

The Drum Exchange

*Noise Monitoring
May and June 2021*

*Prepared for
The Drum Exchange Pty Ltd*



Noise and Vibration Analysis and Solutions

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The Drum Exchange

Noise Monitoring May and June 2021

Reference: 21112_R01

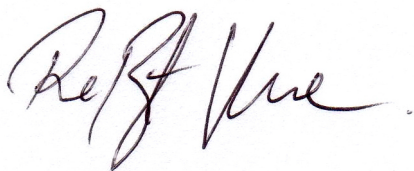
Report date: 8 June 2021

Prepared for

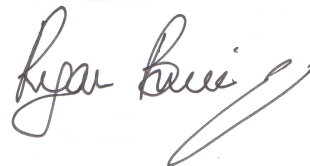
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1 INTRODUCTION

1.1 Background

Global Acoustics were engaged by The Drum Exchange Pty Ltd (The Drum Shop) to undertake measurements of drumming noise at The Drum Shop located at 367 High Street, Maitland. The purpose of the survey was to quantify and describe the acoustic environment around The Drum Shop and compare results with recommended design goals.

Noise measurements described in this report were undertaken during the day of 7 May and 3 June 2021 at commercial and residential monitoring locations surrounding The Drum Shop.

1.2 Noise Monitoring Locations

Noise monitoring locations are detailed in Table 1.1 and shown in Figure 1.

Table 1.1: NOISE MONITORING LOCATIONS

Figure Descriptor	Monitoring Location
1	Outside shop at front entrance
2	Across High Street from shop
3	Inside dentist reception
4	Inside hair salon
5	Residence above – Kitchen area



Figure 1: The Drum Exchange and Monitoring Locations

1.3 Terminology & Abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L _{Amax}	The maximum A-weighted noise level over a time period.
L _{A1}	The noise level which is exceeded for 1 per cent of the time.
L _{A1,1minute}	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L _{A10}	The noise level which is exceeded for 10 percent of the time.
L _{Aeq}	The average noise A-weighted energy during a measurement period.
L _{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L _{A90}	The level exceeded for 90 percent of the time. The L _{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L _{Amin}	The minimum A-weighted noise level over a time period.
L _{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 NOISE CRITERIA

The Australian / New Zealand Standard 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* recommends design criteria for the acoustic environment within occupied spaces.

Noise levels outlined in AS2107 that are relevant to the adjoining residence and commercial premises in this survey and the opening hours of the drum shop are shown in Table 2.1. Sleeping areas in the adjoining apartment above The Drum Shop were not assessed as the drum shop is only open between 9:30am and 6pm.

Table 2.1: AS 2107:2016 – RECOMMENDED DESIGN SOUND LEVELS AND REVERBERATION TIMES FOR BUILDING INTERIORS

Type of occupancy / activity	Recommended design sound level range, $L_{Aeq}(t)$, dB
Dental clinics	40 to 45
Small retail stores (general)	<50
Houses and apartments in inner city areas (living areas)	35 to 45

3 METHODOLOGY

All noise monitoring was conducted at the nearest residence and commercial premises in general accordance with Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and Australian Standard AS 2107:2016 'Recommended design and reverberation times for building interiors 2016'.

Measurements were undertaken of various drums being tested in the drum testing room of The Drum Shop at each monitoring location on 7 May 2021. Subsequent measurements were undertaken on 3 June 2021 in the adjoining residence following noise control improvements to the drum testing room.

It should be noted that measurements were not of 15 minute duration. Measurements were of sufficient duration to allow for accurate quantification of the drum testing L_{Aeq} levels at each monitoring location.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When drumming noise is noted as IA, no drumming noise was audible at the monitoring location. When drumming noise is noted as NM, this means some drumming noise was audible but could not be quantified.

3.1 Monitoring Equipment

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix A.

Table 3.1: NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level meter	701424	14/06/2021
Rion NA-28 sound level meter	30131882	08/02/2023
Pulsar 105 acoustic calibrator	78226	08/02/2023
Pulsar 106 acoustic calibrator	79631	26/05/2023

4 RESULTS

4.1 Total Measured Levels

Overall noise levels measured at each location during monitoring are provided in Table 4.1.

Table 4.1: TOTAL MEASURED NOISE LEVELS¹ – MAY AND JUNE 2021

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{Aeq} dB	L _{A50} dB	L _{A90} dB	L _{Amin} dB
Outside shop at front entrance	07/05/2021 14:29	68	67	62	59	56	52	51
Across High Street from shop	07/05/2021 14:31	68	65	61	57	54	50	49
Inside dentist reception	07/05/2021 14:35	66	62	54	52	50	48	47
Inside hair salon	07/05/2021 14:41	53	48	40	39	37	33	30
Residence above – Kitchen area	07/05/2021 14:49	58	57	54	50	49	45	38
Residence above – Kitchen area	03/06/2021 11:05	55	52	49	45	43	38	36

Notes: 1. Levels in this table are not necessarily the result of activity at The Drum Shop.

