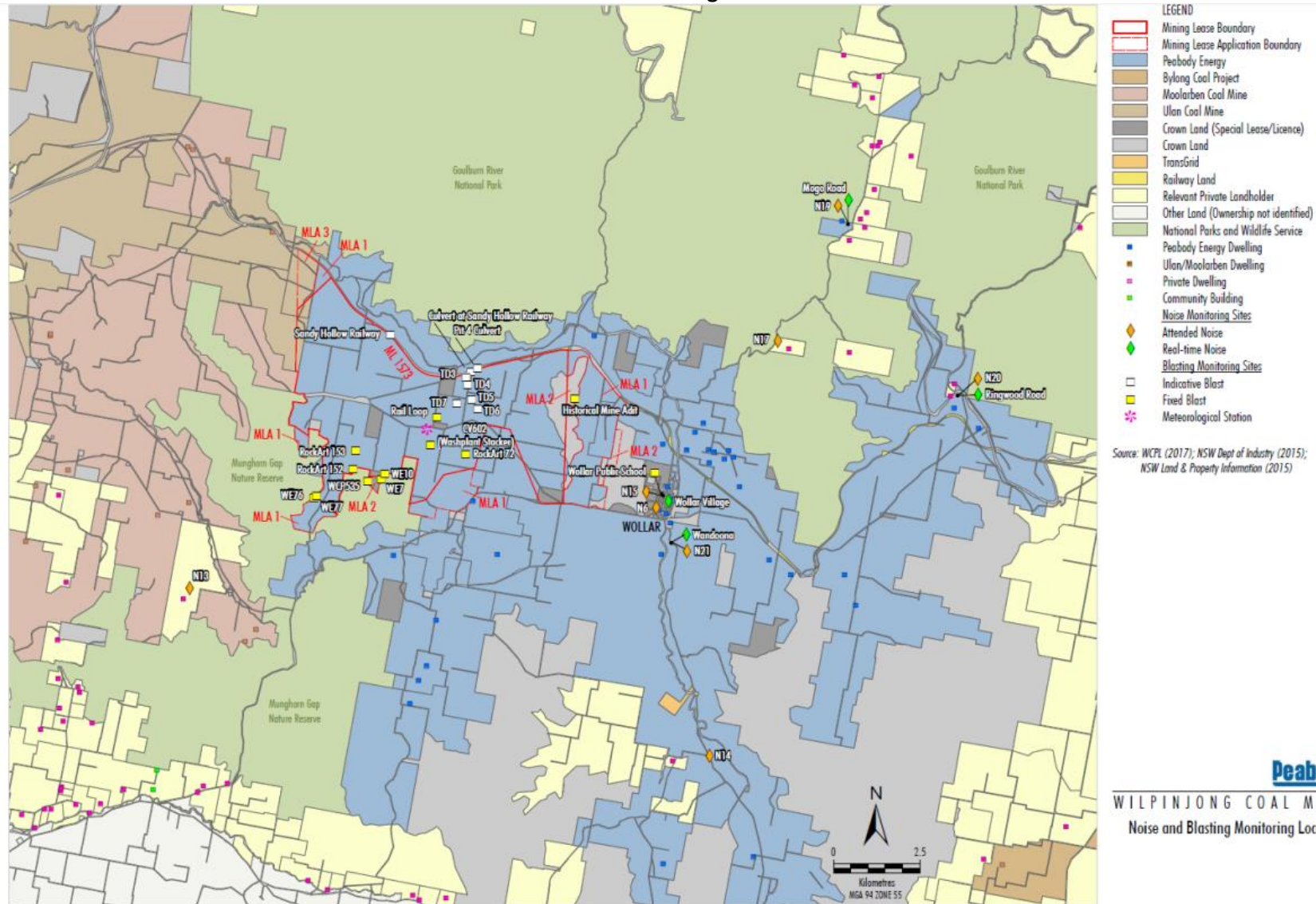


APPENDIX 3F – NOISE MONITORING DATA

Noise Monitoring Locations



Noise Monitoring Locations (Wollar)



LEGEND	
	Peabody Energy
	Crown Land (Special Lease/Licence)
	Crown Land
	Railway Land
	Relevant Private Landholder
1#	Landholder Reference Number
	Peabody Energy Dwelling
	Community Building
	Private Dwelling
#	Special Lease/Licence Holder
	Noise Monitoring Sites
	Attended Noise
	Real-time Noise
	Blasting Monitoring Sites
	Fixed Blast
	Air Quality Monitoring Sites
	Ambient Air Quality - Outdoor
	Static Dust Gauge
	High Volume Air Sampler
	Real-time PM _{2.5}
	Real-time PM ₁₀

Source: WZPL (2017); NSW Dept of Industry (2015); NSW Land & Property Information (2014)

Peabody
 WILPINJONG COAL MINE
 Wollar Environmental Monitoring Sites

Noise Monitoring Reports

Wilpinjong Coal

*Environmental Noise
Monitoring
January 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



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Wilpinjong Coal

Environmental Noise Monitoring January 2018

Reference: 18022_R01

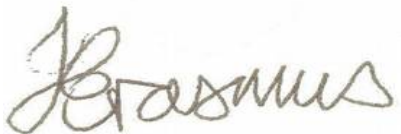
Report date: 8 February 2018

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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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 11/12 January 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the January 2018 monitoring.

Low Frequency Assessment

A low frequency assessment was carried out in accordance with the EPA 'Noise Policy for Industry' (NPfI). Low frequency modification factors, where applicable, did not result in any exceedances of WCP noise limits during the January survey.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 11/12 January 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

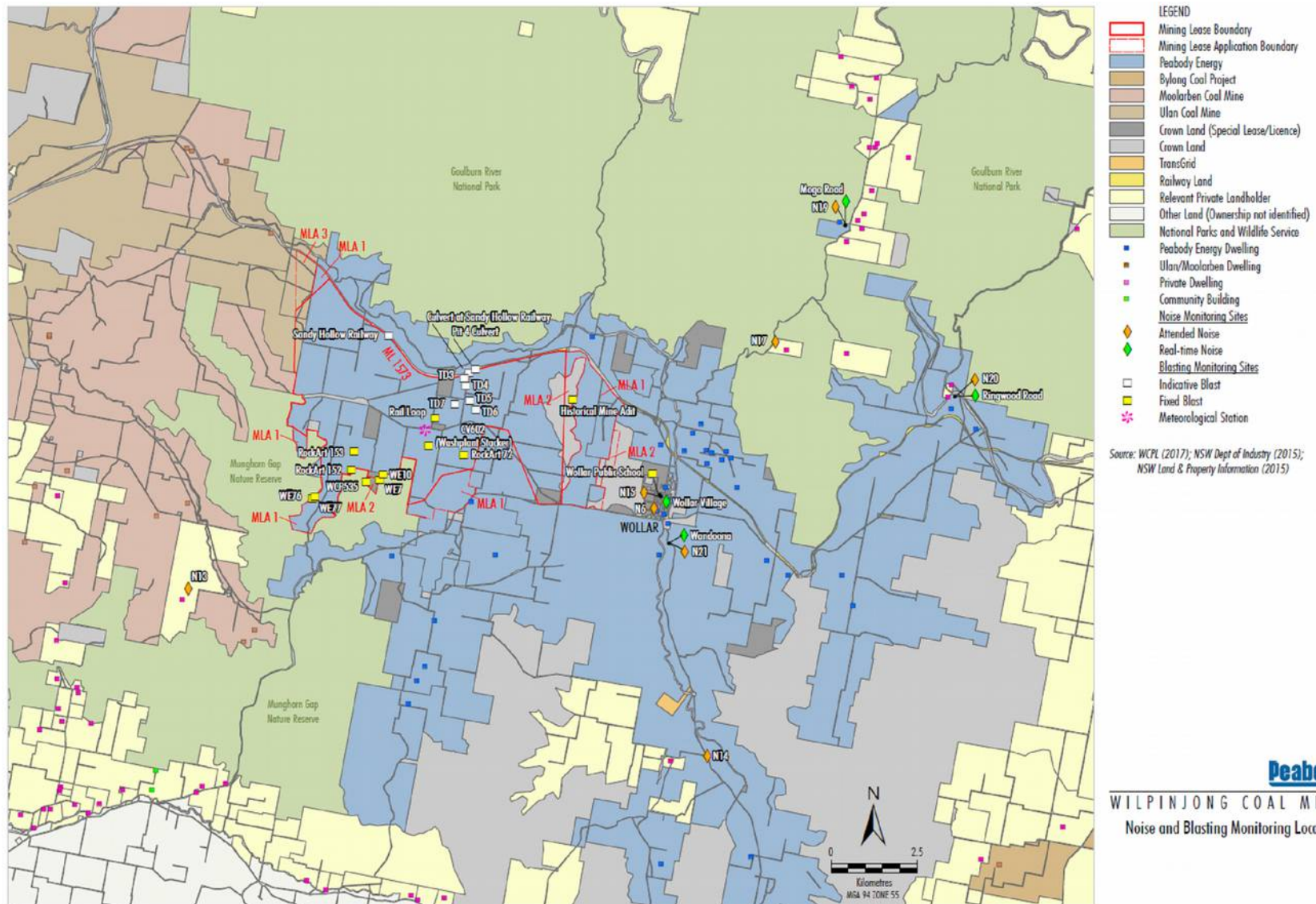


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VIG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day LAeq,15minute	Evening LAeq,15minute	Night LAeq,15minute/ LA1,1minute
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
2. N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.1 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor/ Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or
- c) Temperature inversion conditions greater than 3°C per 100 metres.

2.2 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.2.1 Tonal and Intermittent Noise

As defined in the NPfI:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

Intermittent noise is characterised by the level suddenly dropping/increasing several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only and is not intended to be applied to changes in noise level due to meteorology.

Years of monitoring have indicated that noise levels from mining operations, particularly those levels measured at significant distances from the source are relatively continuous. Given this, noise levels at the monitoring locations are unlikely to be intermittent. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI.

2.2.2 Low Frequency Noise

NPfI Method

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 Assessment Method

Attended monitoring was conducted in accordance with the EPA's NPfI and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Jonathan Erasmus.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.2 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	370304	16/11/2018
Rion NC-73 acoustic calibrator	11248300	10/10/2019
Rion NA-28 sound level analyser	1070590	28/06/2018
Pulsar 106 acoustic calibrator	79631	30/03/2019

3.3 Modification 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 WCP 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 WCP 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 WCP were within 5 dB of the relevant L_{Aeq} criterion, as 5 dB is the maximum penalty that can be applied by low-frequency modification factors; and
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – JANUARY 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	11/01/2018 23:16	59	49	44	43	44	42	36	50
N13	12/01/2018 01:05	41	37	35	32	33	30	28	47
N14	12/01/2018 00:27	48	39	33	29	31	26	23	49
N15	11/01/2018 22:57	47	45	44	42	42	40	38	54
N17	11/01/2018 22:27	58	57	56	56	56	55	54	55
N19	11/01/2018 22:01	47	45	43	42	42	41	38	43
N20	11/01/2018 23:48	42	37	36	34	35	33	26	39
N21	12/01/2018 00:55	42	31	26	22	24	20	19	42

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.2. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.2: REAL-TIME AND ATTENDED NOISE LEVELS, JANUARY 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L _{Aeq} dB	Low pass (<630Hz) L _{Aeq} dB	Low pass (<630Hz) L _{A90} dB	WCP L _{Aeq} dB
N15/SX33	11/01/2018 22:57	11/01/2018 23:00	40	25	20	<20
N19/SX32	11/01/2018 22:01	11/01/2018 22:00	39	19	16	IA
N20/SX30	11/01/2018 23:48	11/01/2018 23:45	40	28	22	IA
N21/SX31	12/01/2018 00:55	12/01/2018 01:00	24	22	20	<20

Notes:

- Levels in this table are not necessarily the result of activity at WCP; and
- NR – no data recorded.

4.2 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.3: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	11/01/2018 23:16	1.2	F	37	Yes	IA	Nil
N13	12/01/2018 01:05	1.6	F	36	Yes	IA	Nil
N14	12/01/2018 00:27	1.6	F	35	Yes	<25	Nil
N15	11/01/2018 22:57	1.1	F	35	Yes	<20	Nil
N17	11/01/2018 22:27	0.6	E	35	Yes	IA	Nil
N19	11/01/2018 22:01	1.7	F	35	Yes	IA	Nil
N20	11/01/2018 23:48	1.4	F	35	Yes	IA	Nil
N21	12/01/2018 00:55	1.6	F	35	Yes	<20	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.4: *L_{A1,1minute}* GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	11/01/2018 23:16	1.2	F	45	Yes	IA	Nil
N13	12/01/2018 01:05	1.6	F	45	Yes	IA	Nil
N14	12/01/2018 00:27	1.6	F	45	Yes	30	Nil
N15	11/01/2018 22:57	1.1	F	45	Yes	<20	Nil
N17	11/01/2018 22:27	0.6	E	45	Yes	IA	Nil
N19	11/01/2018 22:01	1.7	F	45	Yes	IA	Nil
N20	11/01/2018 23:48	1.4	F	45	Yes	IA	Nil
N21	12/01/2018 00:55	1.6	F	45	Yes	<20	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mines EPL.

Table 4.5: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JANUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	11/01/2018 23:16	1.2	F	35	Yes	IA	Nil
N13	12/01/2018 01:05	1.6	F	35	Yes	IA	Nil
N14	12/01/2018 00:27	1.6	F	35	Yes	<25	Nil
N15	11/01/2018 22:57	1.1	F	35	Yes	<20	Nil
N17	11/01/2018 22:27	0.6	E	35	Yes	IA	Nil
N19	11/01/2018 22:01	1.7	F	35	Yes	IA	Nil
N20	11/01/2018 23:48	1.4	F	35	Yes	IA	Nil
N21	12/01/2018 00:55	1.6	F	35	Yes	<20	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.6: $L_{A1,1min}$ GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JANUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	11/01/2018 23:16	1.2	3.2	45	No	IA	NA
N13	12/01/2018 01:05	1.6	3.4	45	No	IA	NA
N14	12/01/2018 00:27	1.6	2.6	45	Yes	30	Nil
N15	11/01/2018 22:57	1.1	3	45	No	<20	NA
N17	11/01/2018 22:27	0.6	1.4	45	Yes	IA	Nil
N19	11/01/2018 22:01	1.7	2.8	45	Yes	IA	Nil
N20	11/01/2018 23:48	1.4	2	45	Yes	IA	Nil
N21	12/01/2018 00:55	1.6	3.4	45	No	<20	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Assessment

Measured WCP only levels were assessed for the applicability of low frequency modification factors in accordance with the EPA's NPfI.

