

Sensitive Land Use	Management level, $L_{Aeq,15min}$
Classrooms at schools and other educational institutions.	Internal noise level – 45 dB External noise level – 65 dB[1]
Hospital wards and operating theatres	Internal noise level – 45 dB External noise level – 65 dB[1]
Places of Worship	Internal noise level – 45 dB External noise level – 65 dB[1]
Commercial premises	External noise level 70 dB
Industrial premises	External noise level 75 dB
Child Care Facilities	Internal noise level – 45 dB External noise level – 65 dB[1]
All ‘other sensitive receivers’ – highly affected noise target – CoA E36	External noise level – 75 dB

Note 1: For predictive assessment and where noise monitoring is required, it is often more practical to assess at external locations. For purpose, external management levels have been established assuming premises have closed windows with a nominal noise reduction of 20 dB(A). Where monitoring occurs, this noise reduction will be verified on site.

Table 6: Project NMLs – critical locations within the Health Precinct (when in use)

Location	**Management level dB $L_{Aeq\ 15min}$ (All periods)**
CMRI Level 2 1-209B	60
CMRI Biological Science Facility (BSF) G65	65
WH Nuclear Medicine and Ultrasound	60
WIMR Biological Science Facility (BSF) I.19	65[1]
WIMR Level 2 R2.04	60
WIMR Level 2 L2.11	65

Notes:

1. See Section 5.1

The noise management levels presented in Table 6 are consistent with previous monitoring carried out at the hospital and have been agreed with relevant parties as part of the consultation. The noise management levels were progressively modified to avoid undue false alerts which were causing more interruption than any observed construction noise intrusion: A significant number of false positive noise trigger alerts were caused by the operation of a fume hood in WIMR L2.11 and WIMR BSF I.19 and by music and people talking in office spaces.

5.1 WIMR Biological Science Facility I.19

On Thursday 22nd August, HAC and WIMR requested that Arup shut down the logger in WIMR BSF room I.19. Arup suggested that the alerts and audio recording could be disabled but the logger could continue to record noise levels and upload them to the cloud, since the cloud service had been paid in advance. This proposal has been accepted on a temporary basis.

As of the afternoon of Thursday 22nd August, any recorded exceedances in Table 7 will not have resulted in an alert message being sent.

As of November 1st, the Noise Cloud subscription for the noise logger in WIMR BSF room I.19 was cancelled. As a result, exceedances recorded by this noise logger after November 1st will not be included in this report.

6 Monitoring results

6.1 Short-term monitoring results

Short-term monitoring has not been conducted for this monitoring period.

6.2 Long-term monitoring results

Monitoring results for the critical locations within the Health Precinct are presented graphically in Appendix C. The graphs show measured $L_{Aeq15min}$ inside the rooms and associated noise management level.

Table 7 describes monitoring periods excluded from the assessment together with the reason for exclusion.

Table 7: Exclusion periods during monitoring period

Noise logger location	Exclusion Periods	Comments
CMRI Level 2 1-209B	17 Oct 08:15 – 17 Oct 09:30	Suspected power outage
	02 Nov 13:00 - present	Cannot connect to noise logger – CMRI staff to try power cycling logger to bring back online.
CMRI Biological Science Facility (BSF) G65	15 Nov 08:15 – 15 Nov 10:00	Suspected power outage
WH Nuclear Medicine and Ultrasound	17 Oct 08:15 – 17 Oct 09:30	Suspected power outage
WIMR Biological Science Facility (BSF) I.19	17 Oct 08:00 – 17 Oct 09:15	Suspected power outage
	01 Nov 10:00 – present	Noise Cloud subscription cancelled; no logger data available after 01 Nov
WIMR Level 2 R2.04	17 Oct 08:15 – 17 Oct 09:30	Suspected power outage
WIMR Level 2 L2.11	17 Oct 08:15 – 17 Oct 09:30	Suspected power outage

The number of Management Level exceedances recorded at each noise monitoring location during the assessment period and within construction hours are shown below in Table 8.

Table 8: Recorded Management Level exceedances.

Noise logger location	Recorded Management Level exceedance instances		
	Standard Hours	OOHW Period 1	OOHW Period 2
CMRI Level 2 1-209B	8	N/A	N/A
CMRI Biological Science Facility (BSF) G65	0	N/A	N/A
WH Nuclear Medicine and Ultrasound	3	N/A	N/A
WIMR Biological Science Facility (BSF) I.19[1]	20	N/A	N/A
WIMR Level 2 R2.04	8	N/A	N/A
WIMR Level 2 L2.11	3	N/A	N/A

Notes:

1. No alert messages were sent for these exceedances (see Section 5.1)

Exceedances of the criteria indicates that noise levels within the spaces where exceeded. However, noise exceedances are not necessary due to construction works.

No recorded noise-related escalations of the Noise & Vibration Impact Protocol V3.0 were provided to Arup during this period; therefore, all other exceedances are assumed to be from internal causes.

7 Noise and Vibration Impact Protocol

The Noise and Vibration Impact Protocol v3 (refer to Appendix D) is followed when a noise exceedance alert comes through to the Research Institutes.

This protocol was developed and agreed upon by HAC and key Hospital stakeholders.

The Research Institutes are responsible for verifying whether construction noise is impacting the Institutes and for notifying PwC/FCC. In case of uncertainty, whether alerts are triggered by construction noise or by extraneous noise, ARUP can review data on an on-demand basis and provide construction mitigations advice to PwC/FCC if required.

Appendix A

Baseline Data (EIS)

Baseline Data

As detailed in the CNVMP, long-term noise monitoring was conducted as part of the EIS, in October 2016. This baseline noise monitoring was conducted to quantify and characterise the existing ambient noise environment across the Parramatta Light Rail project area.

The measured noise levels have been used to establish existing noise levels as a basis for assessing potential noise impacts of the construction works.

Relevant location of the EIS baseline noise monitoring survey for this project are reproduced in Table 9 and graphically in Appendix B. Those noise monitoring locations were selected to be representative of receivers and communities potentially affected by the construction works. With the exception of the Mons Road Compound, the monitoring has been deemed sufficient to characterise the areas potentially affected by the subject works. For the Mons Road residential receivers, the lower background noise levels of BG03 have been adopted for this assessment. Site specific noise monitoring is not proposed due to the lower intensity of works, and standard hours use of the site.

The EIS baseline data is therefore suitably representative of sensitive receivers potentially affected by the Project and no further baseline noise monitoring is proposed as part of this project.

Table 9: Ambient Noise Survey Locations

ID	Precinct	NCA	Noise Monitoring Location Address
BG02	Westmead	NCA03	157 Hawkesbury Road, Westmead
BG03		NCA04	199 Hawkesbury Road, Westmead

Results of the EIS baseline noise monitoring survey for this project are presented in Table 10.

Table 10: Summary of Unattended Noise Logging Results

ID	Measured Noise Level - dB(A)					
	RBL			$L_{Aeq(period)}$		
	Daytime	Evening	Night	Daytime	Evening	Night
BG02	51	48	43	63	63	57
BG03	49	48	47	60	60	55

Appendix B

Land Use Survey

Legend

Buildings

- Residential
- Commercial
- Place of Worship
- Medical
- Educational
- Hotels
- Childcare Centre
- Tribunal

- Heritage Listed Building
- Project Boundary
- Sensitive Equipment Locations
- EIS Noise Monitoring Locations
- Stockpile_Location
- Site Compound
- EIS Noise Catchment Area

KRI	Kids Research Institute
CMRI	Children's Medical Research Institute
WIMR	Westmead Institute of Medical Research
WSLHD	Western Sydney Local Health District

Client

Job Title
Hawkesbury Road Widening

Figure Title
Land Use Survey

Metres
0 50 100 150 200 250 300 350

Issue	Date	By	Chkd	Appd
D1	4/03/2019	CN	CT	BC

ARUP
Level 5, 151 Clarence Street
PO Box 76 Millers Point
Sydney, NSW 2000
Tel +61 (2)9320 9320 Fax +61 (2)9320 9321
www.arup.com

Scale at A4	Figure Status
1:7,000	Draft 1

Coordinate System
GDA 1994 MGA Zone 56

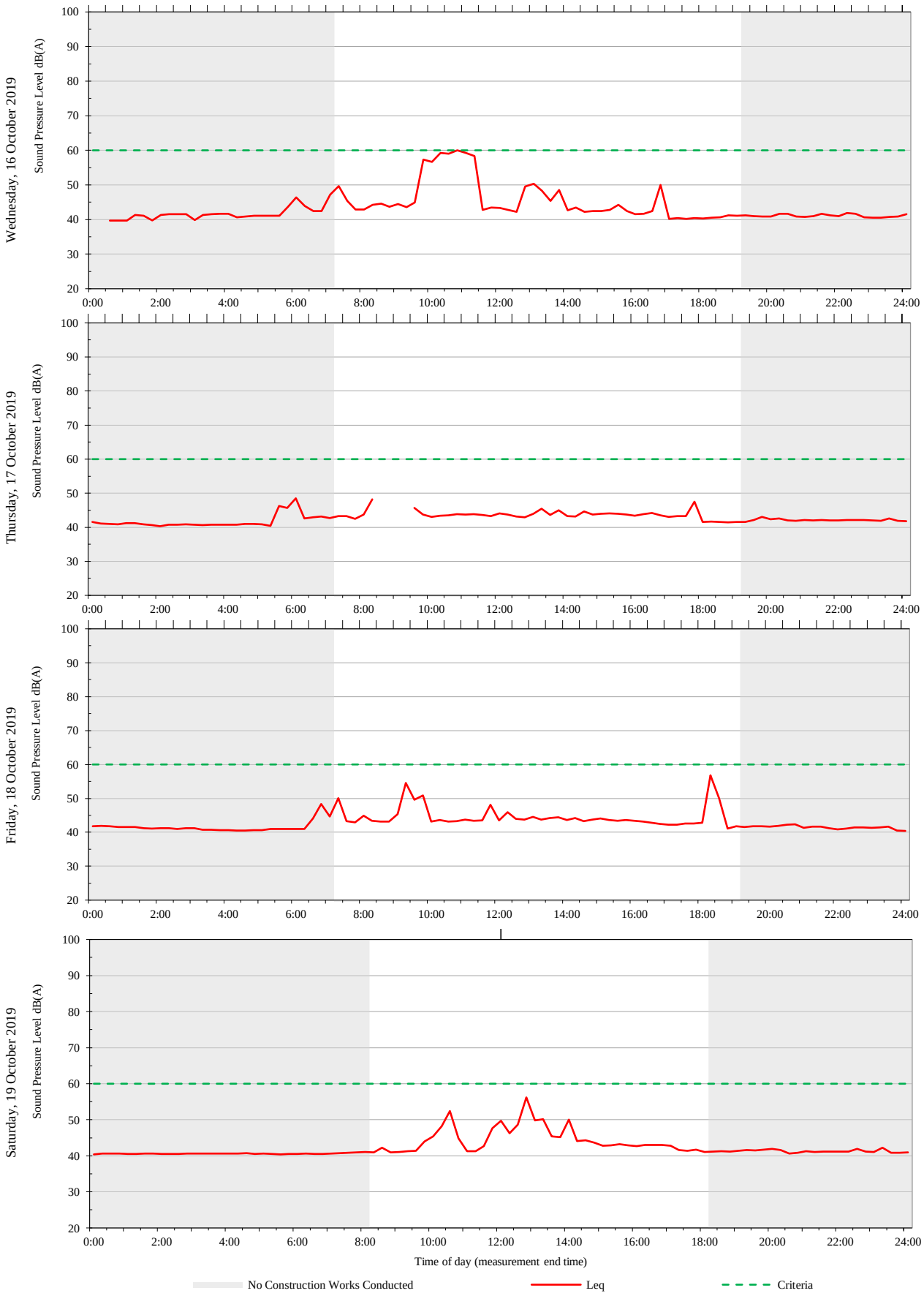
Job No	Figure No
236482-00	TBC

Appendix C

Noise Monitoring Daily Results

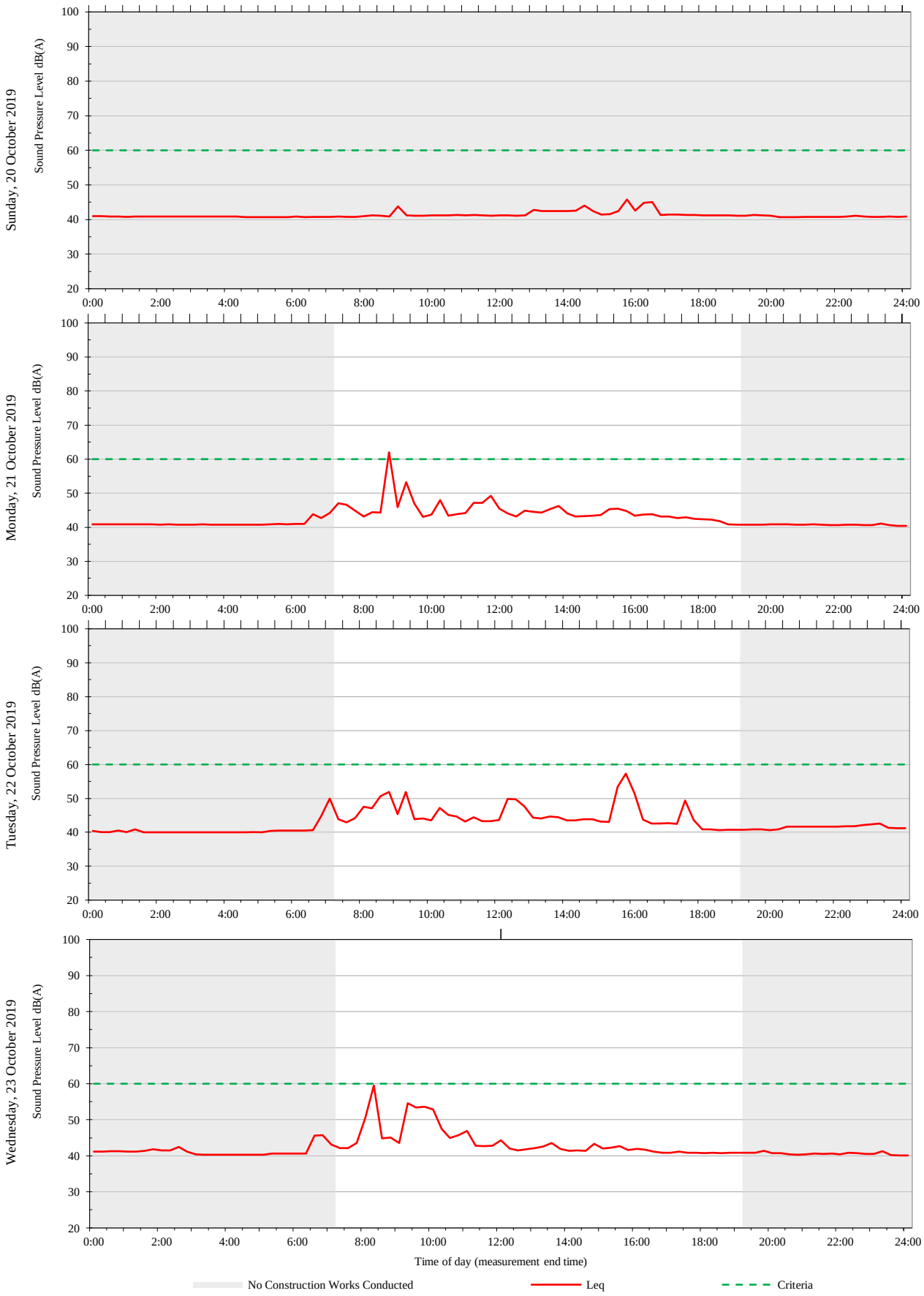
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



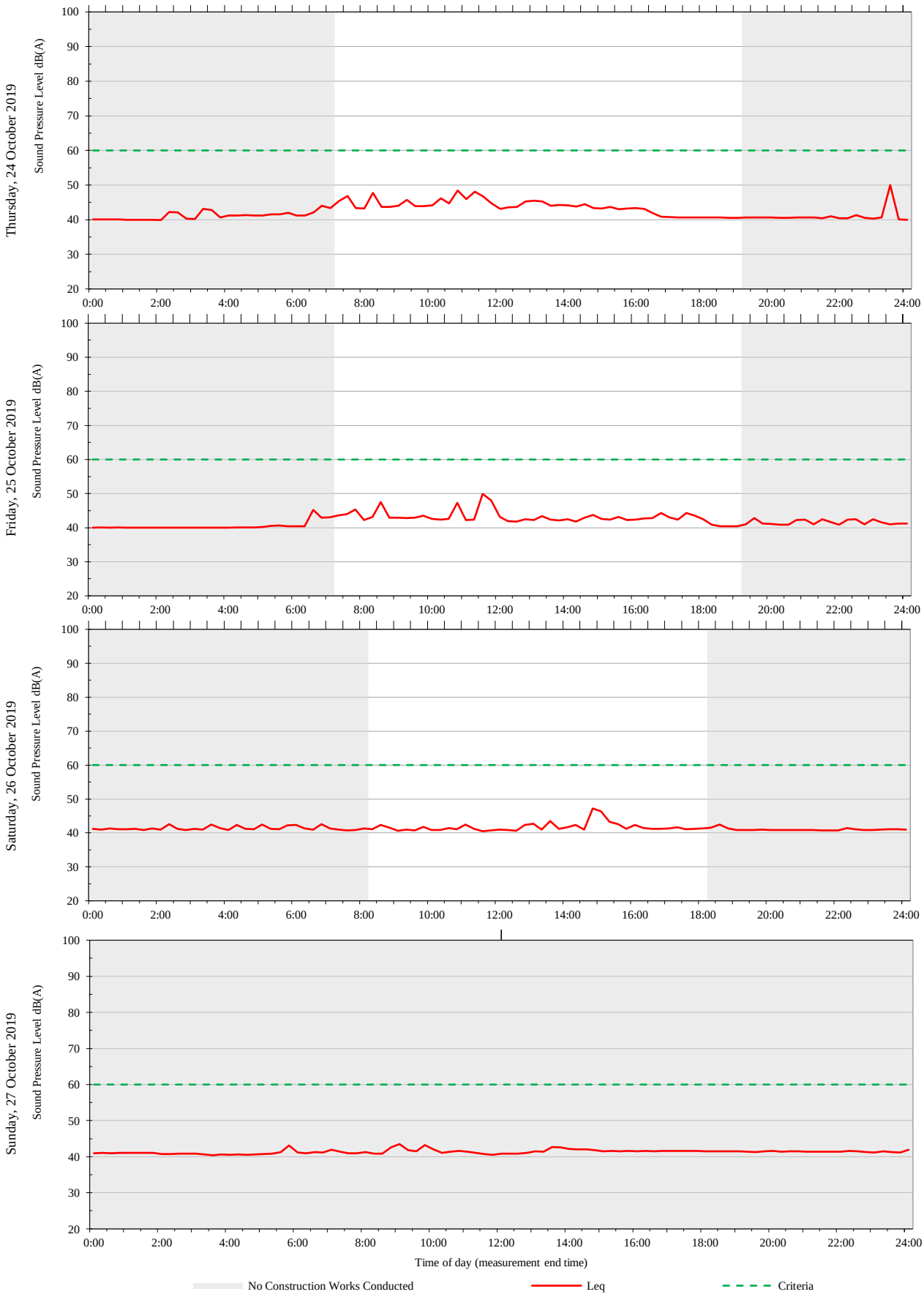
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



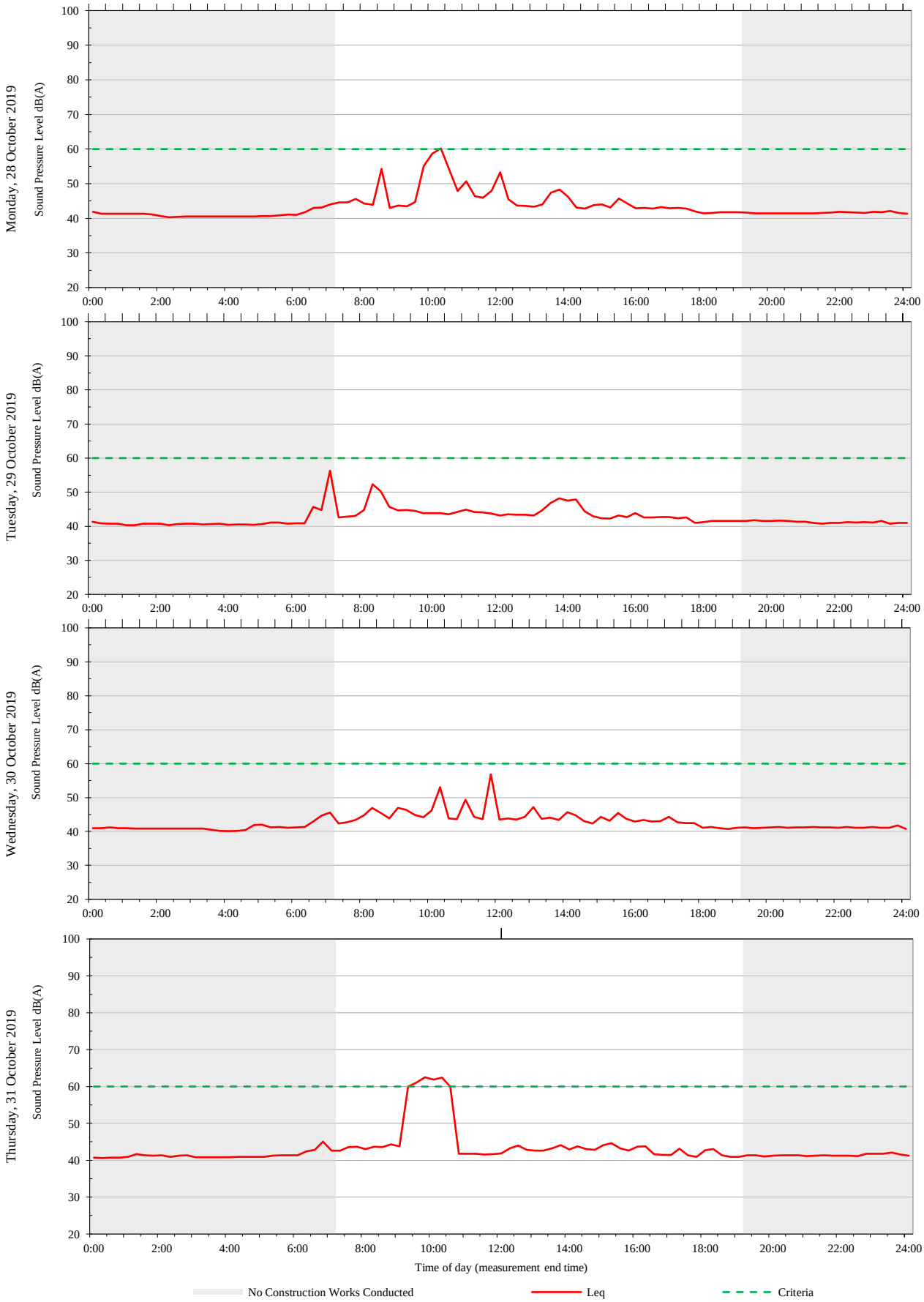
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



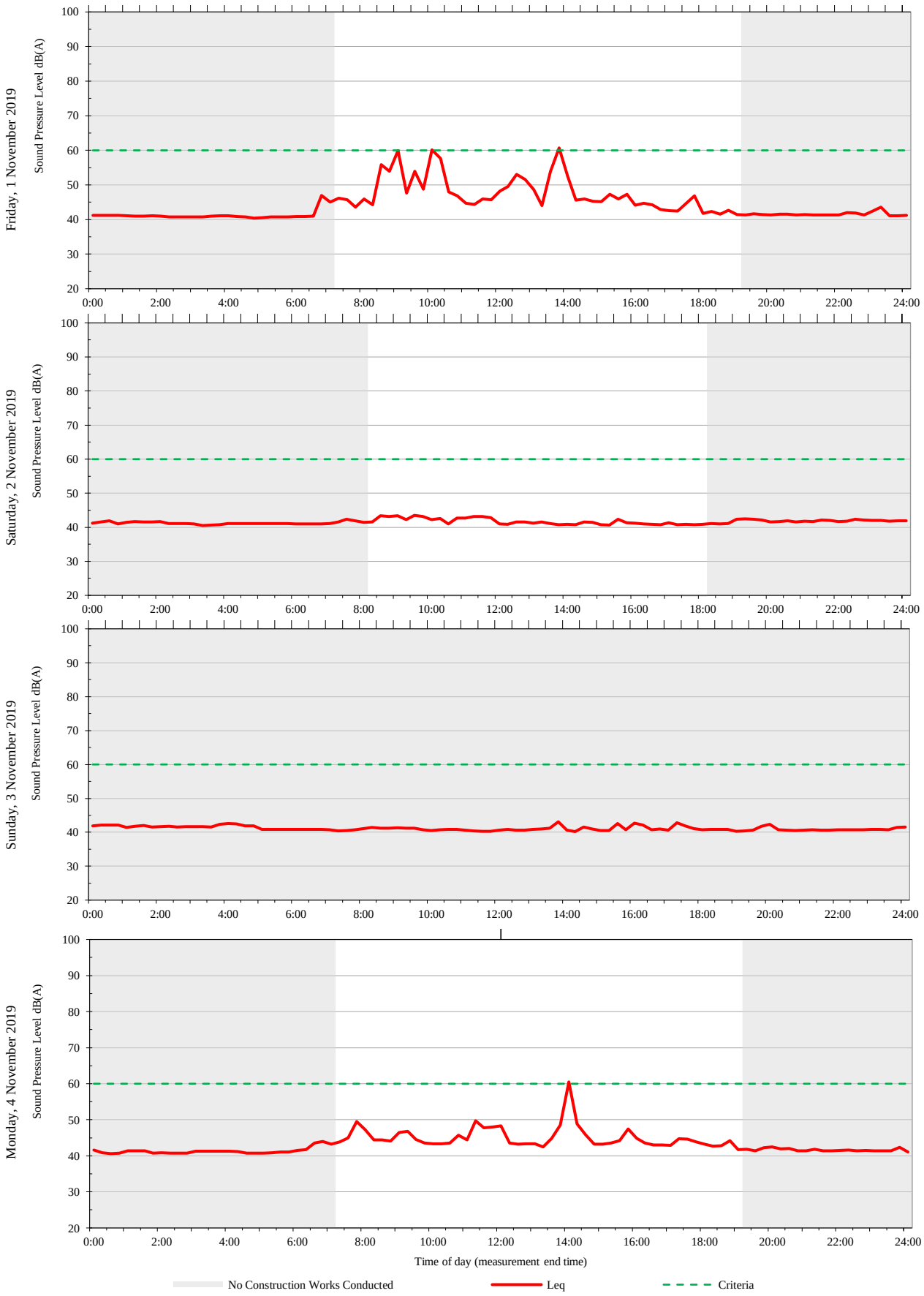
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



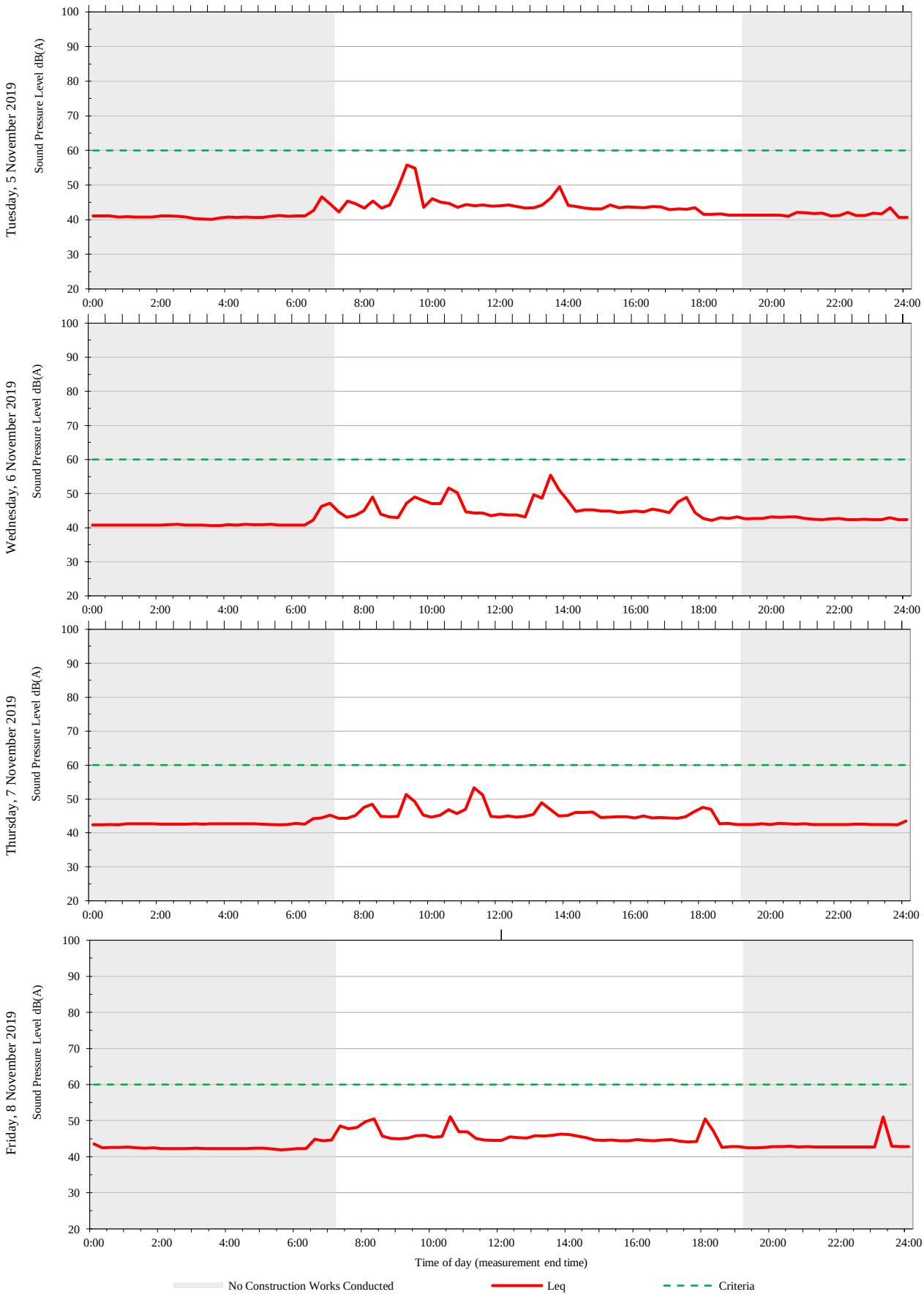
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



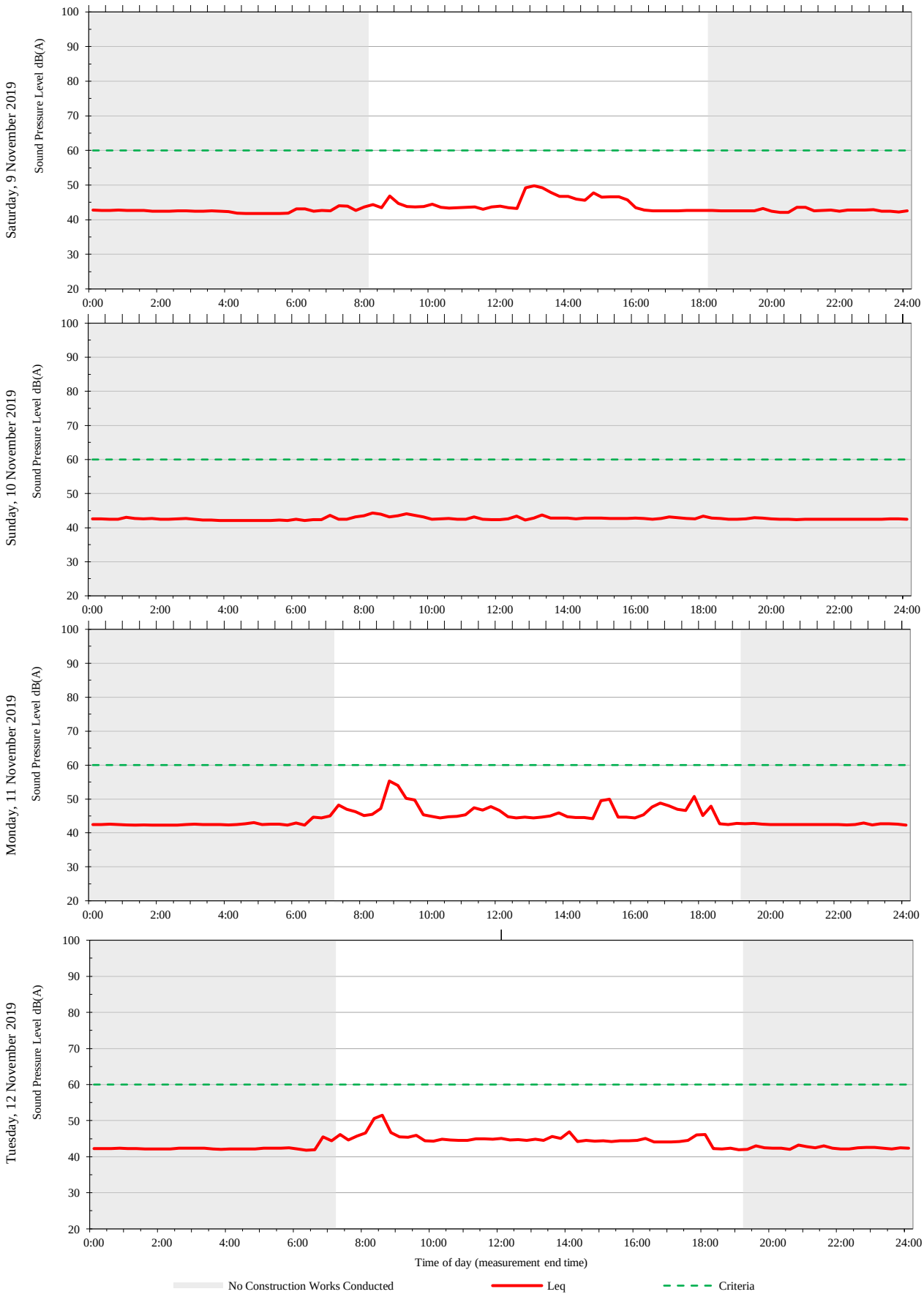
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



