Wambo Coal Mine and Rail Spur

Environmental Noise Monitoring

October 2019

Prepared for

Wambo Coal Pty Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333
Email global@globalacoustics.com.au
ABN 94 094 985 734

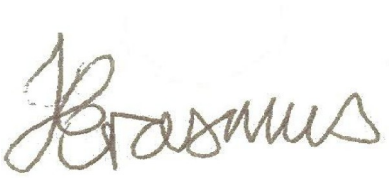
Wambo Coal Mine and Rail Spur

Environmental Noise Monitoring
October 2019

Reference: 19268_R01
Report date: 5 November 2019

Prepared for
Wambo Coal Pty Limited
PMB 1
Singleton NSW 2330

Prepared by
Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared:	Jonathan Erasmus Consultant	QA Review:	Robert Kirwan Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wambo Coal (WC) to conduct a monthly noise survey of operations at Wambo Coal Mine (WCM) and Wambo Coal Rail Spur (WCRS). WCM and WCRS operate under separate development consents and have been monitored separately, while reporting has been combined. The purpose of the survey is to quantify and describe the existing acoustic environment around WCM and WCRS, and compare results with relevant limits.

WC operates both open cut and underground mining operations from their mine at Warkworth, NSW. The open cut operations include use of heavy mobile equipment in open cut pits, on haul roads, and on waste rock emplacements. The underground operations have surface facilities. Both operations utilise a coal handling and preparation plant (CHPP) including conveyors, bins and other material-handling infrastructure.

The WCRS is located between Mt Thorley and Warkworth Village and includes the following components:

- a product coal stockpile and reclaim area, product coal conveyor, train load-out bin, rail loop and a rail spur from the WCM to Mount Thorley;
- rail transport of product coal to the market, an intermittent activity that can take place at any time; and
- a locomotive refuelling facility.

Attended environmental noise monitoring described in this report was undertaken during the night of 15/16 October 2019 at a total of six monitoring locations for WCM and WCRS.

1.2 Monitoring Locations & Frequency

Monitoring locations, type, and frequency are detailed in Table 1.1 and shown in Figure 1. It should be noted that Figure 1 shows the actual monitoring position, not the location of residences.

Table 1.1: WAMBO COAL MONITORING LOCATIONS AND FREQUENCY[1]

Site Reference	Residence[2]	Monitor Type	Consent Requirements	Frequency
N01	*Wambo Road Residence*	Attended	Mine & Rail Spur	Monthly
N03	*Kelly Residence*	Real-Time & Attended	Mine & Rail Spur	Continuous & Monthly
N16	*Jerrys Plains Road*	Attended	Mine	Monthly
N20A	*Redmanvale Road Central*	Attended	Mine	Monthly

Site Reference	Residence[2]	Monitor Type	Consent Requirements	Frequency
N20	Redmanvale Road Central	Real-Time	Mine	Continuous
N21	*Wambo South*	Real-Time & Attended	Mine & Rail Spur	Continuous & Monthly
N26	*Redmanvale Road South*	Attended	Mine	Monthly

Notes:

1. *Sourced from the NMP – WA-ENV-MNP-503, January 2018; and*
2. *Monthly attended monitoring locations are shown in italics.*

Source: Google Maps

Figure 1: WCM Attended Noise Monitoring Locations

1.3 Terminology & Abbreviations

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.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
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 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 WCM Development Consent

The most current development consent for WCM is DA 305-7-2003 (MOD 17, December 2017). Schedule 4 of the WCM consent details specific conditions relating to noise generated by WCM. Relevant sections of the WCM consent are reproduced in Appendix A.

2.2 WCRS Development Consent

The most current development consent for Wambo Rail Loop is WCRS DA 177-8-2004 (MOD 2, February 2012), last modified to include a rail refuelling facility. Schedule 4 of the WCRS consent details specific conditions relating to noise generated by WCRS. Relevant sections of the WCRS consent are reproduced in Appendix A.

2.3 Environment Protection Licence

WCM holds Environment Protection Licence (EPL) No. 529 issued by the Environment Protection Authority (EPA) most recently on 19 July 2019. Relevant sections of the EPL are reproduced in Appendix A.

2.4 Noise Management Plan

Noise monitoring requirements are detailed in the *Wambo Coal Noise Management Plan WA-ENV-MNP-503* (NMP, January 2018), prepared in accordance with the WCM and WCRS consents. The NMP states that monitoring will be conducted to assess noise levels from WCM and WCRS activities. Noise monitoring for rail activities is undertaken at properties numbered N01, N03 and N21 for rail pass-by noise. Relevant sections of the NMP are reproduced in Appendix A.

2.5 Noise Criteria

Environmental noise criteria for WCM and WCRS are consistent between the WCM development consent, NMP, and EPL. Noise criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the WCM development consent.

Table 2.1: WCM SPECIFIC CRITERIA

Location	Day $L_{Aeq,15minute}$ dB	Evening/Night $L_{Aeq,15minute}$ dB	Night $L_{A1,1minute}$ dB
N01[1]	NA	NA	NA
N03[1]	NA	NA	NA

Location	Day $L_{Aeq,15minute}$ dB	Evening/Night $L_{Aeq,15minute}$ dB	Night $L_{A1,1minute}$ dB
N16	35	40	50
N20A	35	40	50
N21	35	40	50
N26	35	40	50

Notes:

1. *N01 and N03 are acquisition upon request and noise criteria are NA 'not applicable'.*

2.6 Meteorological Conditions

In accordance with the WCM consent, noise generated by WCM is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions) of the EPA's 'Industrial Noise Policy' (INP, 2000). In accordance with this requirement, it has been assumed that noise limits apply under all meteorological conditions except during:

- rainfall;
- wind speeds (at 10m above ground) greater than 3 m/s; and/or
- atmospheric stability class G.

Condition L4.5 of the EPL uses slightly different terminology and noise limits outlined in the EPL apply under the following meteorological conditions:

a) *wind speeds of up to 3m/s at 10 metres above the ground level; or*

b) *temperature inversion conditions of up to 3°C/100m* (stability class F) *and wind speeds of up to 2m/s at 10 metres above the ground.*

Condition L4.6 of the EPL states that *"… temperature inversion conditions must be identified using the sigma-theta method in the EPA's Noise Policy for Industry..."* (NPfI, October 2017).

The sigma-theta method outlined in the NPfI allows stability class to be determined from sigma-theta and wind speed data. However, temperature inversion gradient (VTG) cannot be determined by this method. Consequently, stability class prevailing during each measurement has been assessed against the stability class that corresponds with the EPL VTG to determine whether noise criteria were applicable.

2.7 Modifying Factors

The EPA NPfI was approved for use in NSW in October 2017, and supersedes the EPA's 'Industrial Noise Policy' (INP, 2000). Assessment and reporting of modifying factors is to be carried out in accordance with Fact Sheet C of the NPfI.

NPfI modifying factors, as they are applicable to mining noise, are described in more detail below.