None of the eight measurements satisfied the conditions outlined in Section 3.3. Therefore no further assessment was undertaken.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JANUARY 2018

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	11/01/2018 23:16	25	0.0	-	2
N13	12/01/2018 01:05	23	0.0	-	0
N14	12/01/2018 00:27	23	0.0	-	0
N15	11/01/2018 22:57	25	0.0	-	4
N17	11/01/2018 22:27	24	0.0	-	8
N19	11/01/2018 22:01	26	0.0	-	8
N20	11/01/2018 23:48	25	0.0	-	0
N21	12/01/2018 00:55	22	1.0	140	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees/100 metres ²
11/01/2018 22:00	1.0	80	2
11/01/2018 22:15	1.7	86	2.8
11/01/2018 22:30	1.2	103	2
11/01/2018 22:45	0.6	121	1.4
11/01/2018 23:00	0.9	87	2.4
11/01/2018 23:15	1.1	103	3
11/01/2018 23:30	1.2	110	3.2
11/01/2018 23:45	1.5	115	2.6
12/01/2018 00:00	1.4	124	2
12/01/2018 00:15	1.5	106	1.8
12/01/2018 00:30	1.3	111	2
12/01/2018 00:45	1.6	95	2.6
12/01/2018 01:00	1.8	109	3.8
12/01/2018 01:15	1.6	91	3.4
12/01/2018 01:30	1.5	101	3.4
12/01/2018 01:45	1.0	105	3.4
12/01/2018 02:00	1.2	104	3.6
12/01/2018 02:15	1.1	114	2.8
12/01/2018 02:30	1.5	99	2.8
12/01/2018 02:45	1.5	117	2.4
12/01/2018 03:00	1.7	110	2.2
12/01/2018 03:15	1.5	102	2.4
12/01/2018 03:30	1.6	98	2.6
12/01/2018 03:45	1.3	94	2.4
12/01/2018 04:00	0.8	92	2.4
12/01/2018 04:15	1.0	120	3
12/01/2018 04:30	0.0	-	2.8

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.6 present data gathered during attended monitoring. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

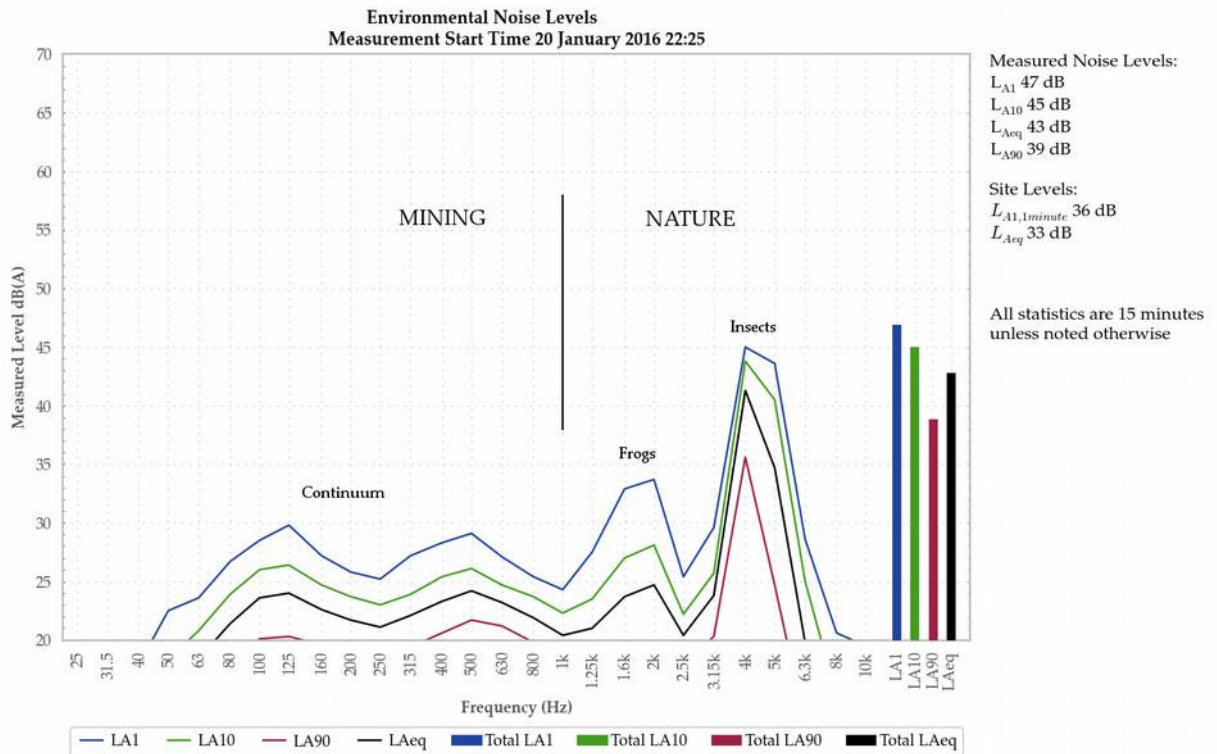


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 11 January 2018

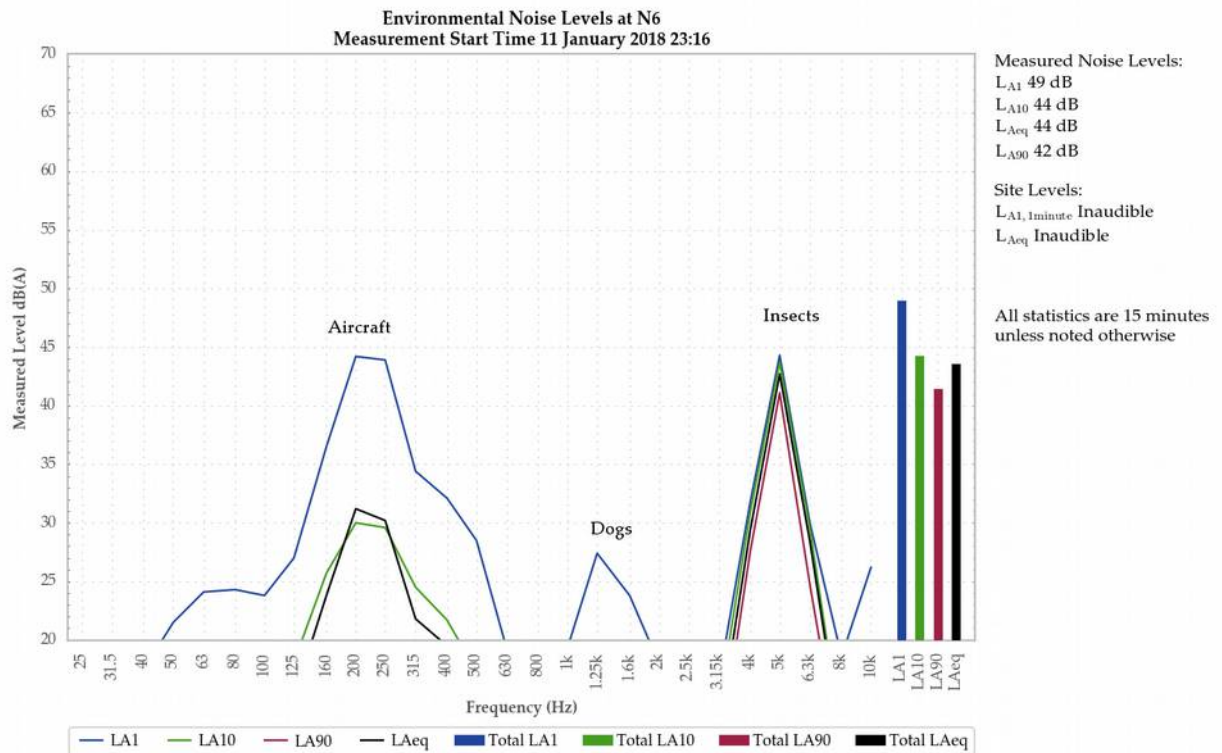


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Aircraft and insects generated the measured LA1. Insects generated the measured LA10, LAeq, and LA90.

Dogs and birds were also noted.

5.1.2 N13, 12 January 2018

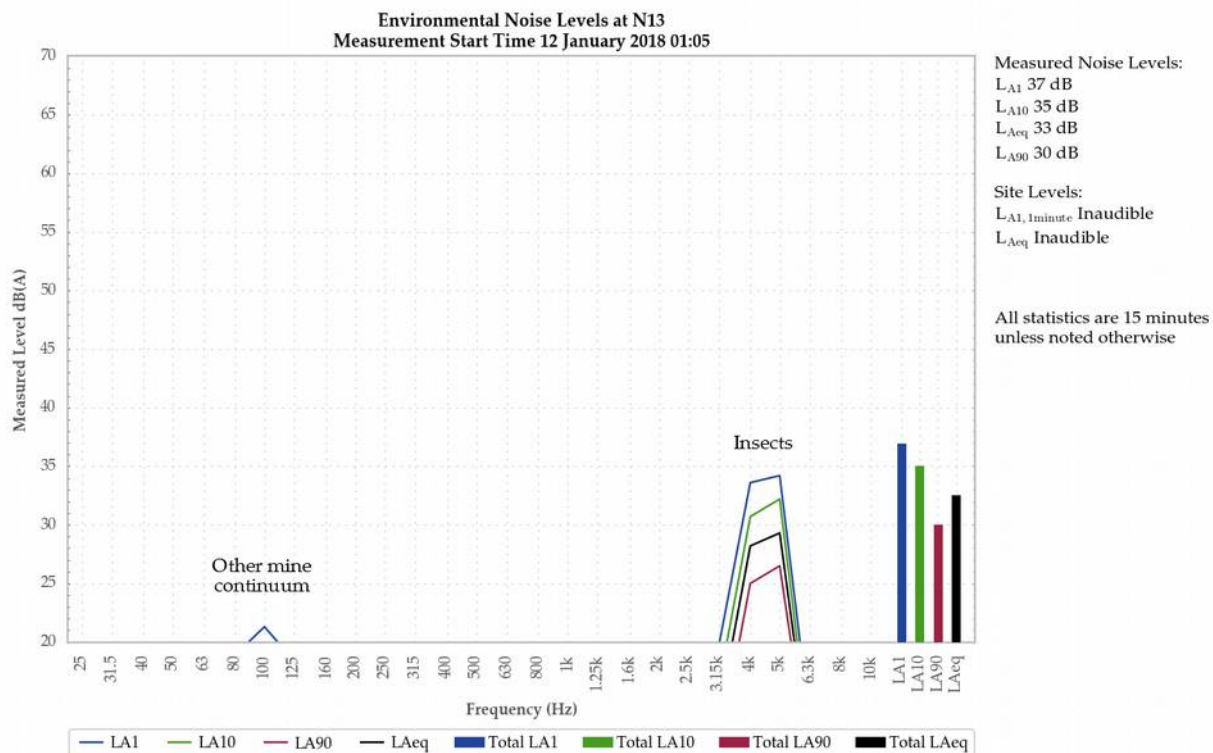


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Insects generated measured levels.

Another mining continuum and livestock were also noted.

5.1.3 N14, 12 January 2018

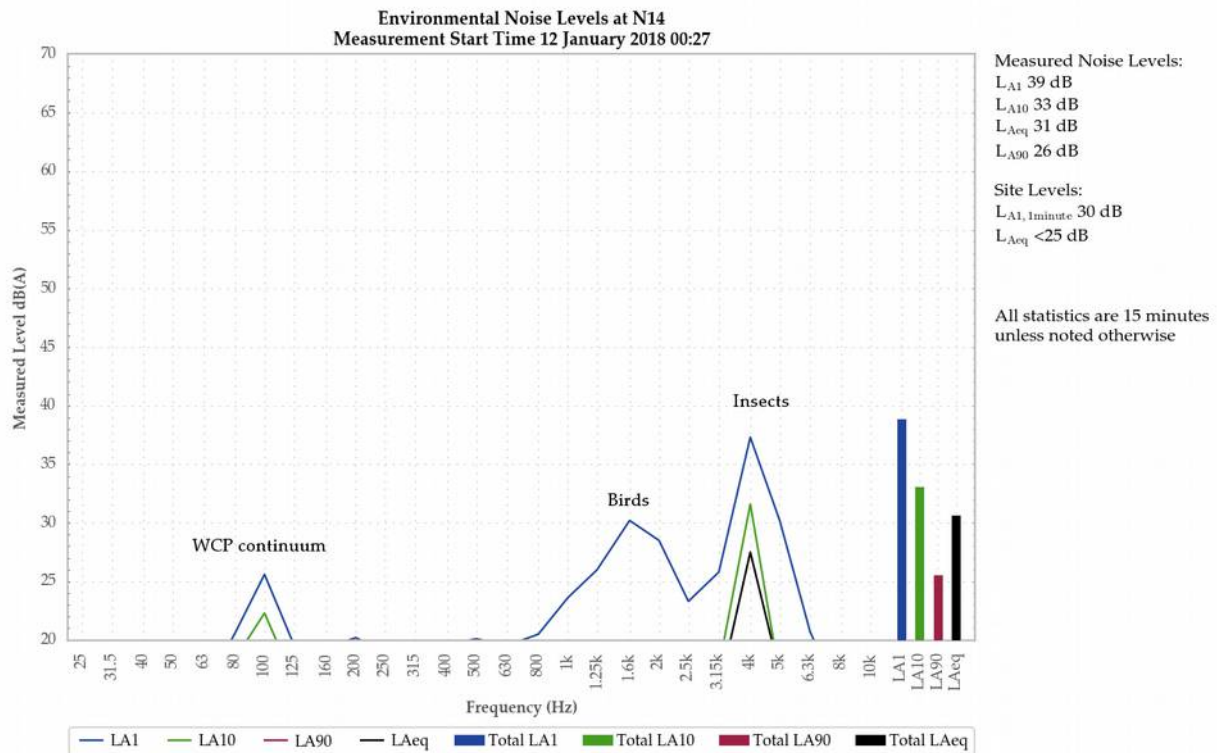


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site only LAeq of less than 25 dB and LA1,1minute of 30 dB.

Birds and insects generated the measured LA1. Insects were primarily responsible for the measured LA10, LAeq, and LA90. The continuum from WCP contributed to the measured LAeq and LA90.