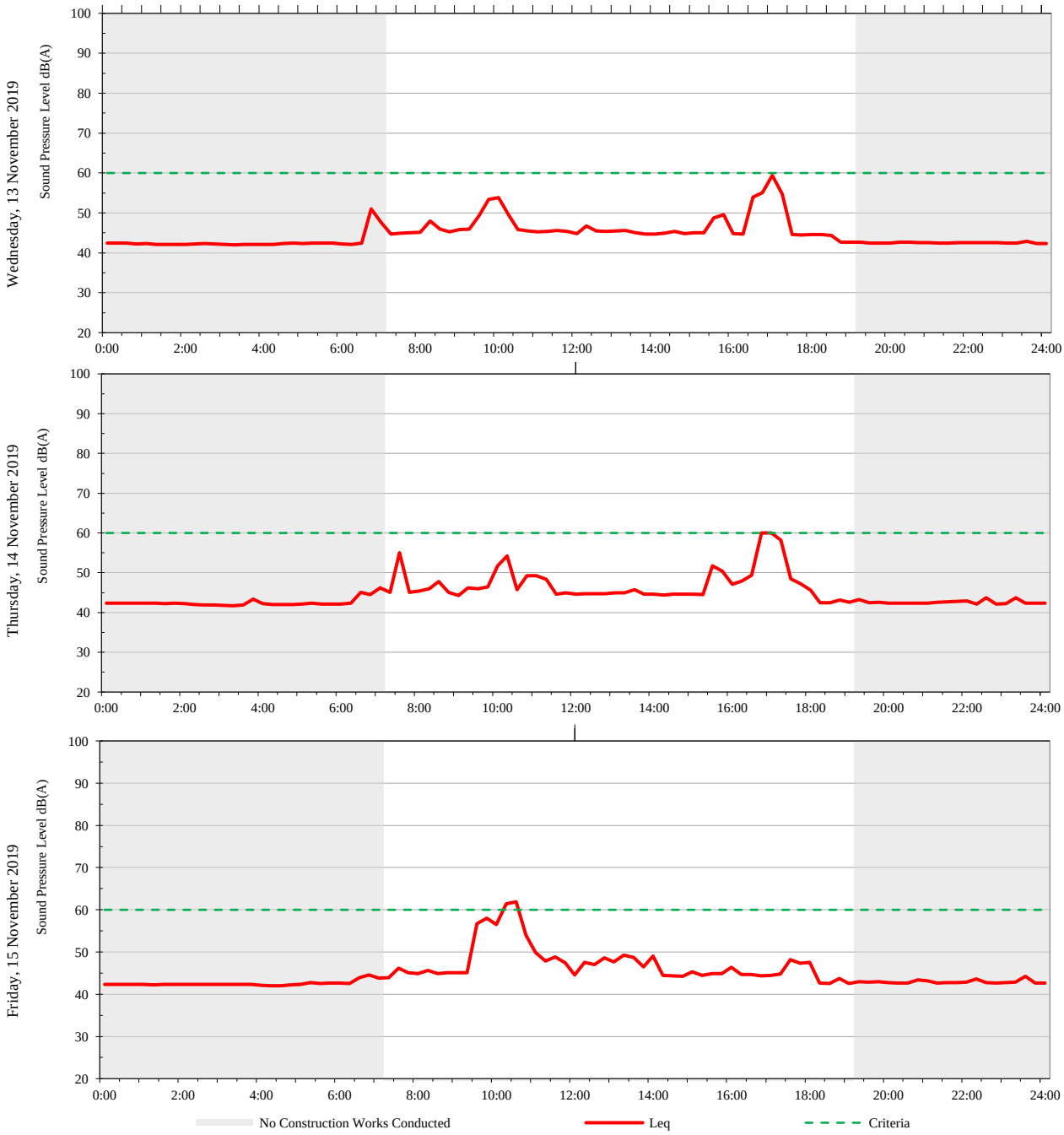
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



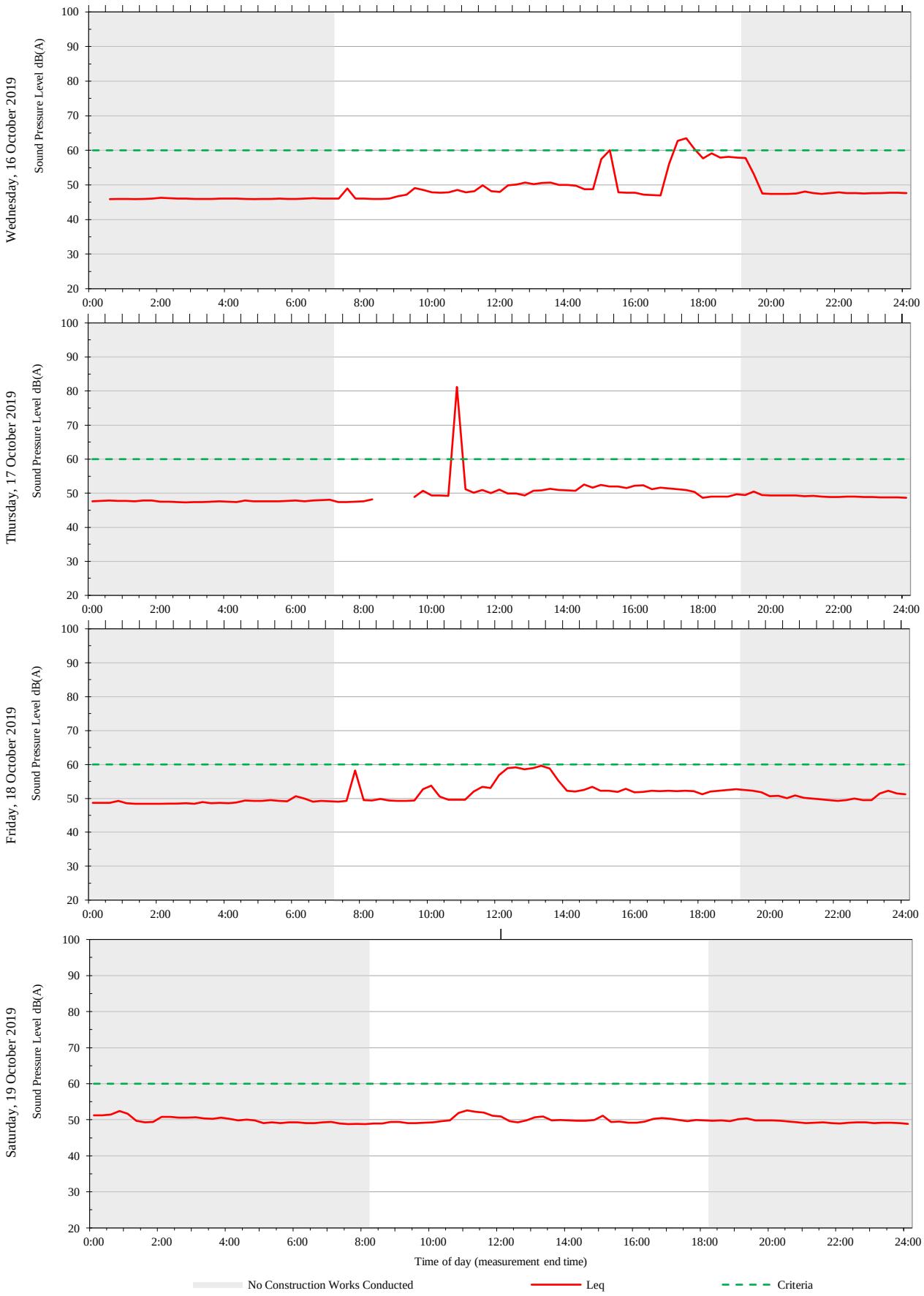
Unattended monitoring: Westmead Adult Hospital, Nuclear Medicine Dept. (Internal)

ARUP



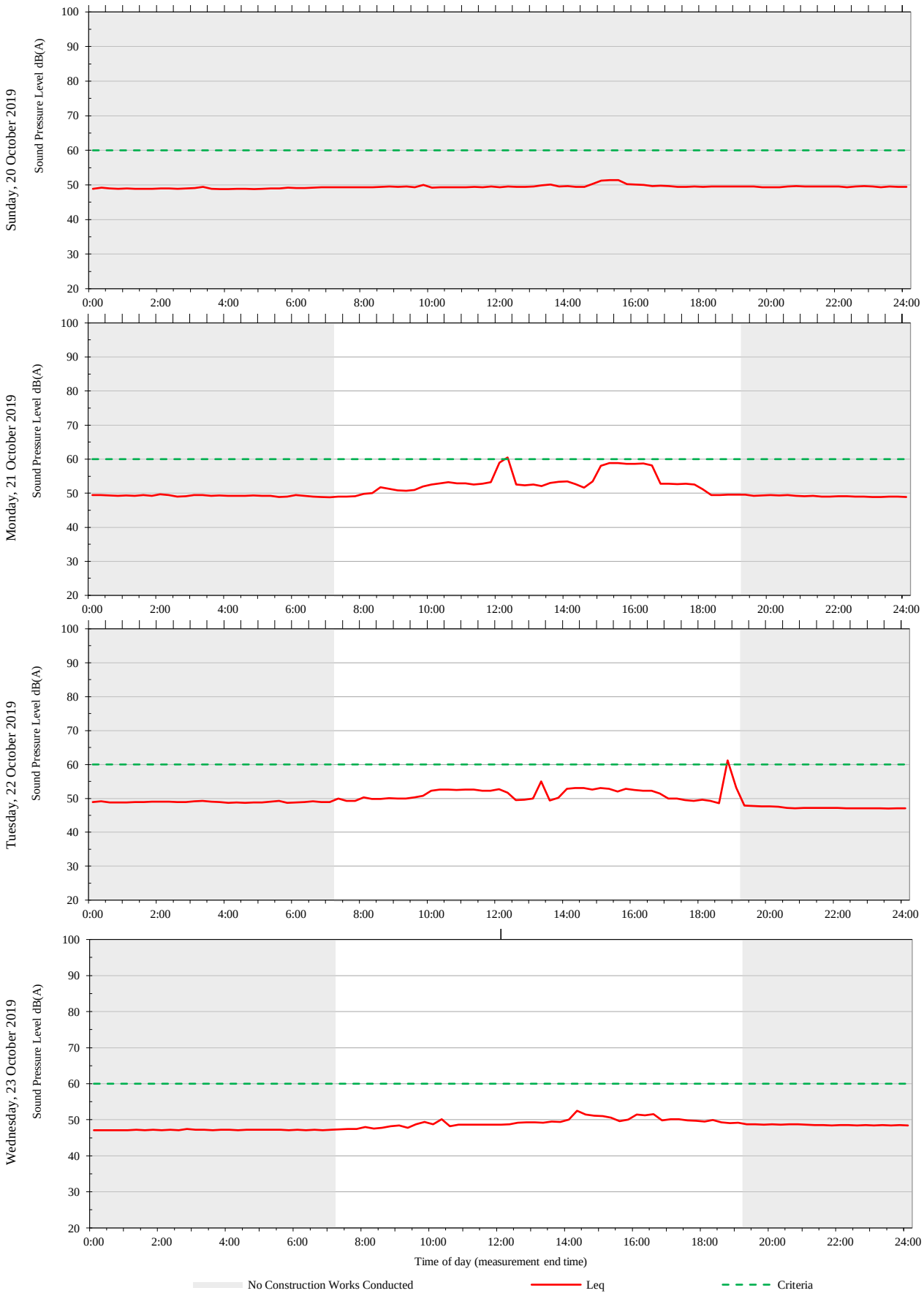
Unattended monitoring: CMRI ATAC 1-209B (Internal)

ARUP



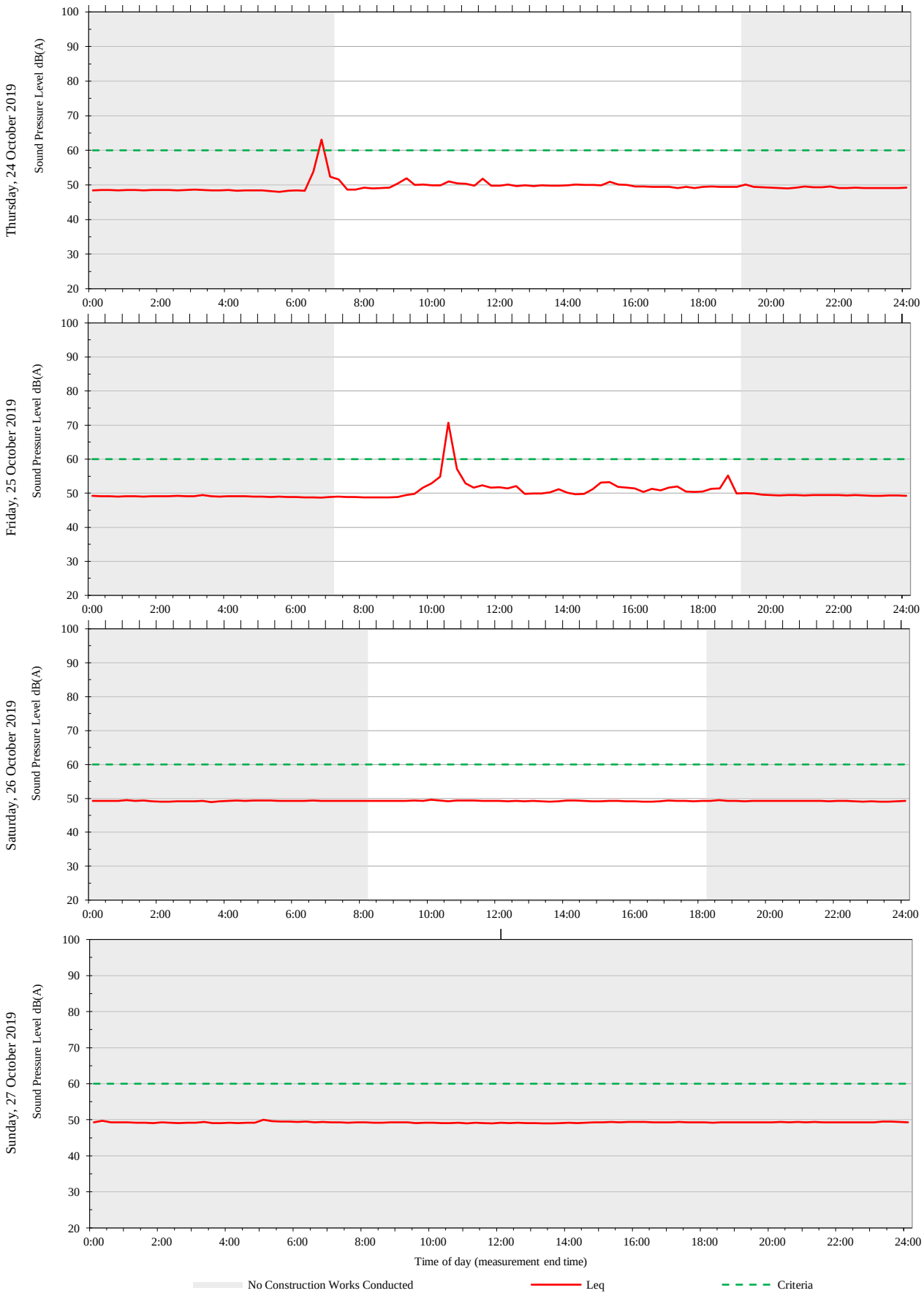
Unattended monitoring: CMRI ATAC 1-209B (Internal)

ARUP



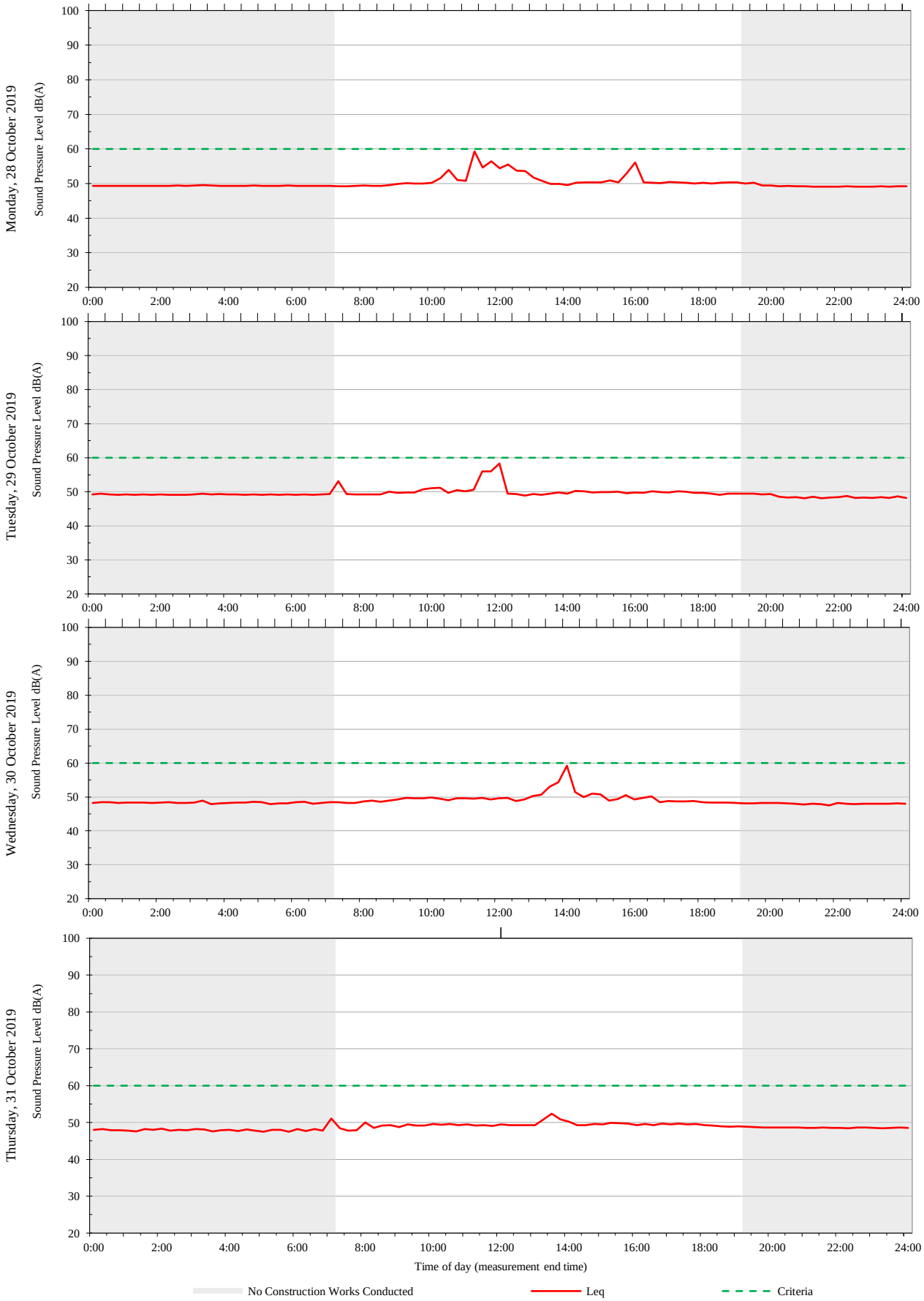
Unattended monitoring: CMRI ATAC 1-209B (Internal)

ARUP



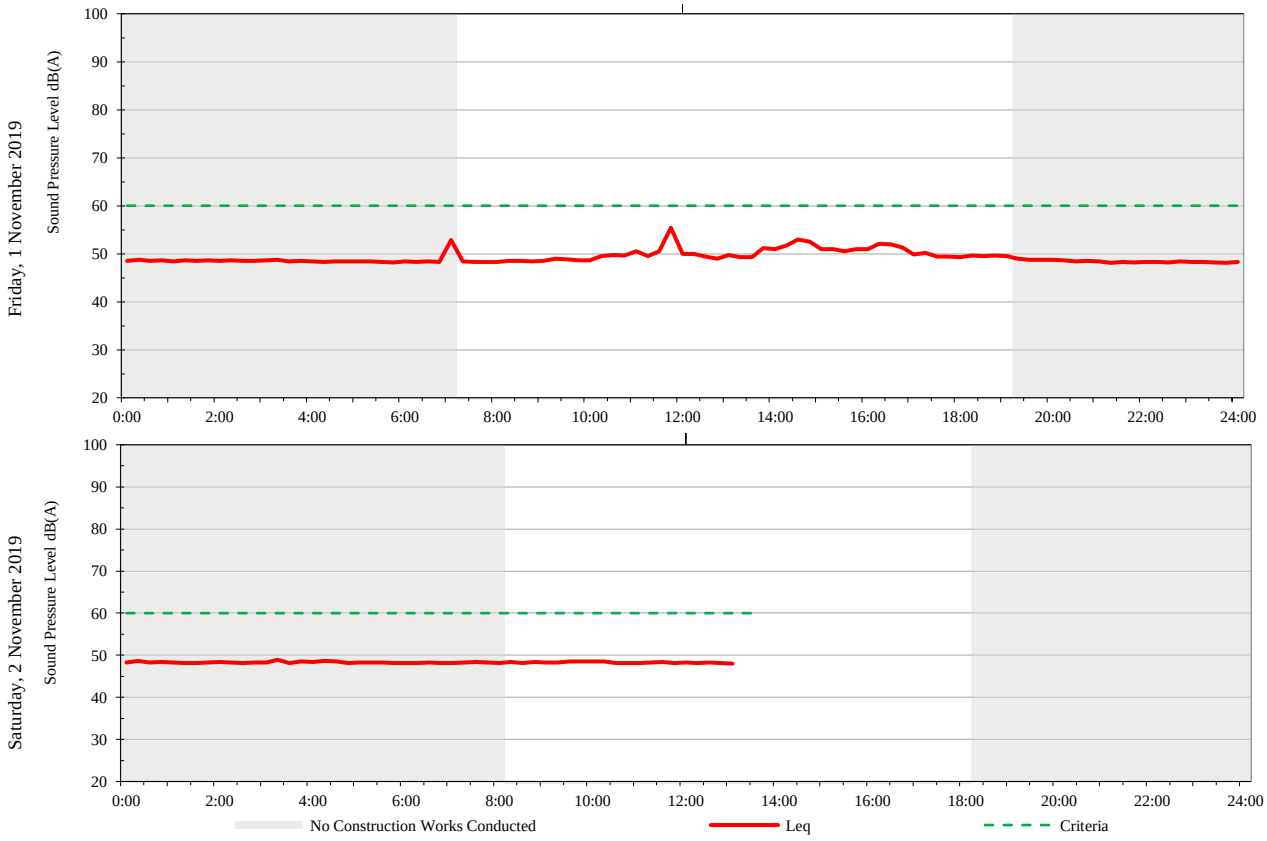
Unattended monitoring: CMRI ATAC 1-209B (Internal)

ARUP



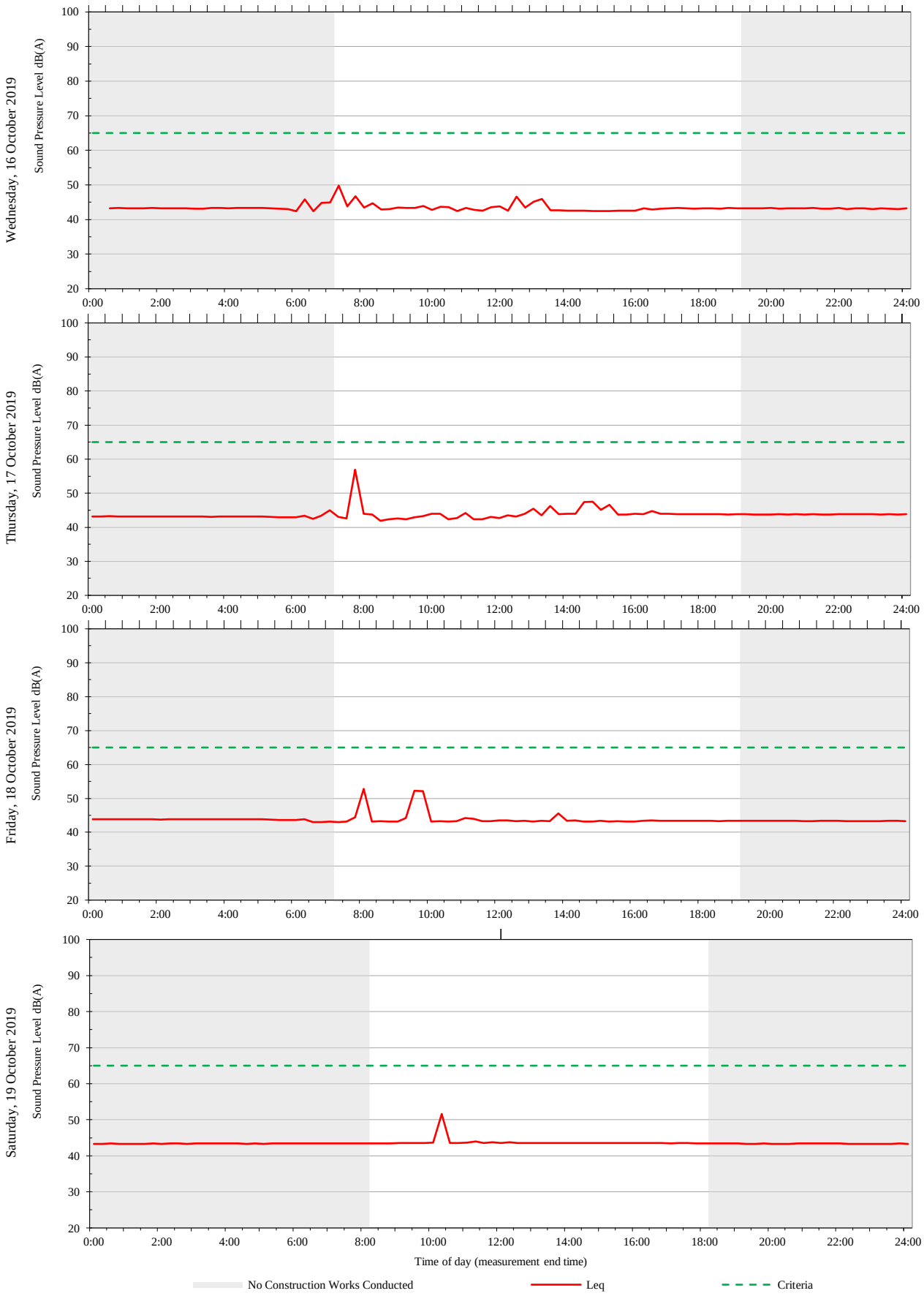
Unattended monitoring: CMRI ATAC 1-209B (Internal)

ARUP



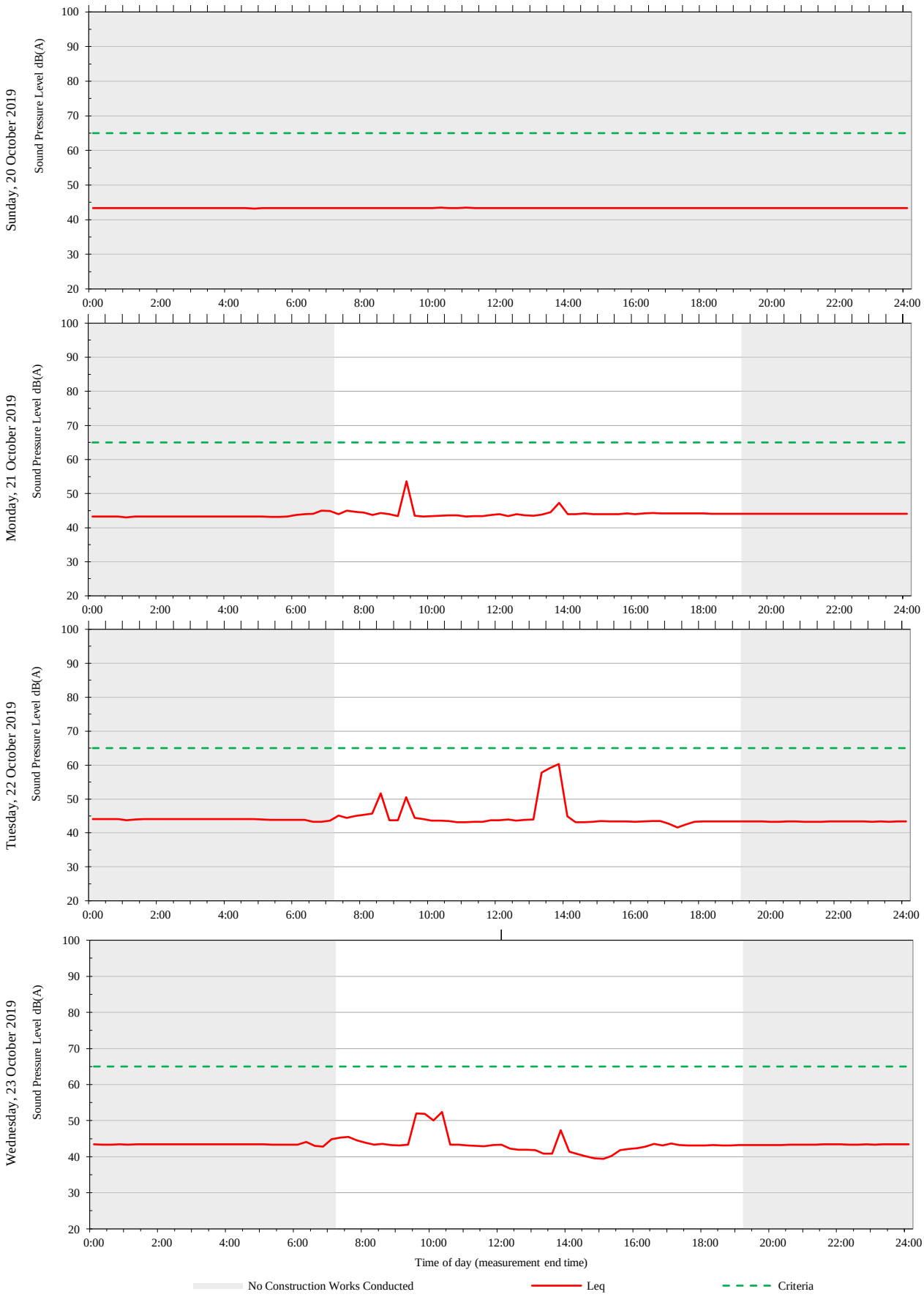
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



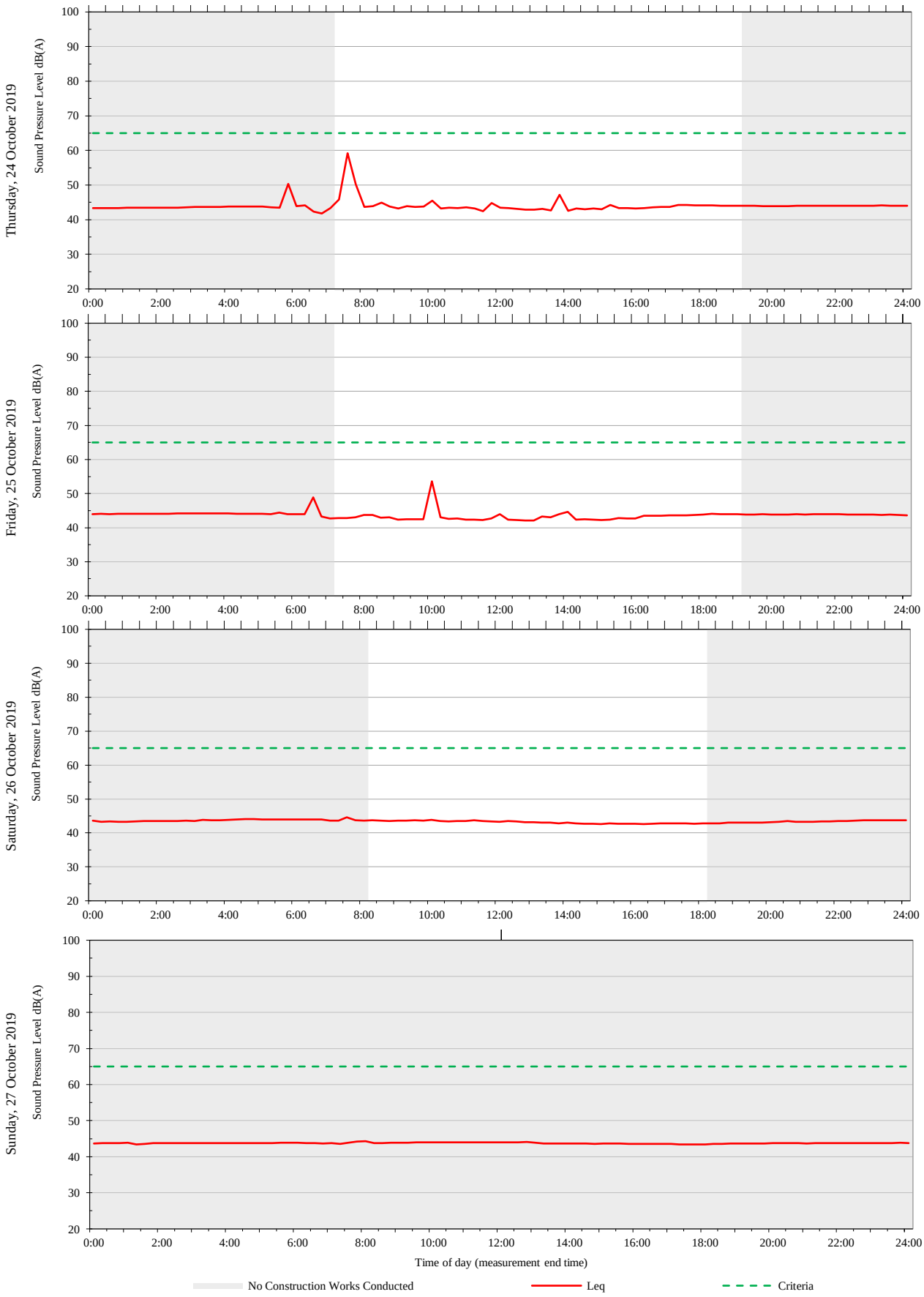
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



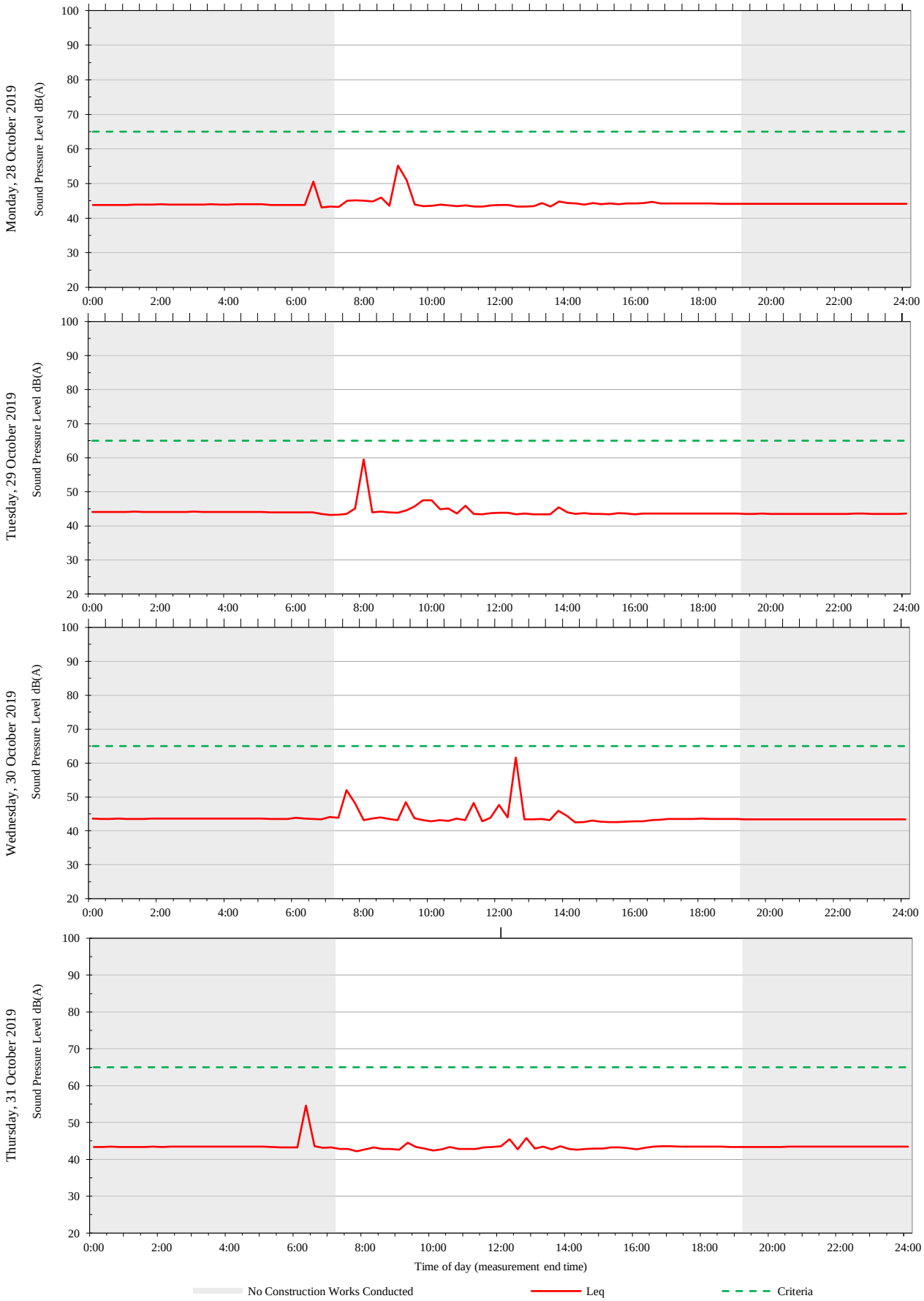
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