2.7.1 Tonality and Intermittent Noise

As defined in the NPfI:

> *Tonal noise contains a prominent frequency and is characterised by a definite pitch.*
>
> *Intermittent noise is noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.*

2.7.2 Low-Frequency Noise

As defined in the NPfI:

> *Low frequency noise is noise with an unbalanced spectrum and containing major components within the low-frequency range (10 – 160 Hz) of the frequency spectrum.*

The NPfI contains the current method of assessing low-frequency noise, which is a 2 step process as detailed below:

> *Measure/assess source contribution C-weighted and A-weighted L_{eq},T levels over the same time period. The low frequency noise modifying factor correction is to be applied where the C-A level is 15 dB or more and:*
>
> • *where any of the 1/3 octave noise levels in Table C2 are exceeded by **up to and including** 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured A weighted levels applies for the evening/night period; and*
>
> • *where any of the 1/3 octave noise levels in Table C2 are exceeded by **more than** 5 dB and cannot be mitigated, a 5 dBA positive adjustment to measured A weighted levels applies for the evening/night period and a 2 dBA positive adjustment applies for the daytime period.*

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for

wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.

- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise', relevant NSW EPA requirements, and the NMP. Meteorological data was obtained from the WCM automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the night period at each location. The duration of each measurement was 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits as it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case WCM and/or WCRS).

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of WCM/WCRS's contribution, if any, to measured levels. At each receptor location, WCM/WCRS's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed;

- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or

- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or L_{Amax}, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15 minute measurement).

3.3 Meteorological Data

Meteorological data was obtained from the WCM meteorological station; this was logged at 10-minute intervals. Atmospheric parameters include wind speed, wind direction, rainfall and sigma theta. When meteorological data is provided in less than 15 minute intervals, an analysis must be conducted to determine the meteorological conditions present for the majority of each measurement period and whether those conditions result in noise criteria being applicable or not.

3.4 Modifying Factors

Years of monitoring have indicated that noise levels from mining operations, particularly those measured at significant distances from the source are relatively continuous and broad spectrum. Given this, noise levels from WCM at the monitoring locations are unlikely to be intermittent or tonal.

Assessment of low-frequency modifying factors is necessary when application of the maximum correction could potentially result in an exceedance of the relevant site-only L_{Aeq} criterion. Low-frequency analysis is therefore undertaken for measurements in this report where:

- meteorological conditions resulted in criteria being applicable;

- contributions from WCM were audible and directly measurable, such that the site-only L_{Aeq} was not “NM” or less than a maximum cut off value (e.g. “<20 dB” or “<30dB”);

- contributions from WCM were within 5 dB of the relevant L_{Aeq} criterion, as 5 dB is the maximum penalty that can be applied by low-frequency modifying factors; and

- WCM was the only low-frequency noise source.

All measurements meeting these conditions were evaluated for possible low-frequency penalty applicability in accordance with the NPfI.

3.5 Attended Noise Monitoring Equipment

Equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are provided in Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	26/11/2020
Rion NA-28 sound level analyser	00701424	14/06/2021
Pulsar 106 acoustic calibrator	81334	18/12/2019
Pulsar 106 acoustic calibrator	74813	21/02/2021

4 RESULTS

4.1 Plant Locations

During monitoring undertaken on 15/16 October 2019 between 22:00 and 02:00, equipment in operation was as follows:

EX211: HD-03-WRCO: Top side loading Rider C Waster. All loads to 135RL Ramp. Late start relocate at start of shift (15 minutes)

EX212: MP-28-WMAO: Double benching, remaining on the western side of EX19 tail. All loads to 110 inpit dump. Digger down for 45 mins.

EX213: MW-02-WMAO: Conventional dig continue to take a pass off the area. All loads to inpit dump. Digger down for 30 mins, due to leak. Sent to crib early.

EX214: ME-S2-WMAO: Conventional dig defined by windrows. All loads to inpit dump. Late start due to all trucks loaded at the ROM.

EX217: HD-03-WRAO: Top side of River A coal. Leaving wind rows below as they dig. Dozer to push up coal as it is exposed. All loads to 135RL Ramp.

EX218: MP-28-WMBO: Relocate to mine Whynot coal at start of shift (15 mins). 6:40pm Washery down. Relocated back to dirt (15 mins). First bucket at 7:05pm.

EX219: HD-S1-WMAO: Conventional dig finish, pulling tail before dropping in (15 min). All loads to the 130RL. Differ down throughout shift (1 hour) for high oil temp.

LD393: Side cast at start of shift. Washery down at 6:40pm. Loaded x2 coal trucks unground coal. All loads to Legra Dump, keeping off windrows. Washery up at 12:00am. Loading underground coal. All loads to ROM bin.

4.2 Total Measured Noise Levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1: MEASURED NOISE LEVELS – OCTOBER 2019[1]

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	L_{Ceq} dB
N01	15/10/2019 22:40	70	65	53	52	32	28	24	55
N03	16/10/2019 00:03	60	56	43	42	37	31	28	61
N16	15/10/2019 23:04	61	43	40	37	34	29	26	55
N20A	15/10/2019 22:34	44	35	30	28	27	25	23	54
N21	15/10/2019 22:17	73	44	34	40	30	28	25	54
N26	15/10/2019 22:06	46	42	38	36	36	32	28	54

Notes:

1. *Levels in this table are not necessarily the result of activity at WCM or WCRS.*

4.3 Modifying Factors

Measured site-only levels were assessed for the applicability of modifying factors in accordance with the NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey.

One of the measurements in this survey satisfied the conditions outlined in Section 3.4 and was assessed for low-frequency modifying factors in Table 4.2.

Table 4.2: LOW-FREQUENCY MODIFYING FACTOR ASSESSMENT – OCTOBER 2019

Location	Start Date and Time	Measured WCM Only L_{Aeq} dB	Measured WCM Only L_{Ceq} dB	WCM Only $L_{Ceq} - L_{Aeq}$ dB[1]	Max exceedance of ref spectrum Result[2]	Penalty dB[3]
N16	15/10/19 23:04	35	48	13	Nil	Nil

Notes:

1. *As per NPfI, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low- frequency noise required as detailed in Sections 2.7.2 and 3.4 of this report;*
2. *As per NPfI, compare measured spectrum against reference spectrum to determine if the low-frequency modifying factor is triggered and application of penalty is required; and*
3. *Bold results indicate that NPfI low-frequency modifying factor has been triggered and application of correction is required.*

4.4 Attended Noise Monitoring

4.4.1 Development Consent Weather Conditions

Table 4.3 to Table 4.4 detail noise levels from WCM in the absence of other noise sources. Noise criteria are applicable if weather conditions during the measurement were within parameters outlined in the WCM development consent.