5.1.4 N15, 11 January 2018

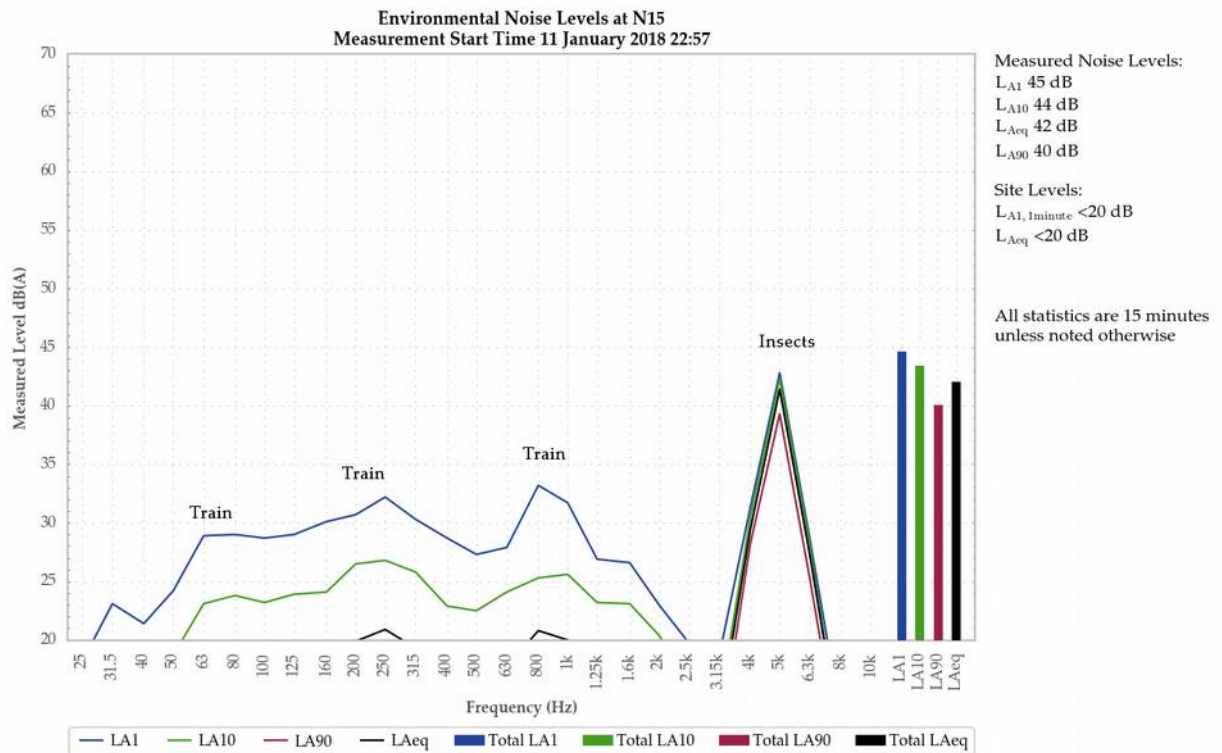


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A low-level continuum from WCP was audible during the measurement generating the site only LAeq and LA1,1minute of less than 20 dB.

Insects primarily generated measured levels.

A train, birds and road traffic noise were also noted.

5.1.5 N17, 11 January 2018

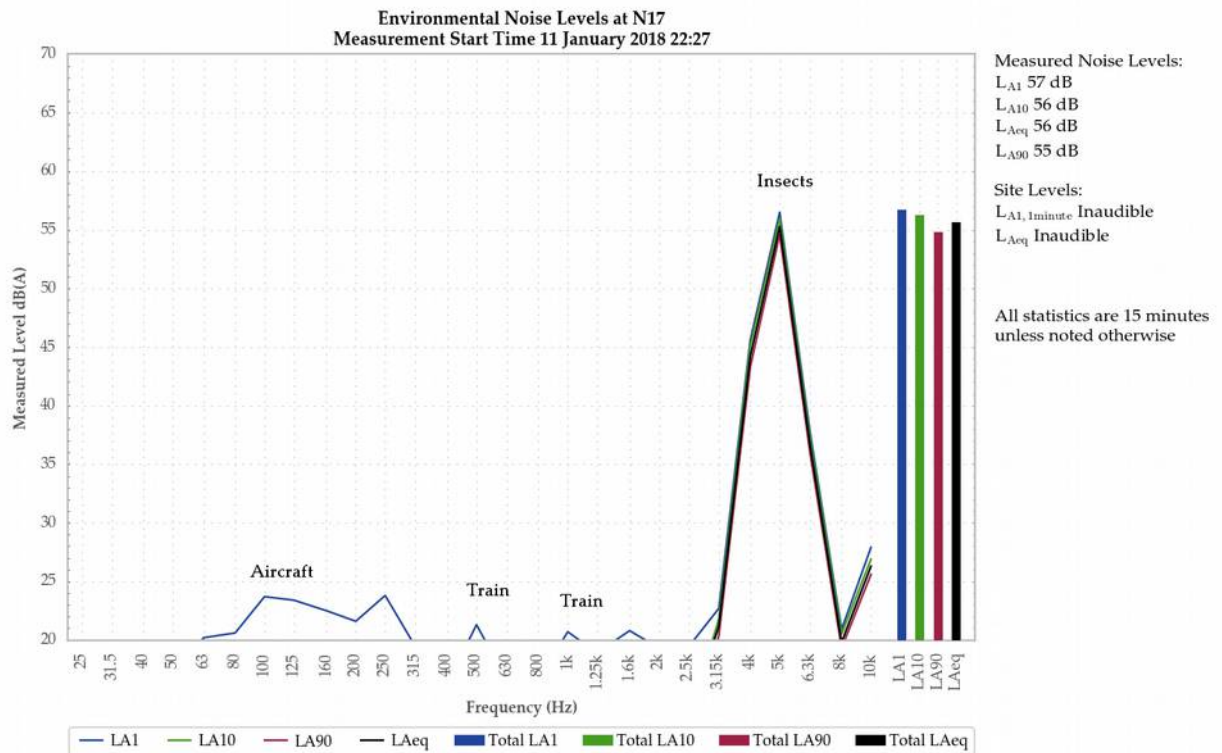


Figure 7: Environmental Noise Levels - N17 Mogo Road, off Araluen Road

WCP was inaudible.

Insects generated measured levels.

An aircraft, train, and birds were also noted.

5.1.6 N19, 11 January 2018

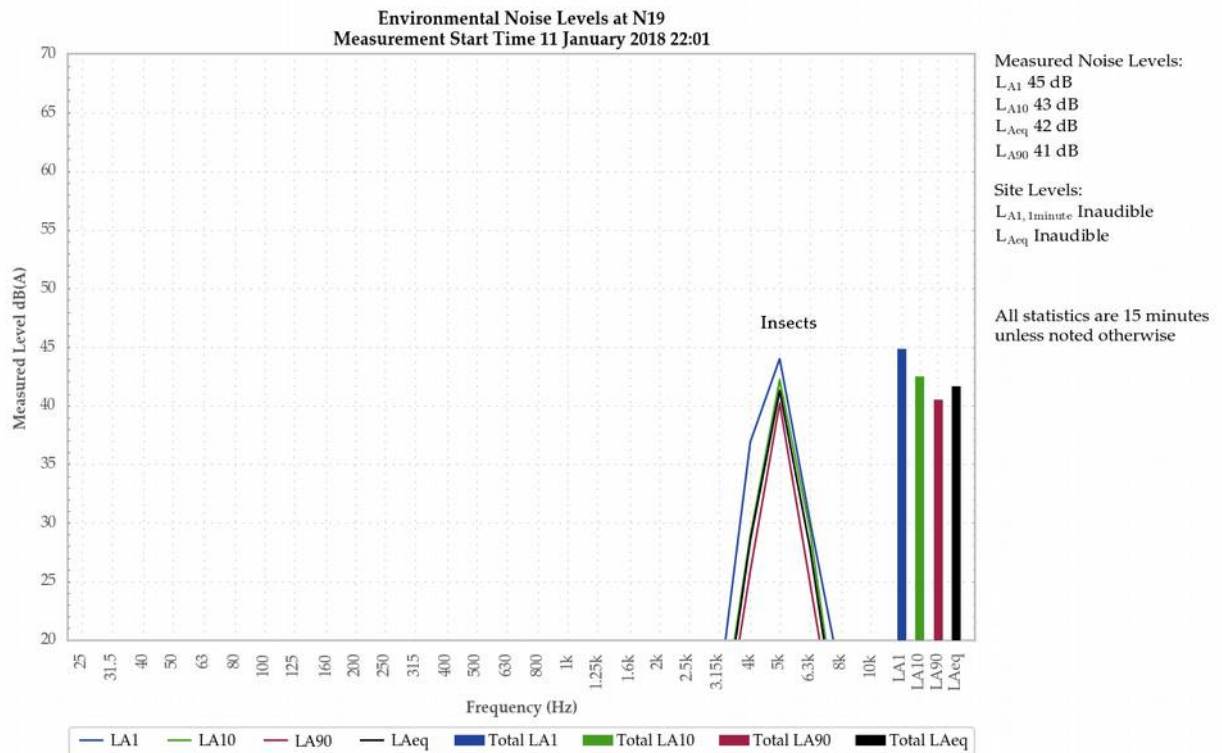


Figure 8: Environmental Noise Levels - N19, Upper Mogo Road

WCP was inaudible.

Insects generated measured levels.

Wildlife noises and an aircraft were also noted.

5.1.7 N20, 11 January 2018

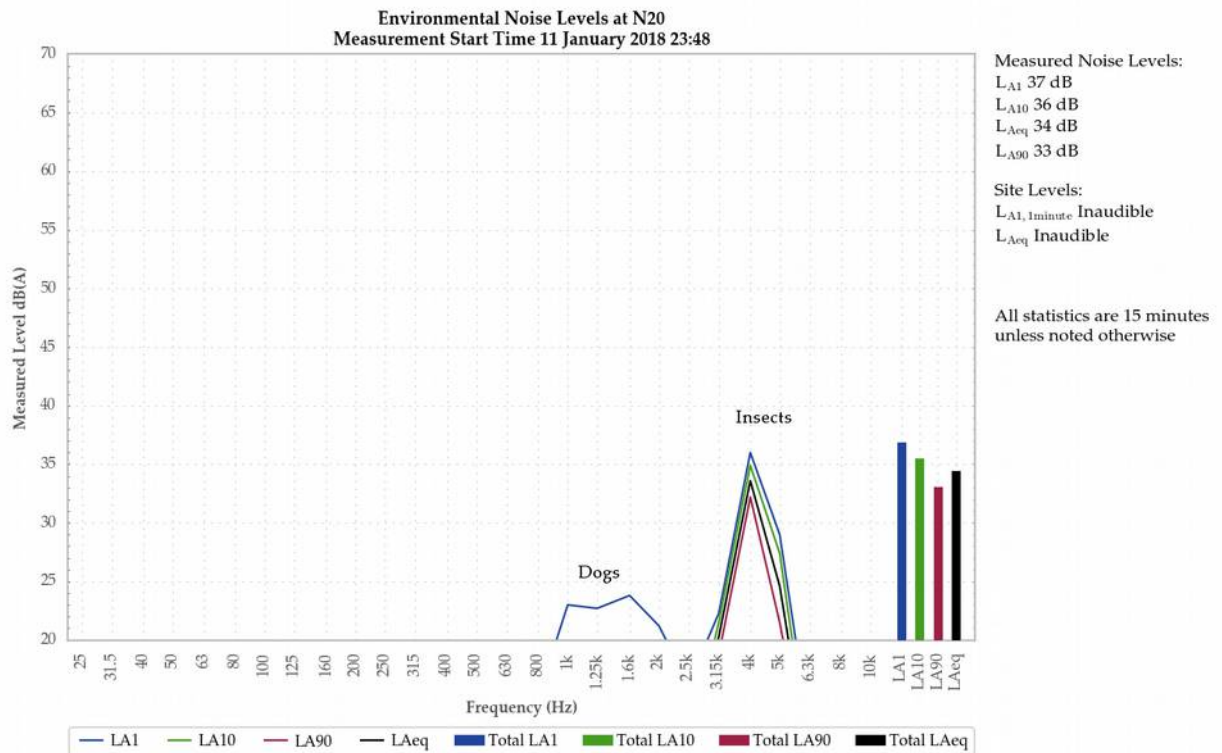


Figure 9: Environmental Noise Levels, N20 - Ringwood Road

WCP was inaudible.

Insects generated measured levels.

Dogs, frogs, aircraft, and road traffic were also noted.

5.1.8 N21, 12 January 2018

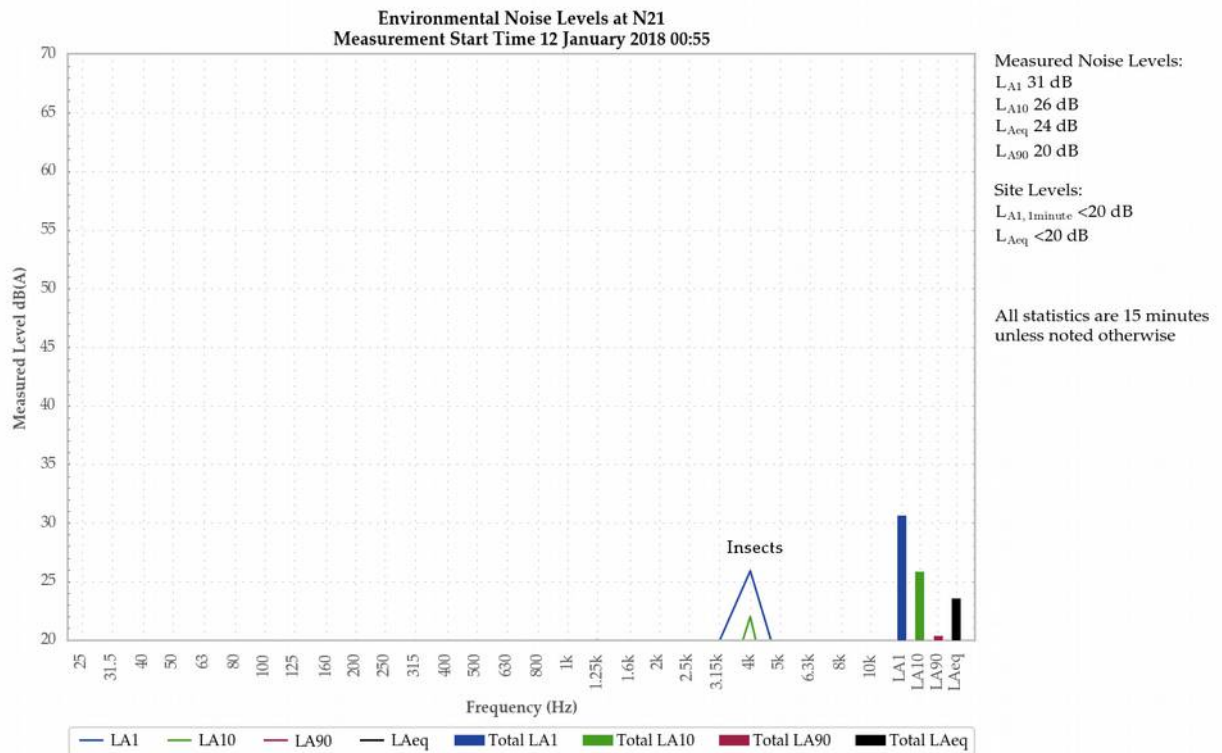


Figure 10: Environmental Noise Levels, N21 - 'Wandoona', Barigan Road

A low-level continuum from WCP was audible during the measurement generating the site only LAeq and LA1,1minute of less than 20 dB.

Insects, road traffic, and livestock contributed to measured levels.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 11/12 January 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the January 2018 monitoring period.