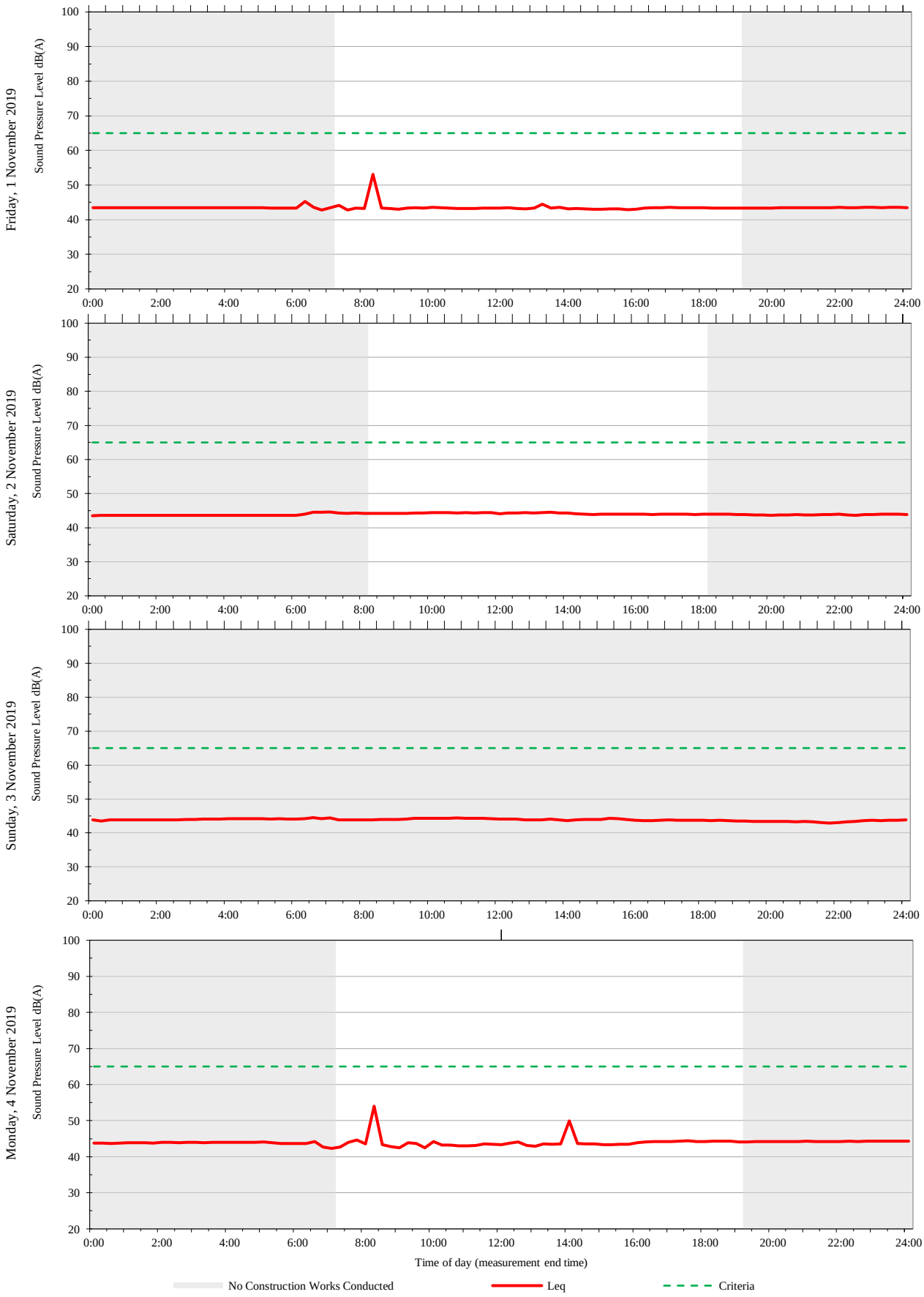
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



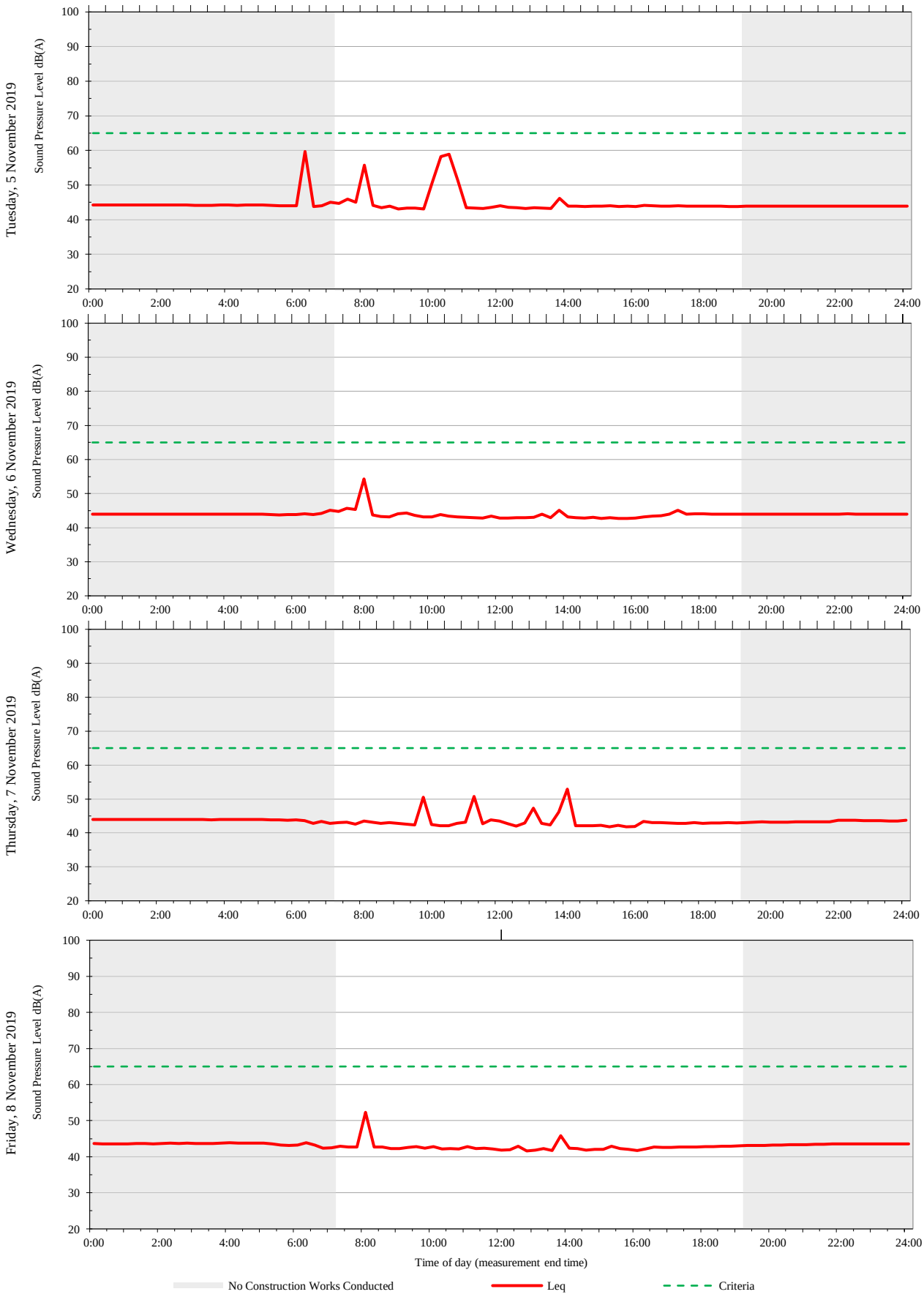
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



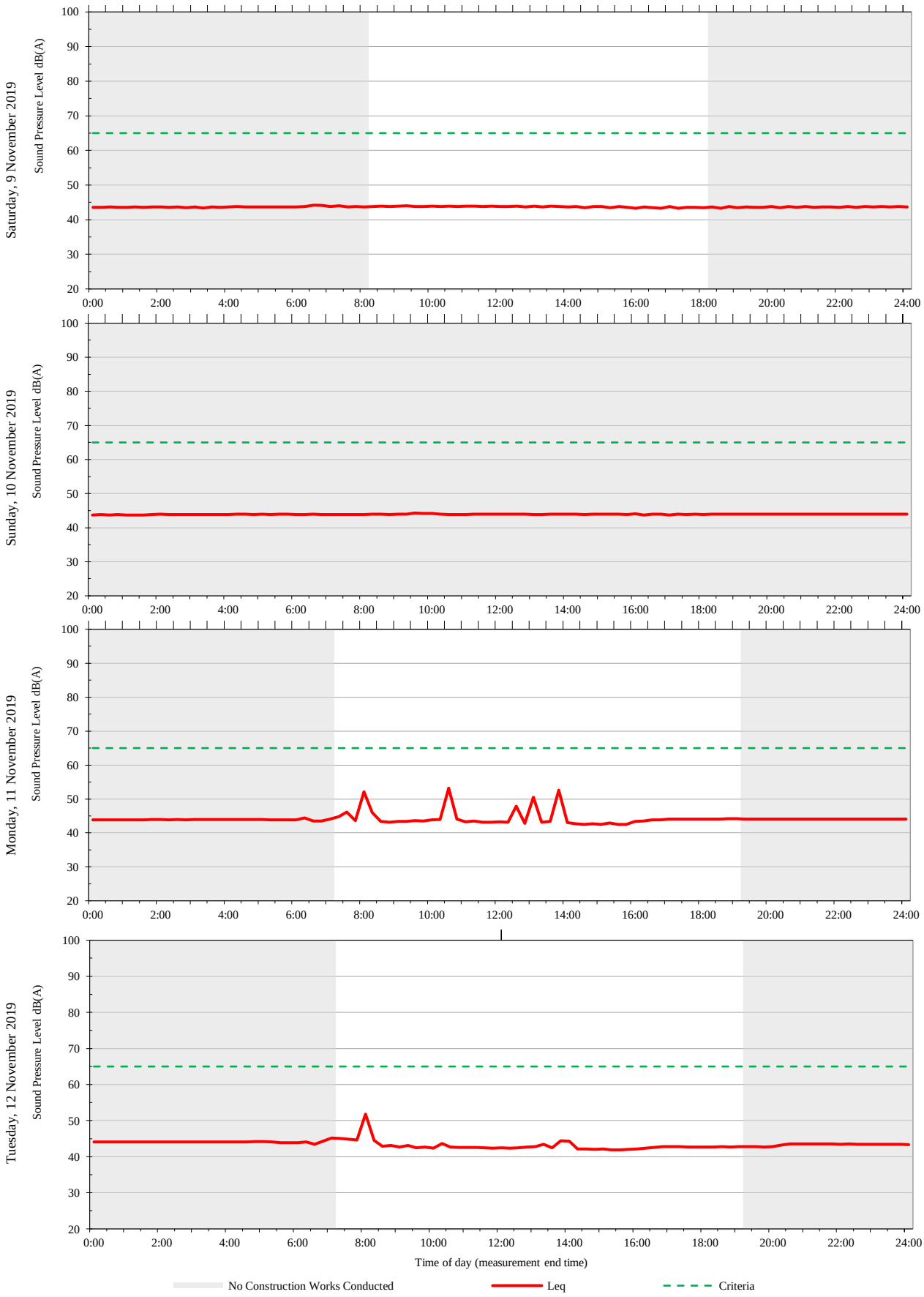
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



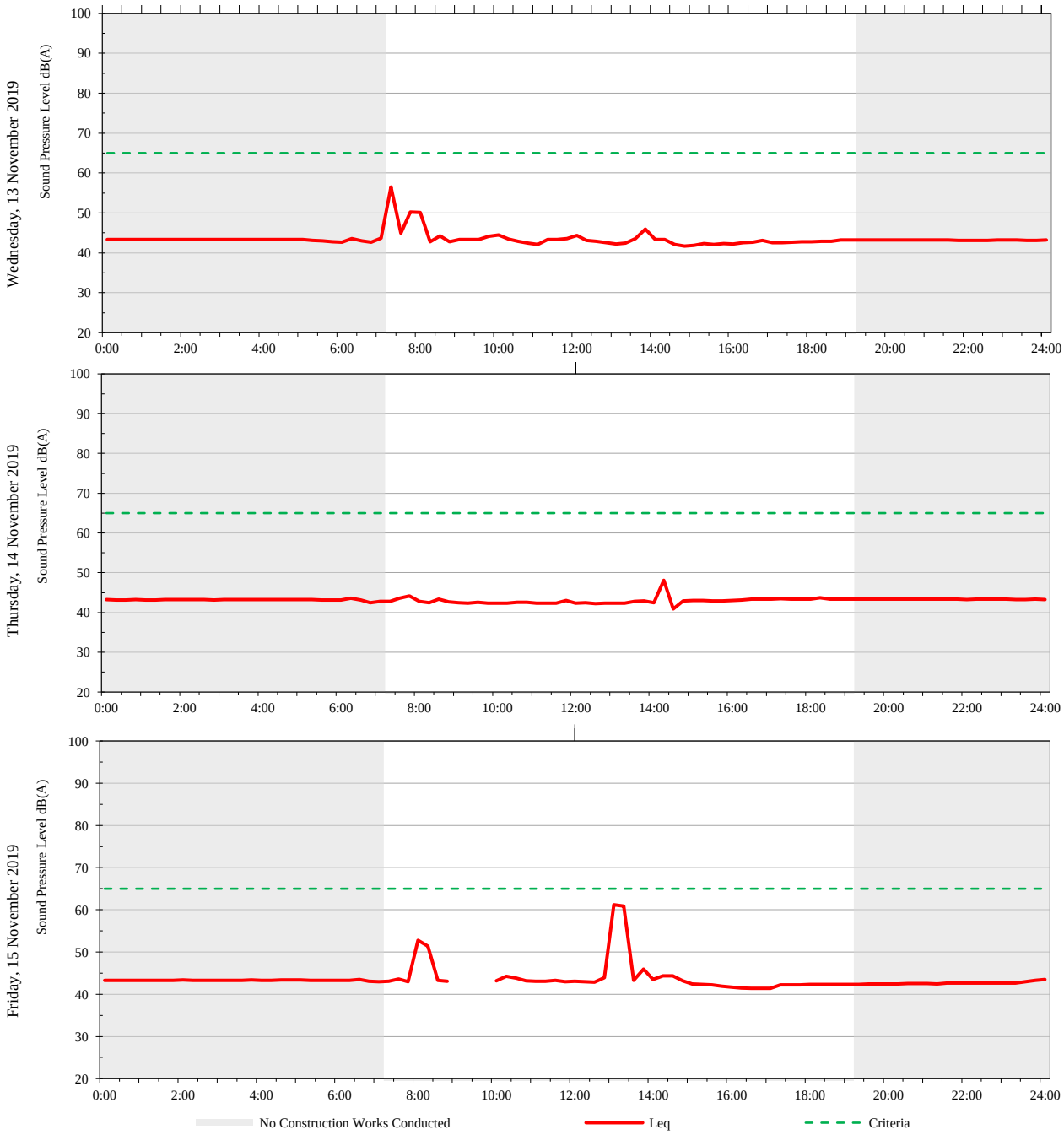
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



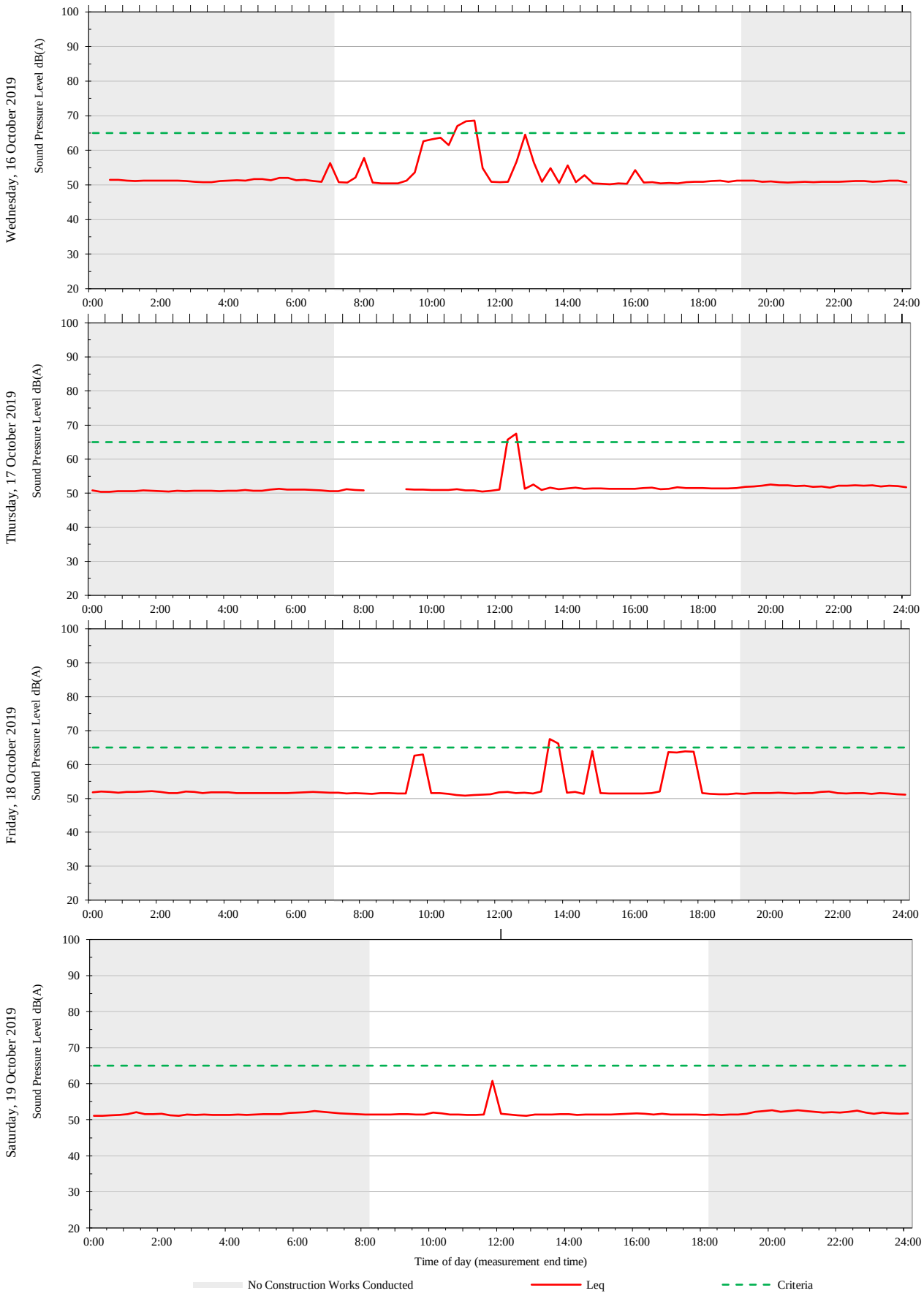
Unattended monitoring: CMRI Biological Science Facility G65 (Internal)

ARUP



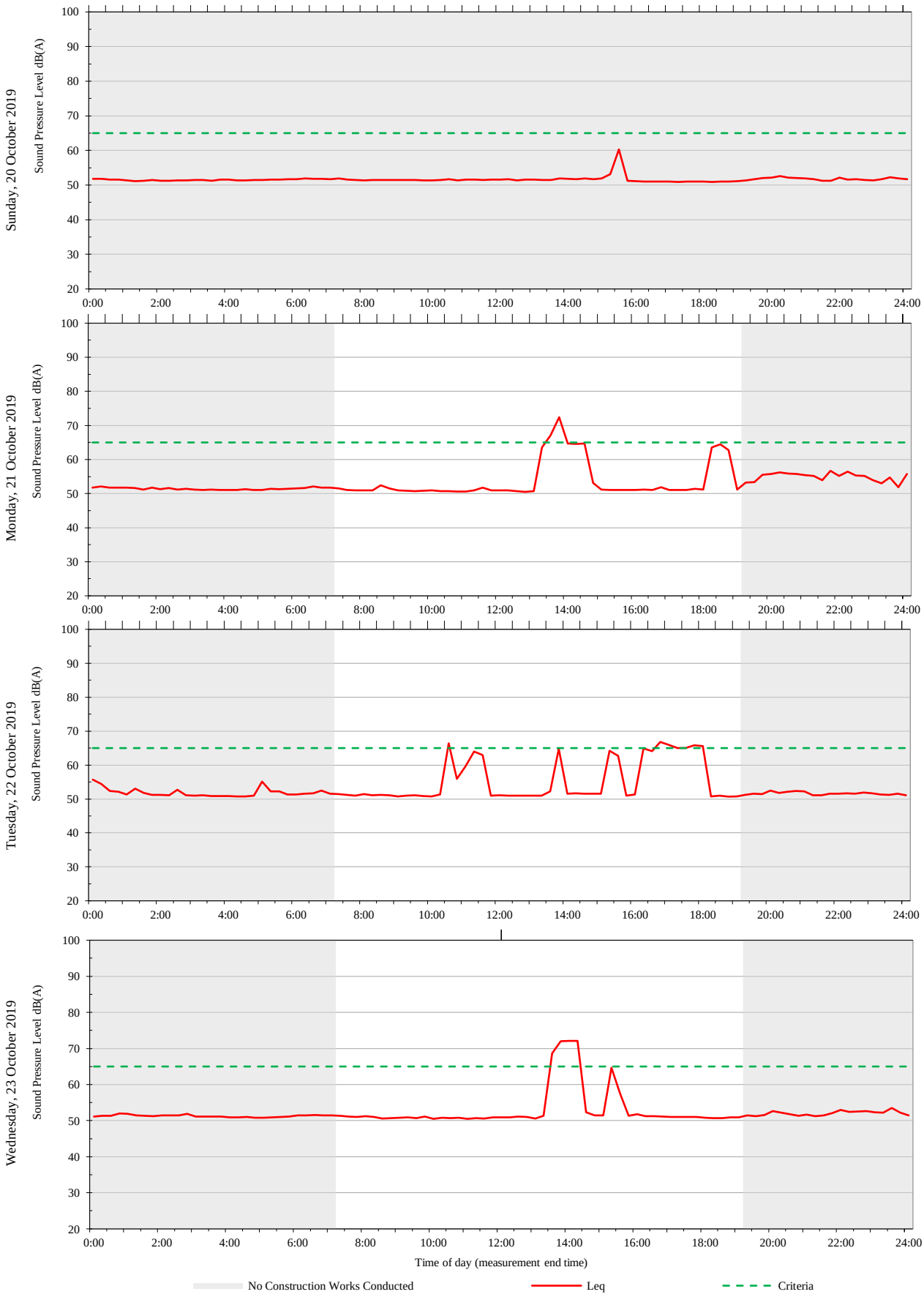
Unattended monitoring: WIMR Biological Science Facility I.19 (Internal)

ARUP



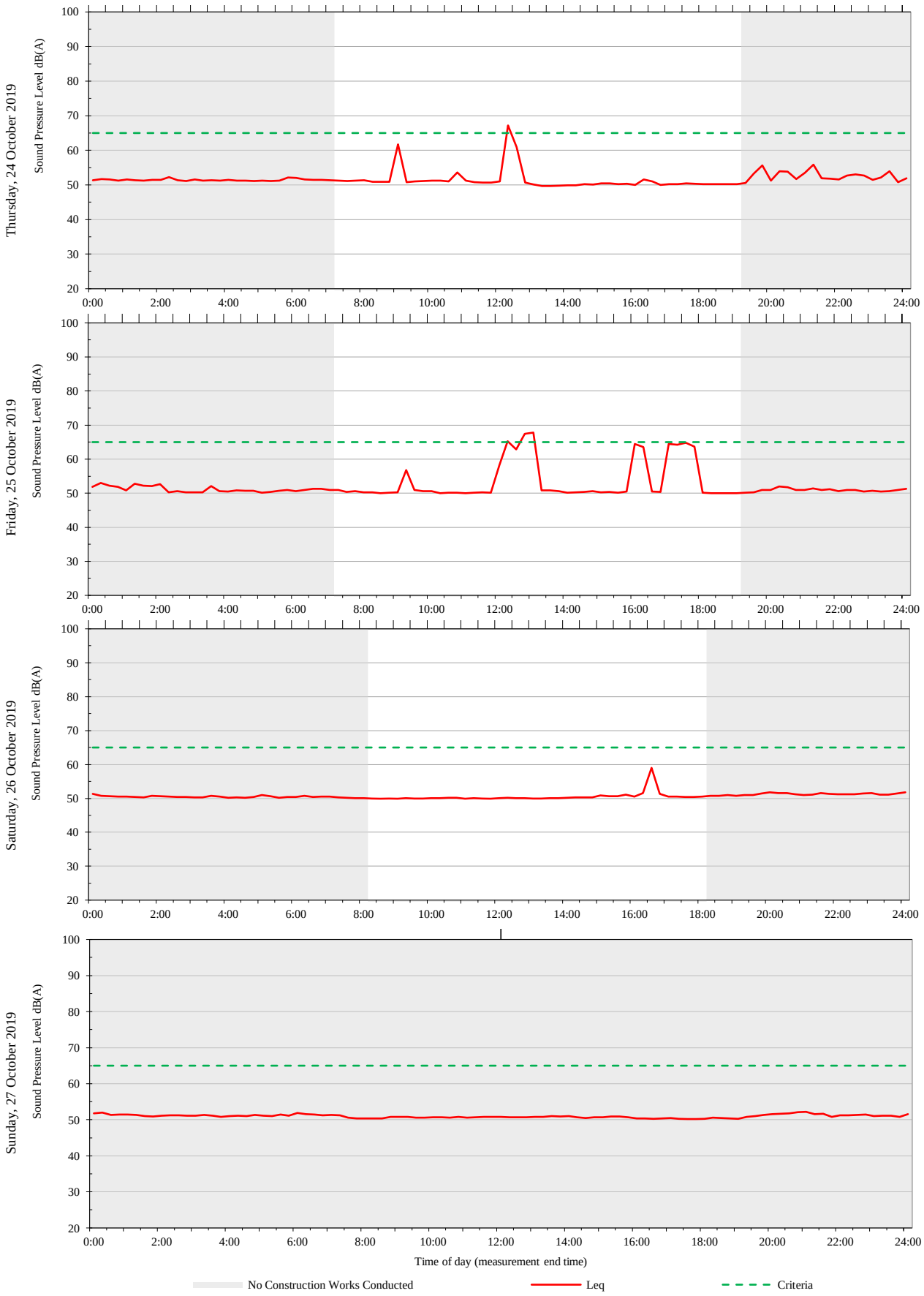
Unattended monitoring: WIMR Biological Science Facility I.19 (Internal)

ARUP



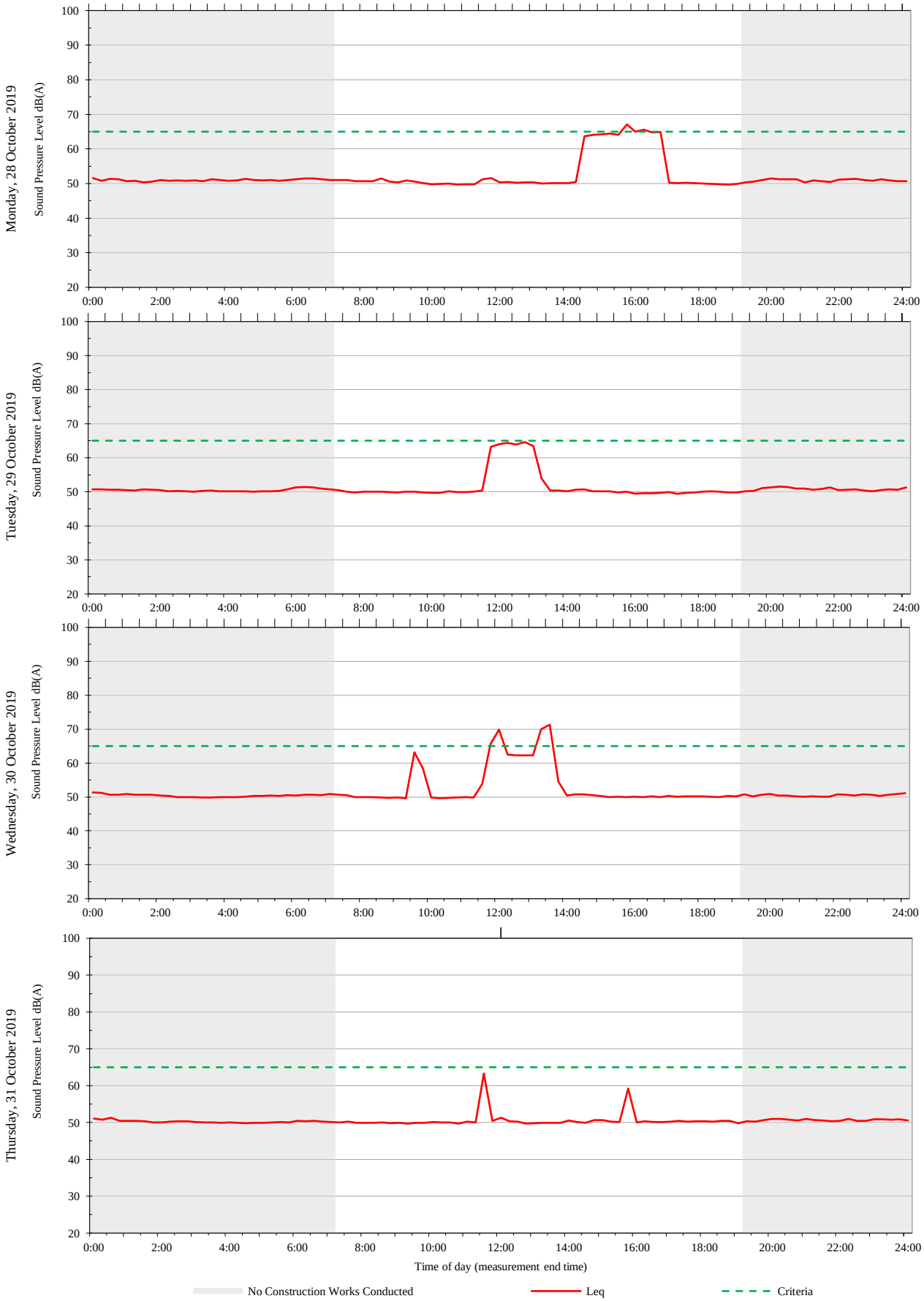
Unattended monitoring: WIMR Biological Science Facility I.19 (Internal)

ARUP



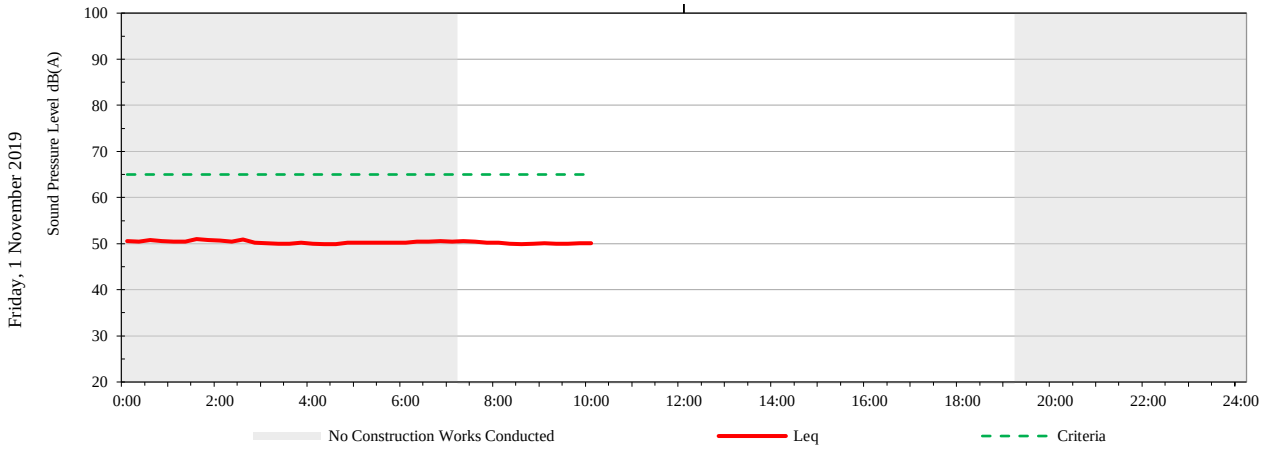
Unattended monitoring: WIMR Biological Science Facility I.19 (Internal)

ARUP



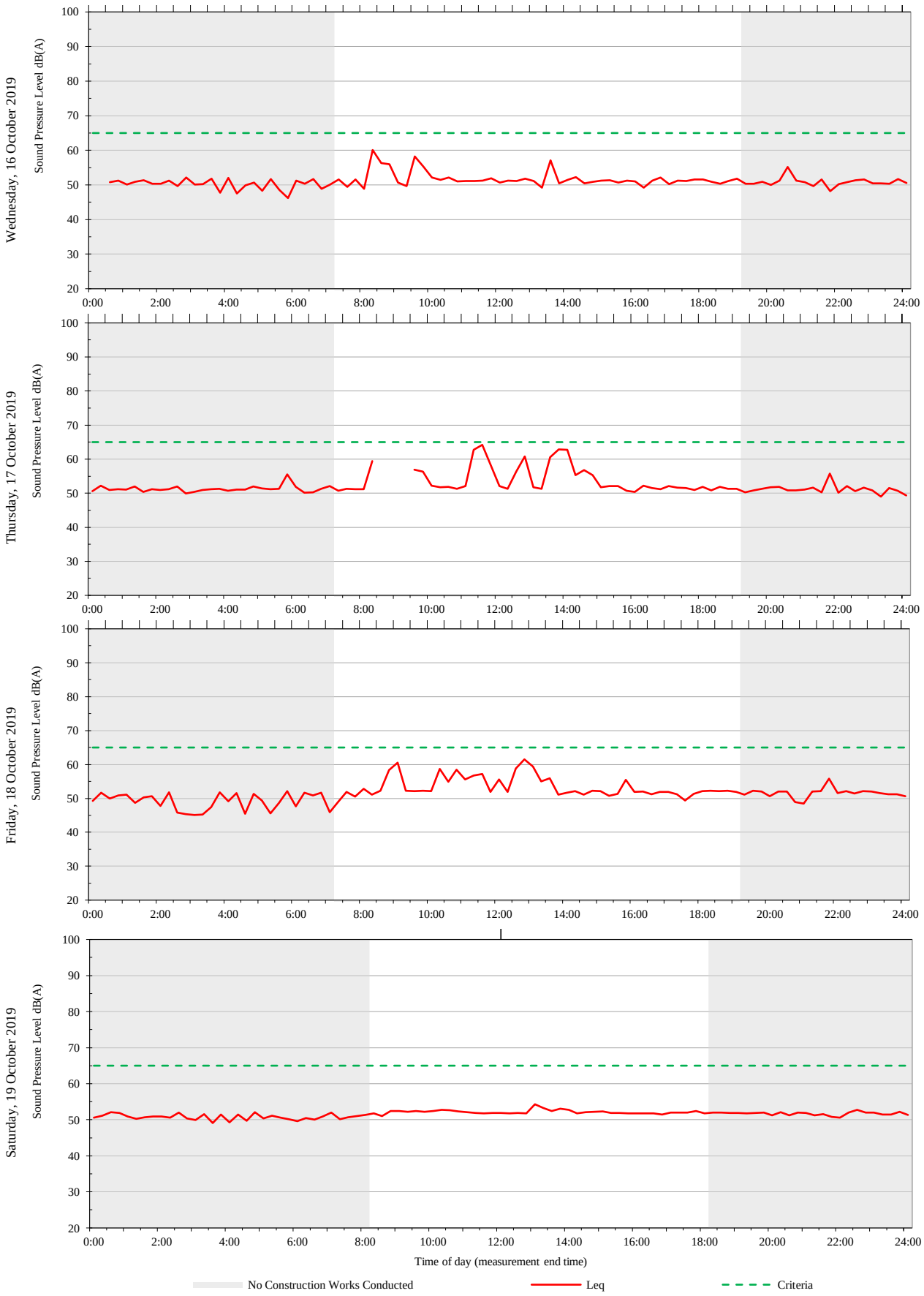
Unattended monitoring: WIMR Biological Science Facility I.19 (Internal)