Table 4.3: $L_{Aeq,15minute}$ GENERATED BY WCM AGAINST PROJECT APPROVAL METEOROLOGICAL CONDITIONS – OCTOBER 2019

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion $L_{Aeq,15min}$ dB[1]	Criterion Applies?[2]	WCM $L_{Aeq,15min}$ dB [3,4]	Exceedance[4,5]
N01	15/10/2019 22:40	2.2	D	NA	NA	<20	NA
N03	16/10/2019 00:03	0.6	F	NA	NA	35	NA
N16	15/10/2019 23:04	1.6	F	40	Yes	35	Nil
N20A	15/10/2019 22:34	2.2	D	40	Yes	<25	Nil
N21	15/10/2019 22:17	1.4	D	40	Yes	30	Nil
N26	15/10/2019 22:06	1.5	D	40	Yes	33	Nil

Notes:

1. *NA indicates that criterion is not applicable, as this location is within the Zone of Affectation;*
2. *The noise emission limits identified in the above table do not apply during rain and/or wind speeds (at 10m above ground) greater than 3 m/s and/or atmospheric stability class G. Criterion may or may not apply due to rounding of meteorological data values;*
3. *Site-only $L_{Aeq,15minute}$ attributed to WCM, including modifying factors if applicable;*
4. *Bold results in red indicate an exceedance of relevant criterion; and*
5. *NA in exceedance column means atmospheric conditions outside conditions specified in approval, therefore criterion was not applicable, or there is no applicable criterion.*

Table 4.4: $L_{A1,1minute}$ GENERATED BY WCM AGAINST PROJECT APPROVAL METEOROLOGICAL CONDITIONS – OCTOBER 2019

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion $L_{A1,1min}$ dB [1]	Criterion Applies? [2]	WCM $L_{A1,1min}$ dB [3,4]	Exceedance[4,5]
N01	15/10/2019 22:40	2.2	D	NA	NA	<20	NA
N03	16/10/2019 00:03	0.6	F	NA	NA	41	NA
N16	15/10/2019 23:04	1.6	F	50	Yes	42	Nil
N20A	15/10/2019 22:34	2.2	D	50	Yes	28	Nil
N21	15/10/2019 22:17	1.4	D	50	Yes	35	Nil
N26	15/10/2019 22:06	1.5	D	50	Yes	45	Nil

Notes:

1. *NA indicates that criterion is not applicable, as this location is within the Zone of Affectation;*
2. *The noise emission limits identified in the above table do not apply during rain and/or wind speeds (at 10m above ground) greater than 3 m/s and/or atmospheric stability class G. Criterion may or may not apply due to rounding of meteorological data values;*
3. *Site-only $L_{A1,1minute}$ attributed to WCM;*
4. *Bold results in red indicate an exceedance of relevant criterion; and*
5. *NA in exceedance column means atmospheric conditions outside conditions specified in approval, therefore criterion was not applicable, or there is no applicable criterion.*

4.4.2 EPL Weather Conditions

Table 4.5 and Table 4.6 detail noise levels from WCM in the absence of other noise sources. Noise criteria are applicable if weather conditions during the measurement were within parameters outlined in the WCM EPL.

Table 4.5: $L_{Aeq,15minute}$ GENERATED BY WCM AGAINST EPL METEOROLOGICAL CONDITIONS – OCTOBER 2019

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion $L_{Aeq,15min}$ dB[1]	Criterion Applies?[2]	WCM $L_{Aeq,15min}$ dB[3,4]	Exceedance[4,5]
N01	15/10/2019 22:40	2.2	D	NA	NA	<20	NA
N03	16/10/2019 00:03	0.6	F	NA	NA	35	NA
N16	15/10/2019 23:04	1.6	F	40	No	35	NA
N20A	15/10/2019 22:34	2.2	D	40	Yes	<25	Nil
N21	15/10/2019 22:17	1.4	D	40	Yes	30	Nil
N26	15/10/2019 22:06	1.5	D	40	Yes	33	Nil

Notes:

1. *NA indicates that criterion is not applicable, as this location is within the Zone of Affectation;*
2. *Noise emission limits identified in the above table apply under meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level, or stability category F temperature inversion conditions and wind speeds of up to 2 m/s at 10 metres above ground level. Criterion may or may not apply due to rounding of meteorological data values;*
3. *Site-only $L_{Aeq,15minute}$ attributed to WCM, including modifying factors if applicable;*
4. *Bold results in red indicate an exceedance of relevant criterion; and*
5. *NA in exceedance column means atmospheric conditions outside conditions specified in EPL, therefore criterion was not applicable, or there is no applicable criterion.*

Table 4.6: $L_{A1,1minute}$ GENERATED BY WCM AGAINST EPL METEOROLOGICAL CONDITIONS – OCTOBER 2019

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion $L_{A1,1min}$ dB [1]	Criterion Applies? [2]	WCM $L_{A1,1min}$ dB [3,4]	Exceedance[4,5]
N01	15/10/2019 22:40	2.2	D	NA	NA	<20	NA
N03	16/10/2019 00:03	0.6	F	NA	NA	41	NA
N16	15/10/2019 23:04	1.6	F	50	No	42	NA
N20A	15/10/2019 22:34	2.2	D	50	Yes	28	Nil
N21	15/10/2019 22:17	1.4	D	50	Yes	35	Nil
N26	15/10/2019 22:06	1.5	D	50	Yes	45	Nil

Notes:

1. *NA indicates that criterion is not applicable, as this location is within the Zone of Affectation;*
2. *Noise emission limits identified in the above table apply under meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level, or stability category F temperature inversion conditions and wind speeds of up to 2 m/s at 10 metres above ground level. Criterion may or may not apply due to rounding of meteorological data values;*
3. *Site-only $L_{A1,1minute}$ attributed to WCM;*
4. *Bold results in red indicate an exceedance of relevant criterion; and*
5. *NA in exceedance column means atmospheric conditions outside conditions specified in EPL, therefore criterion was not applicable, or there is no applicable criterion.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.7. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – OCTOBER 2019

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
N01	15/10/2019 22:40	21	0.3	10	0
N03	16/10/2019 00:03	17	-	-	0
N16	15/10/2019 23:04	22	-	-	0
N20A	15/10/2019 22:34	21	-	-	0
N21	15/10/2019 22:17	22	0.6	200	0
N26	15/10/2019 22:06	22	-	-	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the WCM AWS.

5 DISCUSSION

5.1 Noted Noise Sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are taken into account in each measurement via statistical descriptors. From these observations, summaries have been derived for each location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50} and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz while mining noise is at frequencies less than 1000 Hz, which is typical. Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining, such as dogs, cows, or (most commonly) road traffic.

It should be noted that the method of summing statistical values up to a cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