6.2 Low Frequency Assessment

A low frequency assessment was carried out in accordance with the EPA 'Noise Policy for Industry' (NPfI). Low frequency modification factors, where applicable, did not result in any exceedances of WCP noise limits during the January survey.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the NSW Industrial Noise Policy and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/100m.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

R4 Other reporting conditions

- R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in Condition L5.1; and
 - b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and AS 1055.1-1997 '*Acoustics – Description and measurement of environmental noise – General procedures*'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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 61672-3.2006
Calibration Certificate

Calibration Number C16643

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 : 22.2°C
Relative Humidity : 46.6%
Barometric Pressure : 99.95kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 44.5%
Barometric Pressure : 99.95kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 16/11/2016

Secondary Check: Sandra Minto
Report Issue Date : 17/11/2016

Approved Signatory :

Juan Agüero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.12dB	Relative Humidity	±0.46%
12.5kHz	±0.18dB	Barometric Pressure	±0.017kPa
16kHz	±0.31dB		
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.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17511

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Equipment Tested/ Model Number : Rion NC-73
Instrument Serial Number : 11248300

Atmospheric Conditions
Ambient Temperature : 22.8°C
Relative Humidity : 49.8%
Barometric Pressure : 99.46kPa

Calibration Technician : Jason Gomes
Calibration Date : 10/10/2017
Secondary Check: Riley Cooper
Report Issue Date : 11/10/2017

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	94.2	1004.10

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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.



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Sound Level Meter
IEC 61672-3:2006

Calibration Certificate

Calibration Number C16323

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

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Pre-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.19kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.23kPa

Calibration Technician : Calvin
Simpfendorfer
Calibration Date : 28/06/2016

Secondary Check: Riley Cooper
Report Issue Date : 30/06/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

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	±0.31dB	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.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions	
Ambient Temperature :	21.9°C
Relative Humidity :	54.6%
Barometric Pressure :	98.84kPa

Calibration Technician :	Vicky Jaiswal	Secondary Check:	Riley Cooper
Calibration Date :	30/03/2017	Report Issue Date :	31/03/2017

Approved Signatory :

Juan Aguero

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	1000.38

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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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Wilpinjong Coal

*Environmental Noise
Monitoring*

February 2018

Prepared for

Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring February 2018

Reference: 18052_R01

Report date: 11 March 2018

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Jason Cameron
Acoustics Technician



QA Review: Amanda Borserio
Acoustic 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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 8/9 February 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during the February 2018 monitoring.

Low Frequency Noise Assessment

A low frequency assessment was carried out in accordance with the EPA 'Noise Policy for Industry' (NPfI). Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the February survey.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 8/9 February 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

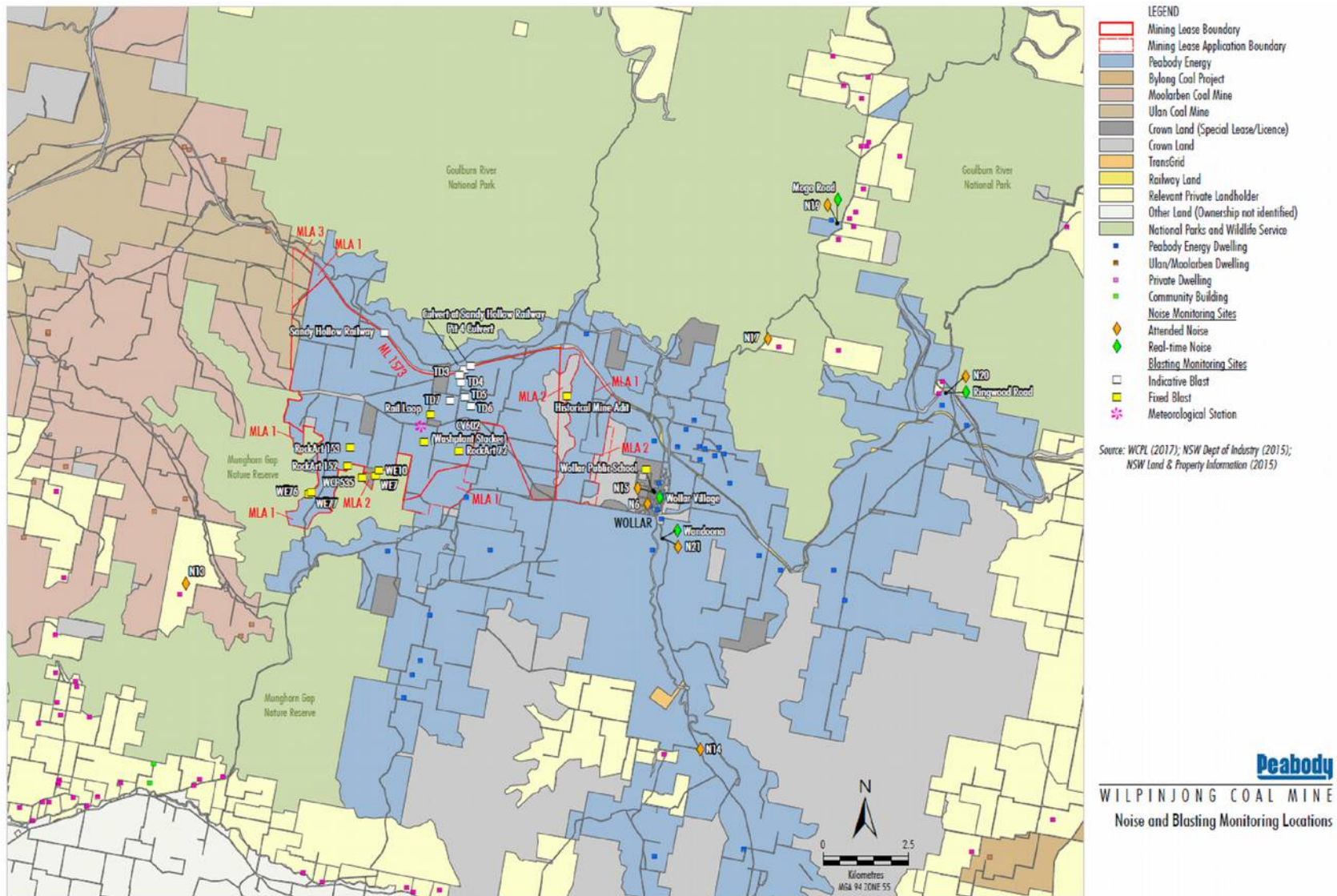


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VIG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
2. N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.1 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor/ Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or
- c) Temperature inversion conditions greater than 3°C per 100 metres.

2.2 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.2.1 Tonal 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.

There were no intermittent noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI.

2.2.2 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 Assessment Method

Attended monitoring was conducted in accordance with relevant EPA guidelines and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Amanda Borserio.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.2 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	370304	16/11/2018
Rion NC-73 acoustic calibrator	11248300	10/10/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. The real-time

measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – FEBRUARY 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	09/02/2018 00:59	56	49	34	26	36	24	19	49
N13	09/02/2018 01:48	54	34	27	24	28	23	21	47
N14	09/02/2018 00:08	51	36	32	31	31	28	21	46
N15	08/02/2018 22:57	62	56	41	29	41	25	21	43
N17	08/02/2018 22:26	46	46	45	44	44	43	40	43
N19	08/02/2018 22:00	43	32	30	28	28	25	21	42
N20	08/02/2018 23:30	49	38	33	30	31	28	21	33
N21	09/02/2018 00:39	41	28	25	23	24	22	19	49

Note:

1. Noise levels in this table are not necessarily the result of activities at WCP.

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.2. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.2: REAL-TIME AND ATTENDED NOISE LEVELS, FEBRUARY 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L _{Aeq} dB	Low pass (<630Hz) L _{Aeq} dB	Low pass (<630Hz) L _{A90} dB	WCP L _{Aeq} dB
N15/SX33	08/02/2018 22:57	08/02/2018 23:00	33	22	20	IA
N19/SX32	08/02/2018 22:00	08/02/2018 22:00	32	12	10	IA
N20/SX30	08/02/2018 23:30	08/02/2018 23:30	35	27	22	IA
N21/SX31	09/02/2018 00:39	09/02/2018 00:45	26	25	23	<30

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no data recorded.

4.2 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.3: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/02/2018 00:59	0.0	G	37	No	IA	NA
N13	09/02/2018 01:48	0.7	F	36	Yes	<25	Nil
N14	09/02/2018 00:08	0.6	G	35	No	<25	NA
N15	08/02/2018 22:57	0.0	G	35	No	IA	NA
N17	08/02/2018 22:26	0.5	G	35	No	IA	NA
N19	08/02/2018 22:00	1.1	F	35	Yes	IA	Nil
N20	08/02/2018 23:30	0.7	G	35	No	IA	NA
N21	09/02/2018 00:39	0.6	G	35	No	<25	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.4: *L_{A1,1minute}* GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP <i>L_{A1,1min}</i> dB ^{4,5}	Exceedance ⁶
N6	09/02/2018 00:59	0.0	G	45	No	IA	NA
N13	09/02/2018 01:48	0.7	F	45	Yes	30	Nil
N14	09/02/2018 00:08	0.6	G	45	No	26	NA
N15	08/02/2018 22:57	0.0	G	45	No	IA	NA
N17	08/02/2018 22:26	0.5	G	45	No	IA	NA
N19	08/02/2018 22:00	1.1	F	45	Yes	IA	Nil
N20	08/02/2018 23:30	0.7	G	45	No	IA	NA
N21	09/02/2018 00:39	0.6	G	45	No	<30	NA

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mines EPL.

Table 4.5: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – FEBRUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	09/02/2018 00:59	0.0	4.8	35	No	IA	NA
N13	09/02/2018 01:48	0.7	3.6	35	No	<25	NA
N14	09/02/2018 00:08	0.6	5.0	35	No	<25	NA
N15	08/02/2018 22:57	0.0	6.4	35	No	IA	NA
N17	08/02/2018 22:26	0.5	4.0	35	No	IA	NA
N19	08/02/2018 22:00	1.1	3.0	35	Yes	IA	Nil
N20	08/02/2018 23:30	0.7	4.8	35	No	IA	NA
N21	09/02/2018 00:39	0.6	4.8	35	No	<25	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.6: $L_{A1,1minute}$ GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	09/02/2018 00:59	0.0	4.8	45	No	IA	NA
N13	09/02/2018 01:48	0.7	3.6	45	No	30	NA
N14	09/02/2018 00:08	0.6	5.0	45	No	26	NA
N15	08/02/2018 22:57	0.0	6.4	45	No	IA	NA
N17	08/02/2018 22:26	0.5	4.0	45	No	IA	NA
N19	08/02/2018 22:00	1.1	3.0	45	Yes	IA	Nil
N20	08/02/2018 23:30	0.7	4.8	45	No	IA	NA
N21	09/02/2018 00:39	0.6	4.8	45	No	<30	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Assessment

Measured WCP only levels were assessed for the applicability of low frequency modifying factors in accordance with the EPA's NPfI.

None of the eight measurements satisfied the conditions outlined in Section 3.3. Therefore no further assessment was undertaken.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.7. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – FEBRUARY 2018

Location	Start Date And Time	Temperature °C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	09/02/2018 00:59	22	0.0	-	0
N13	09/02/2018 01:48	21	0.6	140	0
N14	09/02/2018 00:08	23	0.7	140	0
N15	08/02/2018 22:57	25	0.0	-	0
N17	08/02/2018 22:26	25	0.0	-	0
N19	08/02/2018 22:00	25	0.0	-	0
N20	08/02/2018 23:30	25	0.6	270	0
N21	09/02/2018 00:39	21	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.8 and is used to determine compliance with specified noise criteria.

Table 4.8: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
08/02/2018 22:00	1.2	136	3.8
08/02/2018 22:15	1.1	133	3.0
08/02/2018 22:30	0.9	150	3.0
08/02/2018 22:45	0.5	192	4.0
08/02/2018 23:00	0.7	345	4.8
08/02/2018 23:15	0.0	-	6.4
08/02/2018 23:30	0.0	-	5.2
08/02/2018 23:45	0.7	304	4.8
09/02/2018 00:00	0.6	280	4.4
09/02/2018 00:15	0.8	320	4.4
09/02/2018 00:30	0.6	311	5.0
09/02/2018 00:45	0.5	308	4.4
09/02/2018 01:00	0.6	326	4.8
09/02/2018 01:15	0.0	-	4.8
09/02/2018 01:30	0.5	320	4.2
09/02/2018 01:45	0.0	-	4.8
09/02/2018 02:00	0.7	298	3.6
09/02/2018 02:15	0.7	298	3.0
09/02/2018 02:30	0.2	310	3.8
09/02/2018 02:45	0.5	322	4.4
09/02/2018 03:00	0.0	-	4.6
09/02/2018 03:15	0.6	291	3.6
09/02/2018 03:30	0.8	283	2.0
09/02/2018 03:45	0.5	352	2.4
09/02/2018 04:00	0.5	323	3.2
09/02/2018 04:15	0.8	193	3.2
09/02/2018 04:30	0.6	42	4.8

Notes:

1. Data downloaded from WCP meteorological station;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

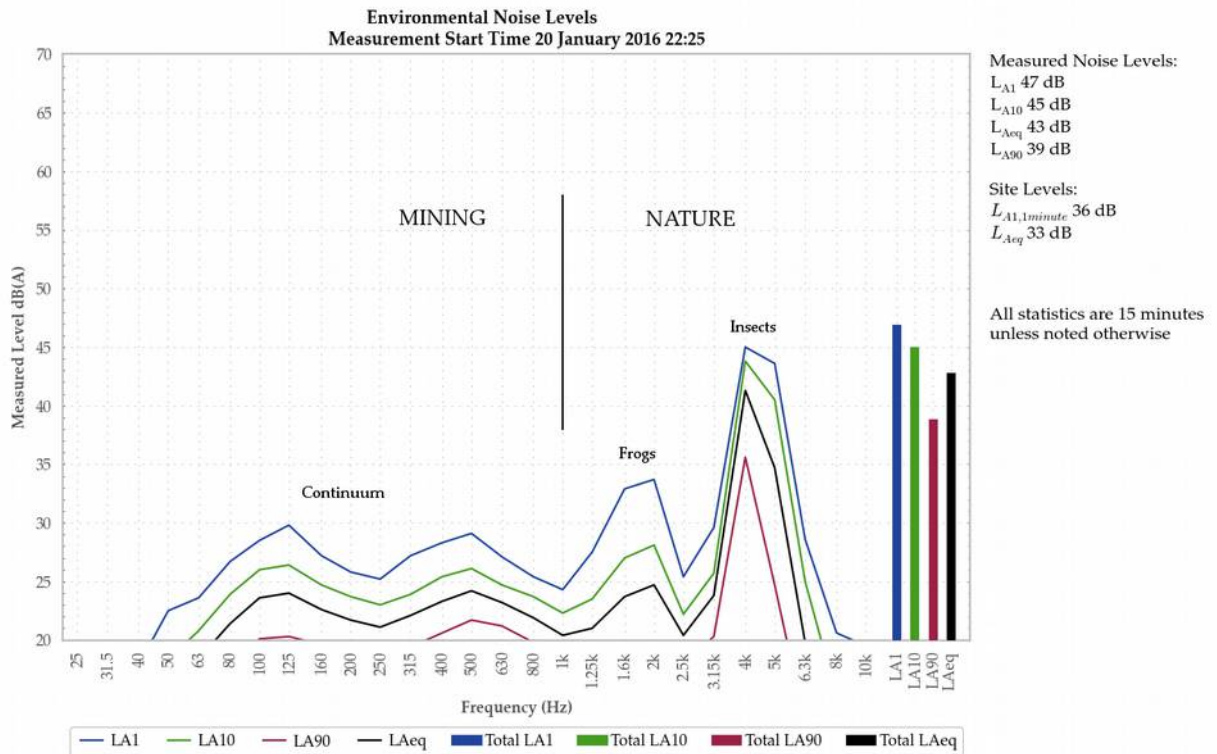
5.1 Noted Noise Sources

Table 4.1 to Table 4.6 present data gathered during attended monitoring. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .



5.1.1 N6, 9 February 2018

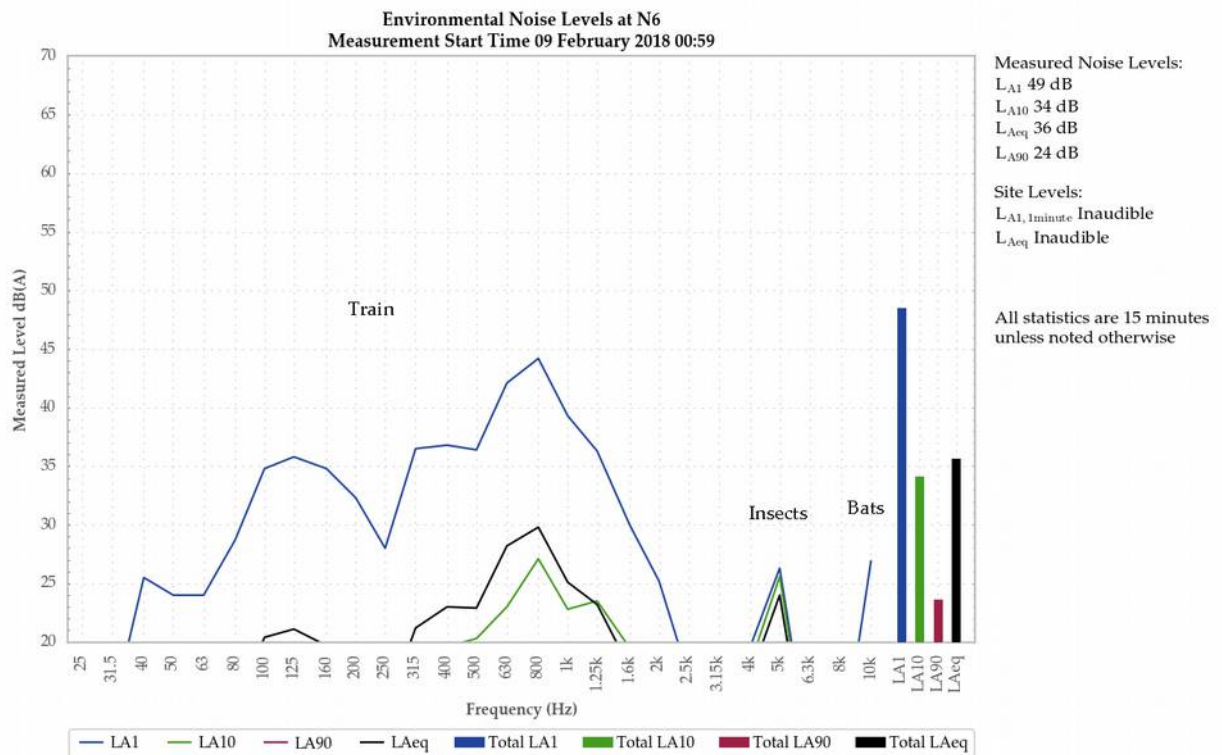


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

A train generated the measured LA1, LA10 and LAeq. Insects generated the measured LA90.

Dogs, cows, bats and breeze were also noted.

5.1.2 N13, 9 February 2018

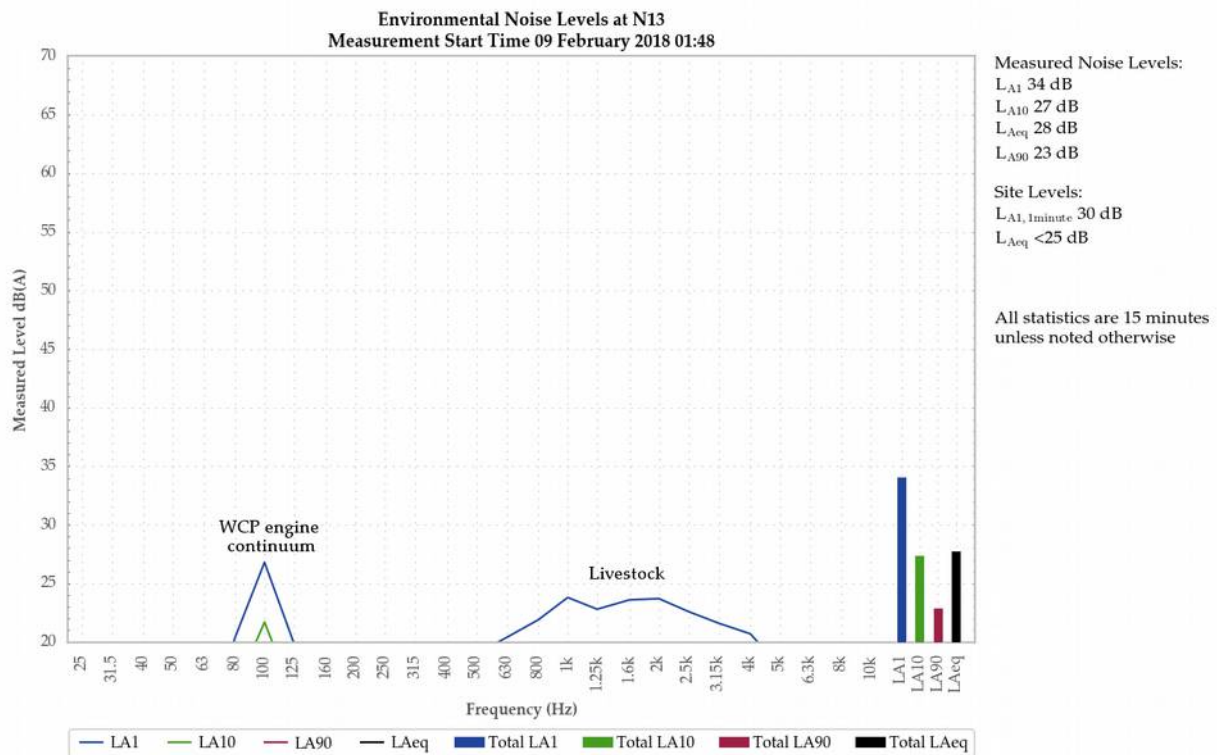


Figure 4: Environmental Noise Levels - N13, 'Coonaroo' off Moolarben Road

A WCP engine continuum was audible throughout the measurement, and generated the site only L_{Aeq} of less than 25dB. A surge in the continuum generated the site only L_{A1,1minute} of 30dB. Track noise was also noted.

The WCP mining continuum contributed to all measured levels. Livestock contributed to the measured LAq and L_{Aeq}. Insects contributed to the measured L_{A90}.

Birds were also noted.

5.1.3 N14, 9 February 2018

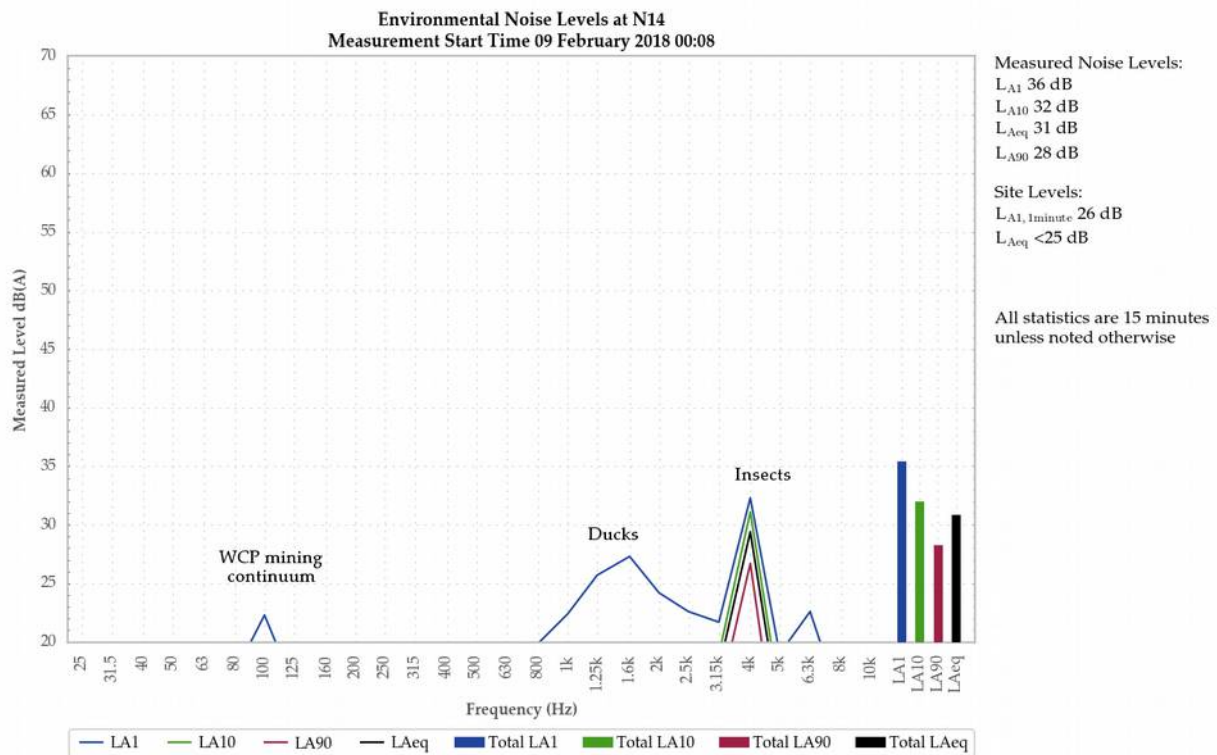


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site only LAeq of less than 25 dB and LA1,1minute of 26 dB.

Insects primarily generated the measured levels. Ducks contributed to the measured LA1.

5.1.4 N15, 8 February 2018

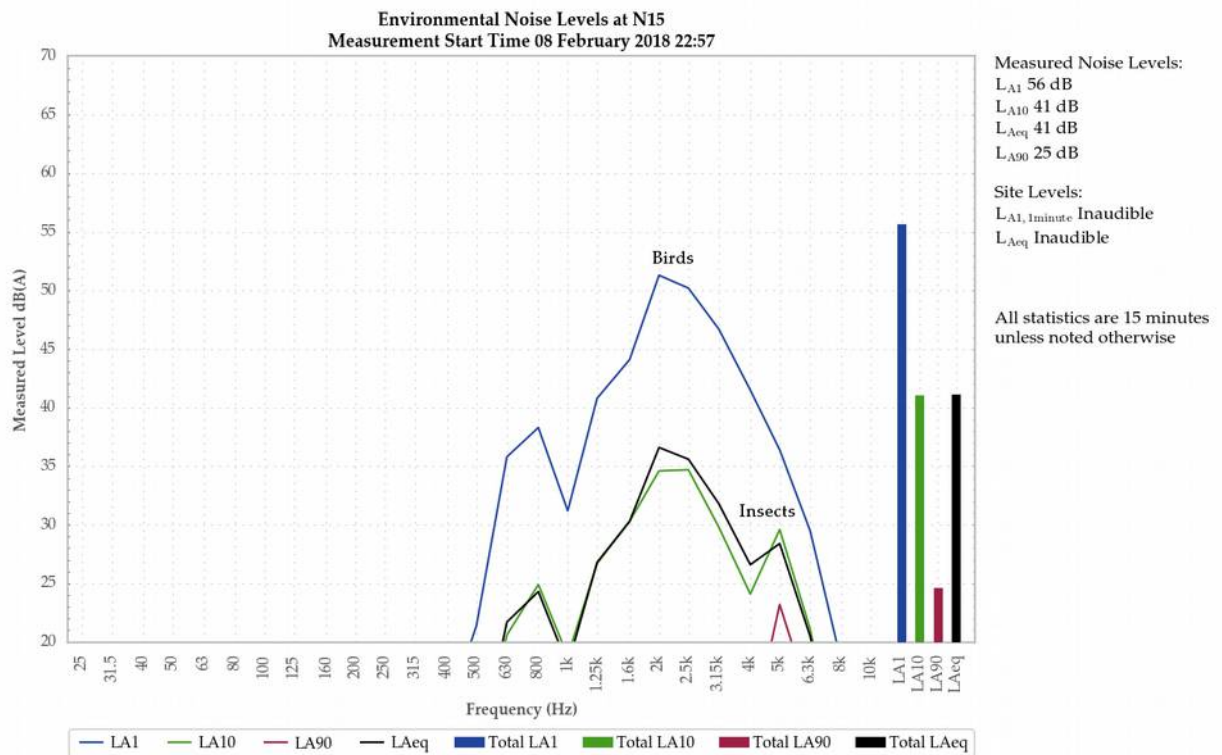


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Birds primarily generated the measured LA1, LA10, and LAeq. Insects generated the measured LA90.

Aircraft and wildlife noises were also noted.

5.1.5 N17, 8 February 2018

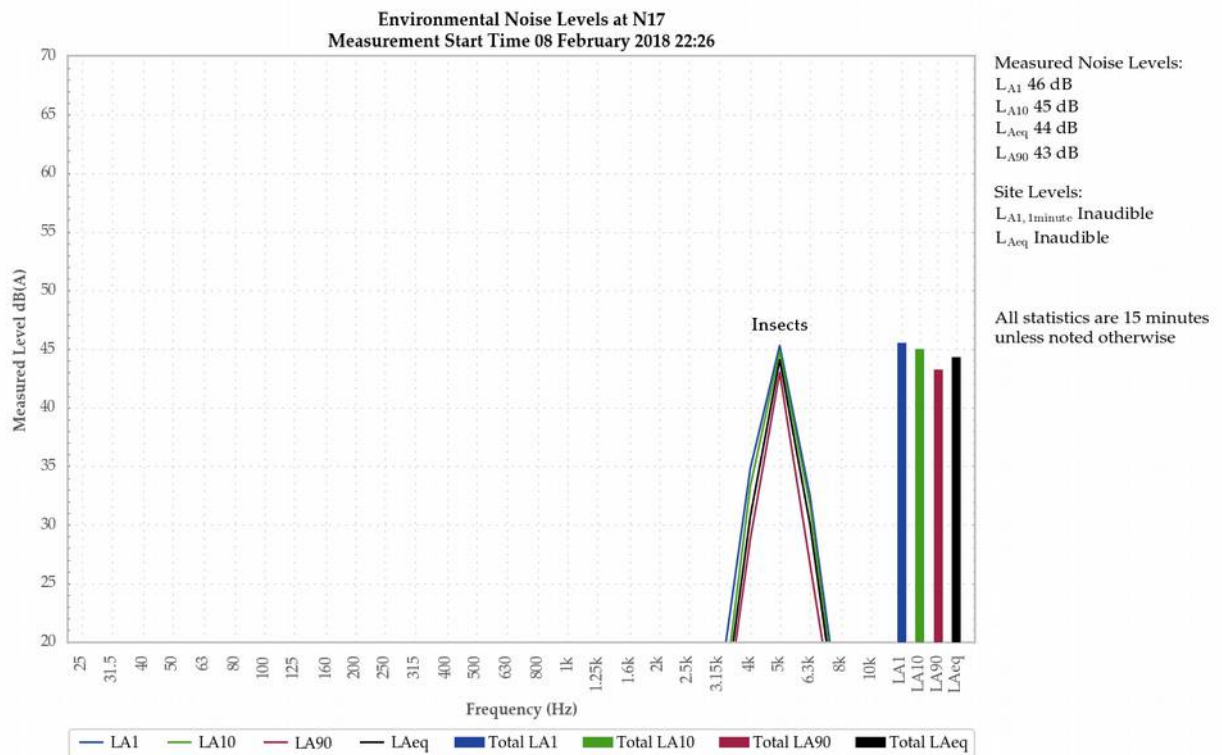


Figure 7: Environmental Noise Levels - N17 Mogo Road, off Araluen Road

WCP was inaudible.