ARUP



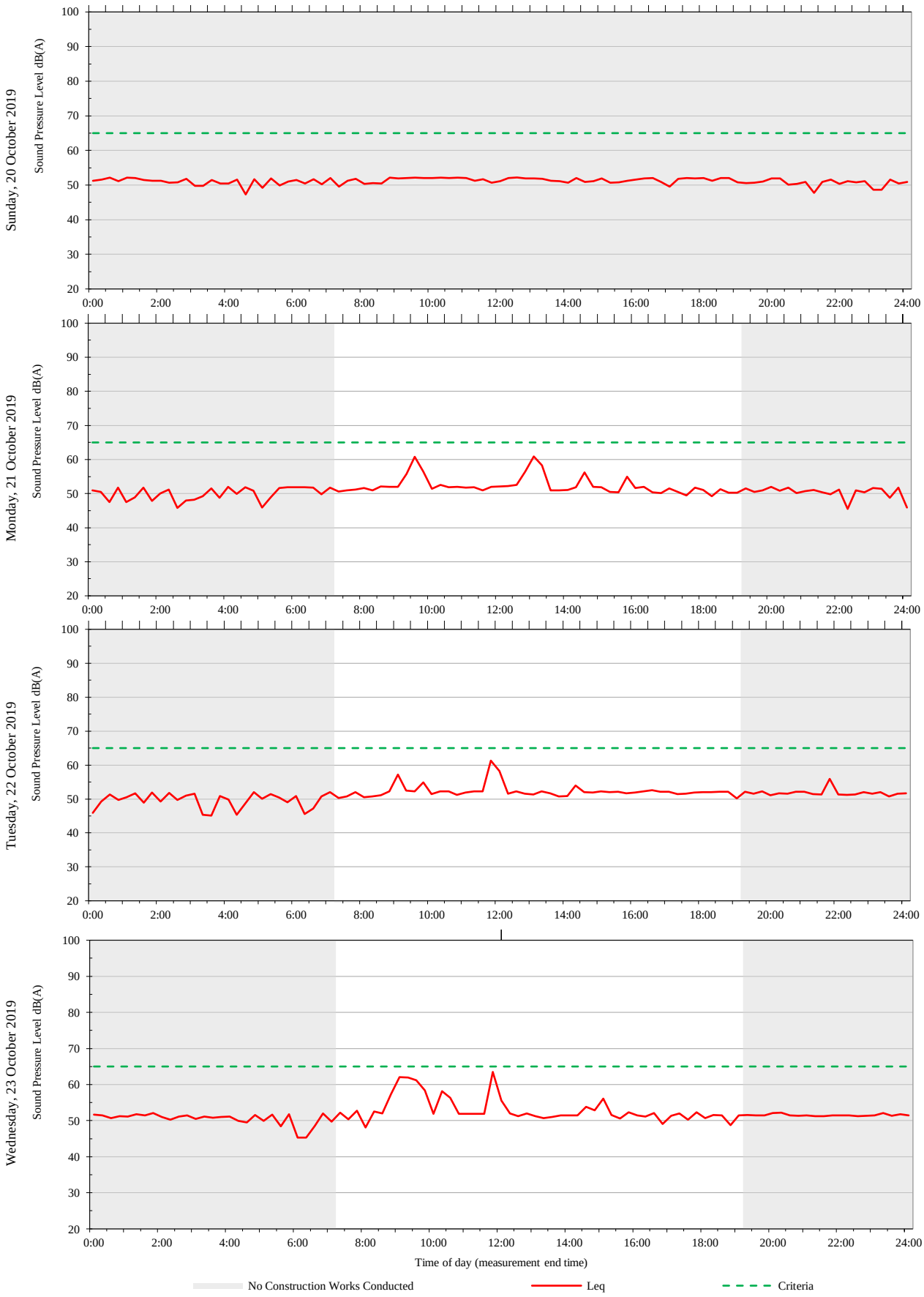
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



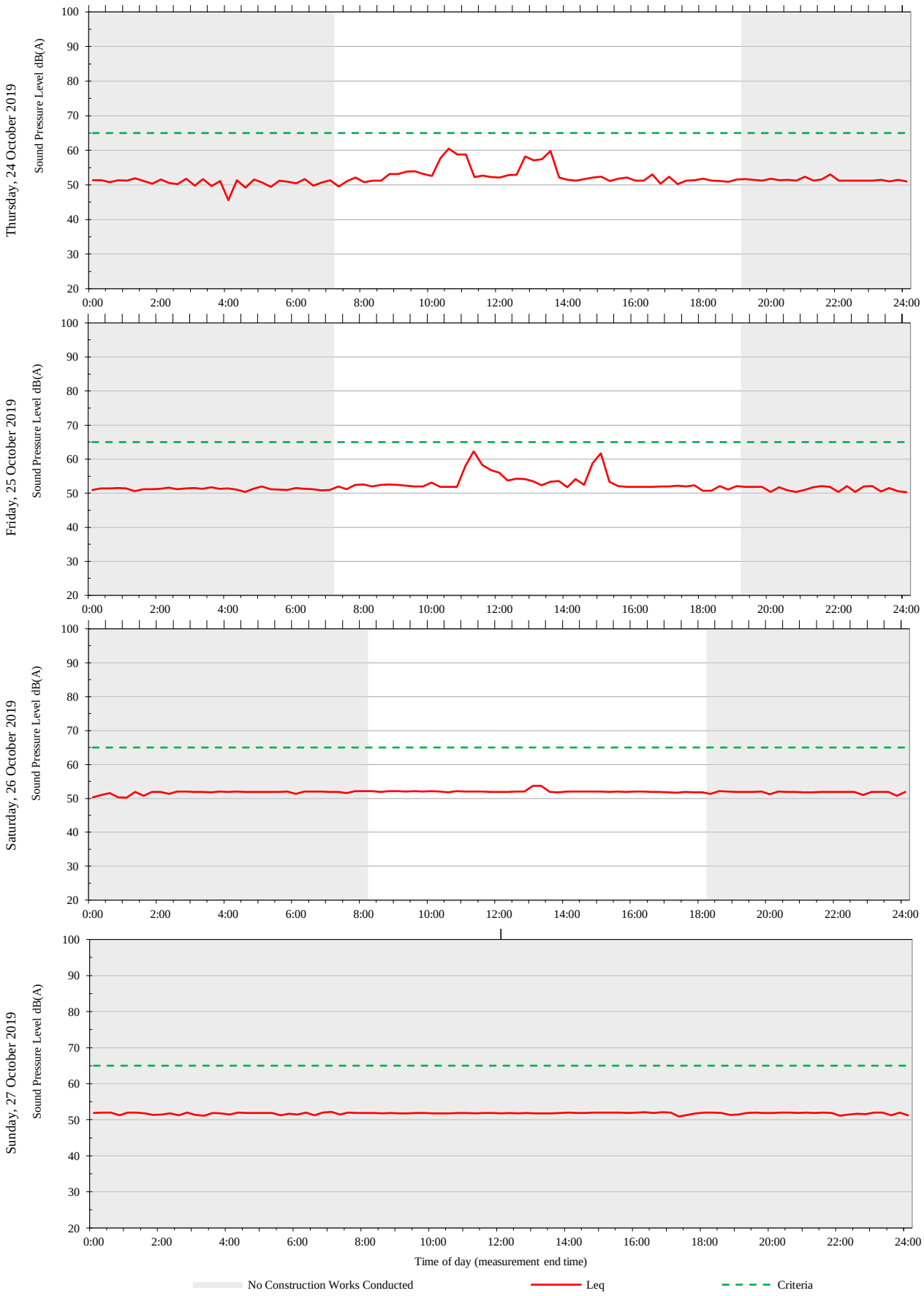
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



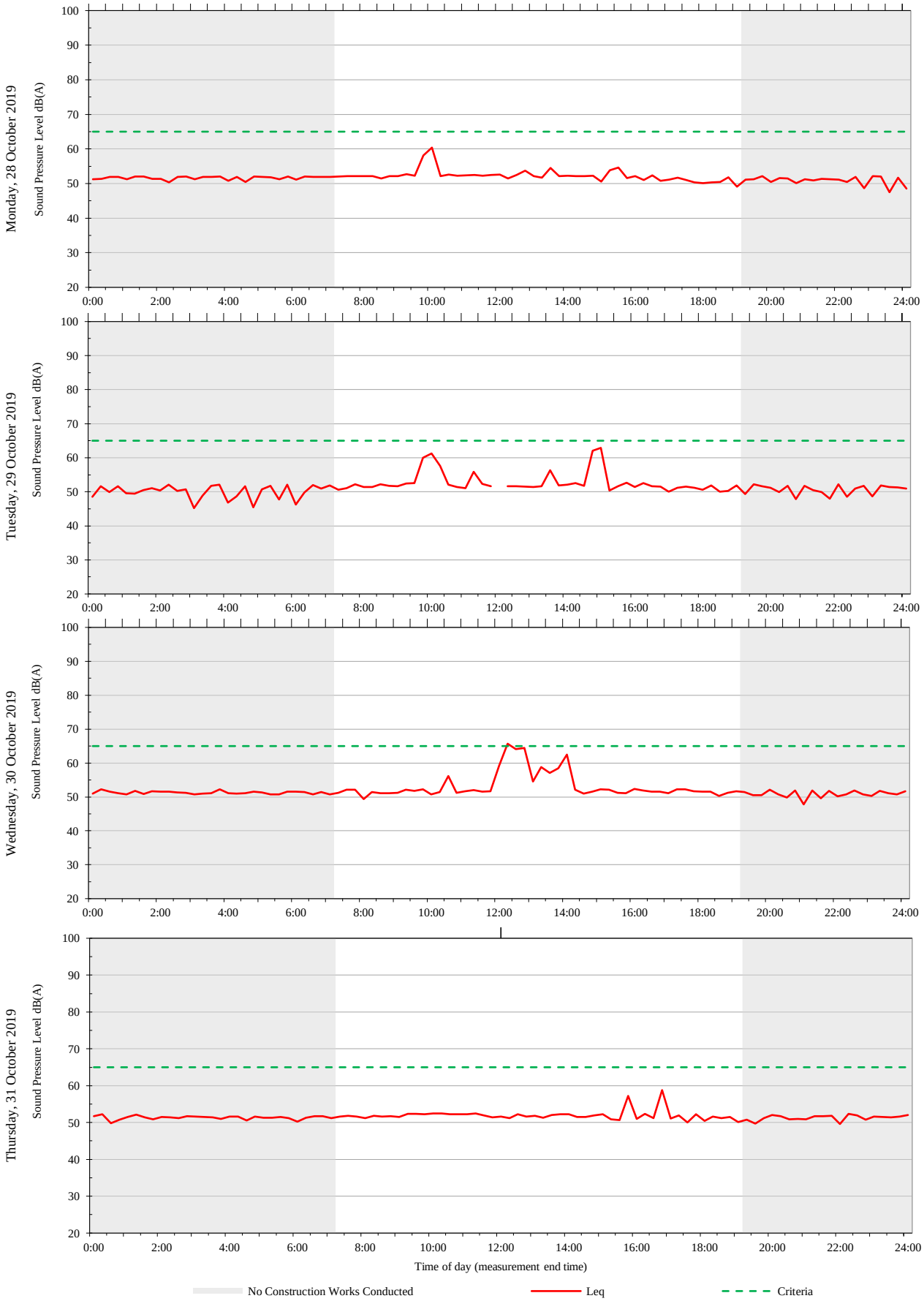
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



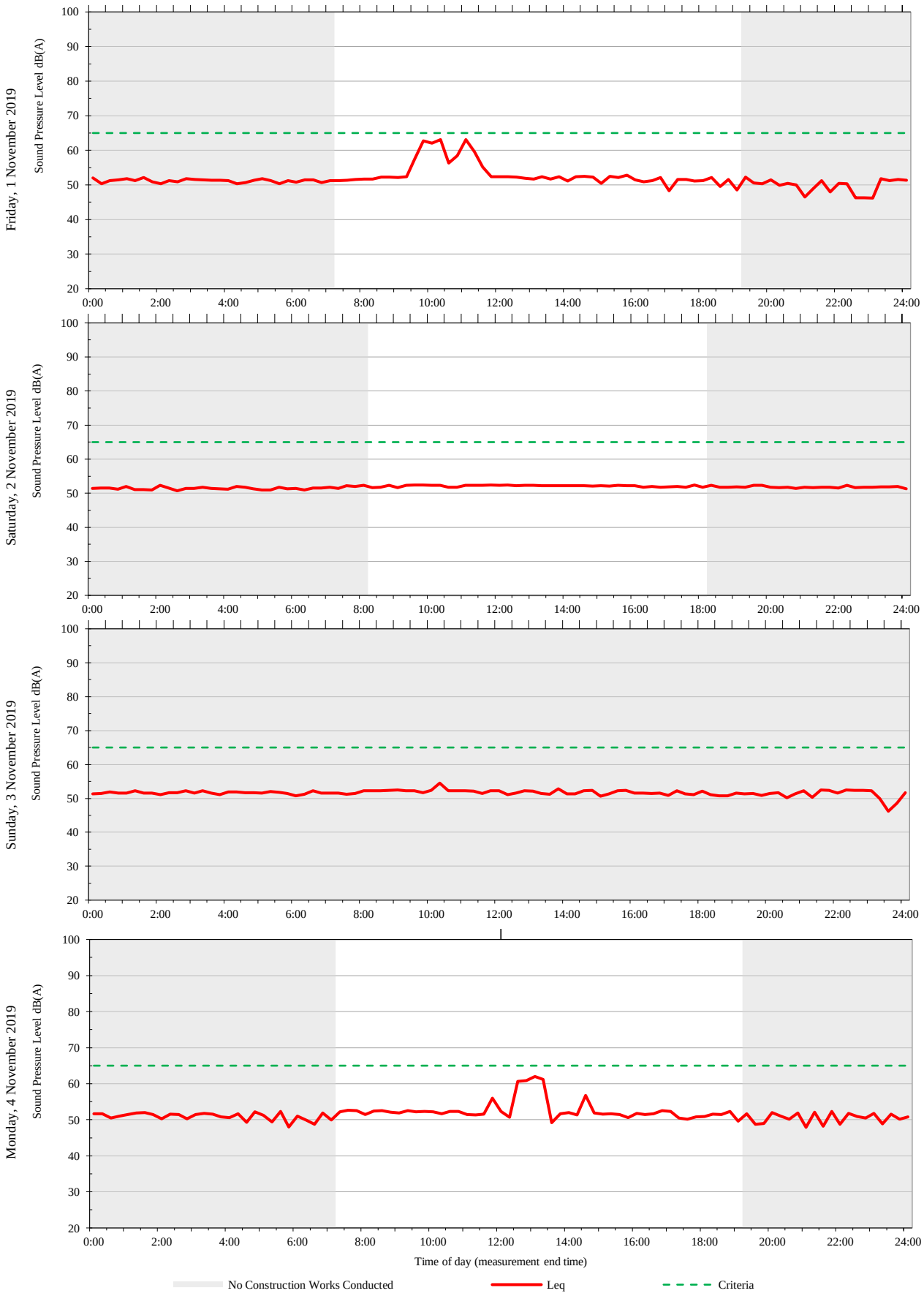
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



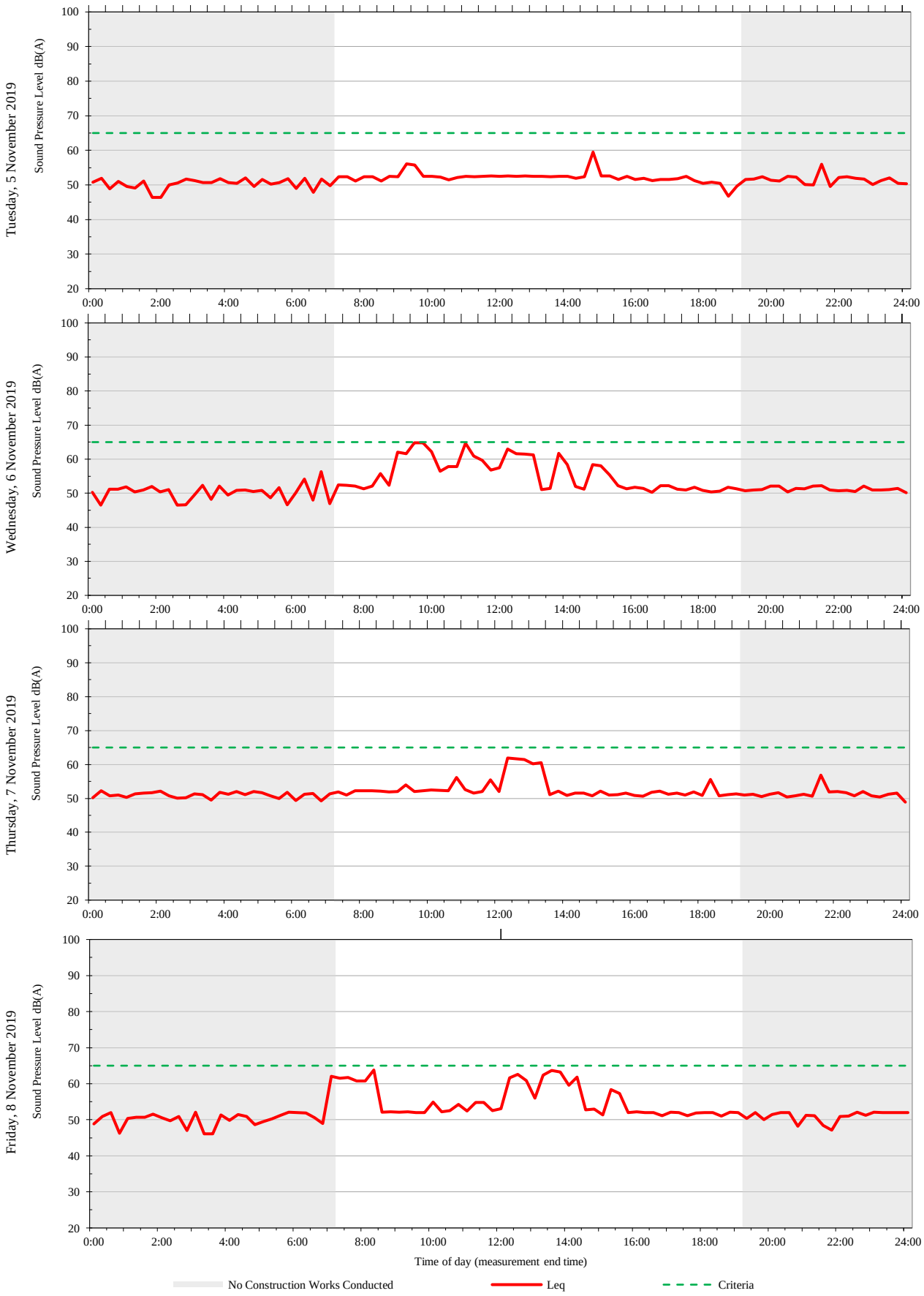
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



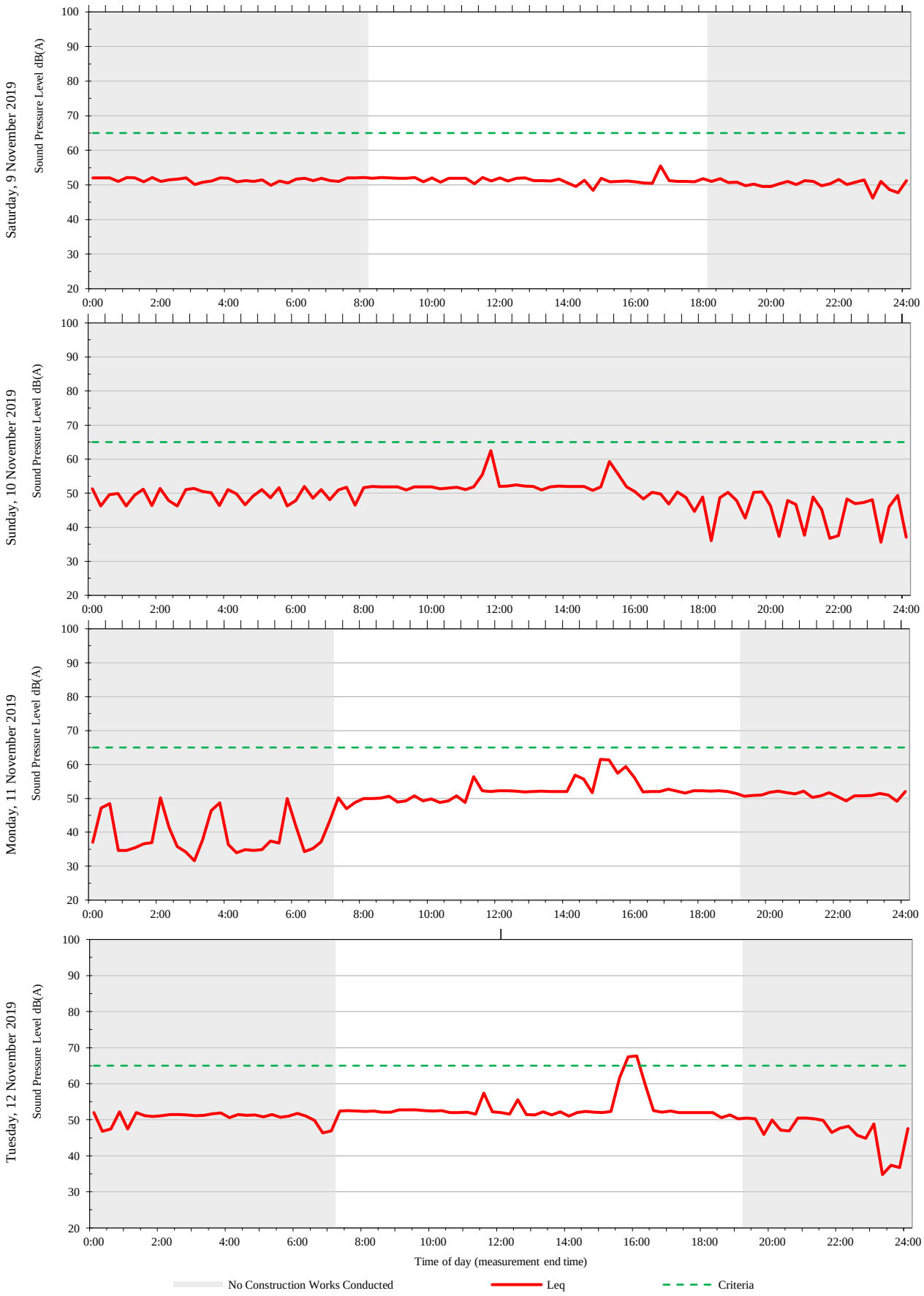
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



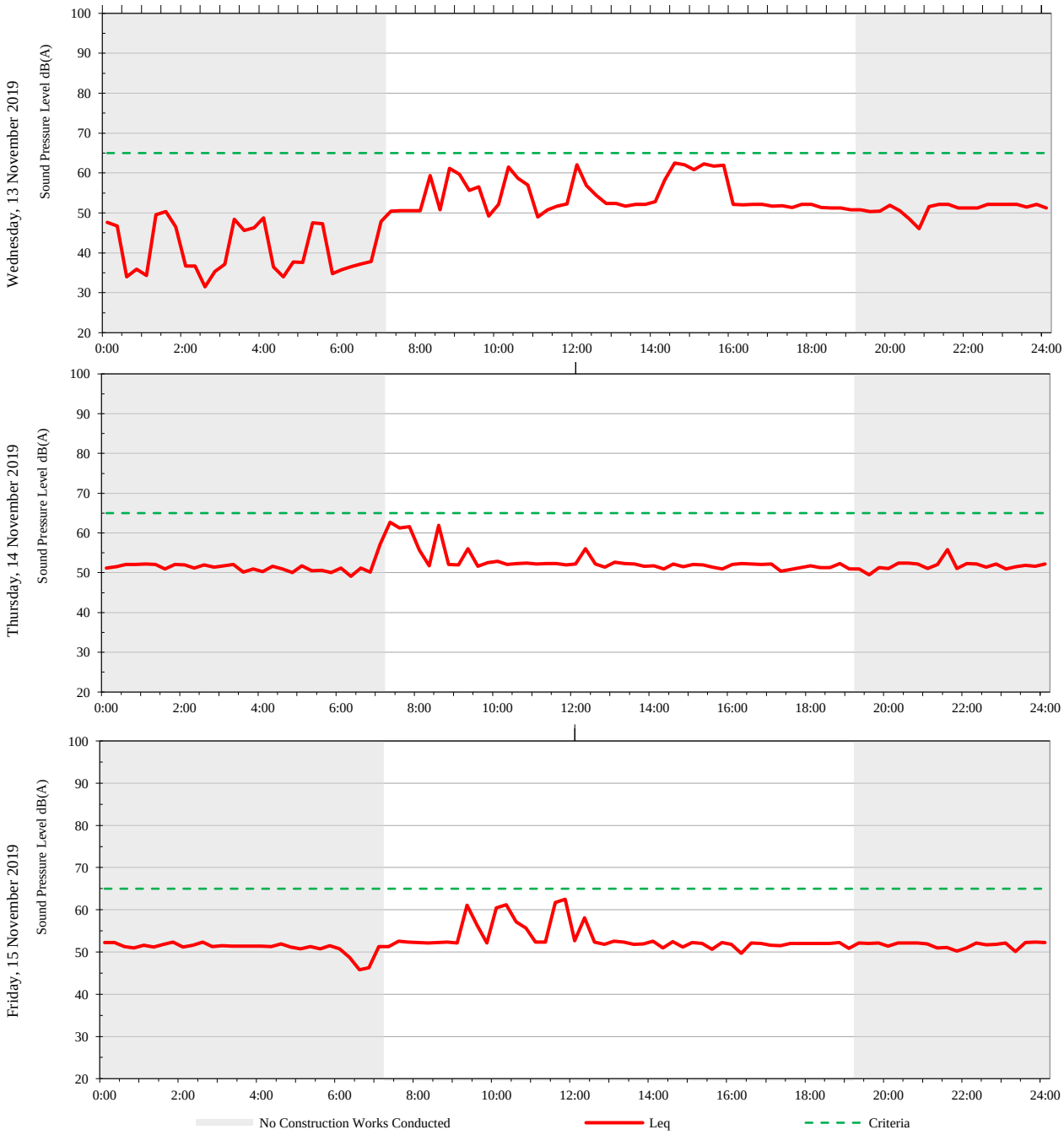
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



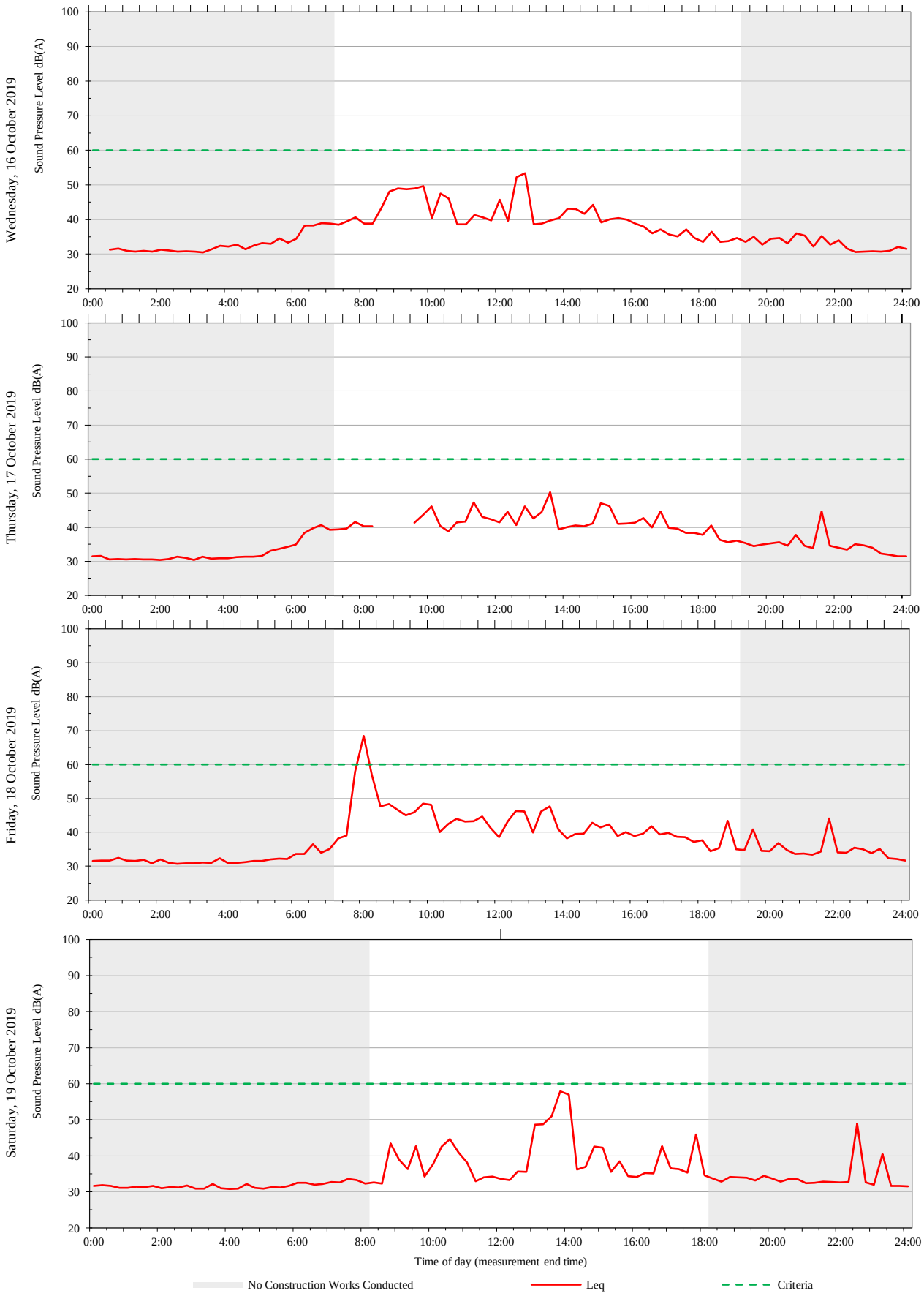
Unattended monitoring: WIMR Level 2 L2.11 (Internal)

ARUP



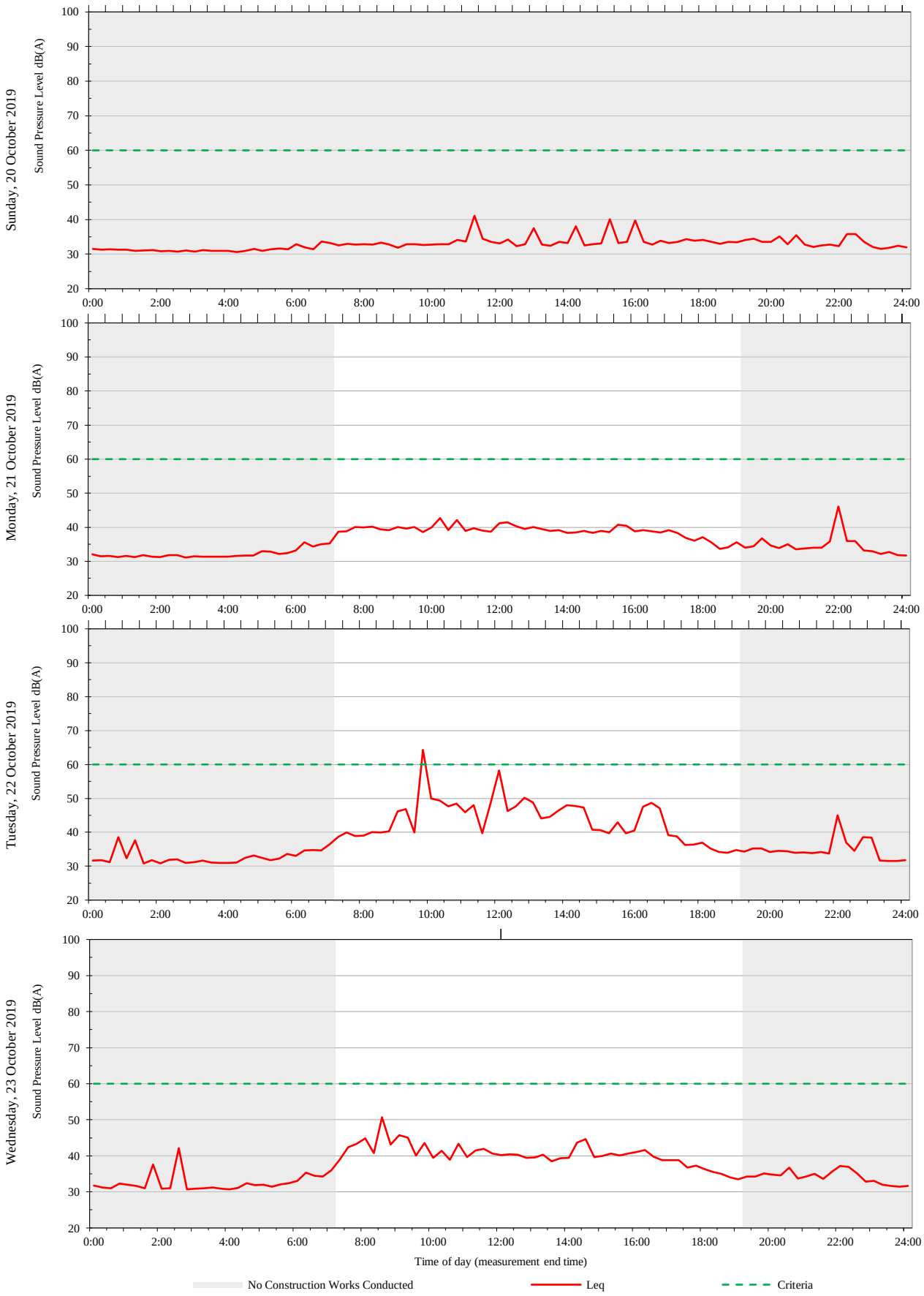
Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP



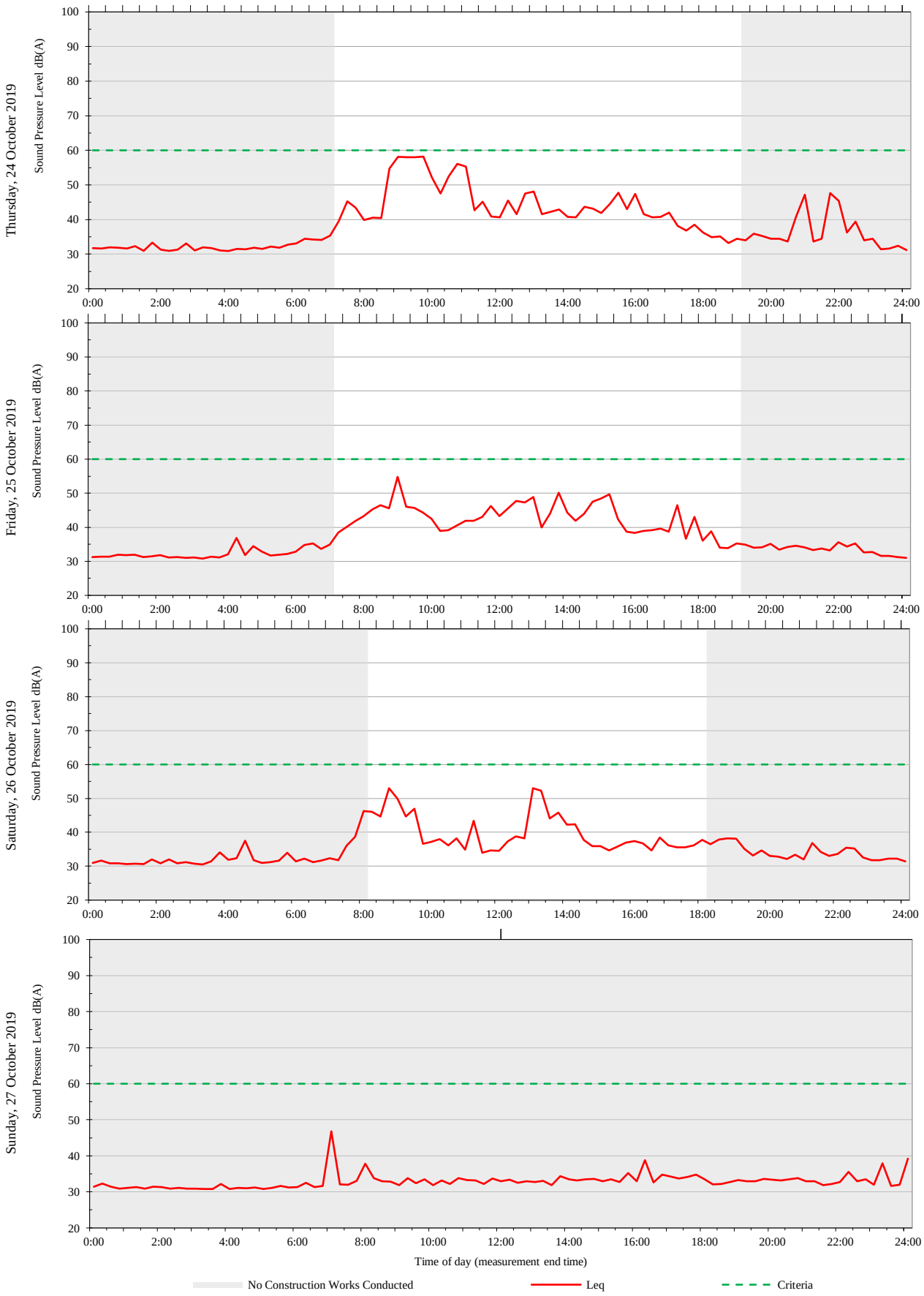
Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP



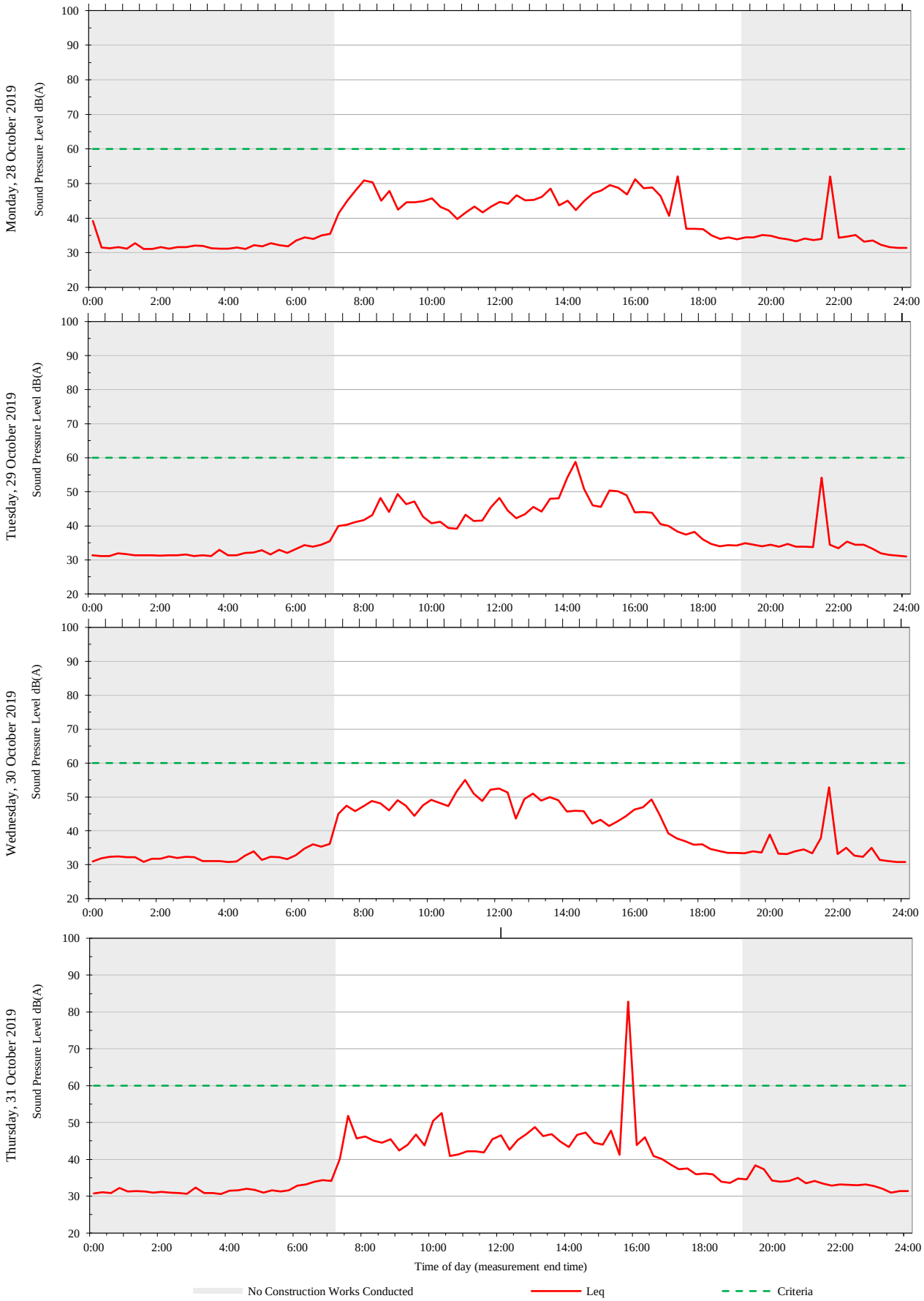
Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP



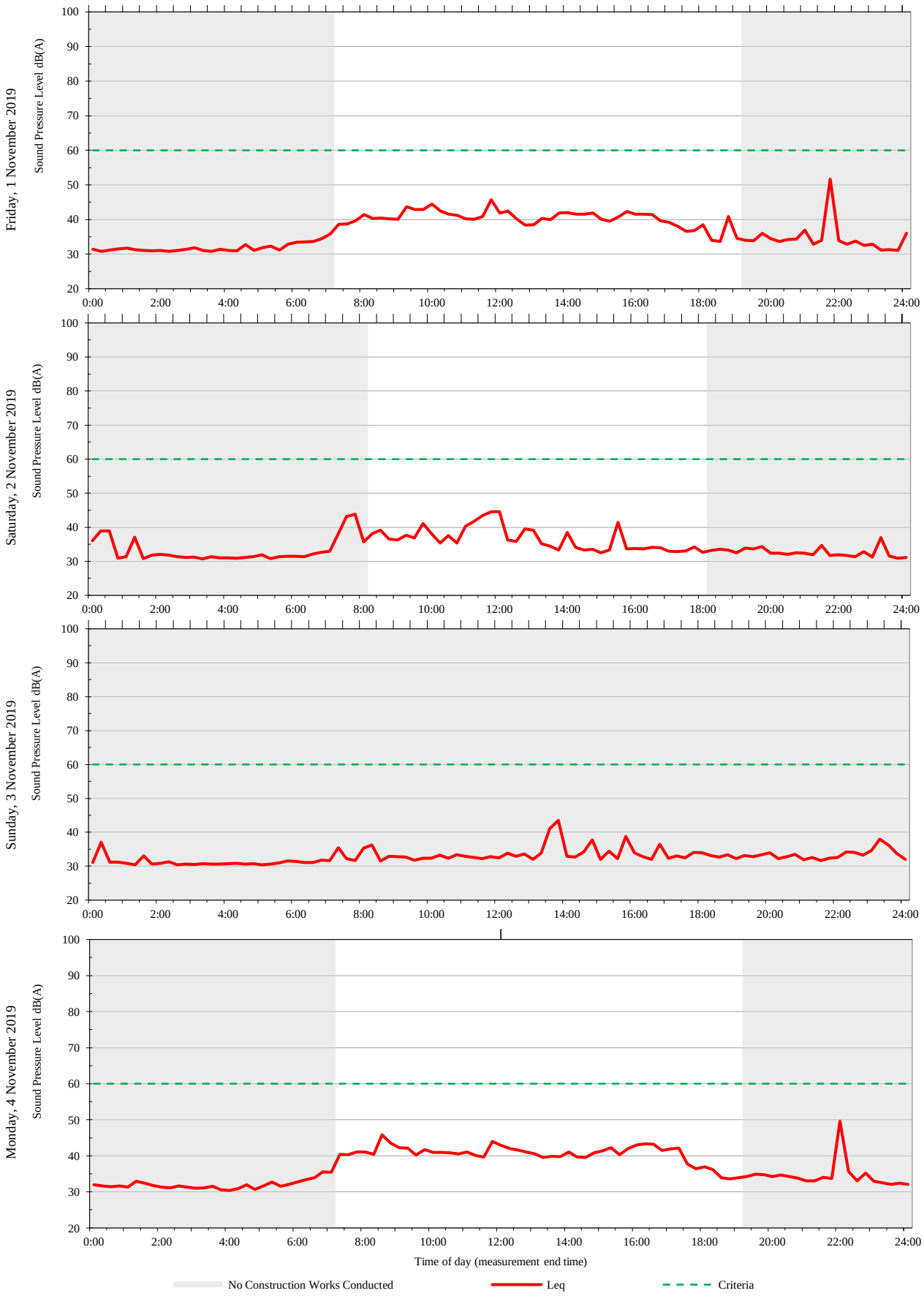
Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP



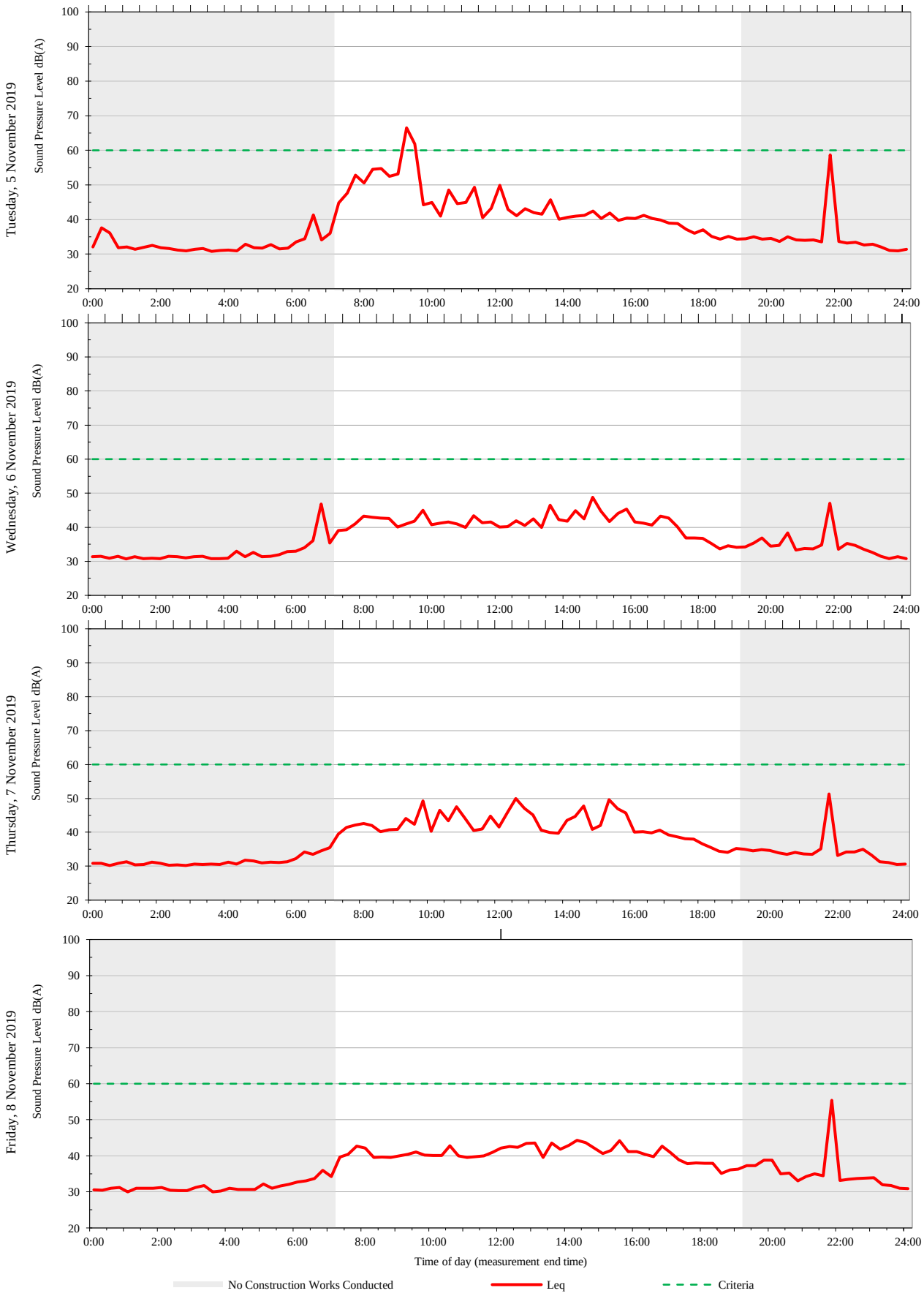
Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP



Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP

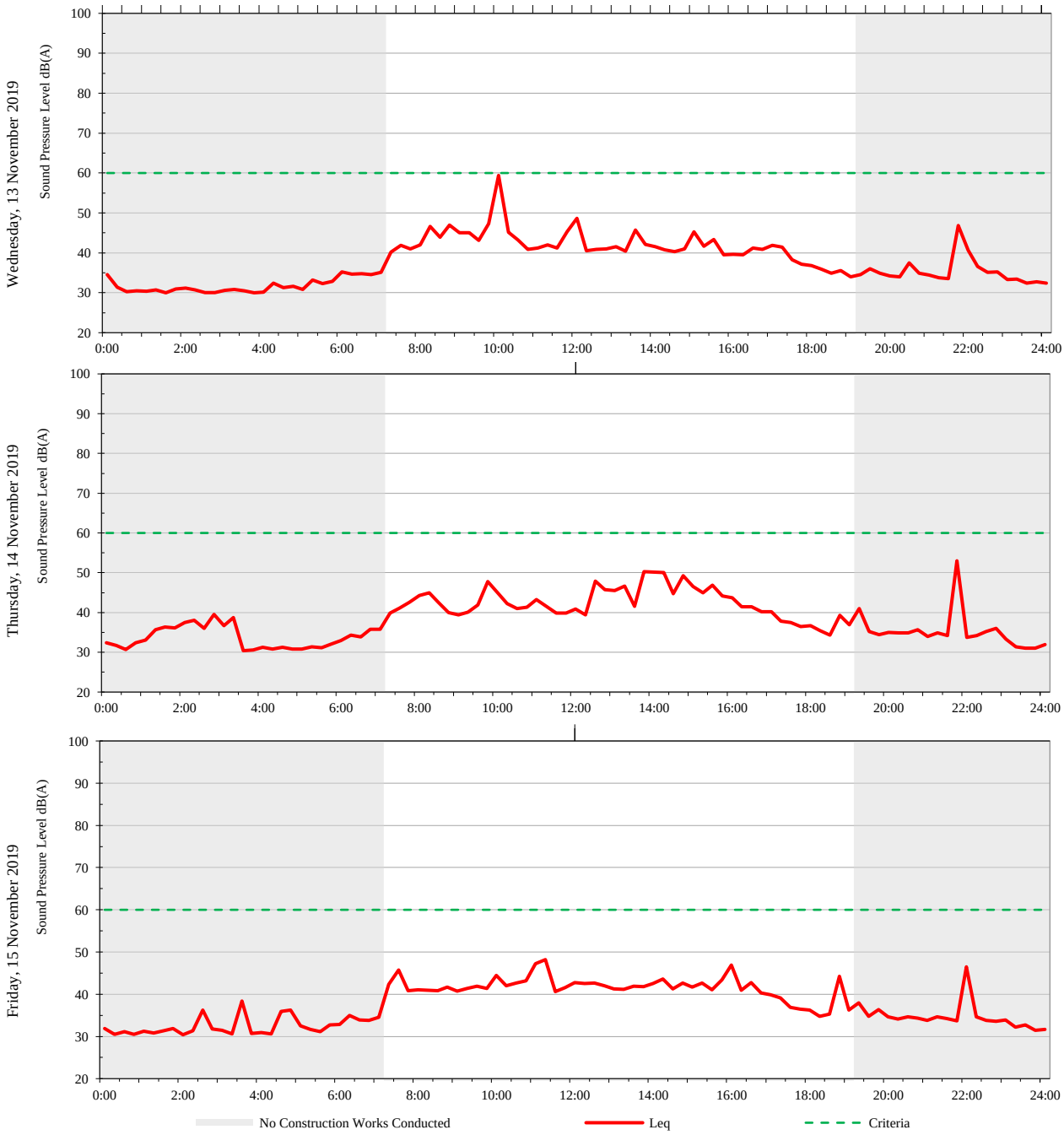


Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP

Unattended monitoring: WIMR Level 2 R2.04 (Internal)

ARUP

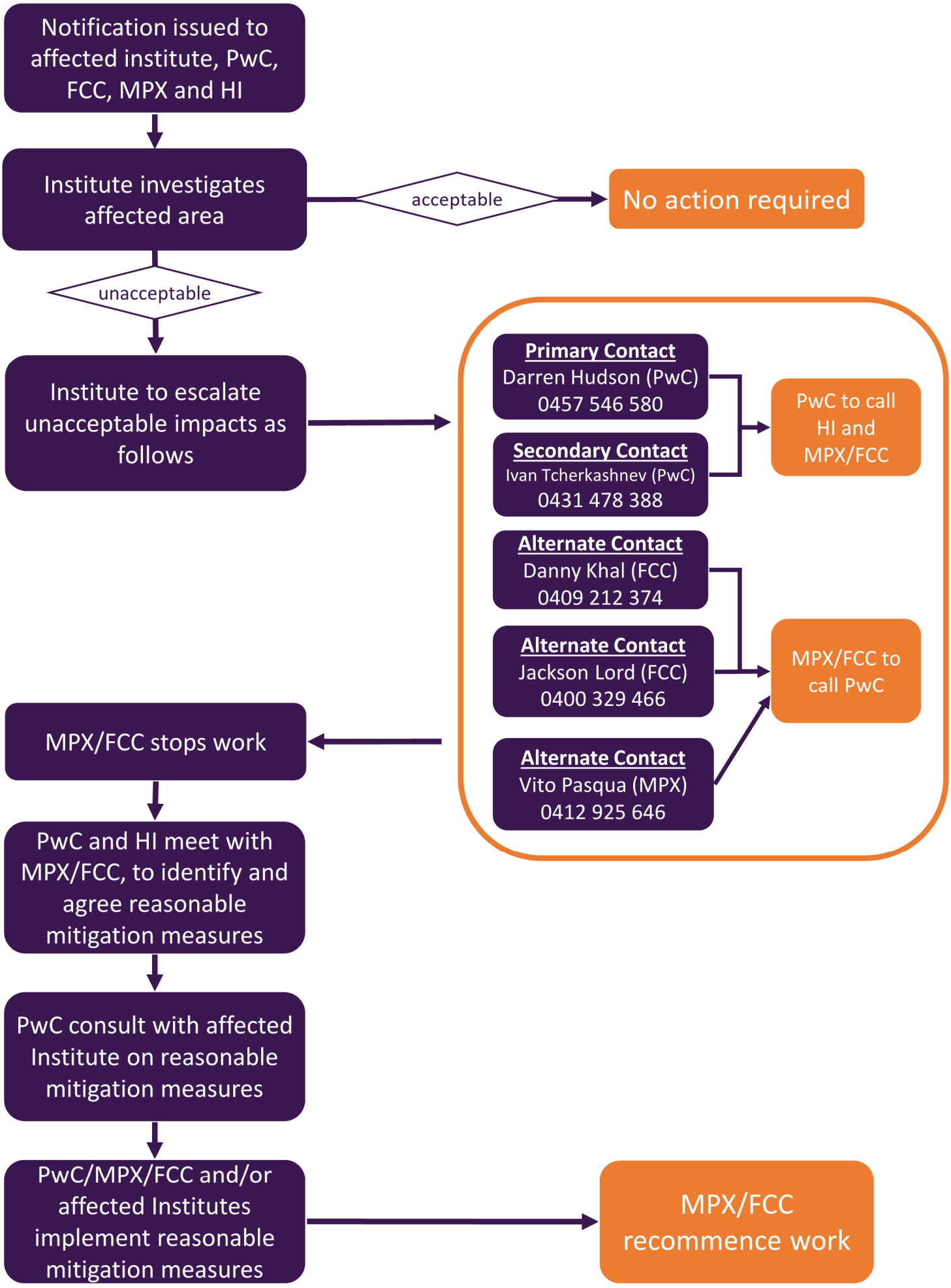


Appendix D

Noise & Vibration Impact Protocol

Westmead Redevelopment
Building health. Transforming lives.

NOISE & VIBRATION IMPACT PROTOCOL
(NORMAL BUSINESS HOURS)



V3.0(N) 05-Jun-2019

Appendix E

NATA Certificates for Noise Loggers

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19293

Client Details	Arup Acoustics Barrack Place, Level 5, 151 Clarence Street SYDNEY NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	878183
Microphone Serial Number :	322005
Pre-amplifier Serial Number :	28318

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.9°C	**Ambient Temperature :**	23.4°C
Relative Humidity :	57.6%	**Relative Humidity :**	57.2%
Barometric Pressure :	101.3kPa	**Barometric Pressure :**	101.29kPa

Calibration Technician : Jeff Yu
Secondary Check: Sandra Minto
Calibration Date : 20 May 2019
Report Issue Date : 21 May 2019

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19294

Client Details	Arup Acoustics (Sydney) Barrack Place Level 5 151 Clarence Street Sydney NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	87819B
Microphone Serial Number :	321997
Pre-amplifier Serial Number :	28306

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	23.9°C	**Ambient Temperature :**	23.7°C
Relative Humidity :	48%	**Relative Humidity :**	48.3%
Barometric Pressure :	101.5kPa	**Barometric Pressure :**	101.49kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Eloise Burrows
Calibration Date :	21 May 2019	**Report Issue Date :**	21 May 2019

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -		Environmental Conditions	
Acoustic Tests		*Temperature*	*±0.2°C*
31.5 Hz to 8kHz	*±0.15dB*	*Relative Humidity*	*±2.4%*
12.5kHz	*±0.2dB*	*Barometric Pressure*	*±0.015kPa*
16kHz	*±0.29dB*		
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

NATA
WORLD RECOGNISED ACCREDITATION

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19295

Client Details	Arup Acoustics (Sydney) Barrack Place Level 5 151 Clarence Street Sydney NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	878176
Microphone Serial Number :	321885
Pre-amplifier Serial Number :	28382

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	24.3°C	**Ambient Temperature :**	23.8°C
Relative Humidity :	48.4%	**Relative Humidity :**	48.5%
Barometric Pressure :	101.54kPa	**Barometric Pressure :**	101.52kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Eloise Burrows
Calibration Date :	21 May 2019	**Report Issue Date :**	21 May 2019

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

NATA WORLD RECOGNISED ACCREDITATION

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19296

Client Details	Arup Acoustics Barrack Place, Level 5, 151 Clarence Street SYDNEY NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	87818F
Microphone Serial Number :	322006
Pre-amplifier Serial Number :	28311

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	24°C	**Ambient Temperature :**	24.1°C
Relative Humidity :	47.3%	**Relative Humidity :**	46.3%
Barometric Pressure :	101.53kPa	**Barometric Pressure :**	101.53kPa

Calibration Technician :	Lucky Jaiswal	**Secondary Check:**	Sandra Minto
Calibration Date :	21 May 2019	**Report Issue Date :**	21 May 2019
Approved Signatory :			Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19298

Client Details	Arup Acoustics Barrack Place, Level 5, 151 Clarence Street SYDNEY NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	87818B
Microphone Serial Number :	321998
Pre-amplifier Serial Number :	28307

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	23.7°C	**Ambient Temperature :**	23.6°C
Relative Humidity :	47.3%	**Relative Humidity :**	46.2%
Barometric Pressure :	101.46kPa	**Barometric Pressure :**	101.44kPa

Calibration Technician : Lucky Jaiswal
Secondary Check: Sandra Minto
Calibration Date : 21 May 2019
Report Issue Date : 21 May 2019

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C19299

Client Details	Arup Acoustics Barrack Place, Level 5, 151 Clarence Street SYDNEY NSW 2000
Equipment Tested/ Model Number :	ARL Ngara
Instrument Serial Number :	878180
Microphone Serial Number :	321999
Pre-amplifier Serial Number :	28386

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	23.4°C	**Ambient Temperature :**	23.5°C
Relative Humidity :	45.2%	**Relative Humidity :**	44.1%
Barometric Pressure :	101.3kPa	**Barometric Pressure :**	101.27kPa

Calibration Technician : Lucky Jaiswal
Secondary Check: Sandra Minto
Calibration Date : 21 May 2019
Report Issue Date : 21 May 2019

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.15dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.2dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

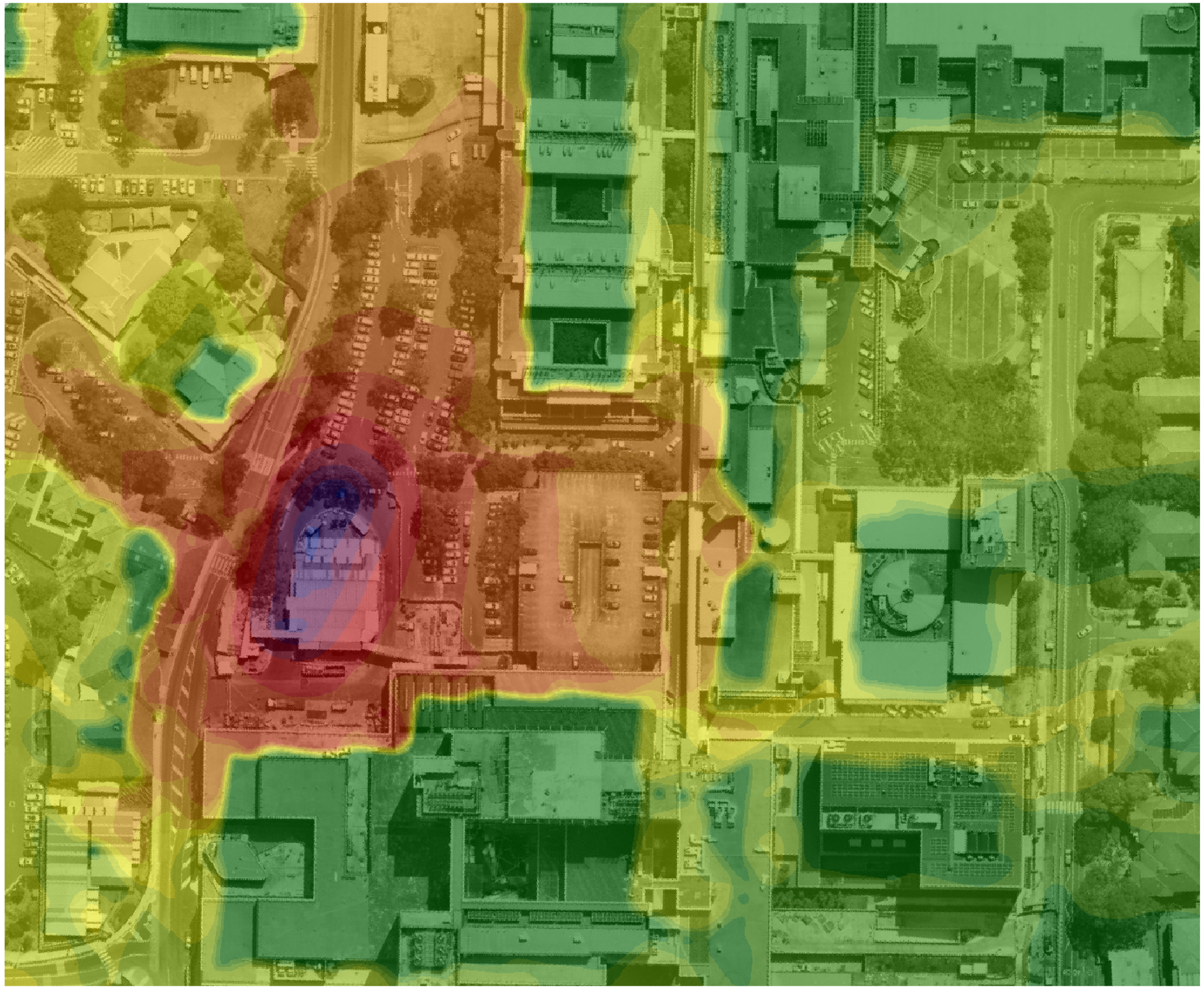
NATA
WORLD RECOGNISED ACCREDITATION

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Appendix C – Predicted Construction Noise Emissions Map



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

NSW GOVERNMENT Health Infrastructure
pwc
ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - EXCAVATION, NO MITIGATION WORST CASE SCENARIO

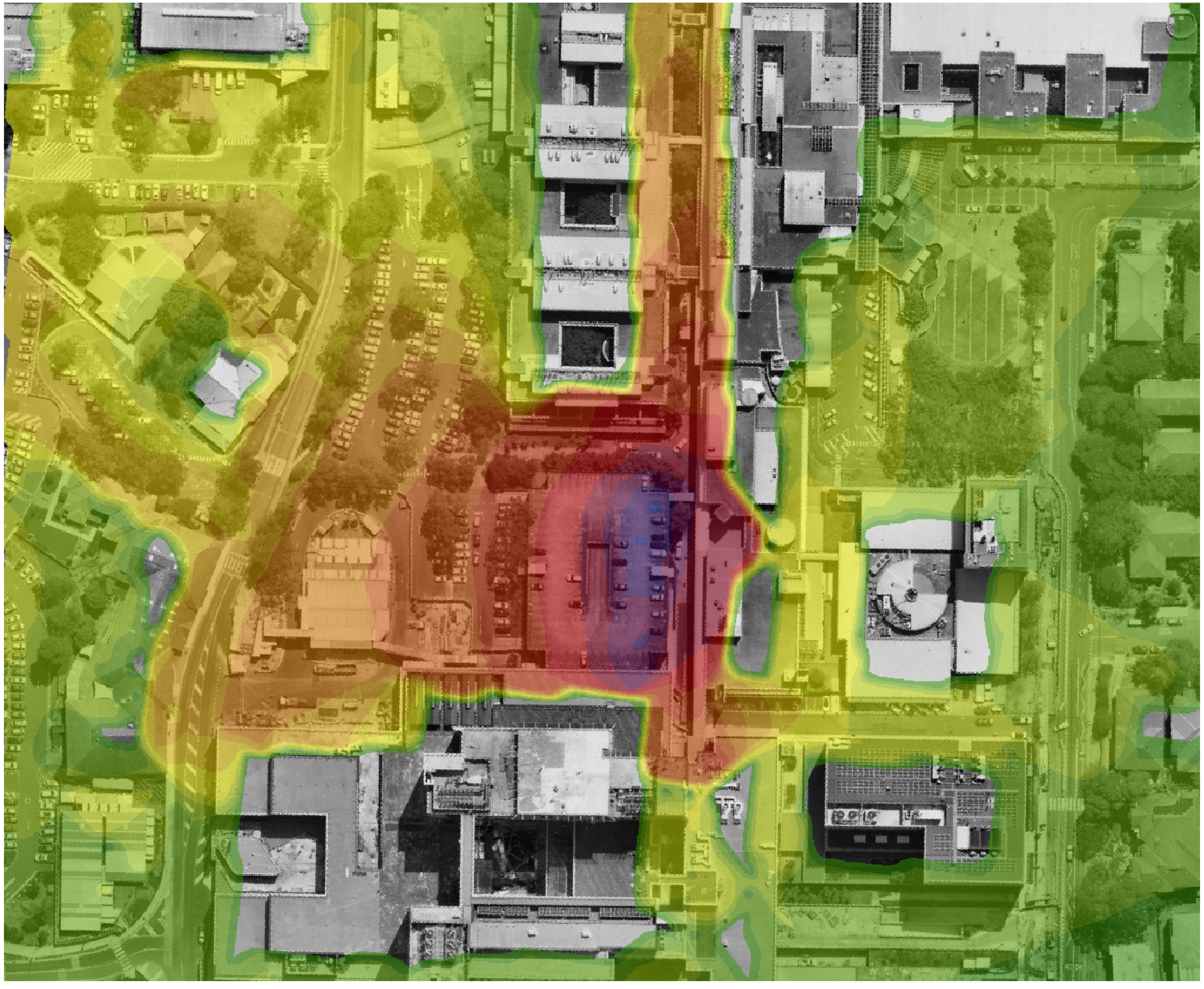
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - EXCAVATION, NO MITIGATION BEST CASE SCENARIO

Stantec

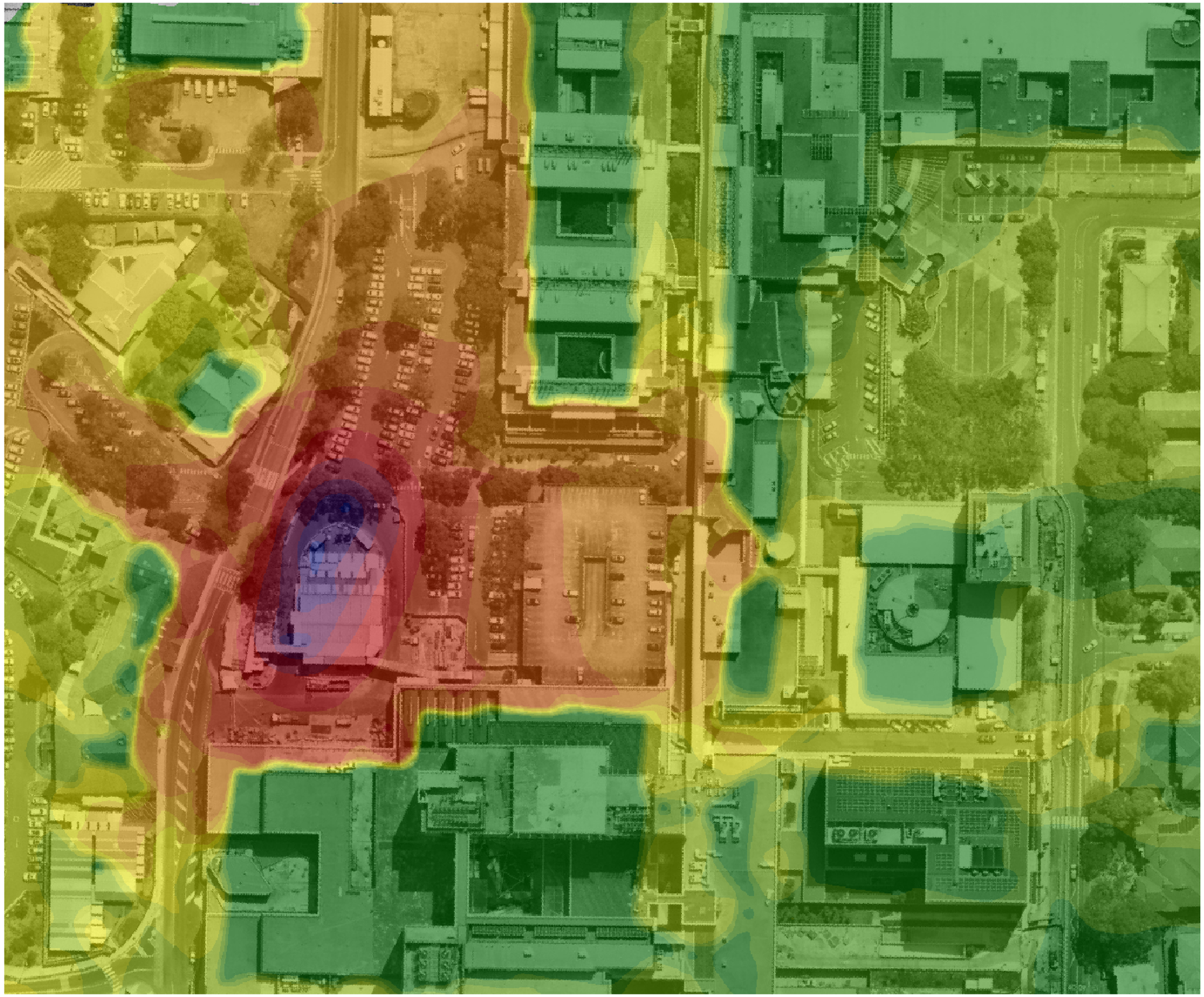
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR.
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR.
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION.
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - EXCAVATION, MITIGATION WORST CASE SCENARIO