4.2 Noise Monitoring

Table 4.2 details drum testing noise levels measured at each monitoring location in the absence of other noise sources. Noise levels are then compared with the relevant AS 2107:2016 recommended design sound level range detailed in Section 2.

Table 4.2: L_{Aeq} GENERATED BY THE DRUM SHOP

Monitoring Location	7 May 2021 L _{Aeq} dB	3 June 2021 L _{Aeq} dB	Recommended design sound level range, L _{Aeq(t)} dB	Exceedance
Outside shop at front entrance	IA	-	<50	Nil
Across High Street from shop	IA	-	<50	Nil
Inside dentist reception	IA	-	40 to 45	Nil
Inside hair salon	IA	-	<50	Nil
Residence above – Kitchen area	50	45	35 to 45	5 / Nil

Drum testing noise levels in the adjoining residence were above the recommended design sound level range by 5 dB during the initial survey on 7 May 2021. Following noise control improvements to the drum testing room, additional measurements were undertaken on 3 June 2021. Drum testing noise levels during this

subsequent survey met the upper bound of the AS 2107:2016 recommended design sound level range. It should be noted that the kitchen area of the adjoining residence is directly above the drum testing room.

The drum testing room with installed noise control is shown in Figure 2.



Figure 2: The drum testing room

5 SUMMARY

Global Acoustics were engaged by The Drum Exchange Pty Ltd to undertake measurements of drumming noise at The Drum Shop located at 367 High Street, Maitland. The purpose of the survey was to quantify and describe the acoustic environment around The Drum Shop and compare results with recommended design goals.

Noise monitoring described in this report was undertaken on 7 May and 3 June 2021 at monitoring locations surrounding The Drum Shop.

Following noise control improvements to the drum testing room, noise levels from The Drum Shop complied with the upper bounds of the AS2107 recommended sound level range during this survey.

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APPENDIX

A CALIBRATION CERTIFICATES



Sound Level Meter
IEC 61672-3:2013
Calibration Certificate
Calibration Number C19342

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	00701424
Microphone Serial Number :	01916
Pre-amplifier Serial Number :	01463
Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 26°C	Ambient Temperature : 26°C
Relative Humidity : 40.2%	Relative Humidity : 40.7%
Barometric Pressure : 100.96kPa	Barometric Pressure : 100.32kPa
Calibration Technician : Lucky Jaiswal	Secondary Check: Eloise Burrows
Calibration Date : 14 Jun 2019	Report Issue Date : 18 Jun 2019
Approved Signatory :	Ken Williams

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	Pass
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	Pass
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.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of 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.



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.



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Sound Level Meter IEC 61672-3.2013 Calibration Certificate

Calibration Number C21058

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 23.5°C
Relative Humidity : 46.7%
Barometric Pressure : 100.28kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 23.3°C
Relative Humidity : 47.7%
Barometric Pressure : 100.25kPa

Calibration Technician : Jeff Yu
Calibration Date : 8 Feb 2021

Secondary Check: Max Moore
Report Issue Date : 9 Feb 2021

Approved Signatory :

Ken Williams

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	Pass
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	Pass
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.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
125Hz-	±0.12dB	Temperature	±0.2°C
1kHz-	±0.11dB	Relative Humidity	±2.4%
8kHz-	±0.13dB	Barometric Pressure	±0.015kPa
Electrical Tests	±0.10dB		

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



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Sound Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C21059

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 78226

Atmospheric Conditions

Ambient Temperature : 23.3°C
Relative Humidity : 47.7%
Barometric Pressure : 100.27kPa

Calibration Technician : Jeff Yu
Calibration Date : 08 Feb 2021
Secondary Check: Max Moore
Report Issue Date : 9 Feb 2021

Approved Signatory :

Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	Pass
Frequency Generated	Pass
Total Distortion	Pass

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.02	1000.40

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -		Environmental Conditions	
Specific Tests			
Generated SPL	±0.14dB	Temperature	±0.2°C
Frequency	±0.09%	Relative Humidity	±2.4%
Distortion	±0.09%	Barometric Pressure	±0.015kPa

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

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.



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

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Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C21341

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 79631

Atmospheric Conditions

Ambient Temperature : 22.7°C
Relative Humidity : 47.5%
Barometric Pressure : 100.64kPa

Calibration Technician : Jeff Yu
Calibration Date : 26 May 2021
Secondary Check: Harrison Kim
Report Issue Date : 26 May 2021

Approved Signatory :  Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	Pass
Frequency Generated	Pass
Total Distortion	Pass

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.02	1000.40

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Specific Tests	Least Uncertainties of Measurement - Environmental Conditions	
Generated SPL	±0.14dB	Temperature ±0.2°C
Frequency	±0.09%	Relative Humidity ±2.4%
Distortion	±0.09%	Barometric Pressure ±0.015kPa

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

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.



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

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