Insects generated measured levels.

Insects and wildlife noises were also noted.

5.1.6 N19, 8 February 2018

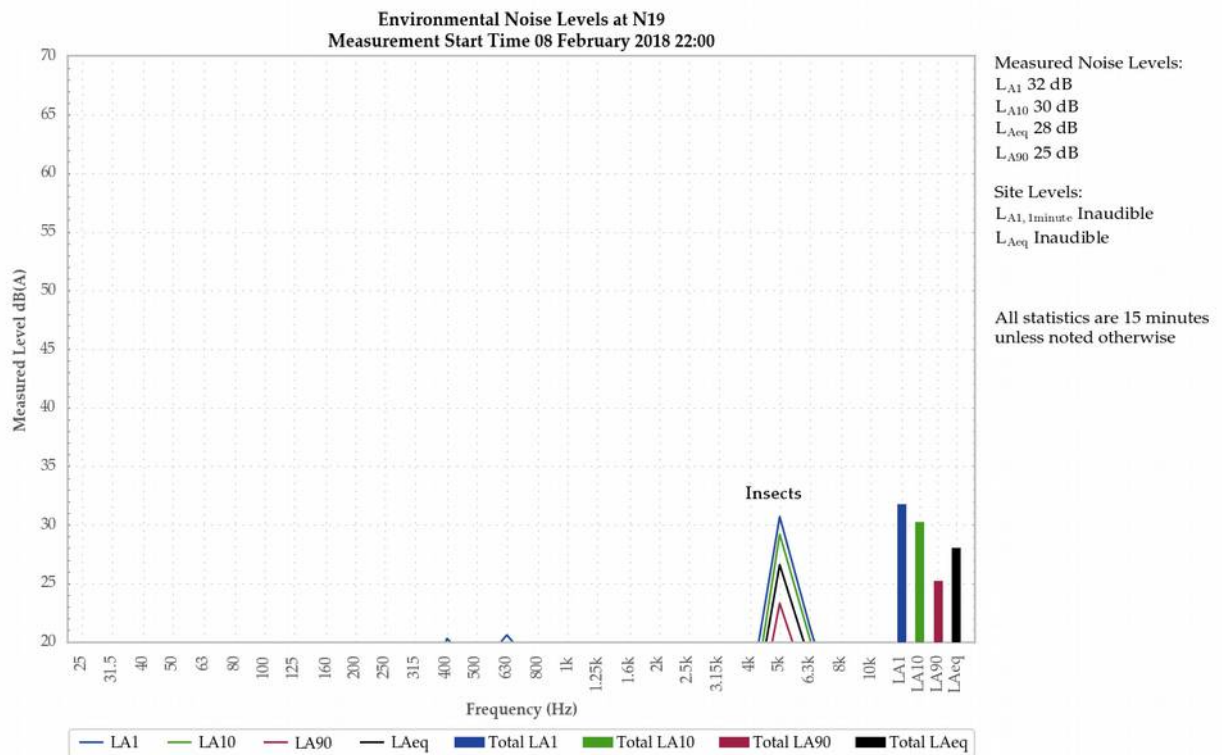


Figure 8: Environmental Noise Levels - N19, Upper Mogo Road

WCP was inaudible.

Insects generated measured levels.

Wildlife, birds, bats and a nearby pump were also noted.

5.1.7 N20, 8 February 2018

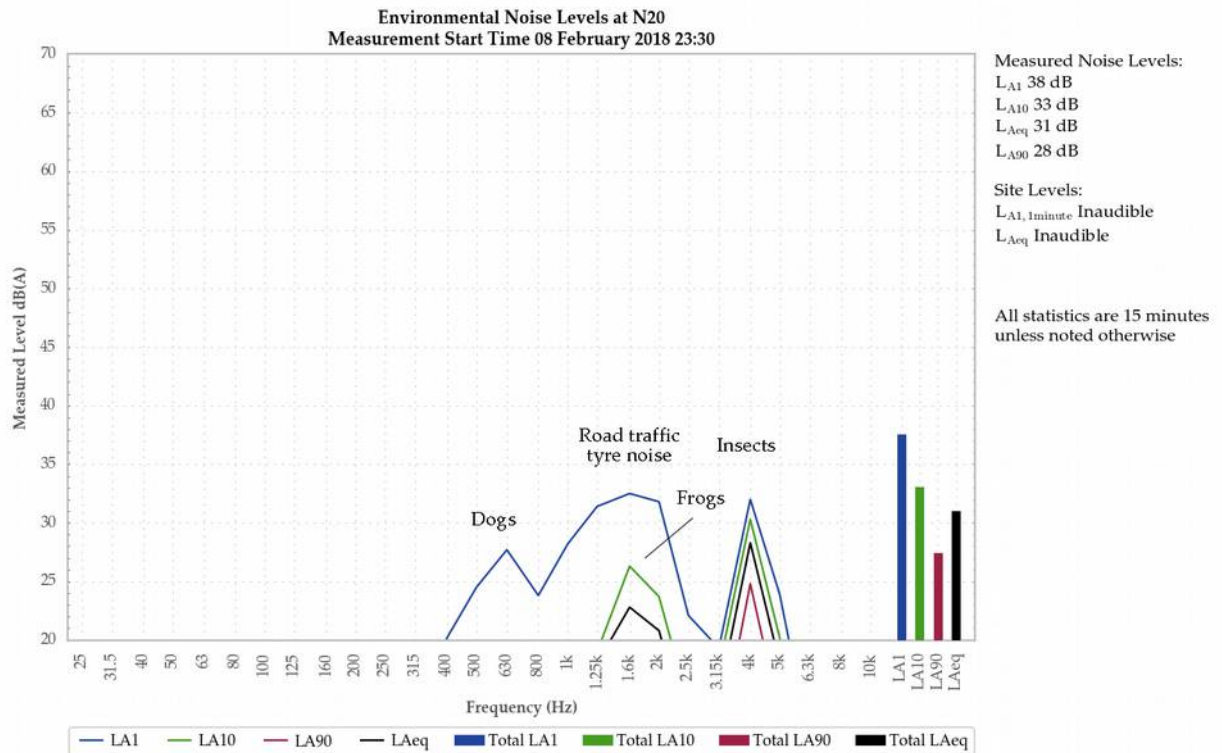


Figure 9: Environmental Noise Levels, N20 - Ringwood Road

WCP was inaudible.

Road traffic tyre noise and insects generated the measured L_{A1}. Insects and frogs generated the measured L_{A10}, L_{Aeq} and L_{A90}.

Dogs, a pump, cows and birds were also noted.

5.1.8 N21, 9 February 2018

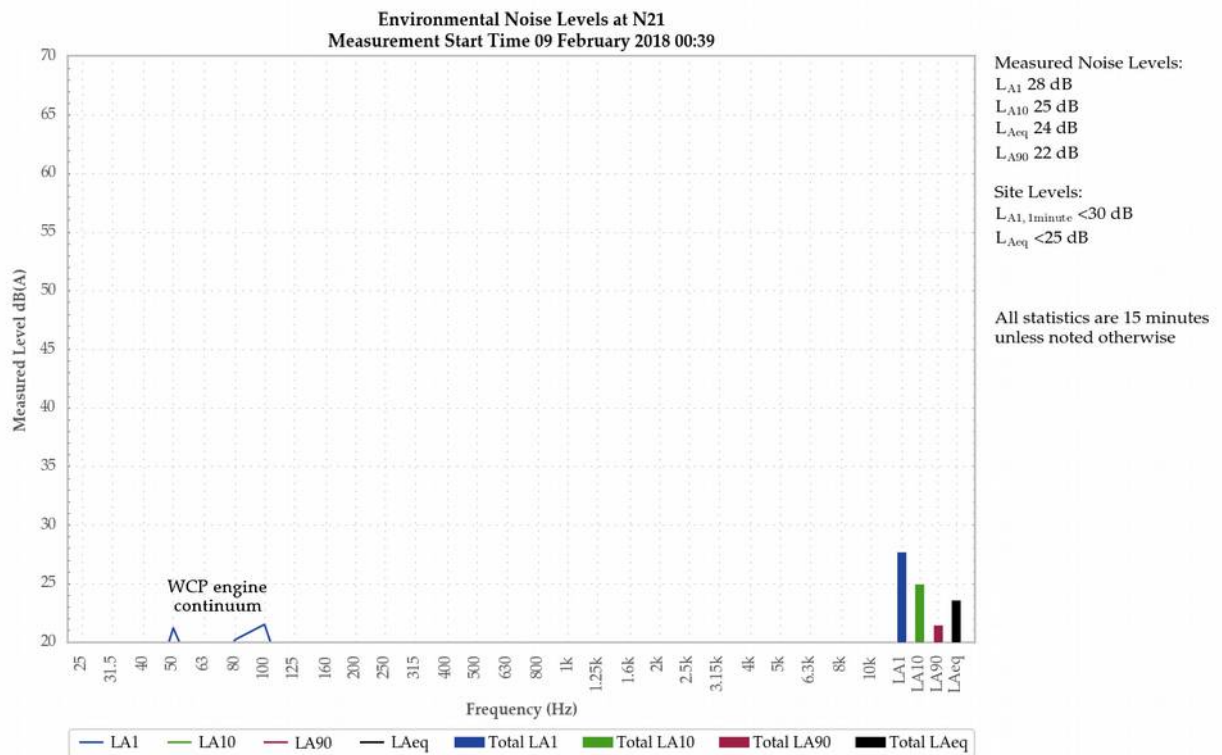


Figure 10: Environmental Noise Levels, N21 - 'Wandoona', Barigan Road

A low-level engine continuum from WCP was audible during the measurement generating the site only LAeq of less than 25dB and the site only LA1,1minute of less than 30 dB.

Insects, birds and cows also contributed to measured levels.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 8/9 February 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the February 2018 monitoring period.

6.2 Low Frequency Noise Assessment

A low frequency assessment was carried out in accordance with the EPA 'Noise Policy for Industry' (NPfI). Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the February survey.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows:
Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/100m.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

R4 Other reporting conditions

- R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in Condition L5.1; and
 - b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and AS 1055.1-1997 '*Acoustics – Description and measurement of environmental noise – General procedures*'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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 61672-3.2006
Calibration Certificate

Calibration Number C16643

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 : 22.2°C
Relative Humidity : 46.6%
Barometric Pressure : 99.95kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 44.5%
Barometric Pressure : 99.95kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 16/11/2016

Secondary Check: Sandra Minto
Report Issue Date : 17/11/2016

Approved Signatory :

Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.12dB	Relative Humidity	±0.46%
12.5kHz	±0.18dB	Barometric Pressure	±0.017kPa
16kHz	±0.31dB		
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.

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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Research
Labs Pty Ltd**

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Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17511

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Equipment Tested/ Model Number : Rion NC-73
Instrument Serial Number : 11248300

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 49.8%
Barometric Pressure : 99.46kPa

Calibration Technician : Jason Gomes
Calibration Date : 10/10/2017
Secondary Check: Riley Cooper
Report Issue Date : 11/10/2017

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	94.2	1004.10

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 ±0.11dB	Temperature ±0.05°C
Short Term Fluct. ±0.02dB	Relative Humidity ±0.46%
Frequency ±0.01%	Barometric Pressure ±0.017kPa
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.

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

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Wilpinjong Coal

*Environmental Noise
Monitoring
March 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring March 2018

Reference: 18111_R01

Report date: 30 April 2018

Prepared for

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Locked Bag 2005
Mudgee NSW 2850

Prepared by

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Thornton NSW 2322



Prepared: Jason Cameron
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QA Review: Amanda Borserio
Acoustic 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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 27/28 March 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during March 2018 monitoring.