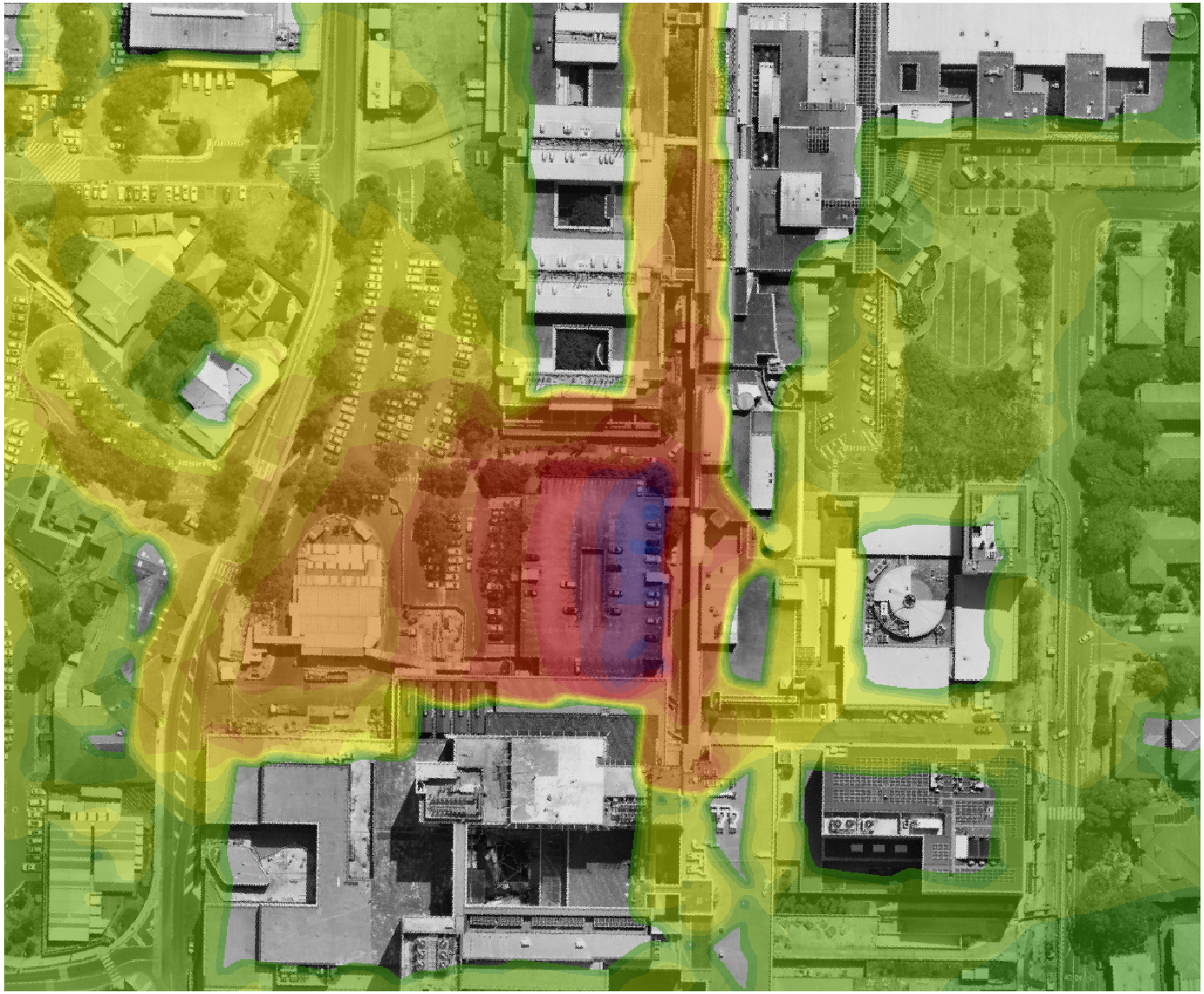
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - EXCAVATION, MITIGATION BEST CASE SCENARIO

Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - STRUCTURE, NO MITIGATION WORST CASE SCENARIO

Stantec

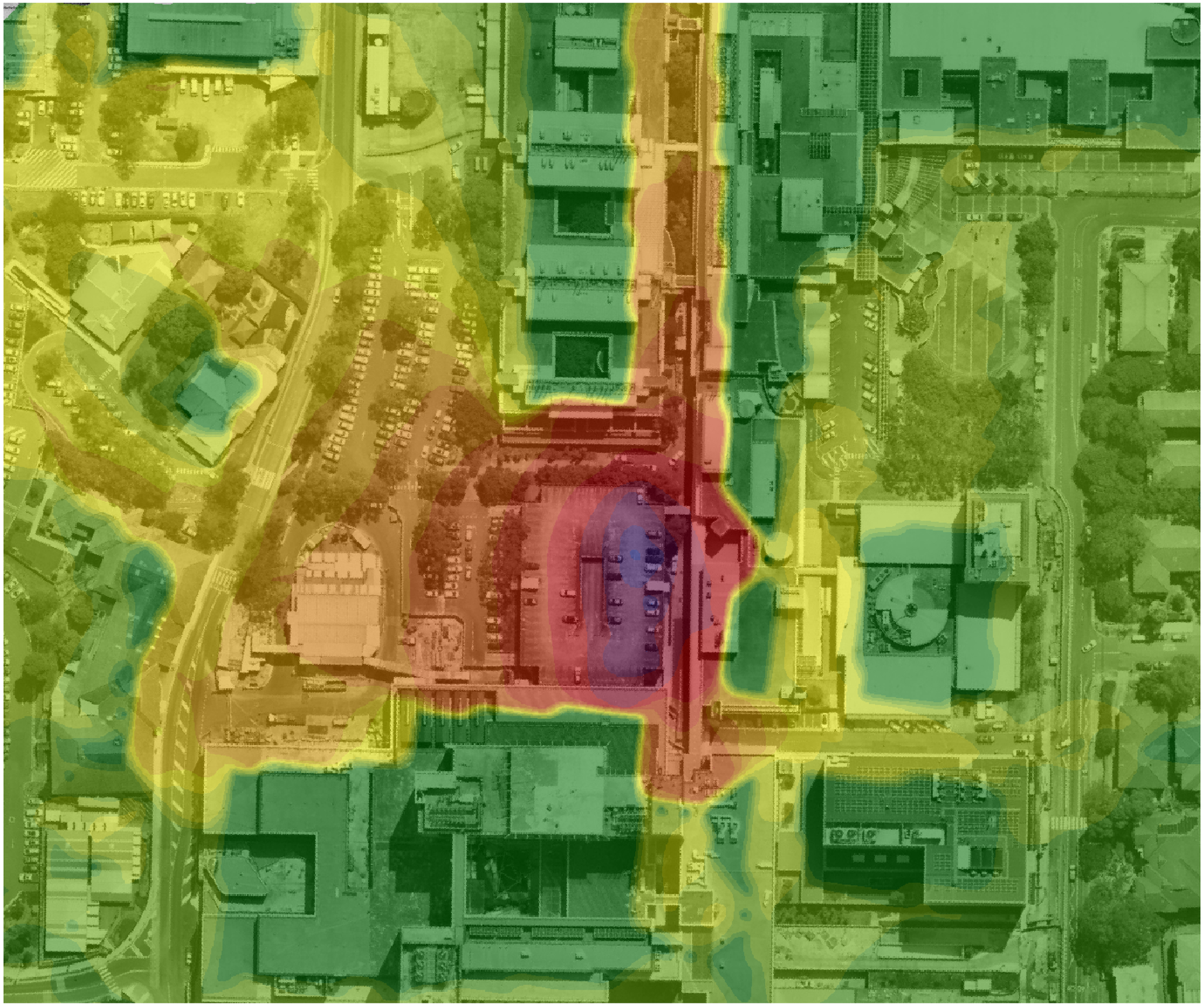
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - STRUCTURE, NO MITIGATION BEST CASE SCENARIO

Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - STRUCTURE, MITIGATION WORST CASE SCENARIO

Stantec

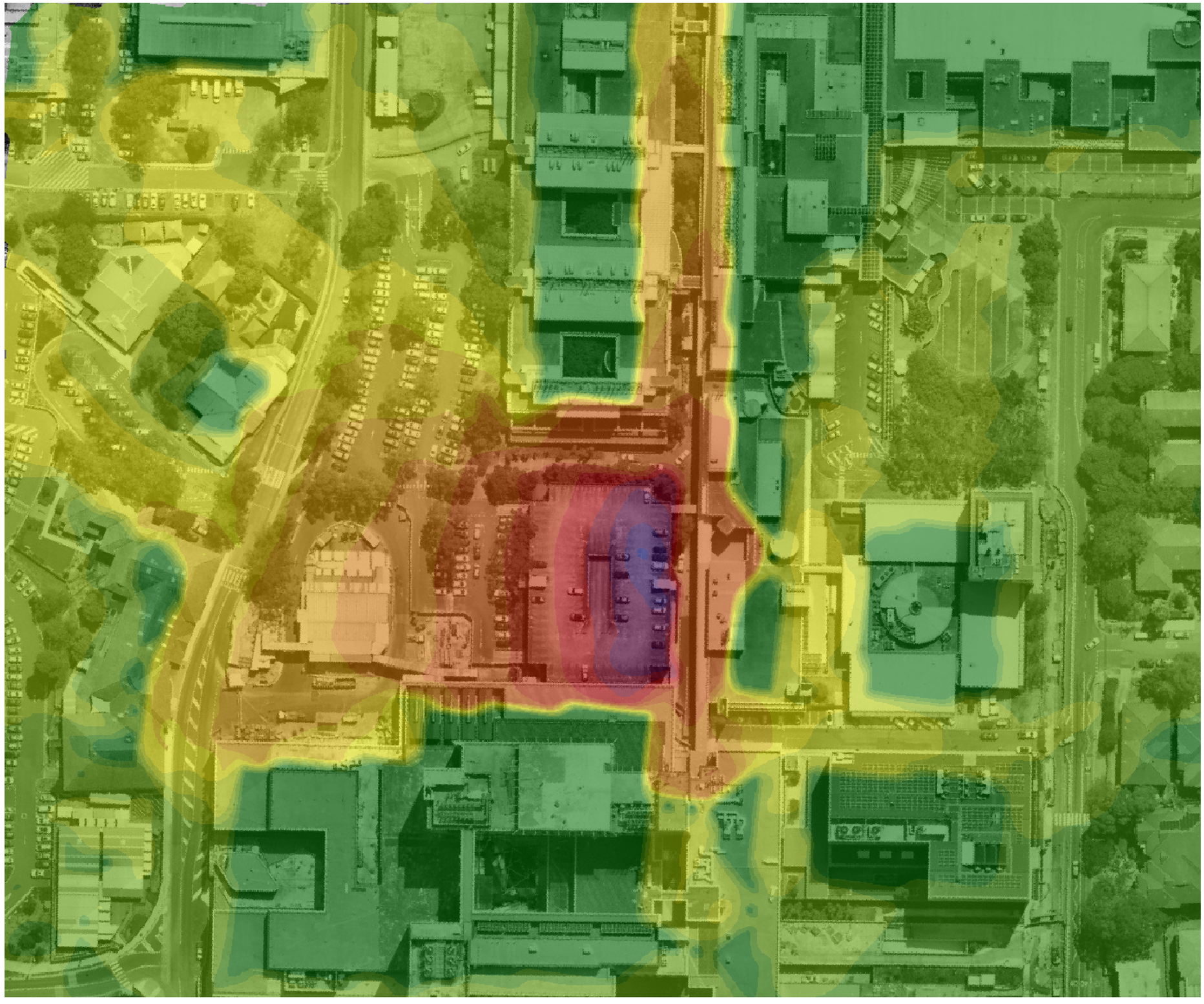
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

NSW GOVERNMENT Health Infrastructure
pwc
ARCHITECT/CLIENT

CHILDREN'S HOSPITAL AT WESTMEAD
PAEDIATRIC SERVICES BUILDING (PSB)
PROJECT

CONSTRUCTION NOISE EMISSIONS - STRUCTURE, MITIGATION BEST CASE SCENARIO
TITLE

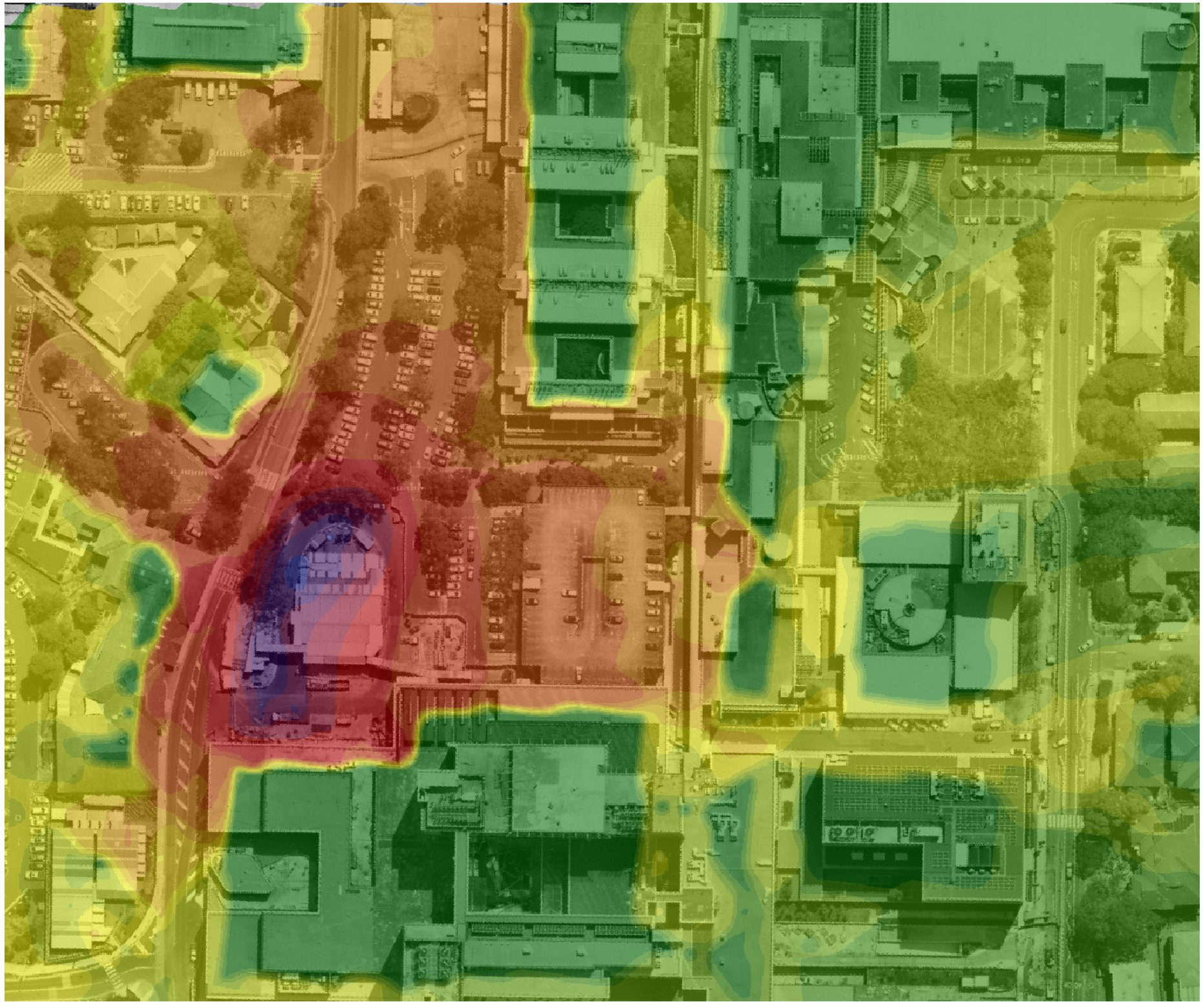
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (GF-L5), NO MITIGATION WORST CASE SCENARIO

Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

	< 32		40-44		52-56		64-68		80-84
	32-36		44-48		56-60		68-72		84-88
	36-40		48-52		60-64		76-80		> 88

NSW GOVERNMENT Health Infrastructure
pwc
ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS- FACADE (GF-L5), NO MITIGATION BEST CASE SCENARIO

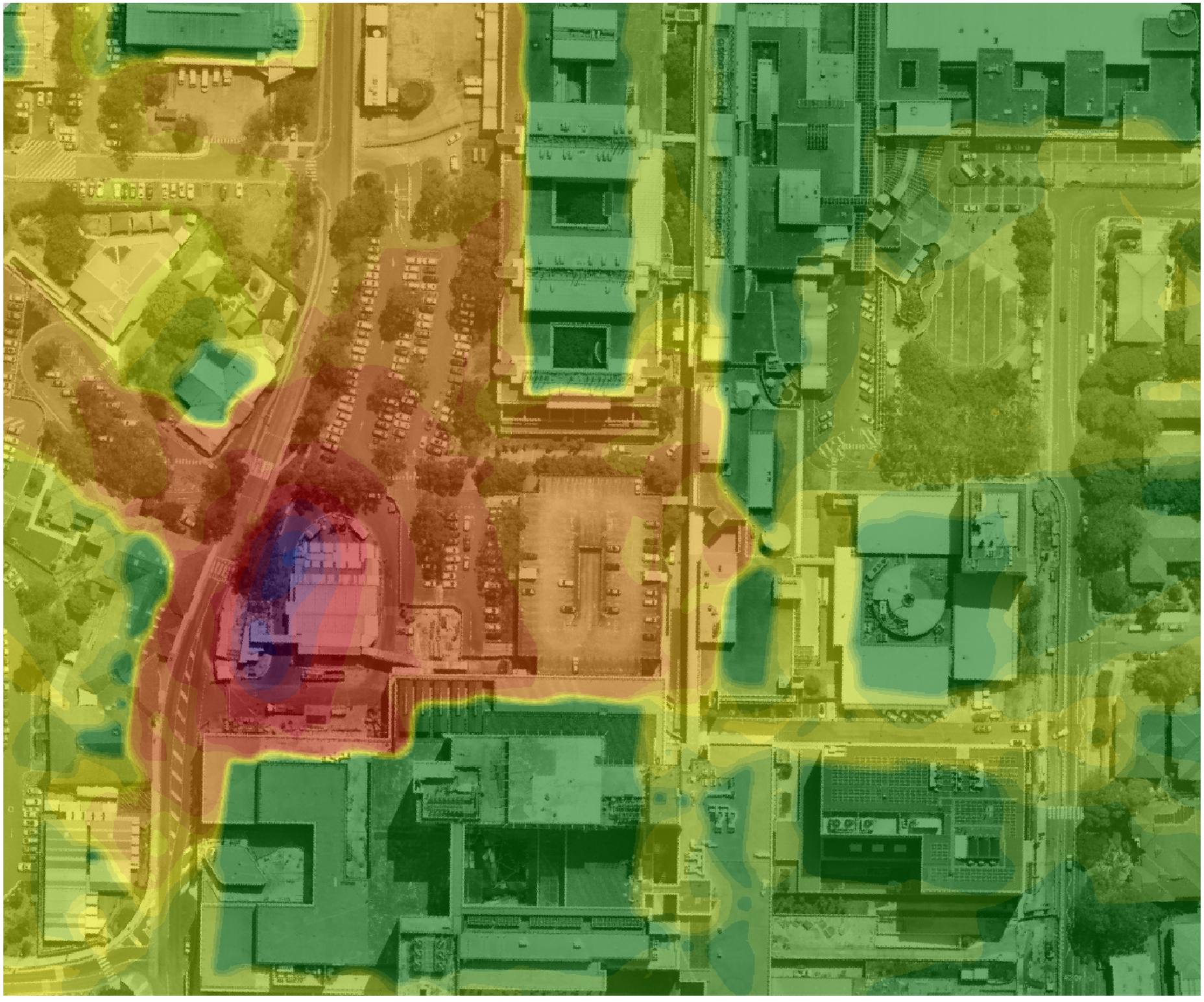
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

NSW GOVERNMENT Health Infrastructure

pwc

ARCHITECT/CLIENT

CHILDREN'S HOSPITAL AT WESTMEAD
PAEDIATRIC SERVICES BUILDING (PSB)

PROJECT

CONSTRUCTION NOISE EMISSIONS - FACADE (GF-L5), MITIGATION
WORST CASE SCENARIO

TITLE

Stantec

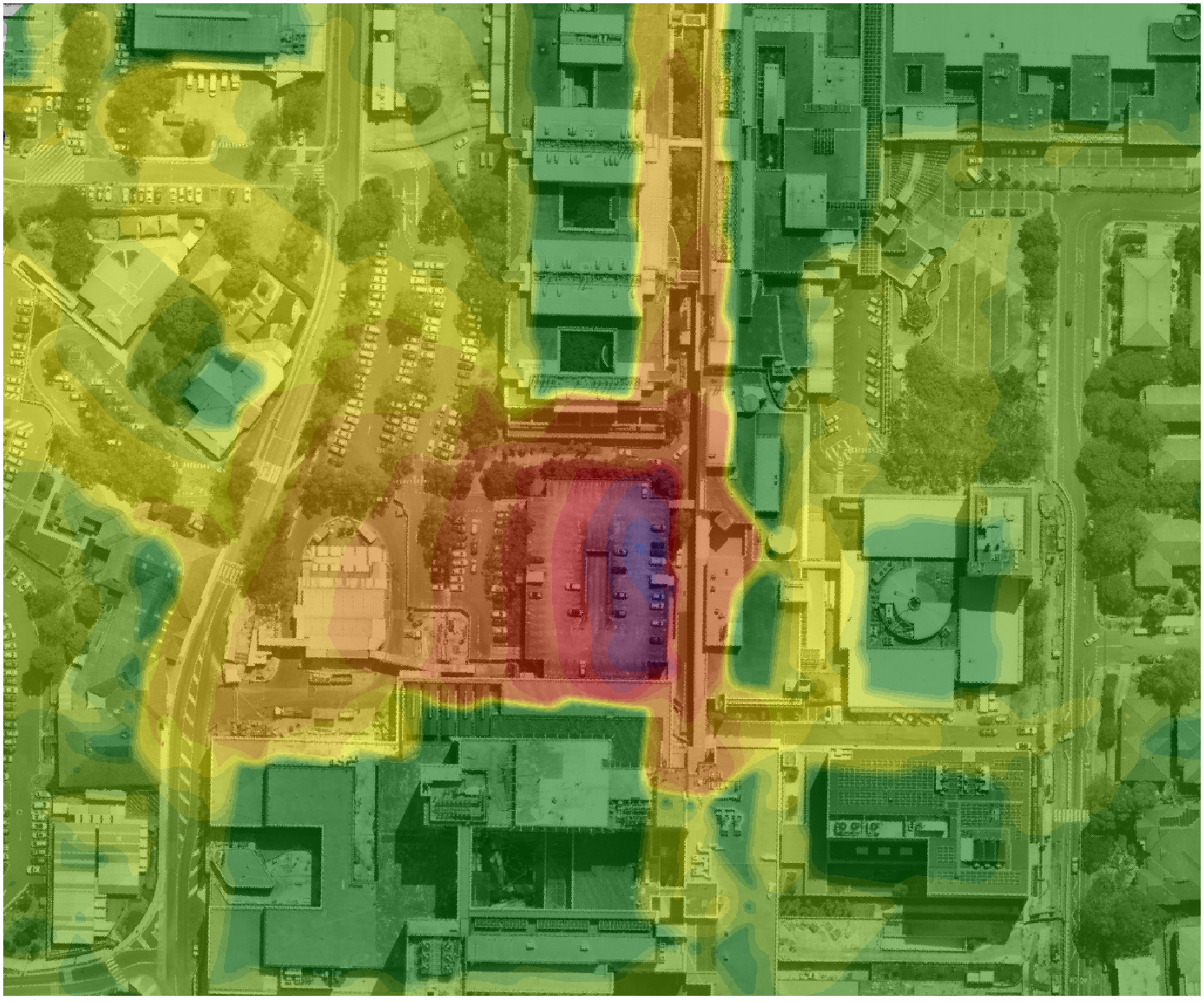
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (GF-L5), MITIGATION BEST CASE SCENARIO

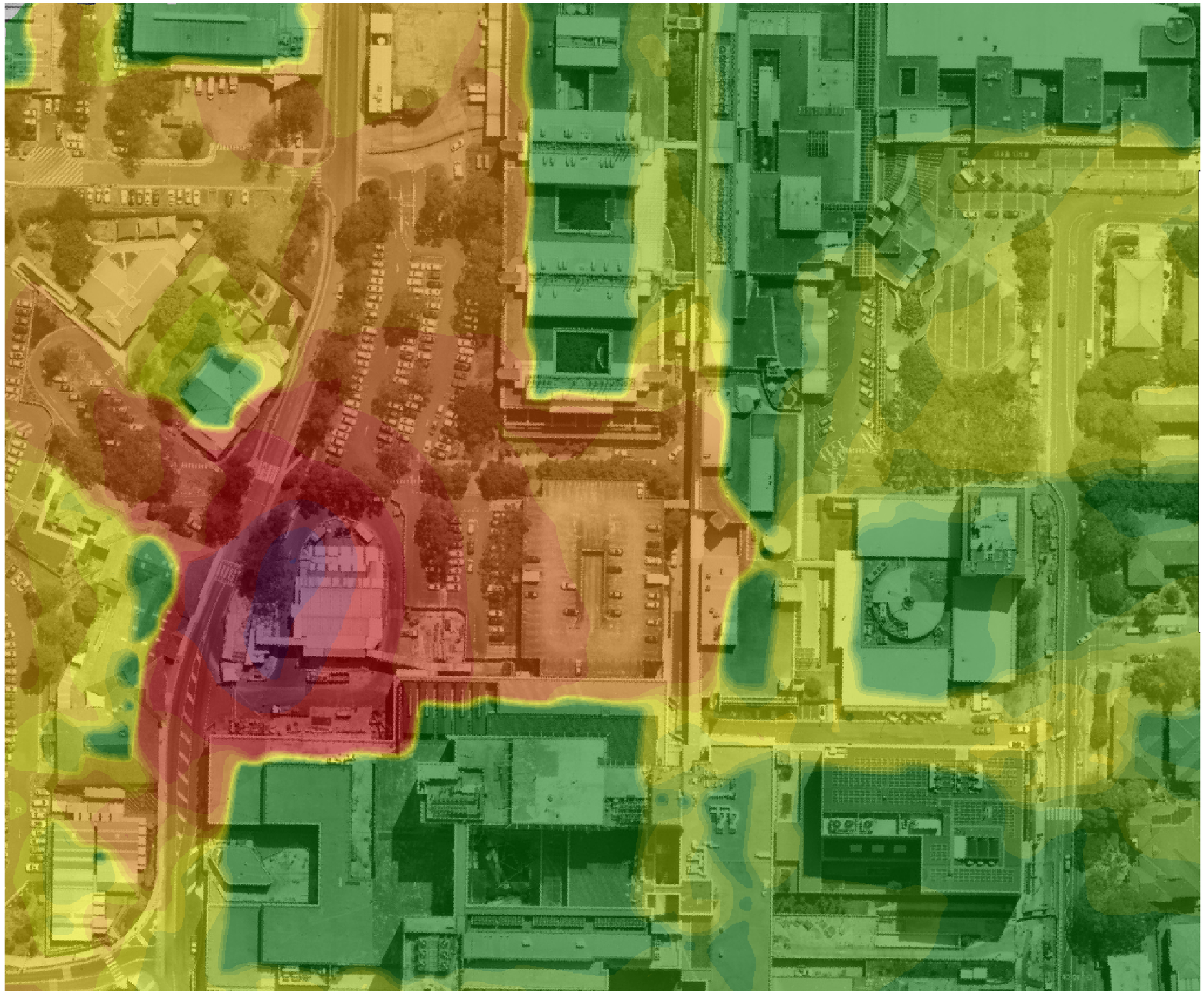
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L6-L10), NO MITIGATION WORST CASE SCENARIO

Stantec

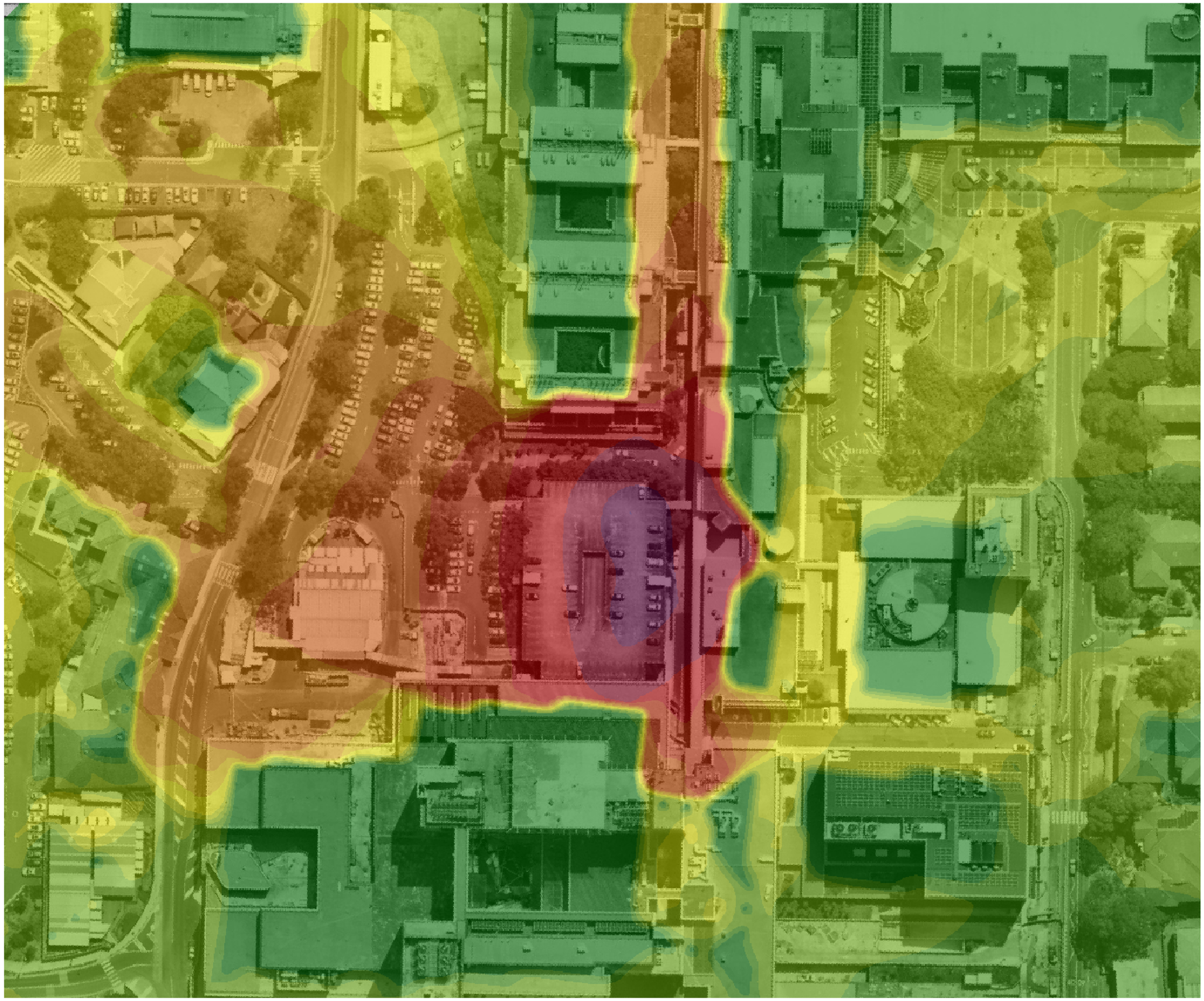
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L6-L10), NO MITIGATION BEST CASE SCENARIO

Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L6-L10), MITIGATION WORST CASE SCENARIO

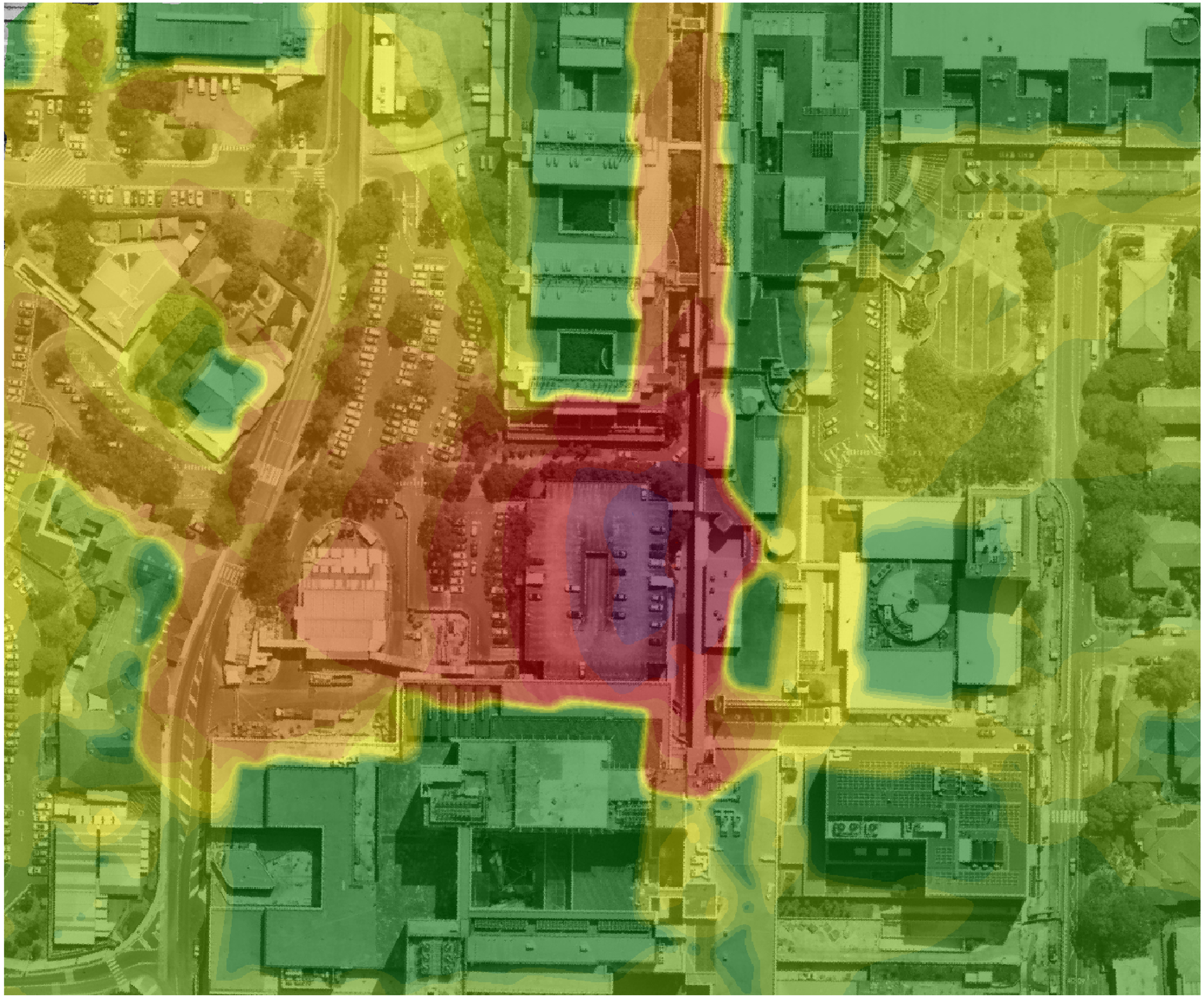
Stantec

Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L6-L10), MITIGATION BEST CASE SCENARIO