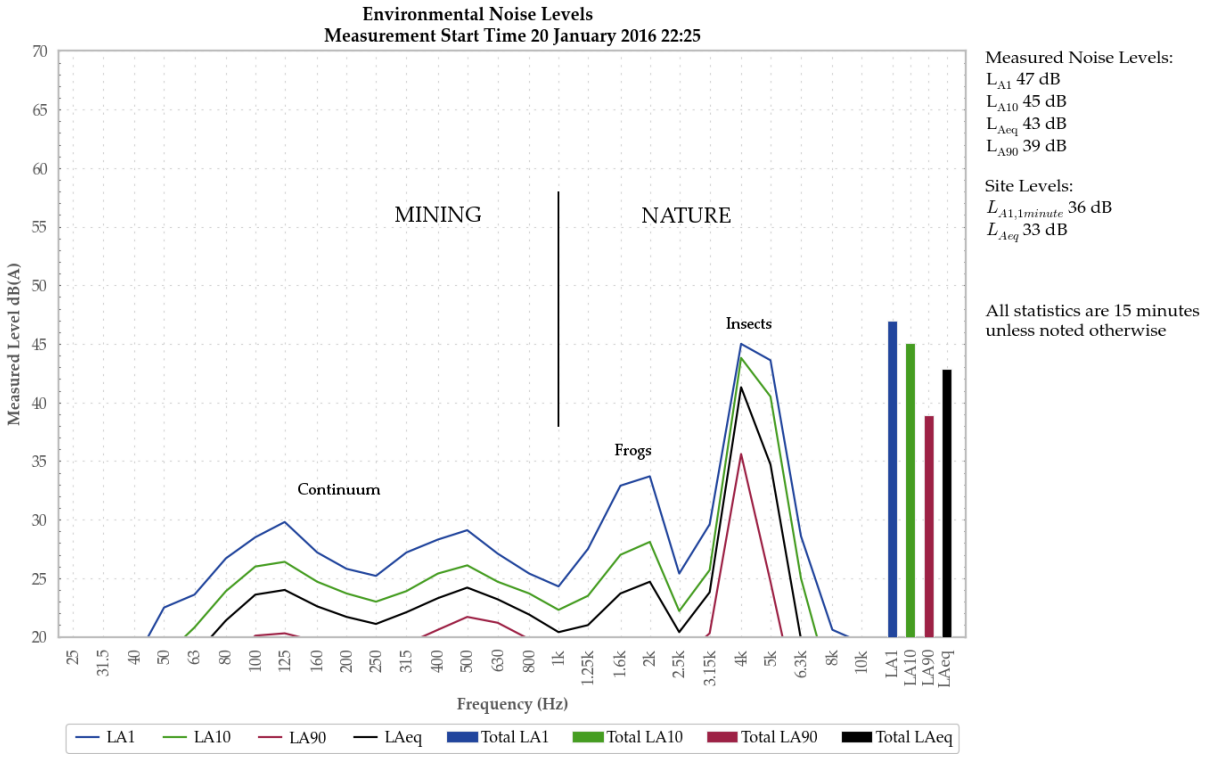


Figure 2: Example Graph (refer to section 5.1 for explanatory note)

5.1.1 N01

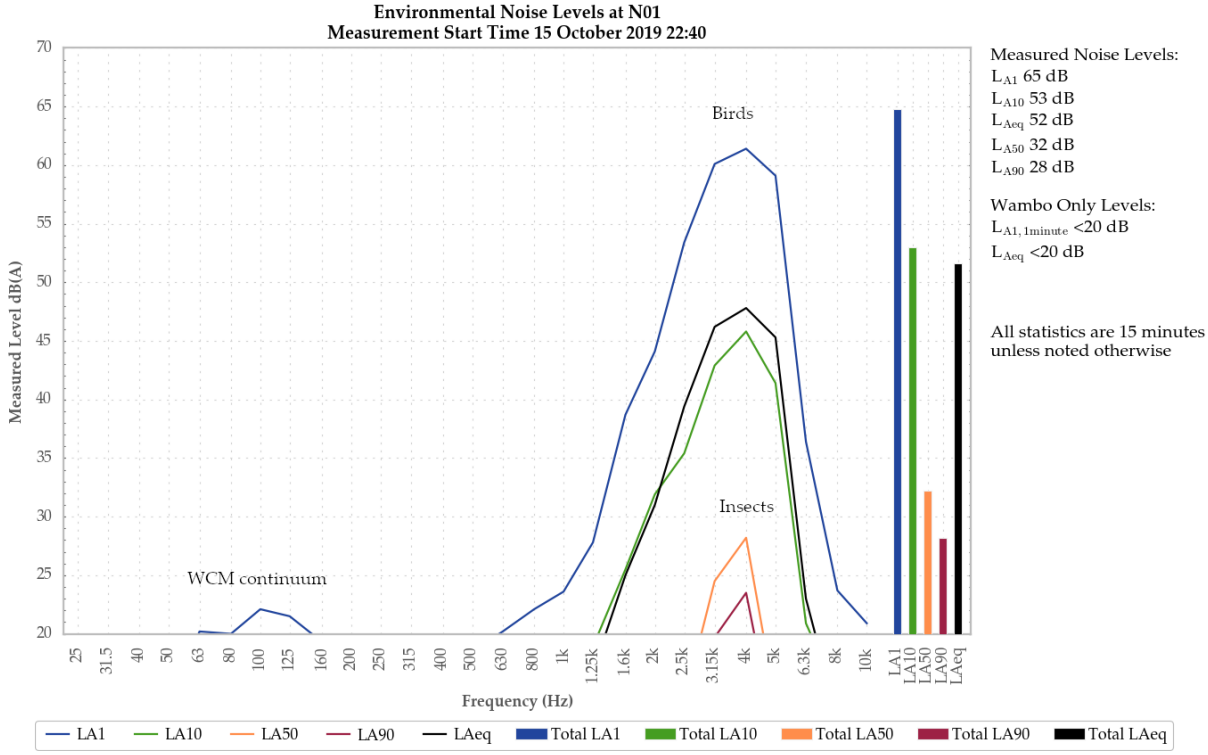


Figure 3: Environmental Noise Levels, N01 – Wambo Road

A low-level continuum was audible from WCM at times during the measurement generating a site only L_{Aeq} and $L_{A1,1minute}$ of less than 20 dB.

Birds generated the measured L_{A1}, L_{A10}, and L_{Aeq}. Insects generated the measured L_{A50} and L_{A90}.

Another mine continuum was also noted.