Low Frequency Noise Assessment

A low frequency noise assessment was carried out in accordance with the EPA's NPfI. Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the March 2018 survey.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 27/28 March 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

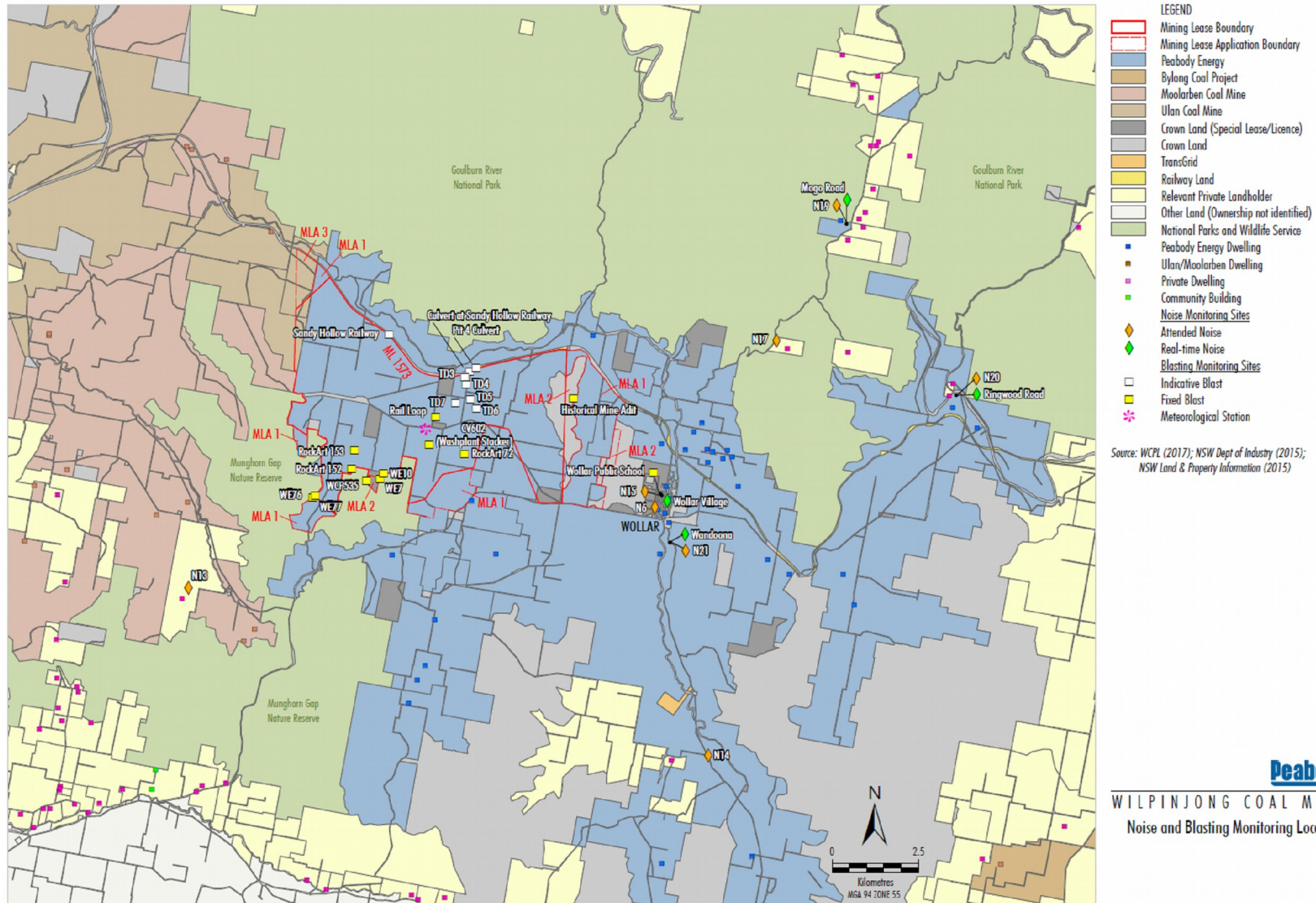


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Approval Criteria and Weather Conditions

Criteria detailed in Table 2.1 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), noise criteria apply under all meteorological conditions except for the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or
- c) stability category G temperature inversion conditions.

2.1 EPL Criteria and Weather Conditions

Criteria detailed in Table 2.2 have been selected as the most appropriate for each monitoring location and are based on the project approval associated with WCP.

Table 2.2: WCP - PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church, Wollar Village	36	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

1. Noise limits for N6 have been assumed to be those listed for 'Wollar Village' in Section L5.1 of the EPL, as it falls within the village of Wollar.

Condition L5.3 in the EPL states:

The noise limits set out in condition 5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres per second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C per 100 metres and wind speeds greater than 2 metres per second at 10 metres above the ground level; or
- c) Temperature inversion conditions greater than 3°C per 100 metres.

2.2 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.2.1 Tonal 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.

There were no intermittent noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI.

2.2.2 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 Assessment Method

Attended monitoring was conducted in accordance with the EPA guidelines and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.2 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30921838	23/06/2019
ARL ND9 acoustic calibrator	435847	26/06/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time

measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – MARCH 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	28/03/2018 01:11	40	26	23	20	21	18	17	36
N13	28/03/2018 01:49	42	38	35	32	32	30	27	52
N14	28/03/2018 00:20	47	30	28	26	27	24	22	50
N15	27/03/2018 23:01	40	26	23	20	21	19	17	42
N17	27/03/2018 22:28	44	29	23	20	21	18	17	40
N19	27/03/2018 22:00	52	38	33	28	30	25	23	47
N20	27/03/2018 23:41	54	52	49	44	45	38	30	60
N21	28/03/2018 00:49	43	29	24	21	23	20	18	41

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.2. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.2: REAL-TIME AND ATTENDED NOISE LEVELS, MARCH 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L _{Aeq} dB	Low pass (<630Hz) L _{Aeq} dB	Low pass (<630Hz) L _{A90} dB	
N15/SX33	27/03/2018 23:01	27/03/2018 23:00	35	22	20	<20
N19/SX32	27/03/2018 22:00	27/03/2018 22:00	29	26	23	IA
N20/SX30	27/03/2018 23:41	27/03/2018 23:45	44	42	35	IA
N21/SX31	28/03/2018 00:49	28/03/2018 00:45	29	27	23	<25

Notes:

- Levels in this table are not necessarily the result of activity at WCP; and
- NR – no data recorded.

4.2 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the project approval. Modifying factors are considered in Section 4.4 of this report.

Table 4.3: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	28/03/2018 01:11	1.4	E	37	Yes	<20	Nil
N13	28/03/2018 01:49	0.7	F	36	Yes	32	Nil
N14	28/03/2018 00:20	1.7	E	35	Yes	<25	Nil
N15	27/03/2018 23:01	2.3	E	35	Yes	<20	Nil
N17	27/03/2018 22:28	2.5	E	35	Yes	IA	Nil
N19	27/03/2018 22:00	2.8	D	35	Yes	IA	Nil
N20	27/03/2018 23:41	2.0	E	35	Yes	IA	Nil
N21	28/03/2018 00:49	1.4	E	35	Yes	<25	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

Table 4.4: LA1,1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ⁶
N6	28/03/2018 01:11	1.4	E	45	Yes	<20	Nil
N13	28/03/2018 01:49	0.7	F	45	Yes	40	Nil
N14	28/03/2018 00:20	1.7	E	45	Yes	31	Nil
N15	27/03/2018 23:01	2.3	E	45	Yes	26	Nil
N17	27/03/2018 22:28	2.5	E	45	Yes	IA	Nil
N19	27/03/2018 22:00	2.8	D	45	Yes	IA	Nil
N20	27/03/2018 23:41	2.0	E	45	Yes	IA	Nil
N21	28/03/2018 00:49	1.4	E	45	Yes	30	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable.

4.3 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources with impact assessment criteria. Criteria are then applied if weather conditions are in accordance with the mines EPL.

Table 4.5: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – MARCH 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	28/03/2018 01:11	1.4	1.0	35	Yes	<20	Nil
N13	28/03/2018 01:49	0.7	1.6	35	Yes	32	Nil
N14	28/03/2018 00:20	1.7	0.2	35	Yes	<25	Nil
N15	27/03/2018 23:01	2.3	-0.4	35	Yes	<20	Nil
N17	27/03/2018 22:28	2.5	-0.4	35	Yes	IA	Nil
N19	27/03/2018 22:00	2.8	-0.6	35	Yes	IA	Nil
N20	27/03/2018 23:41	2.0	0.0	35	Yes	IA	Nil
N21	28/03/2018 00:49	1.4	0.8	35	Yes	<25	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

Table 4.6: LA1,1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – MARCH 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	VTG °C per 100m ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ⁶
N6	28/03/2018 01:11	1.4	1.0	45	Yes	<20	Nil
N13	28/03/2018 01:49	0.7	1.6	45	Yes	40	Nil
N14	28/03/2018 00:20	1.7	0.2	45	Yes	31	Nil
N15	27/03/2018 23:01	2.3	-0.4	45	Yes	26	Nil
N17	27/03/2018 22:28	2.5	-0.4	45	Yes	IA	Nil
N19	27/03/2018 22:00	2.8	-0.6	45	Yes	IA	Nil
N20	27/03/2018 23:41	2.0	0.0	45	Yes	IA	Nil
N21	28/03/2018 00:49	1.4	0.8	45	Yes	30	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is calculated from WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions except for the following: wind speeds greater than 3 m/s at 10 metres above ground level; or temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 m/s at 10 metres above ground level; or temperature inversion conditions greater than 3°C/100m;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions outside conditions specified in EPL and so criterion is not applicable.

4.4 Low Frequency Noise Assessment

Measured WCP only levels were assessed for the applicability of low frequency modifying factors in accordance with the EPA's NPfI.

One of the measurements satisfied the conditions outlined in Section 3.3. Results in Table 4.7 show that low frequency modifying factors were not required to be applied to measured WCP levels during the survey.

Table 4.7: LOW FREQUENCY NOISE MODIFYING FACTOR ASSESSMENT – MARCH 2018

Location	Start Date and Time	Measured Site Only L _{Aeq} dB	WCP Only L _{Ceq} dB ⁴	WCP Only L _{Ceq} - L _{Aeq} dB ^{1,4}	Result ^{2,3,4} Max exceedance of ref spectrum dB	Penalty dB
N13	28/03/2018 01:49	32	52	20	Nil	0

Notes:

1. As per NPfl, if $L_{Ceq} - L_{Aeq} \geq 15$ dB further assessment of low frequency noise required as detailed in Section 2.2.2 of this report;
2. As per NPfl, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded; and
4. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where criteria were not applicable due to meteorological conditions, this is noted as NA (not available) and no further assessment has been undertaken.

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.8. Atmospheric condition data is routinely recorded during each measurement to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.8: MEASURED ATMOSPHERIC CONDITIONS – MARCH 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	28/03/2018 01:11	17	0.0	-	0
N13	28/03/2018 01:49	17	0.0	-	0
N14	28/03/2018 00:20	18	0.0	-	0
N15	27/03/2018 23:01	19	0.0	-	0
N17	27/03/2018 22:28	17	0.0	-	0
N19	27/03/2018 22:00	18	1.1	130	0
N20	27/03/2018 23:41	18	0.0	-	0
N21	28/03/2018 00:49	17	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station is provided in Table 4.9 and is used to determine compliance with specified noise criteria.

Table 4.9: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
27/03/2018 22:00	2.8	90	-0.6
27/03/2018 22:15	2.6	95	-0.6
27/03/2018 22:30	2.5	95	-0.4
27/03/2018 22:45	2.2	97	-0.4
27/03/2018 23:00	2.3	110	-0.4
27/03/2018 23:15	2.6	112	-0.2
27/03/2018 23:30	2.4	99	-0.2
27/03/2018 23:45	2.0	99	0.0
28/03/2018 00:00	1.7	101	0.2
28/03/2018 00:15	1.7	101	0.2
28/03/2018 00:30	1.3	96	0.6
28/03/2018 00:45	1.4	90	0.8
28/03/2018 01:00	1.4	88	1.0
28/03/2018 01:15	1.4	82	1.0
28/03/2018 01:30	1.4	106	1.2
28/03/2018 01:45	0.7	105	1.6
28/03/2018 02:00	0.6	114	2.0
28/03/2018 02:15	0.9	102	1.4
28/03/2018 02:30	0.7	60	1.6
28/03/2018 02:45	0.0	60	2.2
28/03/2018 03:00	0.5	82	1.8
28/03/2018 03:15	1.1	118	1.6
28/03/2018 03:30	0.8	97	3.0
28/03/2018 03:45	0.5	54	3.6
28/03/2018 04:00	0.5	231	2.4
28/03/2018 04:15	0.4	235	0.6
28/03/2018 04:30	0.4	342	0.6

Notes:

1. *Data supplied by WCP;*
2. *"-" indicates calm conditions and therefore no wind direction; and*
3. *Lapse rate calculated using data sourced from WCP inversion tower.*

5 DISCUSSION

5.1 Noted Noise Sources

Table 4.1 to Table 4.6 present data gathered during attended monitoring. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

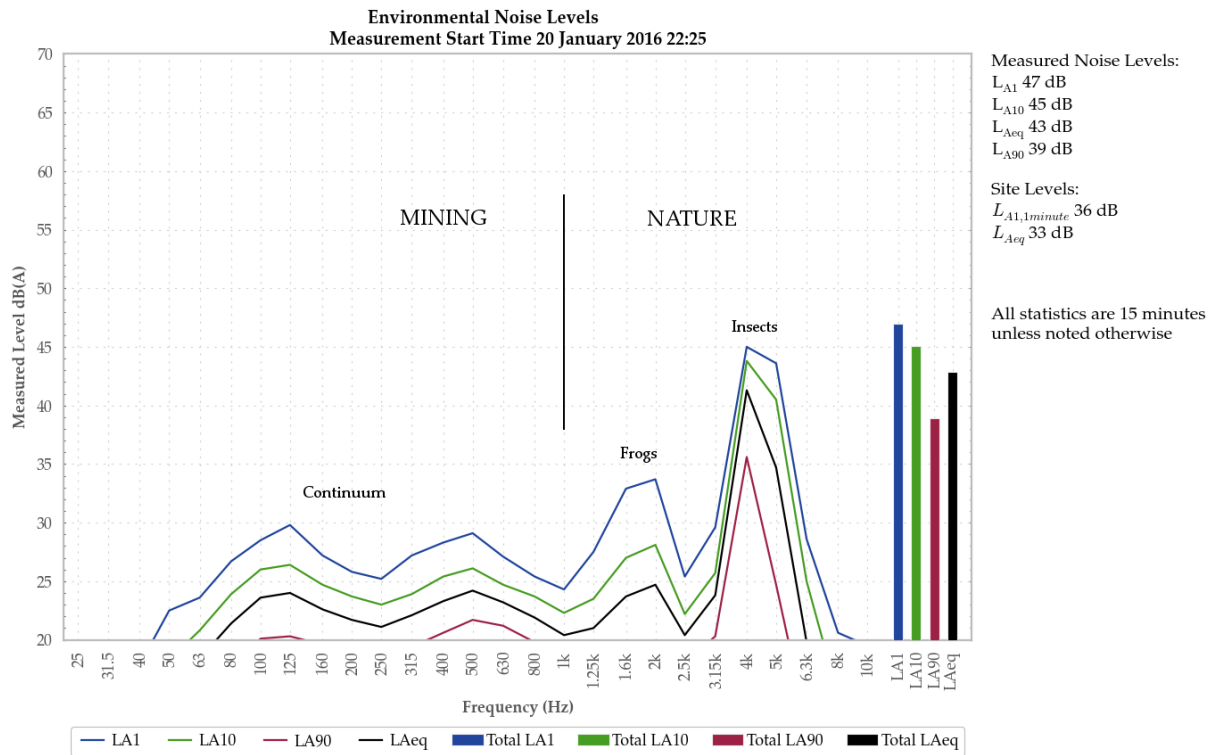


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 28 March 2018

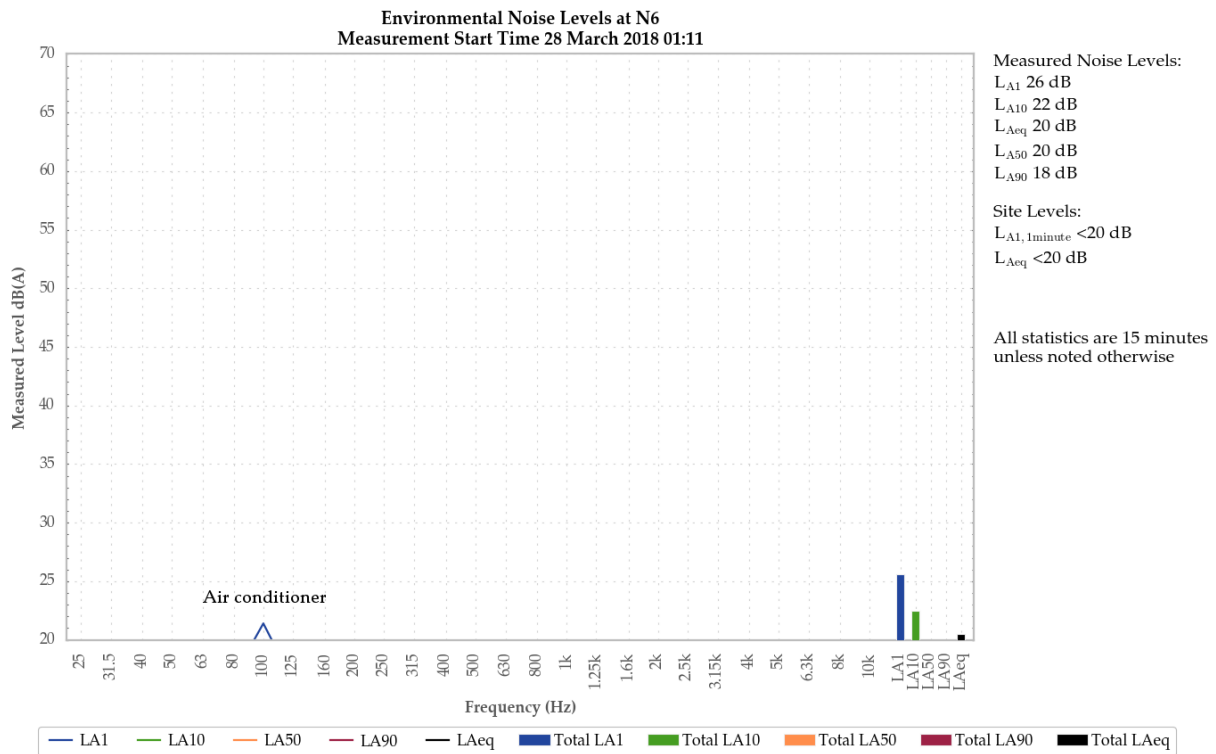


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A continuum from WCP was audible at times and generated the site only LAeq and LA1,1minute of less than 20 dB.