Stantec

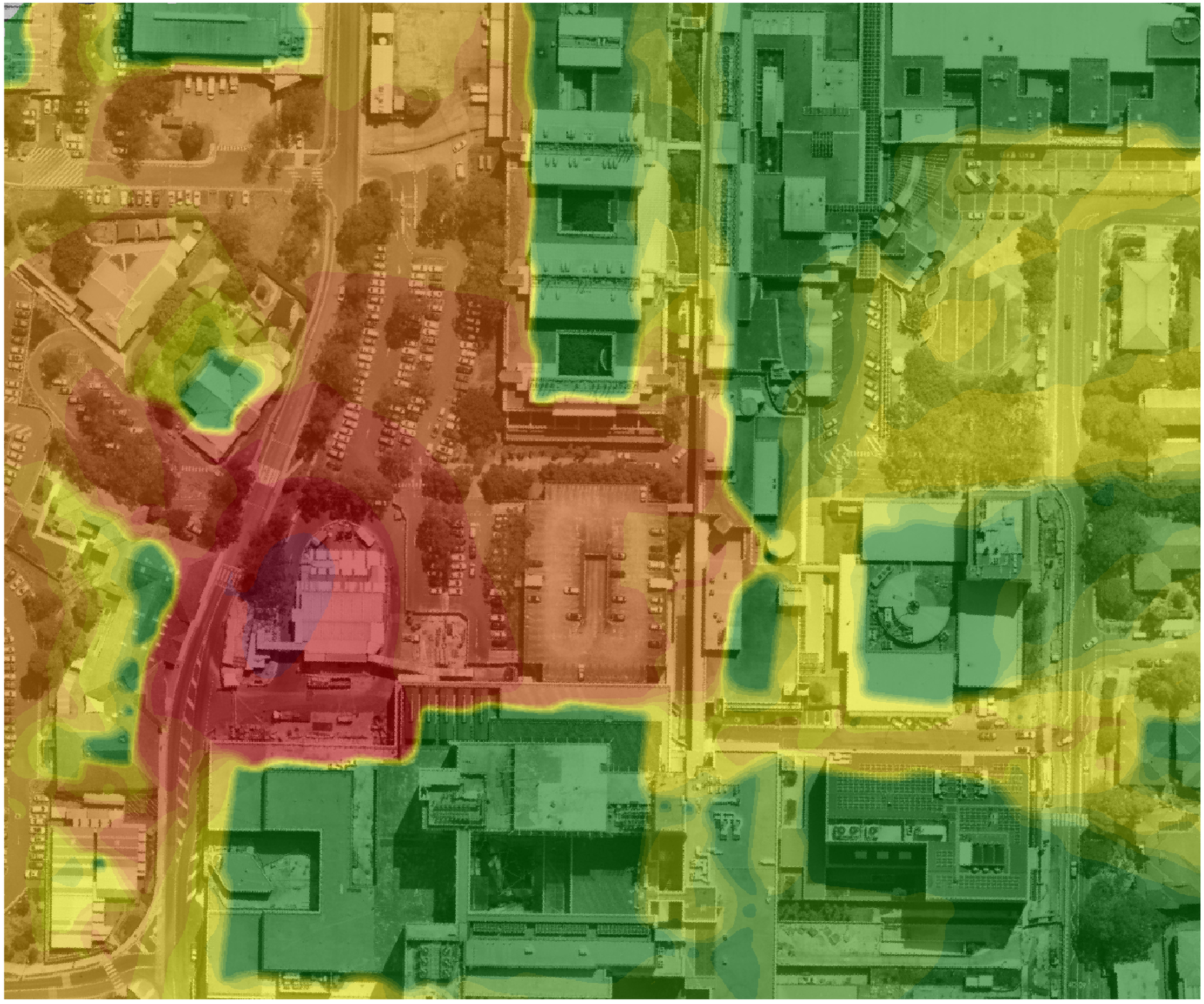
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

NSW GOVERNMENT Health Infrastructure
pwc
ARCHITECT/CLIENT

CHILDREN'S HOSPITAL AT WESTMEAD
PAEDIATRIC SERVICES BUILDING (PSB)
PROJECT

CONSTRUCTION NOISE EMISSIONS - FACADE (L11-L15), NO MITIGATION WORST CASE SCENARIO
TITLE

Stantec

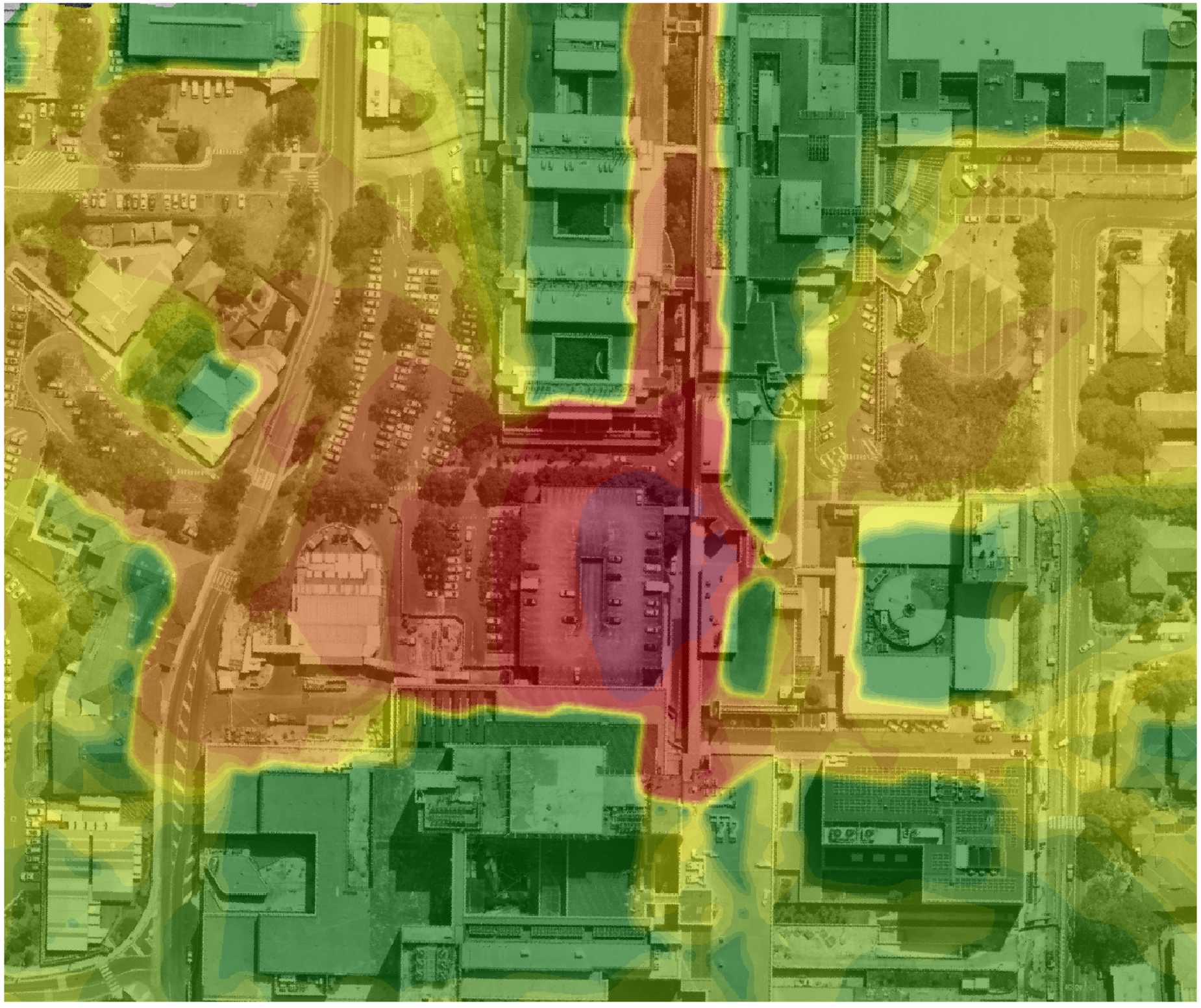
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE



REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

NSW GOVERNMENT Health Infrastructure

pwc

ARCHITECT/CLIENT

CHILDREN'S HOSPITAL AT WESTMEAD
PAEDIATRIC SERVICES BUILDING (PSB)

PROJECT

CONSTRUCTION NOISE EMISSIONS - FACADE (L11-L15), NO MITIGATION BEST CASE SCENARIO

TITLE

Stantec

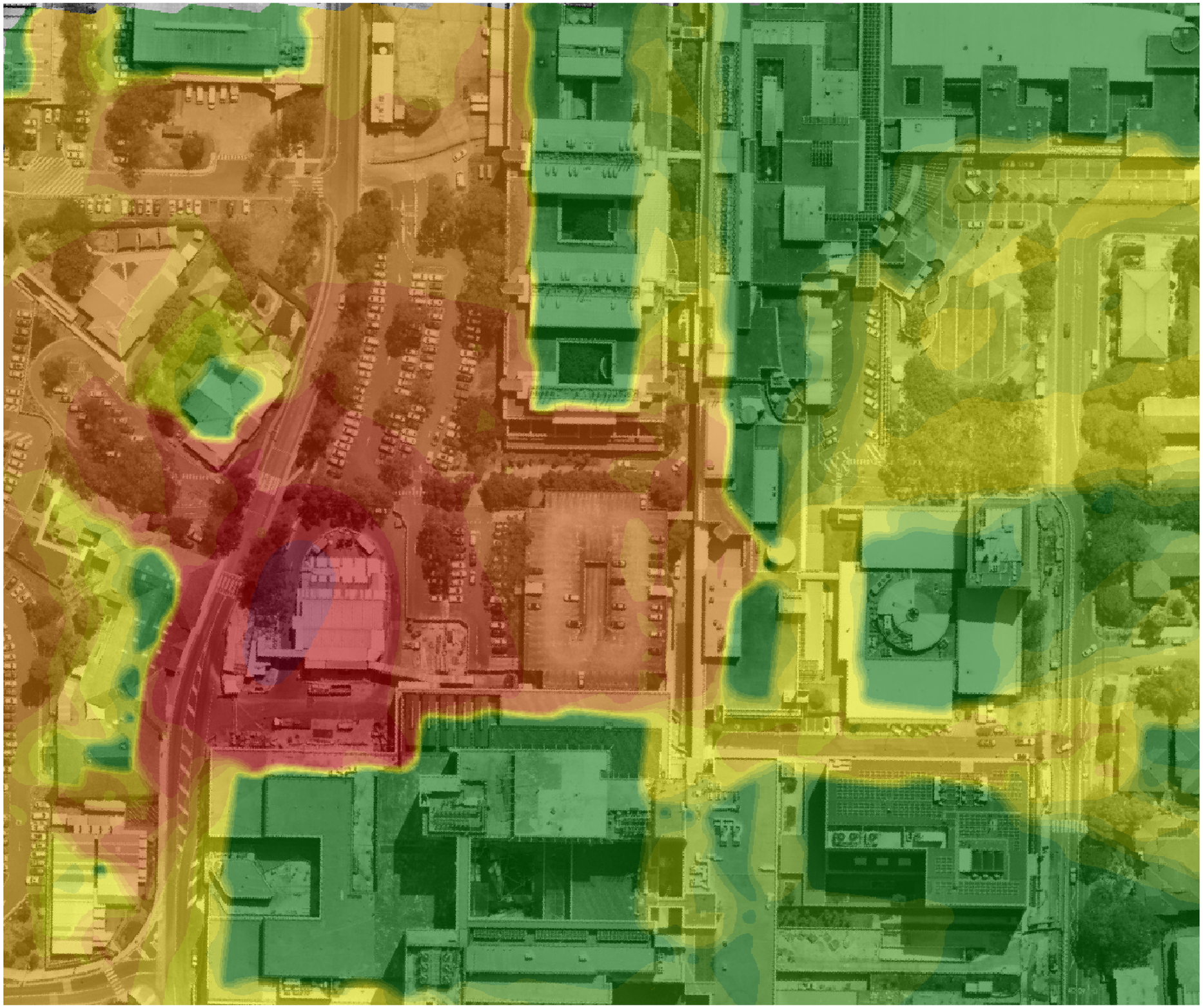
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE



REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

	< 32		40-44		52-56		64-68		80-84
	32-36		44-48		56-60		68-72		84-88
	36-40		48-52		60-64		76-80		> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L11-L15), MITIGATION WORST CASE SCENARIO

Stantec

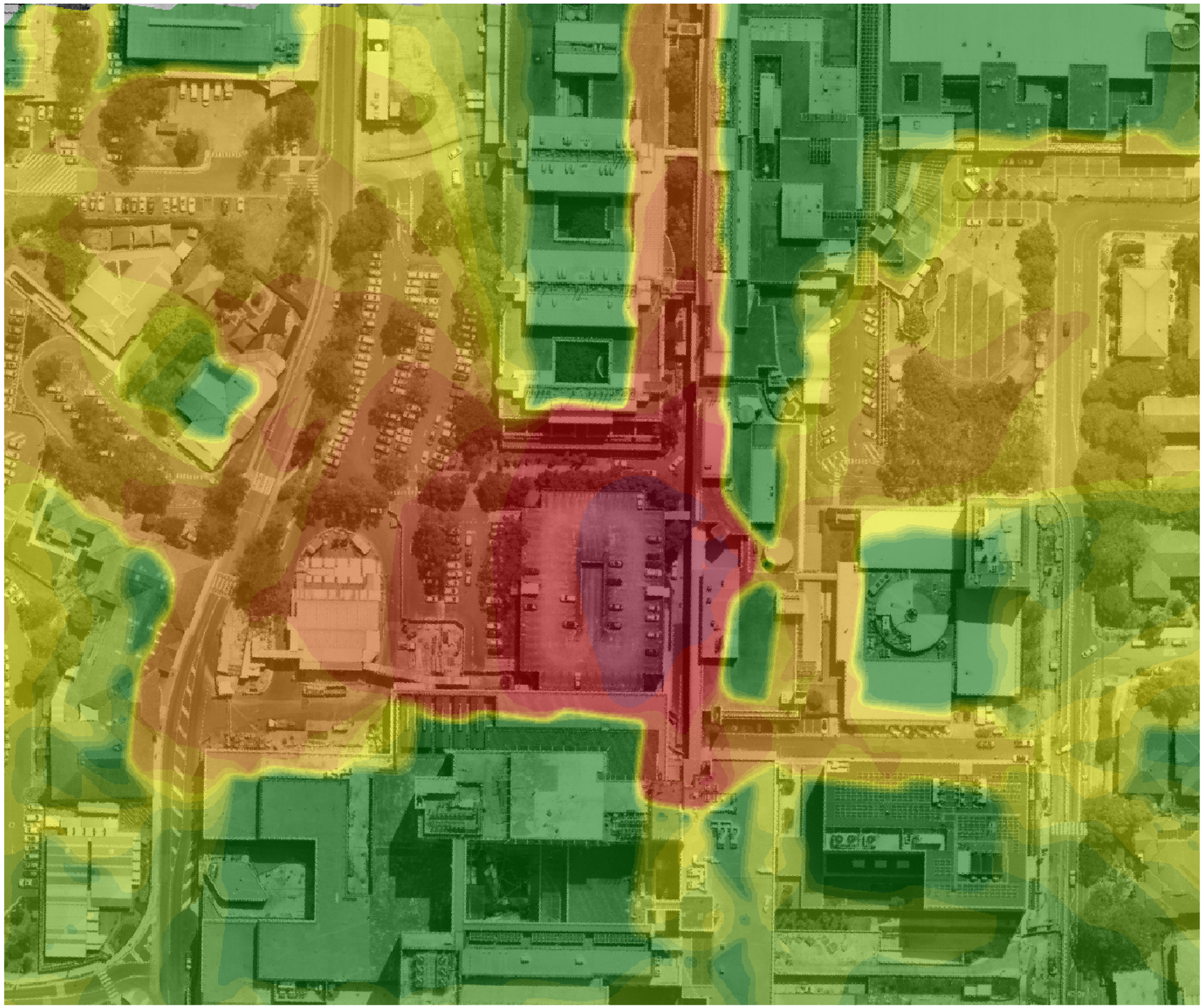
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
001	SSDA Package	MIS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: CONSTRUCTION NOISE EMISSIONS - FACADE (L11-L15), MITIGATION BEST CASE SCENARIO

Stantec

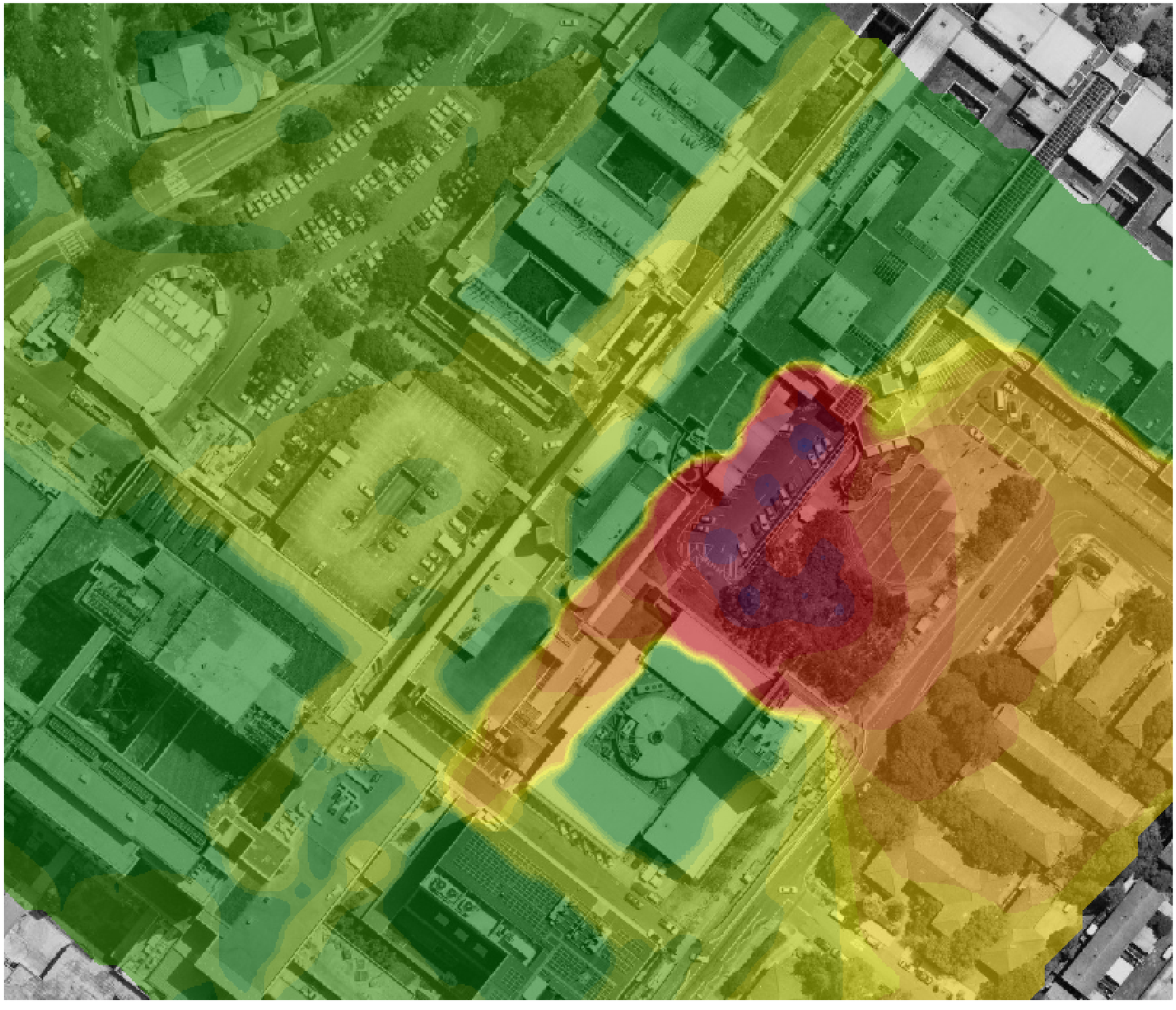
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A0	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	001

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR.
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR.
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION.
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE



Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

REV	DESCRIPTION	DRAWN	APP'D	DATE
002	SSDA Package Update	JUK	MS	04/06/21
001	SSDA Package	MS	ORFG	22/01/21

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: FORECOURT AND ENTRY DEMOLITIONS WORKS

Stantec

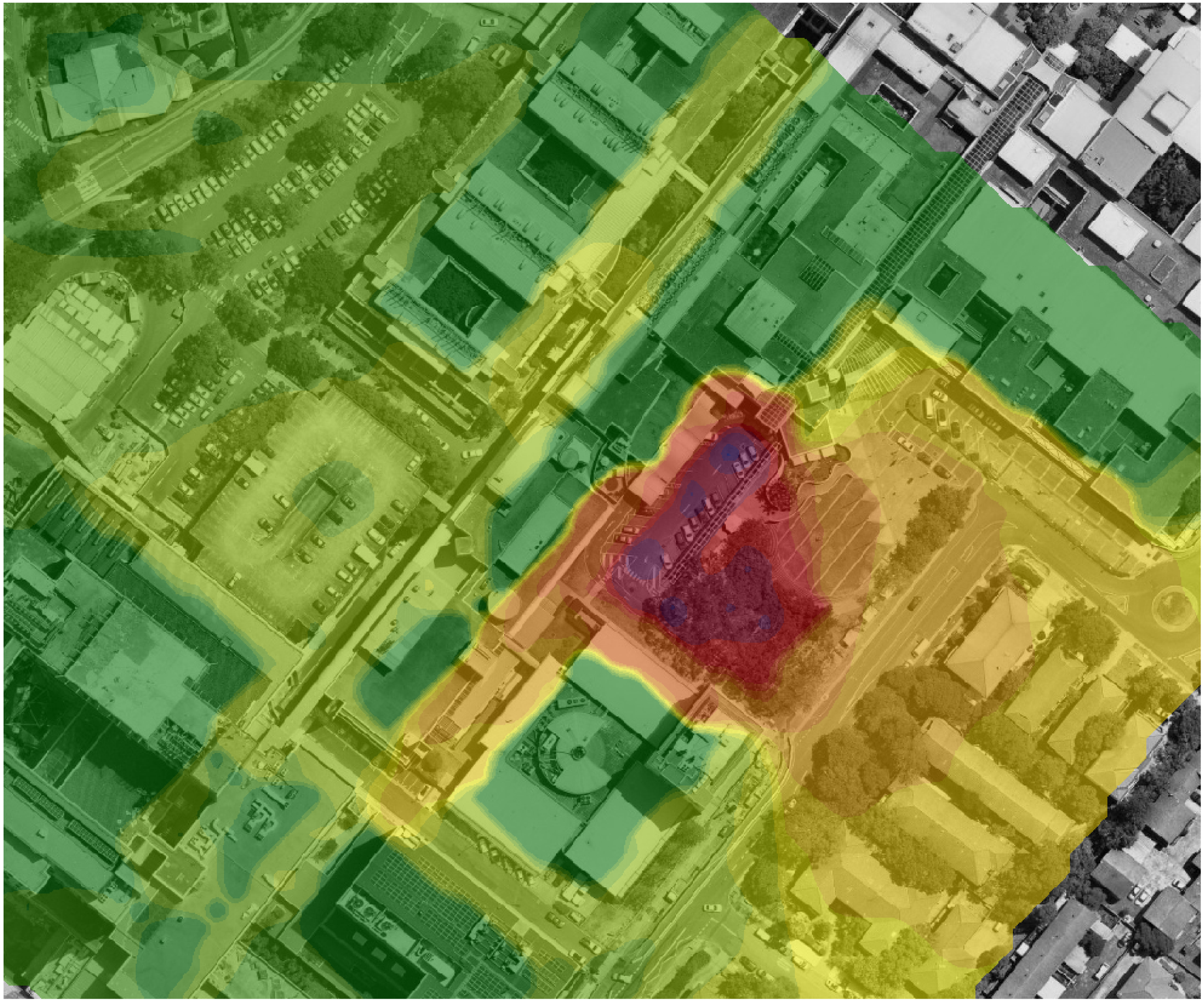
Noise Model

Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	002

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WSE



REV	DESCRIPTION	DRAWN	APPD	DATE
002	SSDA Package Update	JUK	MIS	04/06/21
001	SSDA Package	MIS	ORFG	22/01/21

Noise Level Legend - $L_{Aeq,15min}$ in dB(A)

< 32	40-44	52-56	64-68	80-84
32-36	44-48	56-60	68-72	84-88
36-40	48-52	60-64	76-80	> 88

ARCHITECT/CLIENT

PROJECT: CHILDREN'S HOSPITAL AT WESTMEAD PAEDIATRIC SERVICES BUILDING (PSB)

TITLE: FORECOURT AND ENTRY DEMOLITIONS WORKS WITH MITIGATION

Stantec

Noise Model

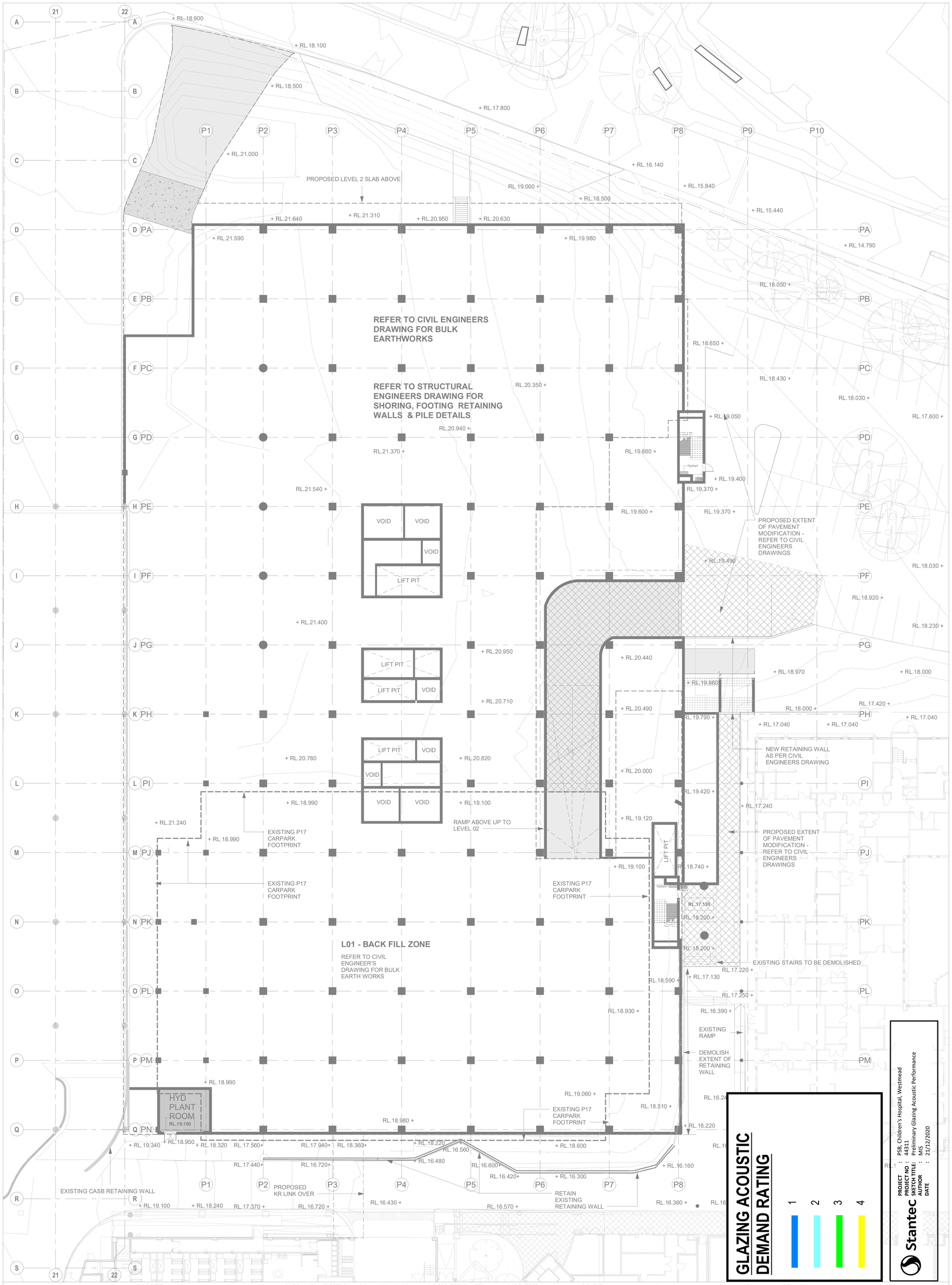
Construction Noise Modelling Results

Noise & Vibration

SCALE @ A3	PROJECT No	DRAWING No	REV
1:200	44311	PSB-AC-GRM	002

THIS DRAWING HAS BEEN DOCUMENTED IN COLOUR
THIS DRAWING IS REQUIRED TO BE PRINTED IN COLOUR
FAILURE TO DO SO MAY RESULT IN LOSS OF INFORMATION
BLACK & WHITE PRINTING MAY BE USED IF SPECIFIC BLACK & WHITE DOCUMENTS HAVE BEEN OBTAINED FROM WGE

Appendix D – Acoustic Demand Ratings of Façade



Rev	Description	Date
H	ISSUED FOR 50% SD	18/11/20
G	ISSUED FOR COORDINATION	11/11/20
F	ISSUED FOR COORDINATION	09/11/20
E	ISSUED FOR COORDINATION	04/11/20
D	ISSUED FOR COORDINATION	30/10/20
C	ISSUED FOR COORDINATION	23/10/20
B	ISSUED FOR COORDINATION	16/10/20
A	ISSUED FOR COORDINATION	02/10/20

NOTES:

MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

KERB MODIFICATIONS AS PER CIVIL DRAWINGS
STEEL COLUMNS TO STRUCTURAL ENGINEERS DETAIL

MECHANICAL / ELECTRICAL
Stantec
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
pwc
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

1:200

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 01

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	AB	AF/KK	18/11/20

Drawing No: CHW-AR-DG-PSB-10-01001
Revision: H

ISSUED FOR 50% SD

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE : Preliminary Glazing Acoustic Performance
AUTHOR : MG
DATE : 21/12/2020

Stantec

BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L01_L02_L03.rvt
18/11/2020 7:57:21 PM

Rev	Description	Date
A	ISSUED FOR COORDINATION	18/09/20
B	ISSUED FOR COORDINATION	02/10/20
C	ISSUED FOR COORDINATION	16/10/20
D	ISSUED FOR COORDINATION	30/10/20
E	ISSUED FOR COORDINATION	09/11/20
F	ISSUED FOR COORDINATION	11/11/20
G	ISSUED FOR COORDINATION	13/11/20
H	ISSUED FOR 50% SD	18/11/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 02
FFL - RL 21.60

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
T +61 2 9484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 10, 151 Clarence Street Sydney, NSW, 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo, NSW, 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Strathfield NSW 2135
T +61 2 8084 1000
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road
St Leonards, NSW, 2065
T +61 2 9464 4666
www.hinfra.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

0 2 4 6 8 10m
1:200

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 02

Project No	Scale	Drawn By	Checked By	Date
43038	1:200@A1	AB	AP/KK	18/11/20

Drawing No
CHW-AR-DG-PSB-10-02001

Revision
H

ISSUED FOR 50% SD

GLAZING ACOUSTIC DEMAND RATING

1
2
3
4

Stantec
PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

NOTES:

MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON ROOG 3 OUTCOME.