5.1.2 N03

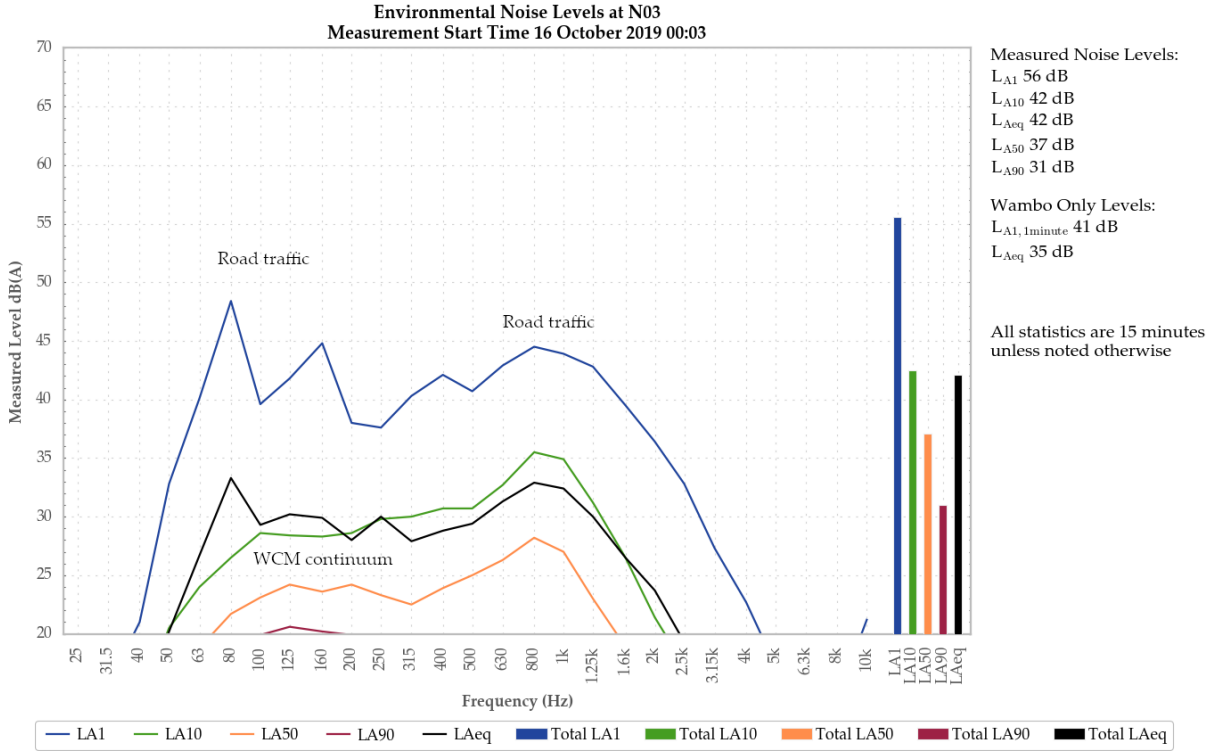


Figure 4: Environmental Noise Levels, N03 - Kelly

An continuum including dump truck engine noise was audible from WCM throughout the measurement generating a site only L_{Aeq} of 35 dB and $L_{A1,1minute}$ of 41 dB.

Road traffic noise generated the measured L_{A1}, L_{A10}, L_{Aeq}, and contributed to the measured L_{A50}. The mining continuum from WCM contributed to the measured L_{A50} and generated the measured L_{A90}.

Insects, birds, and bats were also noted.

5.1.3 N16

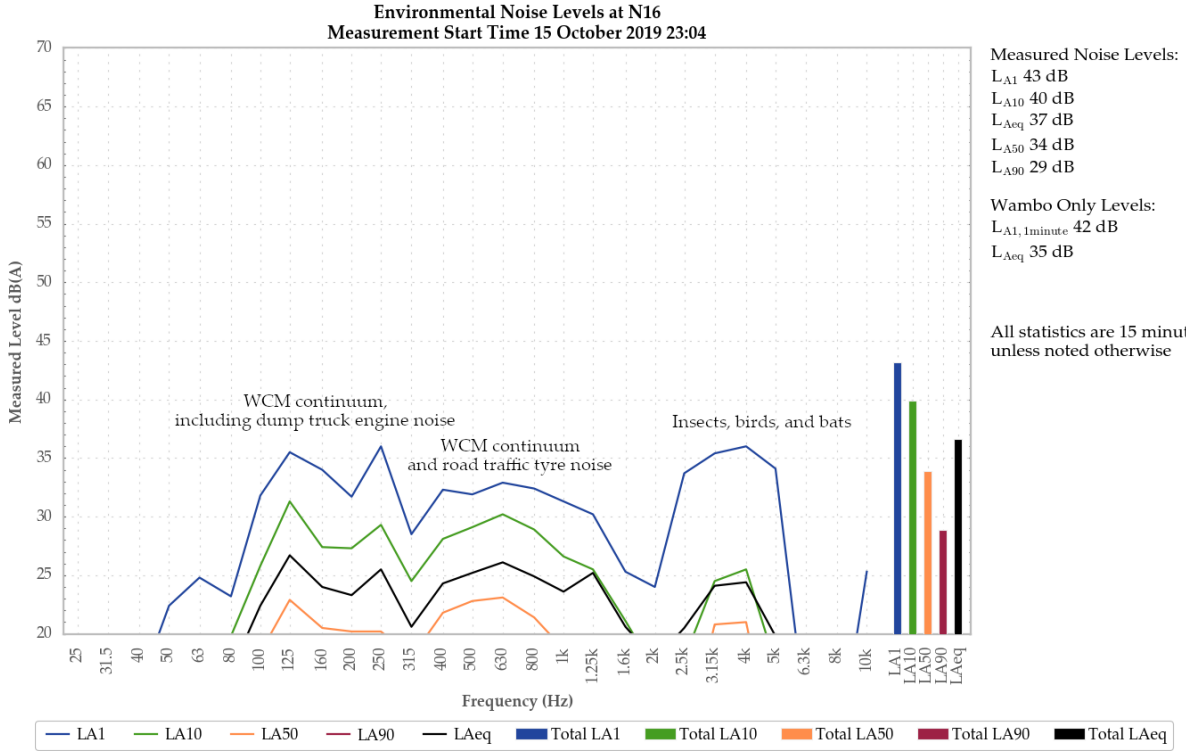


Figure 5: Environmental Noise Levels, N16 – Jerrys Plains Road

An engine continuum including dump truck, exhaust noise, and dozer tracks were audible from WCM throughout the measurement generating a site only L_{Aeq} of 35 dB and $L_{A1,1minute}$ of 42 dB.

WCM primarily generated the measured L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90}. Birds contributed to the measured L_{A1}. Road traffic noise contributed to the measured L_{A10} and L_{Aeq}. Insects contributed to the measured L_{A90}.

An aircraft, bats, and livestock were also noted.

5.1.4 N20A

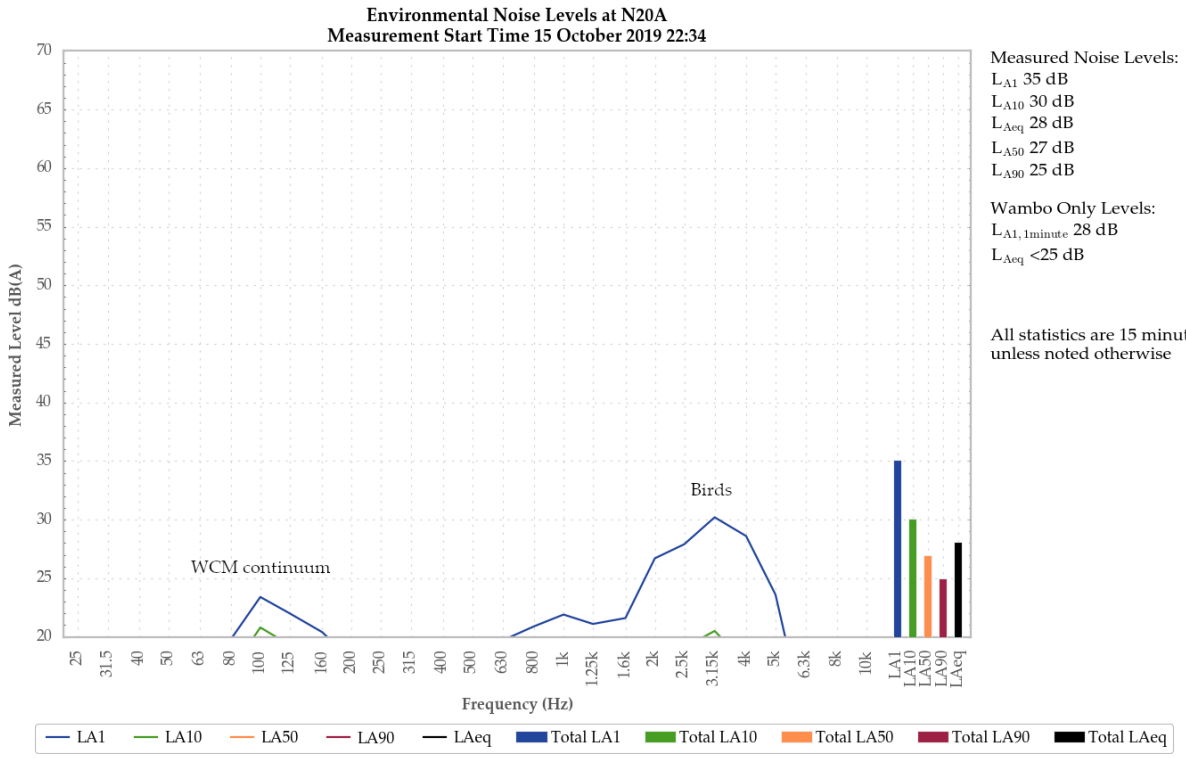


Figure 6: Environmental Noise Levels, N20A – Redmanvale Road Central

A low-level continuum from WCM was audible throughout the measurement generating a site only L_{Aeq} of less than 25 dB and $L_{A1,1minute}$ of 28 dB.

Birds generated the measured L_{A1}. Insects and WCM continuum generated the measured L_{A10}, L_{Aeq}, and L_{A50} and with a continuum from another mine generated the measured L_{A90}.

Livestock and breeze in foliage were also noted.

5.1.5 N21

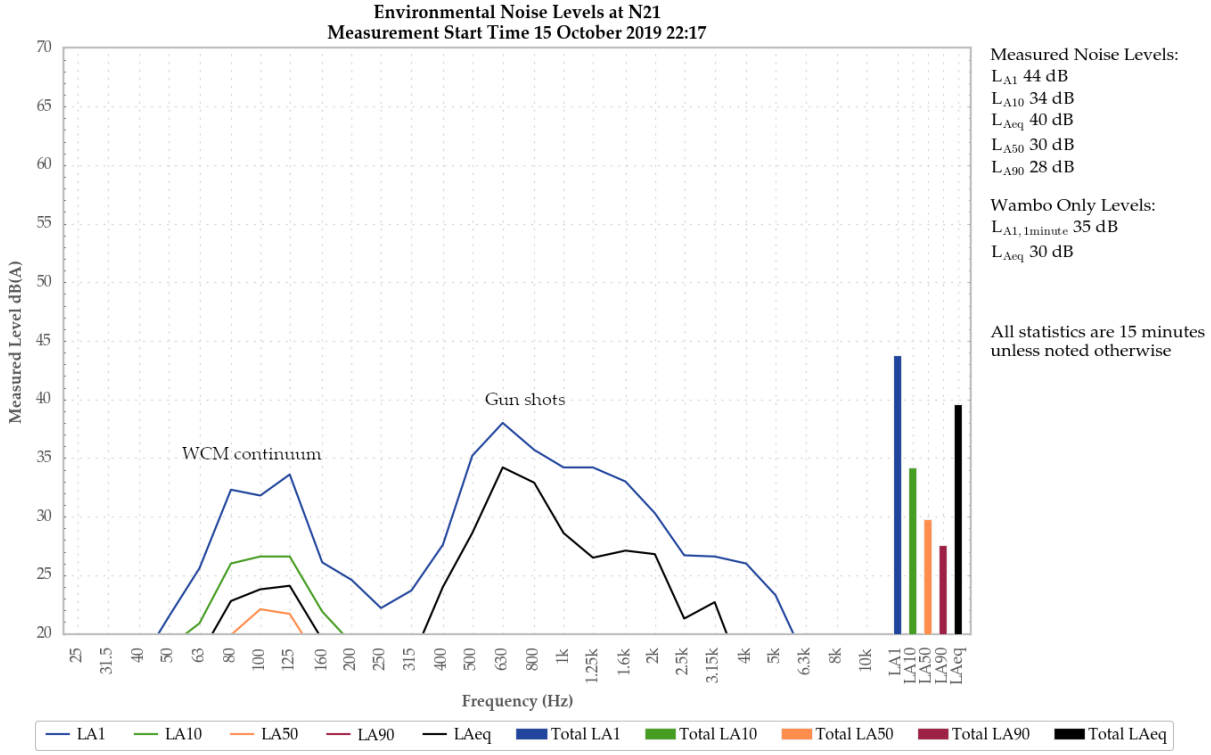


Figure 7: Environmental Noise Levels, N21 – Wambo South

A continuum from WCM was audible throughout the measurement generating a site only L_{Aeq} of 30 dB and $L_{A1,1minute}$ of 35 dB.

Gun shot noise primarily generated the measured L_{A1} and L_{Aeq}. The mining continuum from WCM generated the measured L_{A10}, L_{A50} and L_{A90}.

Birds, road traffic, frogs, and insects were also noted.

5.1.6 N26

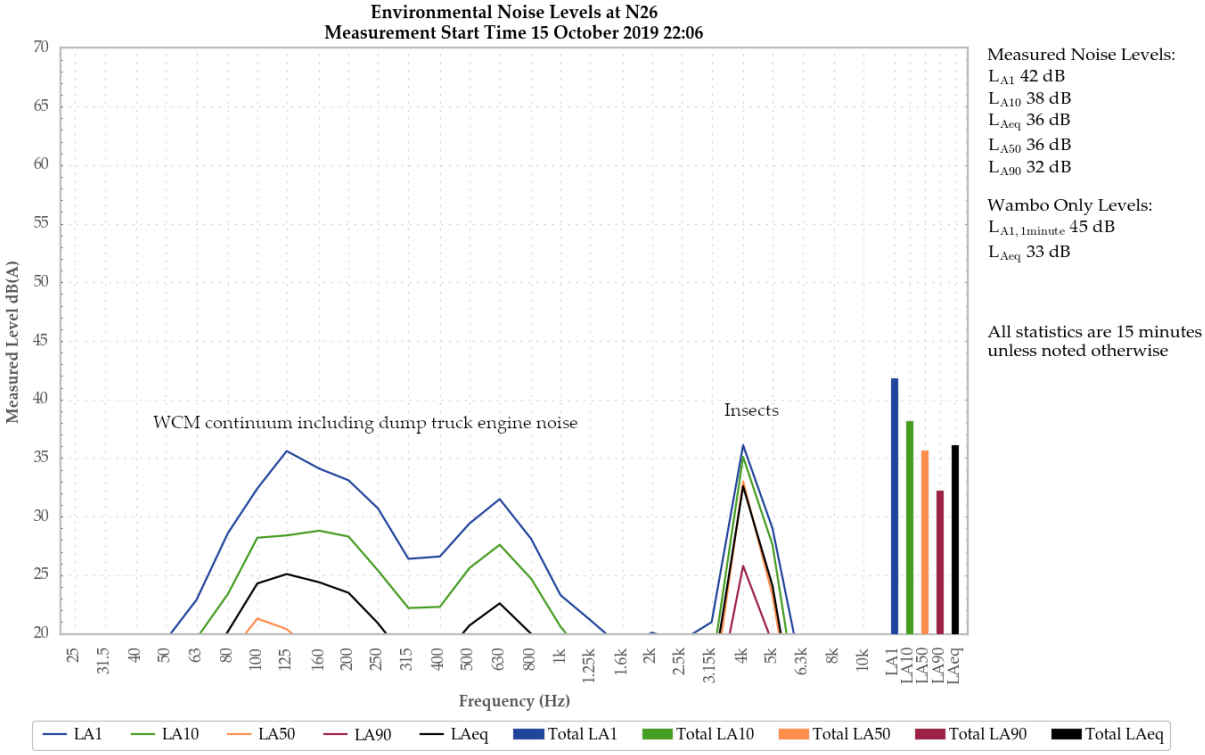


Figure 8: Environmental Noise Levels, N26 – Redmanvale Road South

A continuum from WCM including dump truck engine and exhaust noise generated the measured L_{Aeq} of 33 dB and $L_{A1,1minute}$ of 45 dB.