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards
NSW, Australia 2065
T +61 2 9484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 10, 151 Clarence Street
Sydney, NSW, 2000
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Bates Leese Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 9356 4166
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
NSW Infrastructure
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9464 4000
www.health.nsw.gov.au

0 2.5 5 7.5 10 12.5m
1:250

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 02 - KIDS WAY

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	NM	AFKK	18/11/20

Sheet No: CHW-AR-DG-PSB-10-02011
Revision: G

ISSUED FOR 50% SD

CMRI

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

GLAZING ACOUSTIC DEMAND RATING

1
2
3
4

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

VOLUNTEER ROOM 28 m² (0 m²)
CHANGING PLACES WC 15 m² (14 m²)
PLAY ZONE 16 m² (0 m²)
PLAY ZONE 39 m² (0 m²)
TRANSITION 431 m² (0 m²)
AMENITIES
CLNR
AIRLOCK
PARKING
BEV
SEC CNTRL RM
OFF 1P
OFF WKSTN
PROP STF
MEET
WAIT
AIRLOCK
KIOSK
RETAIL
LOBBY - DISPLAY
RECEPT 20 m² (20 m²)
OUTDOOR SPACE
CASH
BWC
OUTDOOR ABORIGINAL
ABORIGINAL MEET
CORRIDOR 20 m² (0 m²)
PATHOLOGY
LAB CORE 165 m² (115 m²)
STR CONSUM 15 m² (15 m²)
STR SPEC REQ'G 15 m² (15 m²)
COLD STR 11 m² (11 m²)
WC STF
SHWR
LOCKER
WC PUB
SHR ST
COLD SHELL - PATHOLOGY
NEW AIR LOCK

TRAVEL - LOGISTICS
TRAVEL - STAFF
TRAVEL - PUBLIC
TRAVEL - OTHER
PLANT/ ENGINEERING
DEPARTMENT CIRCULATION
FAMILY
FOH
OPERATING
PHARMACY
SHELL - PATHOLOGY
TERRACE
PATIENT AREAS
CLINICAL SUPPORT
SHARED
STAFF
COLD SHELL
UNEQUIPPED ROOM

GLAZING ACOUSTIC DEMAND RATING

Blue	1
Light blue	2
Green	3
Yellow	4

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 03 FFL - RL 25.8

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

0 2 4 6 8 10m
1:200

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 03

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	RG/MTH	MK	18/11/20

Drawing No: CHW-AR-DG-PSB-10-03001 — Revision: G

ISSUED FOR 50% SD

18/11/2020 7:59:25 PM BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L01_L02_L03.rvt

Rev	Description	Date
G	ISSUED FOR 50% SD	
F	ISSUED FOR COORDINATION	18/11/20
E	ISSUED FOR COORDINATION	11/11/20
D	ISSUED FOR COORDINATION	30/10/20
C	ISSUED FOR COORDINATION	23/10/20
B	ISSUED FOR COORDINATION	16/10/20
A	ISSUED FOR COORDINATION	02/10/20
	ISSUED FOR 80% SD	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 04 FFL - RL 30.0

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Hwy, St Leonards NSW 2065
T +61 2 9484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP, 151 Clarence Street Sydney NSW 2000
T +61 2 9320 8320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T +61 2 8266 0000
E info@dp.com.au
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills NSW 2010
T +61 2 9360 4066
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health
Health Infrastructure
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9464 4666
www.hinfra.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

0 2.5 5 7.5 10 12.5m
1:250

GLAZING ACOUSTIC DEMAND RATING

1
2
3
4

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 04

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	RG	AF	18/11/20

Drawing No
CHW-AR-DG-PSB-L0-04001

Revision
G

ISSUED FOR 50% SD

TRAVEL - LOGISTICS
TRAVEL - STAFF
TRAVEL - PUBLIC
TRAVEL - OTHER
PLANT / ENGINEERING
DEPARTMENT CIRCULATION
FAMILY
FOH
OPERATING
PHARMACY
TERRACE
PATIENT AREAS
CLINICAL SUPPORT
SHARED
STAFF
COLD SHELL
UNEQUIPPED ROOM

FACADE ACCESS
POINT FROM LEVEL
02 LOADING DOCK
HARDSTAND BELOW

REFER TO SERVICES ENGINEERS
DRAWINGS FOR
CONCEPT LAYOUT

2551.5 m²
PLANT
4237 m² (0 m²)

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME

LEVEL 05 FFL - RL 34.8

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards NSW, Australia 2065
T +61 2 9484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills NSW 2010
T +61 2 9699 4066
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health
Health Infrastructure
NSW Health Infrastructure
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9464 4600
www.hinfra.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

0 2.5 5 7.5 10 12.5m
1:250

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 05

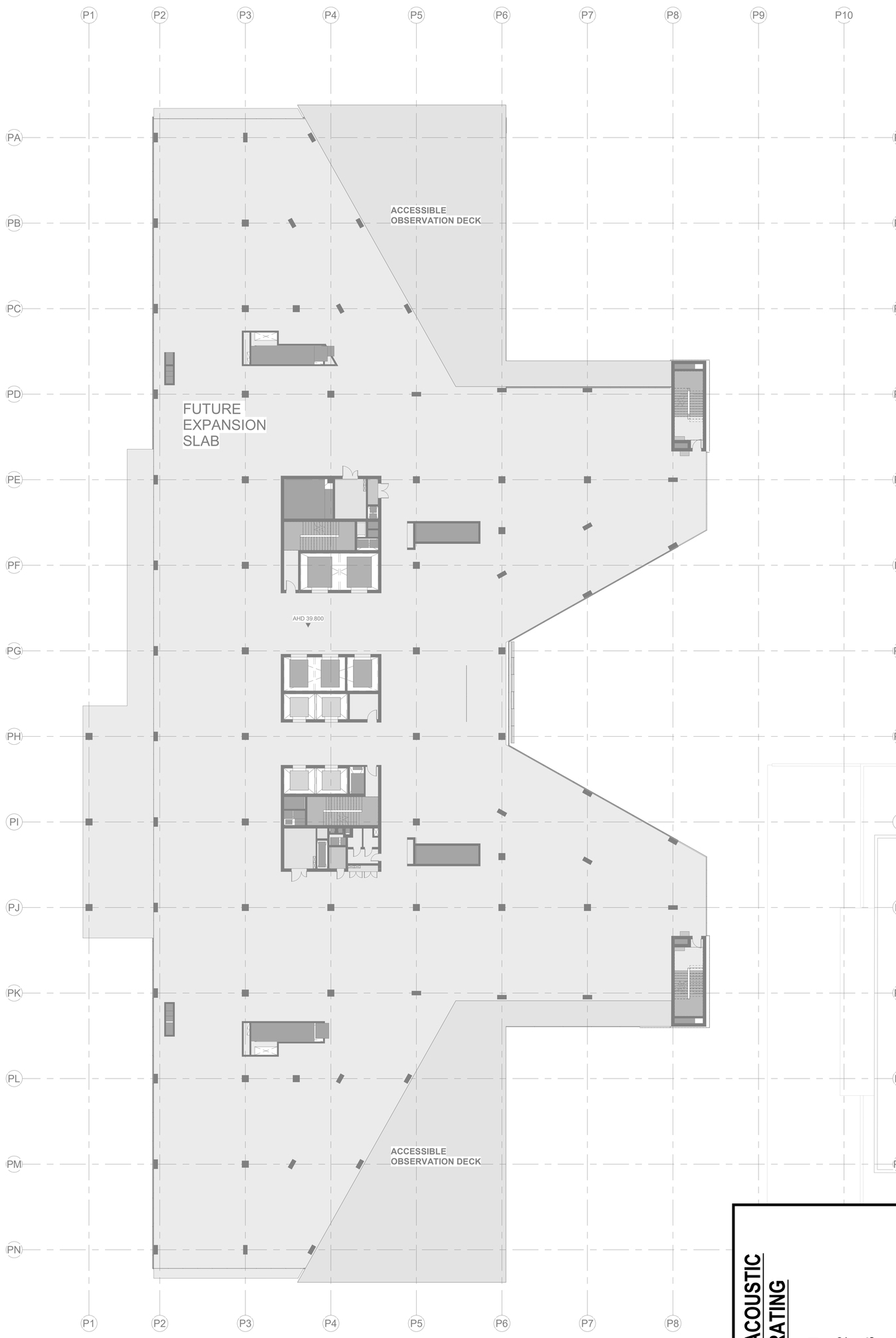
Project No	15638
Scale	1 : 200@A1
Drawn By	AB
Checked By	APRK
Date	18/11/20
Sheet No	CHW-AR-DG-PSB-10-05001
Revision	G

ISSUED FOR 50% SD

GLAZING ACOUSTIC DEMAND RATING

1
2
3
4

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020



GLAZING ACOUSTIC DEMAND RATING

1 2 3 4

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 4431
SKETCH TITLE : Preliminary Glazing Acoustic Performance
AUTHOR : MS
DATE : 21/12/2020

Stantec

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 06
FFL - RL 39.8

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066

E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

0 2.5 5 7.5 10 12.5m
1:250

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 06

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	AB	AF/KK	18/11/20

Drawing No
CHW-AR-DG-PSB-10-06001
Revision
G

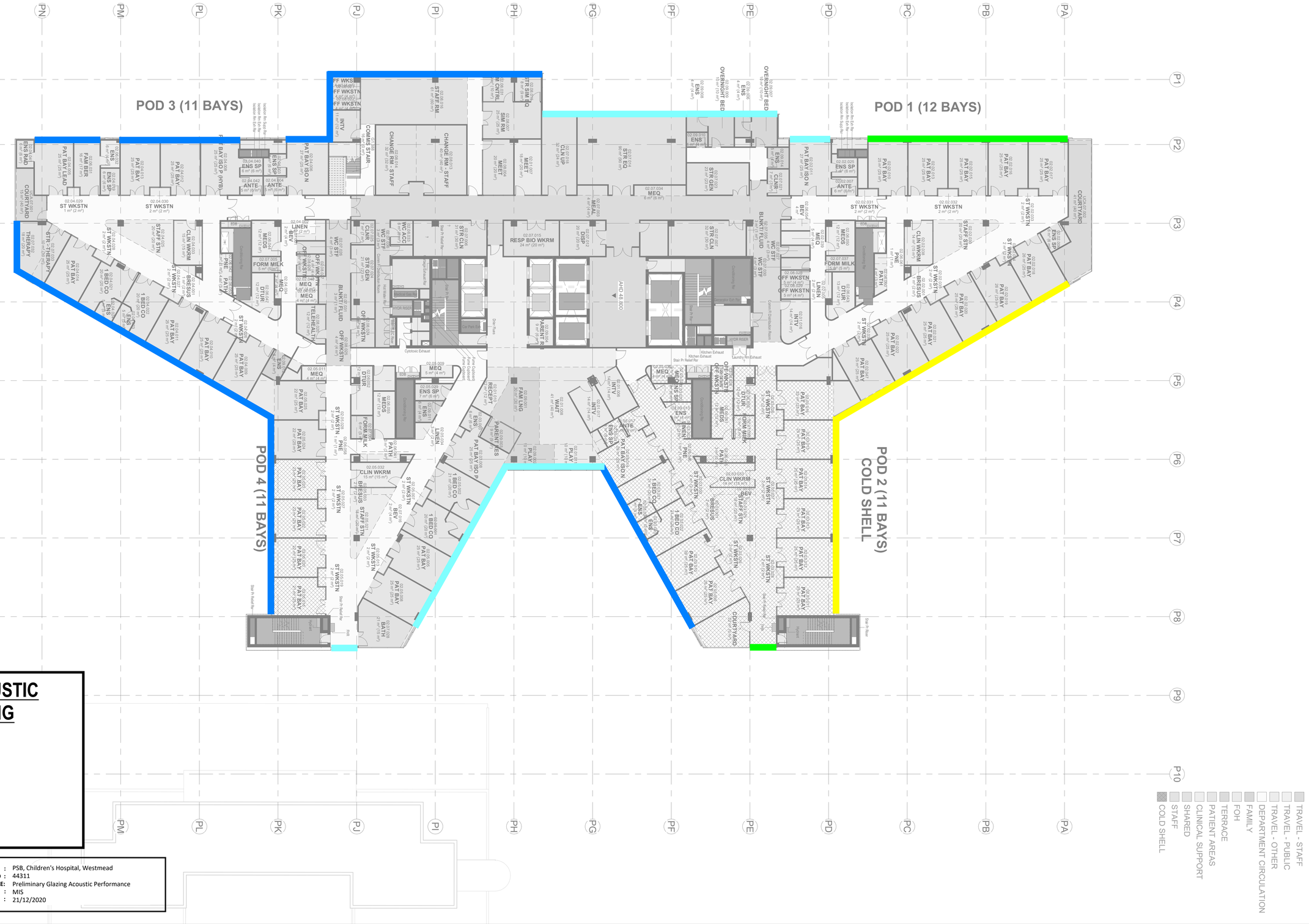
ISSUED FOR 50% SD

BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L05_L06_L07.rvt
18/11/2020 8:56:07 PM

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 08 FFL - RL 48.8



GLAZING ACOUSTIC DEMAND RATING

- 1
- 2
- 3
- 4

TRAVEL - STAFF
TRAVEL - PUBLIC
TRAVEL - OTHER
DEPARTMENT CIRCULATION
FAMILY
FOH
TERRACE
PATIENT AREAS
CLINICAL SUPPORT
SHARED
STAFF
COLD SHELL

0 2 4 6 8 10m
1:200

Stantec
PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065
T: +61 2 9484 7000
E: enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP, 151 Clarence Street Sydney NSW 2000
T: +61 2 9320 9320
E: sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T: +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills NSW 2010
T: +61 2 8399 0606
E: info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road
St Leonards, NSW, 2065
T: +61 2 9464 4666
www.hinsw.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

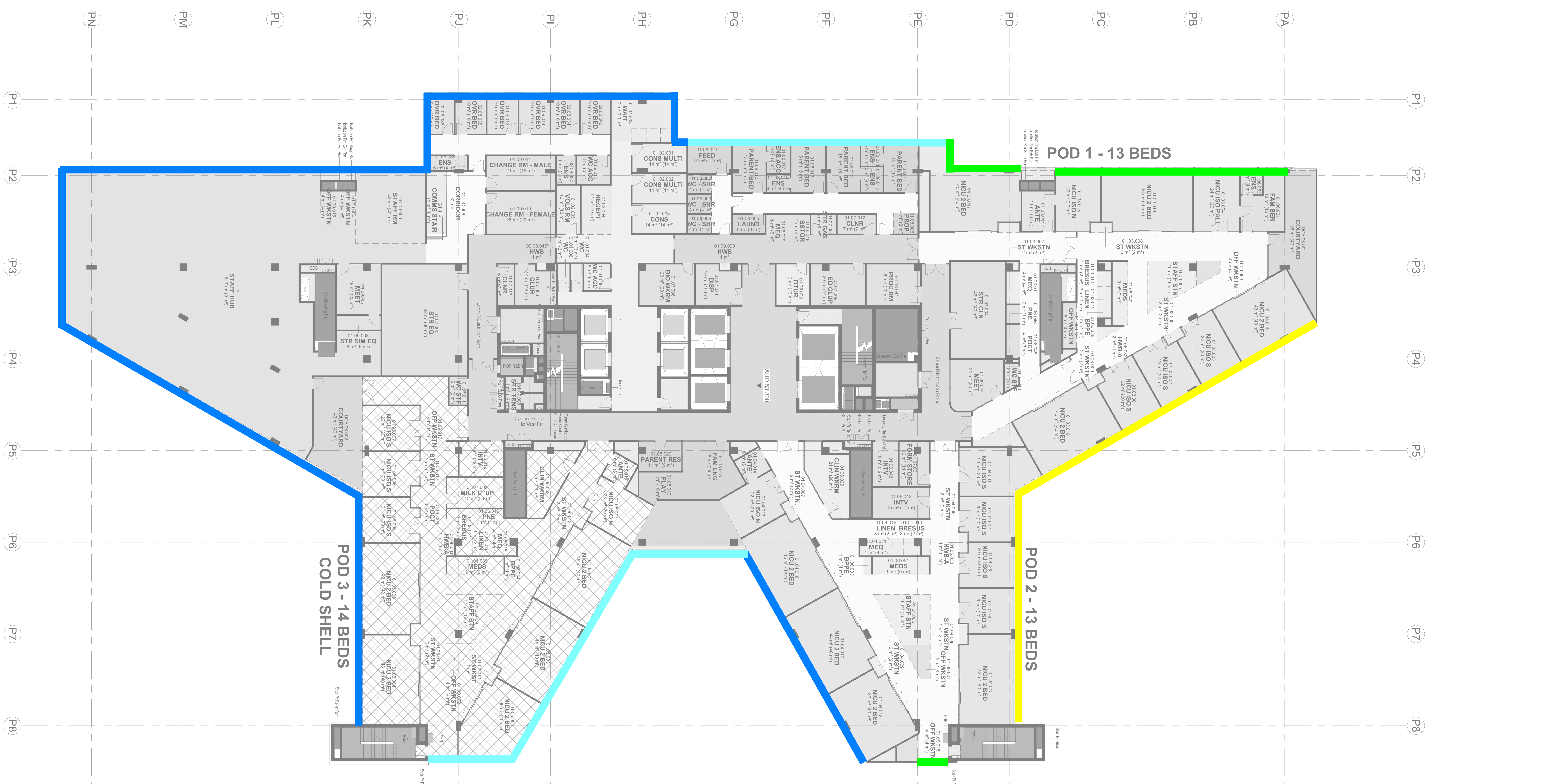
Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 08

Project No	Scale	Drawn By	Checked By	Date
13838	1 : 200@A1	RG	AH*	18/11/20

Drawing No
CHW-AR-DG-PSB-10-08001

Revision G

ISSUED FOR 50% SD



GLAZING ACOUSTIC DEMAND RATING

Line	Rating
Blue	1
Light blue	2
Green	3
Yellow	4

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/02/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 09 FFL - RL 53.3

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
Level 5, 151 Clarence Street Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney Watermans Quay, Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

1:200 — 0 2 4 6 8 10m

PROJECT
The Children's Hospital at Westmead Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 09

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	RG	KK	18/11/20

Drawing No	Revision
CHW-AR-DG-PSB-10-09001	G

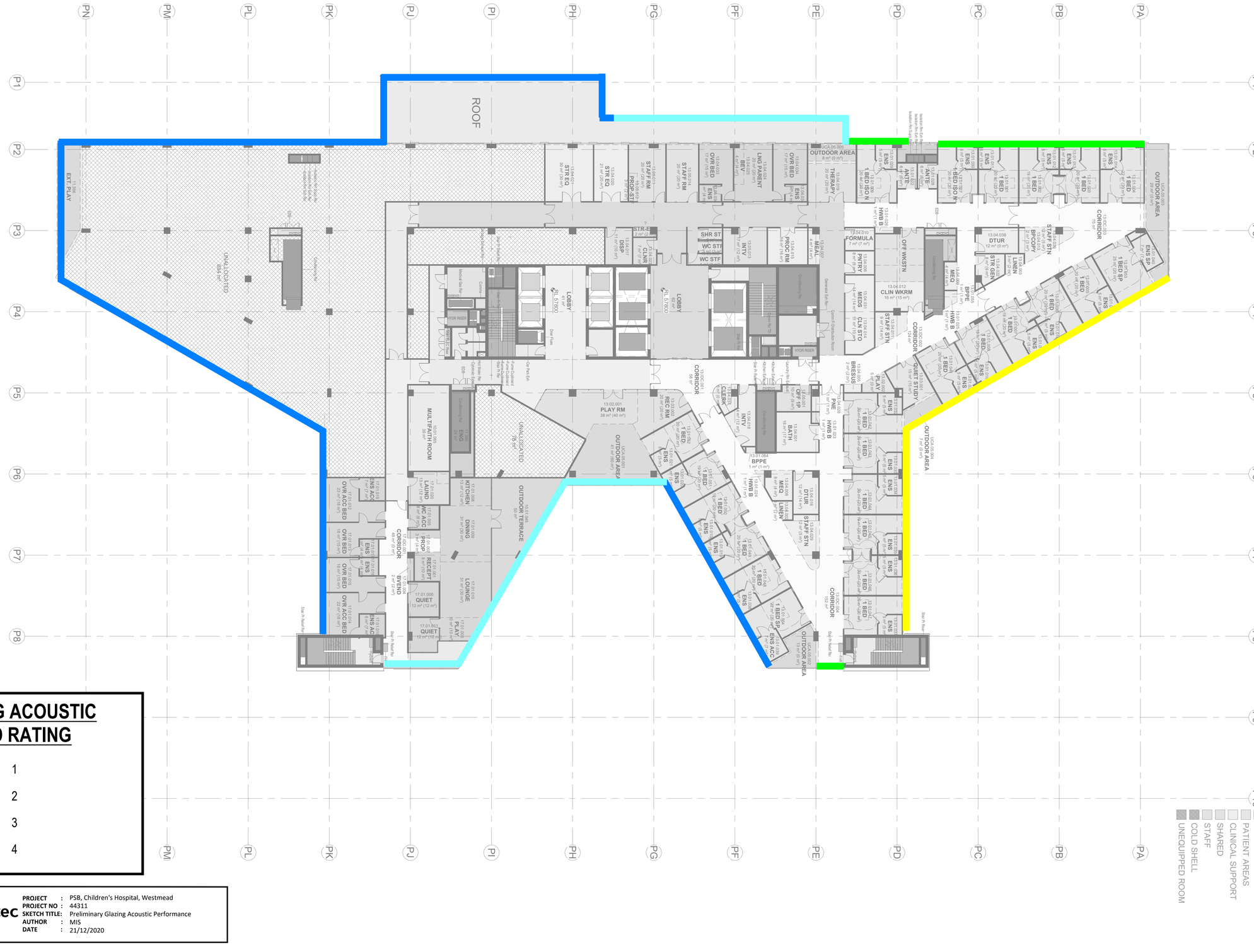
ISSUED FOR 50% SD

18/11/2020 8:40:01 PM BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L08_L09.rvt

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

LEVEL 10
FFL - RL 57.8



GLAZING ACOUSTIC DEMAND RATING

1
2
3
4

PROJECT	: PSB, Children's Hospital, Westmead
PROJECT NO	: 44311
SKETCH TITLE:	Preliminary Glazing Acoustic Performance
AUTHOR	: MIS
DATE	: 21/12/2020

Stantec

TRAVEL - LOGISTICS
TRAVEL - STAFF
TRAVEL - PUBLIC
TRAVEL - OTHER
PLANT/ ENGINEERING
DEPARTMENT CIRCULATION
FAMILY
FOH
OPERATING
PHARMACY
TERRACE
PATIENT AREAS
CLINICAL SUPPORT
SHARED
STAFF
COLD SHELL
UNEQUIPPED ROOM

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards, NSW 2065
T: +61 2 9484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 10, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 8320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills NSW 2010
T +61 2 9360 4066
E. info@blp.com.au
www.blp.com.au

CLIENT
NSW Health
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9391 9000
www.hinfra.health.nsw.gov.au

0 2 4 6 8 10m
1:200

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 10

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	MH	AFRY	18/11/20
Drawing No.				Revision
CHW-AR-DG-PSB-10-10001				G

ISSUED FOR 50% SD

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:

MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 11
FFL - RL 62.0

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

1:200

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 11

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	MH	AF/RY	18/11/20

Drawing No	Revision
CHW-AR-DG-PSB-10-11001	G

ISSUED FOR 50% SD

GLAZING ACOUSTIC DEMAND RATING

- 1
- 2
- 3
- 4

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

18/11/2020 8:45:31 PM BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L10_L11.rvt

- TRAVEL - LOGISTICS
- TRAVEL - STAFF
- TRAVEL - PUBLIC
- TRAVEL - OTHER
- PLANT/ ENGINEERING
- LANDSCAPE
- DEPARTMENT CIRCULATION
- FAMILY
- FOH
- OPERATING
- PHARMACY
- TERRACE
- PATIENT AREAS
- CLINICAL SUPPORT
- SHARED
- STAFF
- COLD SHELL
- UNEQUIPPED ROOM

SUBJECT TO CONFIRMATION BY SCHN

GLAZING ACOUSTIC DEMAND RATING

1 2 3 4

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 12
FFL - RL 66.2

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Bulidign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
pwc
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
Health Infrastructure NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

0 2.5 5 7.5 10 12.5m
1:250

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

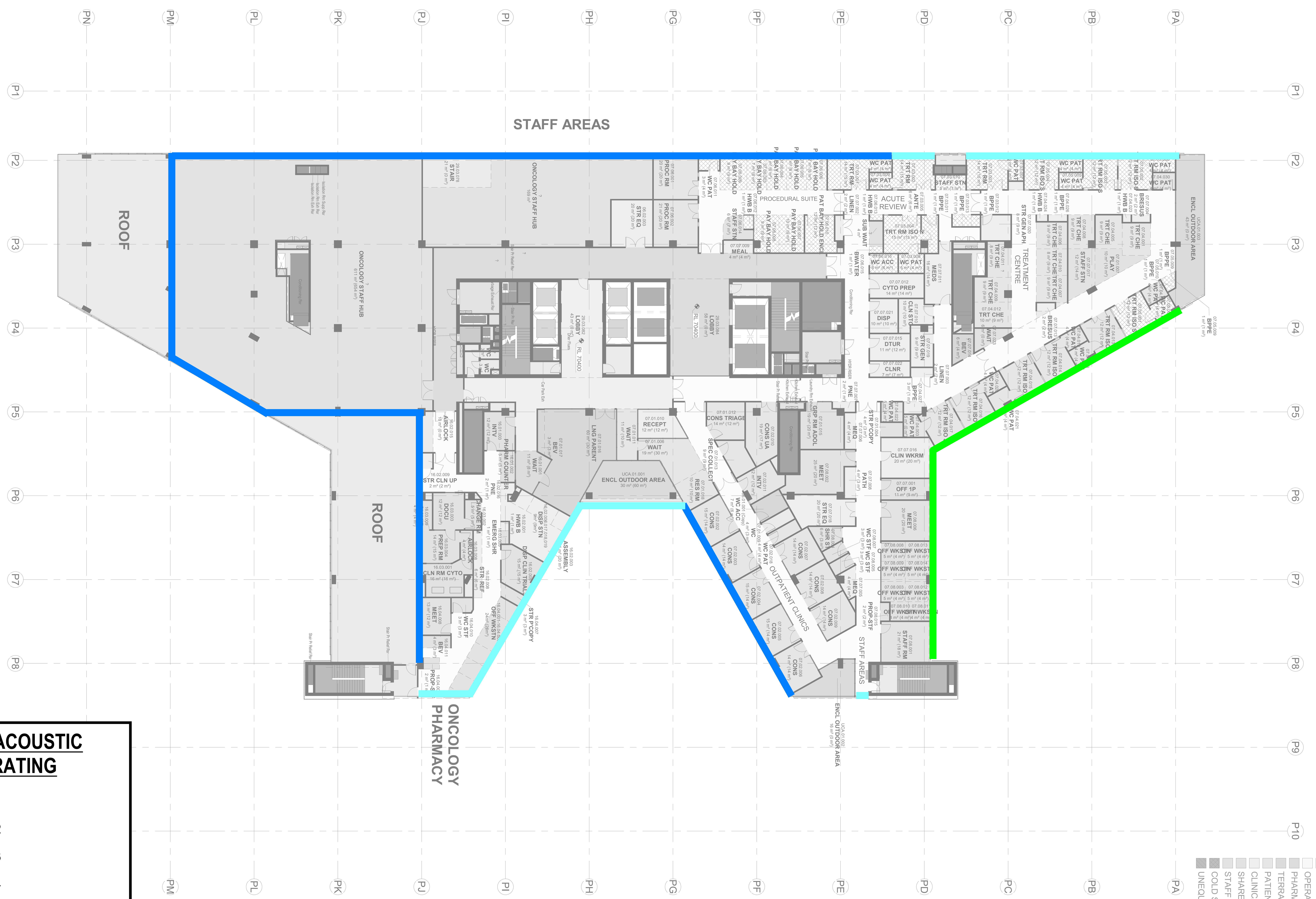
Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 12

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	MB	AF/KK	18/11/20

Drawing No: CHW-AR-DG-PSB-10-12001
Revision: G

ISSUED FOR 50% SD

BIM 360://CHW-Stage 2/CHW-BLP-MID_-ARC-PSB-L12_L13_L14_L15.rvt
18/11/2020 8:52:05 PM



GLAZING ACOUSTIC DEMAND RATING

- 1
- 2
- 3
- 4

PROJECT	:	PSB, Children's Hospital, Westmead
PROJECT NO	:	44311
SKETCH TITLE:		Preliminary Glazing Acoustic Performance
AUTHOR	:	MIS
DATE	:	21/12/2020

UNEQUIPPED ROOM
COLD SHELL
STAFF
SHARED
CLINICAL SUPPORT
PATIENT AREAS
TERRACE
PHARMACY
OPERATING
FOH
FAMILY
DEPARTMENT CIRCULATION
LANDSCAPE
PLANT/ ENGINEERING
TRAVEL - OTHER
TRAVEL - PUBLIC
TRAVEL - STAFF
TRAVEL - LOGISTICS

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:
MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 13
FFL - RL 70.4

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW Australia 2065
T +61 2 8484 7000
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066
E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

1:200

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 13

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	MB	AF/JC	18/11/20

Drawing No	Revision
CHW-AR-DG-PSB-10-13001	G

ISSUED FOR 50% SD

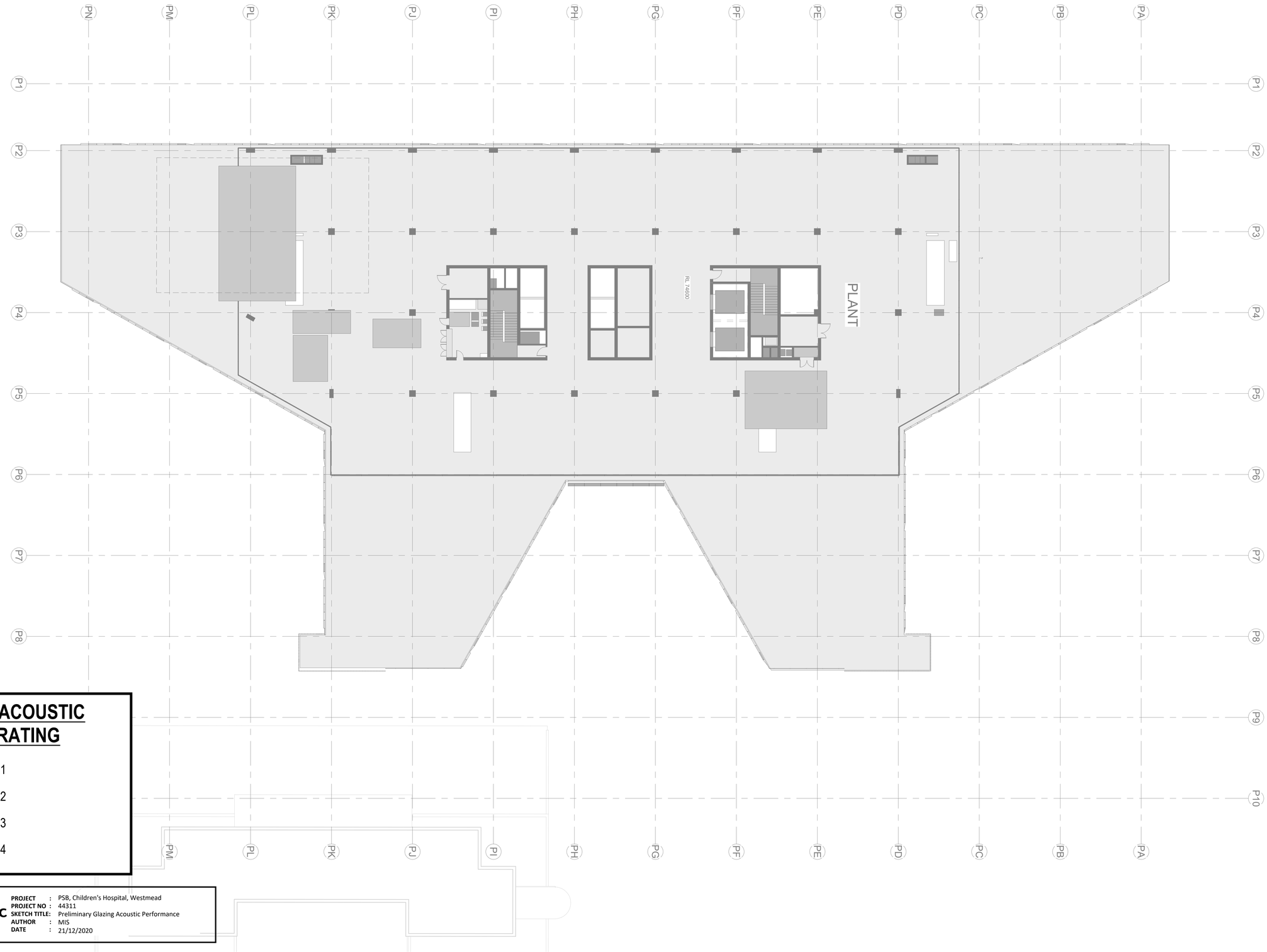
18/11/2020 8:52:16 PM BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L12_L13_L14_L15.rvt

NOTES:

MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PLUG 3 OUTCOME.

Rev	Description	Date
G	ISSUED FOR 50% SD	18/11/20
F	ISSUED FOR COORDINATION	11/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

LEVEL 14
FFL - RL 74.6



GLAZING ACOUSTIC DEMAND RATING

- 1
- 2
- 3
- 4

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Building B, 207 Pacific Highway, St Leonards
NSW, Australia, 2065
T +61 2 9484 7000
enquiries.syd@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
Arup, 151 Clarence Street
Sydney, NSW, 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay
Barangaroo, NSW, 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills, NSW, 2010
T +61 2 8090 4066
E. info@blp.com.au
www.blp.com.au

CLIENT
NSW Health Infrastructure
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9464 4666
www.health.health.nsw.gov.au

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

1:200
0 2 4 6 8 10m

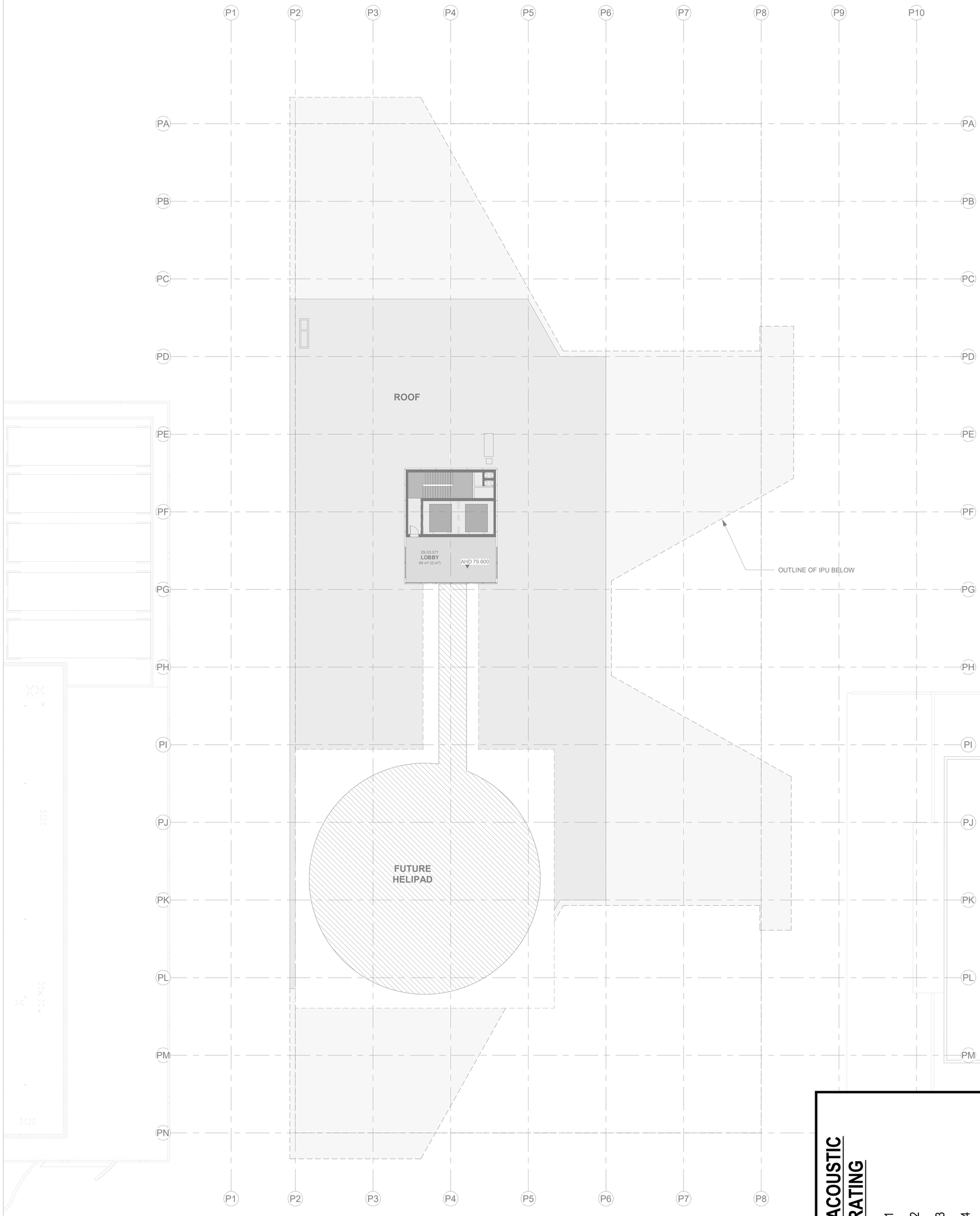
Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 14

Project No	19038
Drawing No	CHW-AR-DG-PSB-10-1401
Scale	1 : 200@A1
Drawn By	AB
Checked By	Checker
Date	18/11/20
Revision	G

ISSUED FOR 50% SD

Stantec

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020



GLAZING ACOUSTIC DEMAND RATING

1 2 3 4

PROJECT : PSB, Children's Hospital, Westmead
PROJECT NO : 44311
SKETCH TITLE: Preliminary Glazing Acoustic Performance
AUTHOR : MIS
DATE : 21/12/2020

Stantec

Rev	Description	Date
H	ISSUED FOR 50% SD	18/11/20
G	ISSUED FOR COORDINATION	11/11/20
F	ISSUED FOR COORDINATION	02/11/20
E	ISSUED FOR COORDINATION	30/10/20
D	ISSUED FOR COORDINATION	23/10/20
C	ISSUED FOR COORDINATION	16/10/20
B	ISSUED FOR COORDINATION	02/10/20
A	ISSUED FOR COORDINATION	18/09/20

NOTES:

MARKED RISERS ARE SUBJECT TO FURTHER COORDINATION.
CLINICAL PLANNING SUBJECT TO UPDATE BASED ON PUG 3 OUTCOME.

LEVEL 15 FFL - RL 76.60

MECHANICAL / ELECTRICAL
Wood & Grieve Engineers
Level 6, Buildign B, 207 Pacific Highway, St Leonards
NSW 2065 Australia
T +61 2 9439 4439
enquiries.sdy@stantec.com
https://www.stantec.com

CIVIL / STRUCTURE / HYDRAULIC / FIRE
ARUP
ARUP
Level 5, 151 Clarence Street
Sydney, NSW 2000
T +61 2 9320 9320
sydney@arup.com
www.arup.com

PROJECT MANAGER
PricewaterhouseCoopers
One International Towers Sydney
Watermans Quay,
Barangaroo NSW 2000
T +61 2 8266 0000
www.pwc.com.au

ARCHITECT
Billard Leece Partnership Pty Ltd
Architects & Urban Planners
72-80 Cooper St
Surry Hills 2010
T +61 2 8096 4066

E info@blp.com.au
www.blp.com.au

CLIENT
Health Infrastructure
NSW
Level 6, 1 Reserve Road
St Leonards, NSW 2065
T +61 2 9978 5402
www.hinfra.health.nsw.gov.au

0 2 4 6 8 10m
1:200

PROJECT
The Children's Hospital at Westmead
Stage 2 Redevelopment

Sheet Name
PLAN - GENERAL ARRANGEMENT - LEVEL 15 - HELIPAD - ROOF

Project No	Scale	Drawn By	Checked By	Date
19038	1 : 200@A1	RG	KK	18/11/20

Drawing No: CHW-AR-DG-PSB-10-15001
Revision: H

ISSUED FOR 50% SD

18/11/2020 8:52:31 PM
BIM 360://CHW-Stage 2/CHW-BLP-MDL-ARC-PSB-L12_L13_L14_L15.rvt

Design with
community in mind

Level 6, Building B
207 Pacific Highway
St Leonards NSW 2065
Tel +61 2 8484 7000

For more information please visit
www.stantec.com

Stantec