The mining continuum from WCM and insects combined to generate the measured L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90}.

Bats, birds, dogs, and breeze in foliage were also noted.

6 SUMMARY

Global Acoustics was engaged by WC to conduct a monthly noise survey of operations at WCM and WCRS. The purpose of the survey is to quantify and describe the existing acoustic environment and compare results with relevant limits.

Attended environmental noise monitoring described in this report was undertaken during the night of 15/16 October 2019 at six monitoring locations.

Noise levels from WCM and WCRS complied with relevant criteria at all monitoring locations during the October 2019 survey. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

A.1 WAMBO COAL MINE DEVELOPMENT CONSENT

SCHEDULE 4
SPECIFIC ENVIRONMENTAL CONDITIONS

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the landowner of the land listed in Table 1, the Applicant must acquire the land in accordance with the procedures in conditions 9-11 of schedule 5:

Table 1: Land subject to acquisition upon request

2 – Lambkin	23A & B - Kannar
13C - Skinner	31A,B,C & D - Fisher
19A & B – Kelly	51 – Hawkes
22 – Henderson	56 - Haynes

Note: For more information on the numbering and identification of properties used in this consent, see Attachment 1 of the EIS for the Wambo Development Project. Lands titled 23A & B – Kannar, 31A,B,C & D – Fisher, 51 – Hawkes and 56 – Haynes have been acquired and are now mine-owned.

[1]NOISE

Noise Impact Assessment Criteria

6. The Applicant must ensure that the noise generated by the Wambo Mining Complex does not exceed the noise impact assessment criteria presented in Table 9.

Table 9: Noise impact assessment criteria dB(A))

Day $L_{Aeq(15\ minute)}$	***Evening/Night*** $L_{Aeq(15\ minute)}$	***Night*** $L_{A1(1\ minute)}$	***Land Number***
35	*41*	*50*	*94 – Curlewis*
			3 – Birrell

[1] Incorporates EPA GTAs

Day $L_{Aeq(15\ minute)}$	Evening/Night $L_{Aeq(15\ minute)}$	Night $L_{A1(1\ minute)}$	Land Number
35	40	50	4B – Circosta
			15B - McGowen/Caslick
			16 – Cooper
			23C – Kannar
			25 – Fenwick
			28A & B – Garland
			33 -Thelander/O'Neill
			39 – Northcote
			40 – Muller
			254A – Algie
35	39	50	5 – Strachan
			6 - Merrick
			7 - Maizey
			37 - Lawry
			48 - Ponder
35	38	50	1 - Brosi
			17 - Carter
			18 - Denney
			38 - Williams
			49 - Oliver
			63 - Abrocuff
			75 - Barnes
			91 - Bailey
35	37	50	27 - Birralee
			43 - Carmody
			137 - Woodruff
			163 - Rodger/Williams
			246 - Bailey
35	36	50	13B - Skinner
			178 - Smith
			188 - Fuller
			262A, B & C - Moses
35	35	50	All other residential or sensitive receptors, excluding the receptors listed in condition 1 above

Notes:

- Noise generated by the Wambo Mining Complex is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy

Land Acquisition Criteria

7. If the noise generated by the Wambo Mining Complex exceeds the criteria in Table 10, the Applicant must, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 9-11 of schedule 5.

Table 10: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	***Property***
43	*94 - Curlewis*
	23C – Kannar
	254A - Algie
40	*All other residential or sensitive receptor, excluding the receptors listed in condition 1 above*

Note: Noise generated by the Wambo Mining Complex is to be measured in accordance with the notes presented below Table 9 above. Property 23C – Kannar has been acquired and is now mine-owned.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice to minimise the operational, low frequency and traffic noise of the Wambo Mining Complex;
   (b) operate a comprehensive noise management system for the Wambo Mining Complex that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
   (c) maintain the effectiveness of noise suppression equipment (if fitted) on plant at all times and ensure defective plant is not used operationally until fully repaired;
   (d) ensure that noise attenuated plant (if used) is deployed preferentially in locations relevant to sensitive receivers;
   (e) minimise the noise impacts of the Wambo Mining Complex during meteorological conditions when the noise limits in this consent do not apply;
   (f) co-ordinate the noise management for the Wambo Mining Complex with the noise management at nearby mines (including HVO South, HVO North and Mt Thorley Warkworth mines) to minimise the cumulative noise impacts of these mines and the Wambo Mining Complex,

to the satisfaction of the Secretary.

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the Wambo Mining Complex to the satisfaction of the Secretary. This plan must:
   (a) be prepared in consultation with the EPA, and submitted to the Secretary for approval by the end of June 2013;
   (b) describe the measures that would be implemented to ensure:
      - best management practice is being employed;
      - the noise impacts of the Wambo Mining Complex are minimised during meteorological conditions when the noise limits in this consent do not apply; and
      - compliance with the relevant conditions of this consent;
   (c) describe the proposed noise management system in detail;
   (d) include a monitoring program that:
      - uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the Wambo Mining Complex;
      - adequately supports the proactive and reactive noise management system for the Wambo Mining Complex;
      - includes a protocol for determining exceedances of the relevant conditions in this consent;
      - evaluates and reports on the effectiveness of the noise management system for the Wambo Mining Complex;
      - provides for the annual validation of the noise model for the Wambo Mining Complex; and
   (e) include a protocol that has been prepared in consultation with the owners of nearby mines (including HVO South, HVO North and Mount Thorley Warkworth mines) to minimise the cumulative noise impacts of these mines and the Wambo Mining Complex.

   The Applicant must implement the approved management plan as approved from time to time by the Secretary.

A.2 WAMBO RAIL SPUR DEVELOPMENT CONSENT

SCHEDULE 4
GENERAL ENVIRONMENTAL CONDITIONS

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the landowner of the land listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in conditions 1-3 of schedule 5.

Table 1: Land subject to acquisition upon request

19 - L Kelly	55 - E & C Burley

Note: For more information on the numbering and identification of properties used in this consent, see Attachment 1A and Attachment 1B of the SEE for the Alterations to the Wambo Development Project – Rail and Train Loading Infrastructure.

2. While the land listed in Table 1 is privately owned, the Applicant shall implement all practicable measures to ensure that the impacts of the development comply with the predictions in the SEE, and the relevant conditions in this consent, at any residence on this land, to the satisfaction of the Director-General.

[1]NOISE

Noise Impact Assessment Criteria

3. The Applicant shall ensure that noise generated by the development, combined with noise generated by any development in the Wambo Mining Complex, does not exceed the noise criteria provided in Table 2, unless higher noise criteria are specified in the consent for the Wambo Coal Mine (DA 305-7-2003).

Table 2: Noise impact assessment criteria dB(A)

Day $L_{Aeq(15\ minute)}$	Evening/Night $L_{Aeq(15\ minute)}$	Night $L_{A1(1\ minute)}$	Land Number
35	35	50	All private residential or sensitive receptors, excluding the receptors listed in Table 1

Notes:
- *Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.*
- *For this condition to apply, the exceedance of the criteria must be systemic.*

Construction Hours

4. The Applicant shall ensure that all construction work is carried out from 7 am to 6 pm Monday to Saturday (inclusive) and 8 am to 6 pm Sundays and Public Holidays.

Operating Hours

5. The Applicant shall:
   (a) take all practicable measures to minimise train movements at the development on Friday evening (6 pm-9 pm) and Sunday morning (9 am-12 am);
   (b) report on the implementation and effectiveness of these measures,
   to the satisfaction of the Director-General.

Rail Noise

6. The Applicant shall seek to ensure that its rail spur is only accessed by locomotives that are approved to operate on the NSW rail network in accordance with noise limits L6.1 to L6.4 in RailCorp's EPL (No. 12208) and ARTC's EPL (No. 3142) or a Pollution Control Approval issued under the former *Pollution Control Act 1970.*

Noise Monitoring

7. The Applicant shall monitor the noise generated by the development, and noise generated by the Wambo Mine, in general accordance with the Noise Management Plan for the Wambo Mining Complex and the *NSW Industrial Noise Policy.*

7A. By 31 May 2012, the Applicant shall review and update the Noise Management Plan for the Wambo Mining Complex, including a noise monitoring protocol for evaluating compliance with the criteria in condition 3 above.

7B. During the first 12 months of operation of the Rail Refuelling Facility, the Applicant must conduct attended noise monitoring at the nearest private receptor during refuelling events, no less often than every three months.

A.3 WAMBO RAIL LINE DEVELOPMENT CONSENT

Operational Noise

8. The Applicant shall ensure noise emissions from the operations of the railway line when measured at any residence along the railway line corridor shall not exceed the following EPA criteria:

   (a) planning level of $L_{Aeq\ 24hr}$ 55dBA; and

   (b) maximum passby level of L_{Amax} 85dBA

   The noise criteria levels shall be measured under prevailing weather conditions in accordance with EPA requirements and to be consistent with EPA's requirements as applied to the New South Wales coal industry, or otherwise agreed to by the EPA.

9. Prior to the commencement of operations, the Applicant shall prepare in consultation with the EPA and Singleton Shire Council an Operational Noise Management Plan. The Operation Noise Management Plan shall demonstrate that all practical design and noise mitigation methods have been undertaken to achieve the noise levels specified in Condition 8.

A.4 ENVIRONMENT PROTECTION LICENCE 529

L4.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The noise limits in the table below represent the noise contribution from the premises.

Noise Limits dB(A)

Receiver Land Number	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LA1(1 minute)
94 - Curlewis	35	41	41	50
3 - Birrell 4B - Circosta 15 - McGowen/ Caslick 16 - Cooper 25 - Fenwick 28 - Garland 33 - Thelander/ O'Neill 39 - Northcote 40 - Muller 254 - Algie	35	40	40	50
5 - Strachan 6 - Merrick 7 - Maizey 37 - Lawry 48 - Ponder	35	39	39	50
1 - Brosi 17 - Carter 18 - Denney 30 - Williams 49 - Oliver 63 - Abrocuff 75 - Barnes 91 - Bailey	35	38	38	50
27 - Birralee 43 - Carmody 137 - Woodruff 163 - Rodger/ Williams 246 - Bailey	35	37	37	50
13B - Skinner 178 - Smith 188 - Fuller 262 - Moses	35	36	36	50

All other residential or sensitive receptors excluding the receptors listed above and also excluding those listed in Table 1 of Schedule 4 of the Wambo Coal Mine Development Consent (DA 305-7-2003).	35	35	35	50

L4.2 For the purpose of Condition L4.1:
a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays,
b) Evening is defined as the period from 6pm to 10pm
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays
d) The Receiver Land Owner locations are as detailed in the Environmental Impact Statement titled "*Wambo Development Project*", Volumes 1-5 dated July 2003 and prepared by Resource Strategies Pty Ltd.

L4.3 Noise from the premises is to be measured at the most affected point or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary to determine compliance with the LAeq(15 minute) noise limits in condition L4.1.

Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance. See Chapter 11 of the NSW Industrial Noise Policy.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.

L4.4 Noise from the premises is to be measured at 1m from the dwelling façade to determine compliance with the LA1(1minute) noise limit in condition L4.1.

L4.5 The noise emission limits identified in condition L4.1 apply under meteorological conditions of:

a) Wind speeds of up to 3m/s at 10 metres above the ground level; or
b) Temperature inversion conditions of up to 3°C/100m and wind speeds of up to 2m/s at 10 metres above the ground.

L4.6 In regard to condition 4.5(b) of the Licence, temperature inversion conditions must be identified using the sigma-theta method in the EPA's Noise Policy for Industry, October 2017, from data obtained from the premises weather station at EPA monitoring point 17.

APPENDIX

B CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
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 C18618

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

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00370304
Microphone Serial Number : 10421
Pre-amplifier Serial Number : 60313

Pre-Test Atmospheric Conditions
Ambient Temperature : 23.6°C
Relative Humidity : 42.6%
Barometric Pressure : 98.42kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 42.4%
Barometric Pressure : 98.45kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 26 Nov 2018

Secondary Check: Lewis Boorman
Report Issue Date : 29 Nov 2018

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	
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.51dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

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.

PAGE 1 OF 1

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 C19342

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thorton 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 -

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.

PAGE 1 OF 1

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17682_Reissued

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

Equipment Tested/ Model Number : Pulsar 106
Instrument Serial Number : 81334

Atmospheric Conditions
Ambient Temperature : 23.5°C
Relative Humidity : 49.8%
Barometric Pressure : 98.79kPa

Calibration Technician : Vicky Jaiswal **Secondary Check:** Riley Cooper
Calibration Date : 18 Dec 2017 **Report Issue Date :** 27 Mar 2018

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressure Level	*Pass*	5.3.2: Frequency Generated	*Pass*
5.2.3: Short Term Fluctuation	*Pass*	5.5: Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.1	1000.36

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.1dB*	*Temperature*	*±°C*
Short Term Fluct.	*±0.02dB*	*Relative Humidity*	*±%*
Frequency	*±0.01%*	*Barometric Pressure*	*±kPa*
Distortion	*±0.5%*		

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.

PAGE 1 OF 1

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C19124

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

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 74813

Atmospheric Conditions
Ambient Temperature : 24°C
Relative Humidity : 50.4%
Barometric Pressure : 99.54kPa

Calibration Technician : Lucky Jaiswal **Secondary Check:** Lewis Boorman
Calibration Date : 21 Feb 2019 **Report Issue Date :** 22 Feb 2019

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
Measured Output	94.0	1000.0	94.0	1000.33

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.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.48%*	*Barometric Pressure*	*±0.015kPa*

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.

PAGE 1 OF 1