An air conditioner was primarily responsible for all measured levels.

Insects and bats were also noted.

5.1.2 N13, 28 March 2018

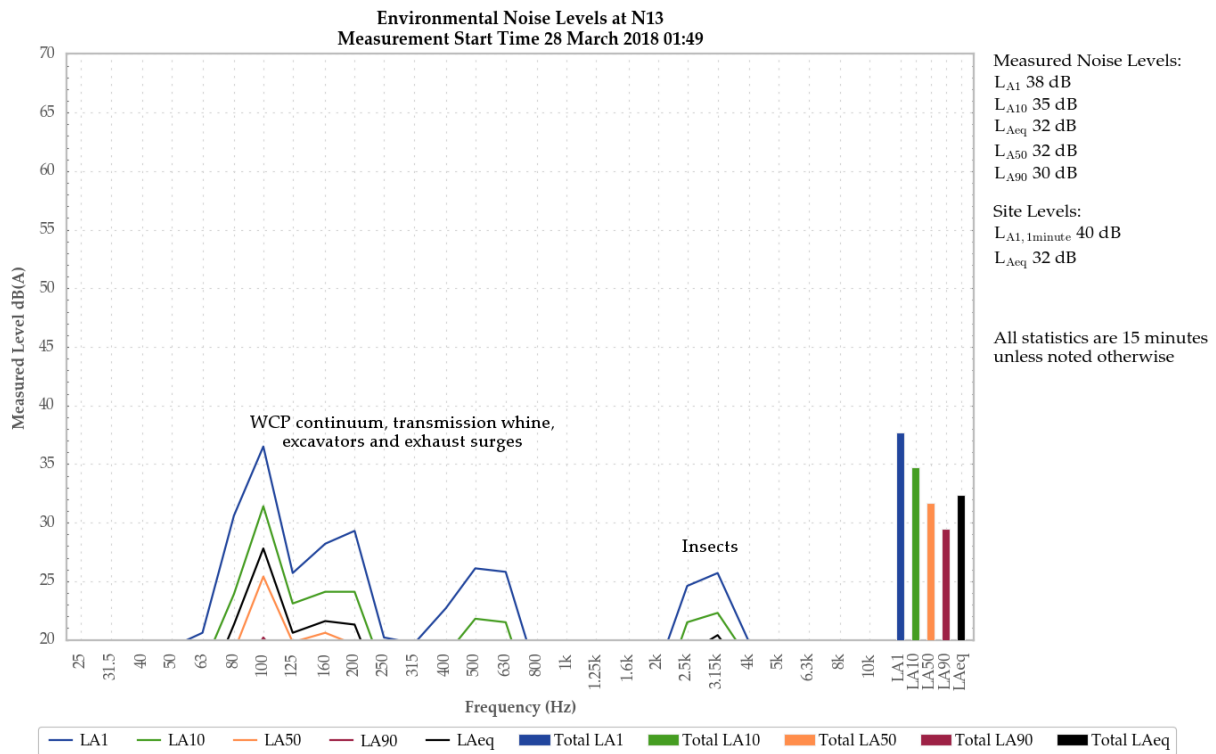


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

A WCP continuum, including excavator groans and squeals, was audible throughout the measurement and generated the site only LAeq of 32 dB. Exhaust surges generated the site only LA1,1minute of 40dB. Track noise was also noted.

WCP mining noise generated all measured levels.

Insects, cows and bats were also noted.

5.1.3 N14, 28 March 2018

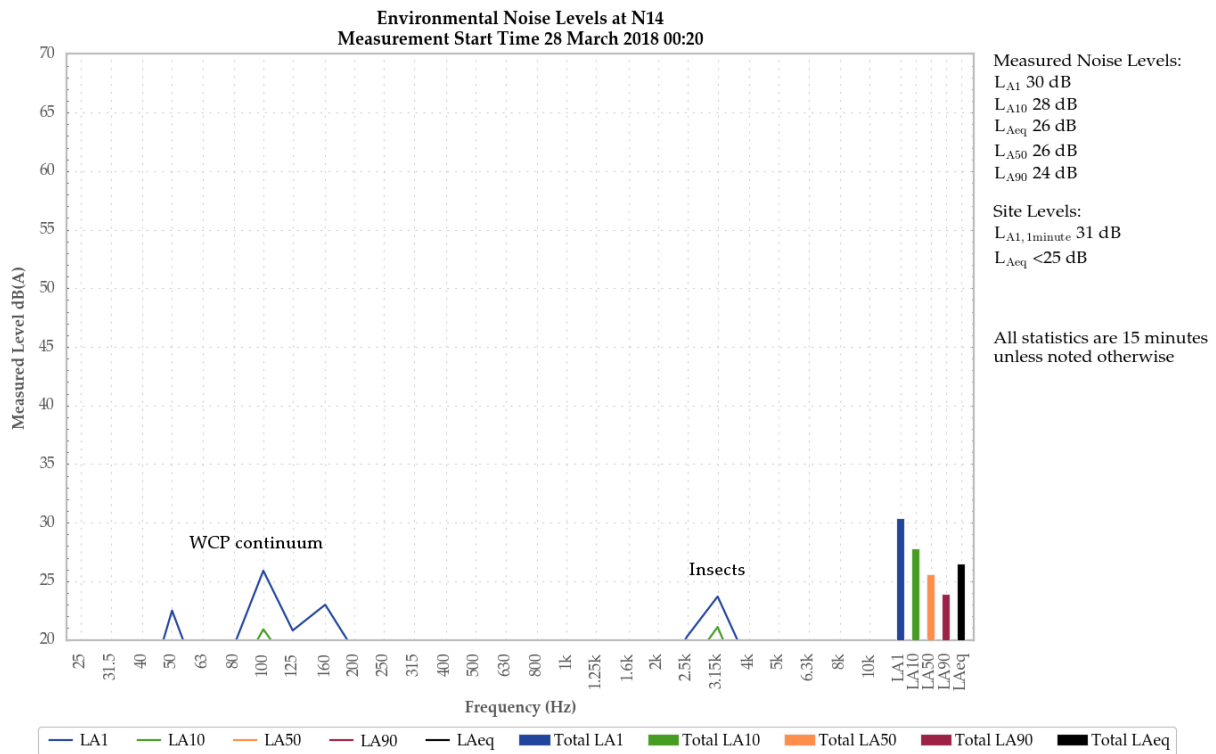


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A continuum from WCP was audible throughout the measurement generating a site only LAeq of less than 25 dB and site only LA1,1minute of 31 dB.

The continuum from WCP was primarily responsible for all measured levels. Insects were a minor contributor to the measured levels.

Birds were also noted.

5.1.4 N15, 27 March 2018

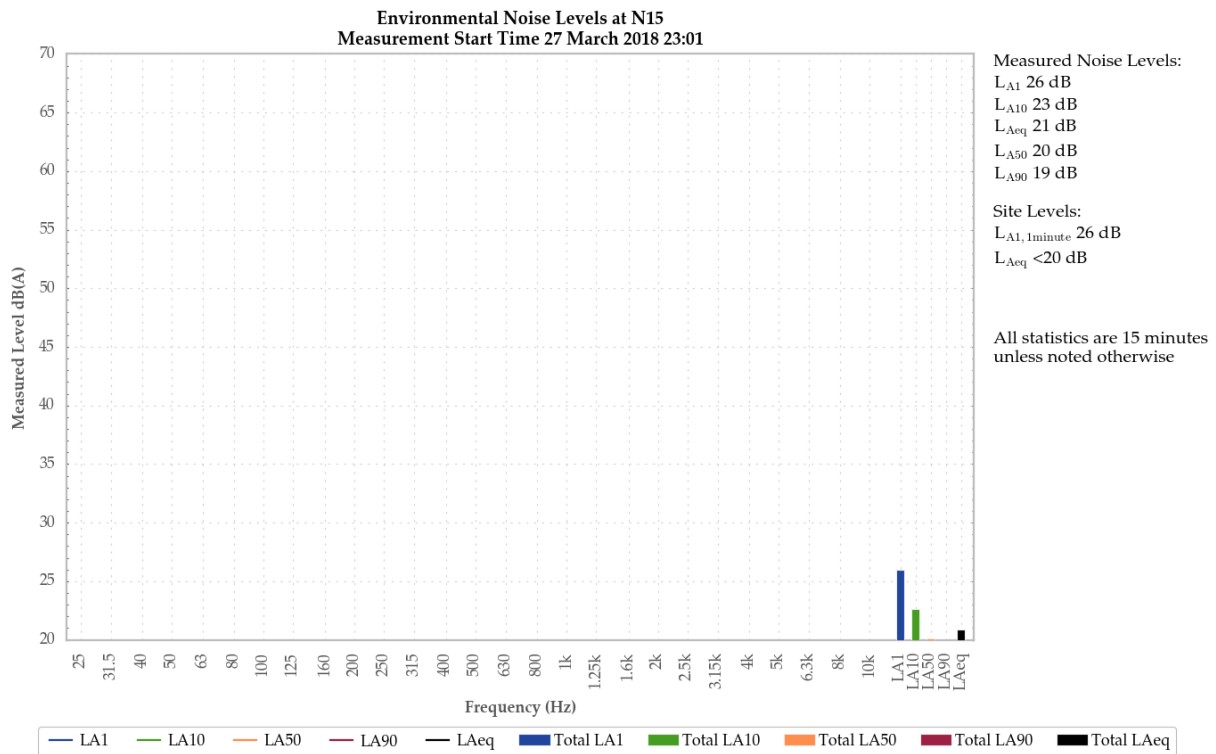


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A low-level continuum from WCP was audible during most of the measurement generating the site only L_{Aeq} of less than 20 dB. A surge in the continuum generated the site only L_{A1,1minute} of 26 dB.

The WCP continuum and breeze in foliage generated the measured levels.

5.1.5 N17, 27 March 2018

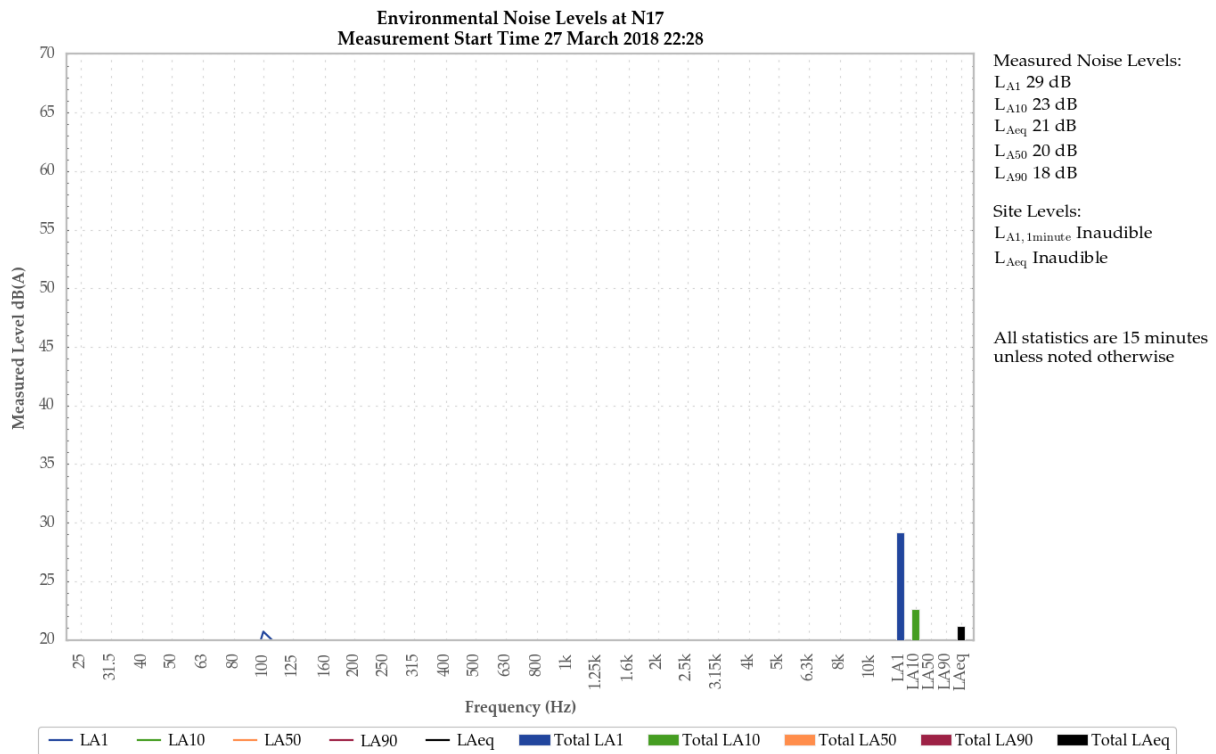


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

Birds and animals generated the measured LA1. A continuum from another mine and the noise floor of the measurement instrument generated other measured levels.

Animals in foliage were also noted.

5.1.6 N19, 27 March 2018

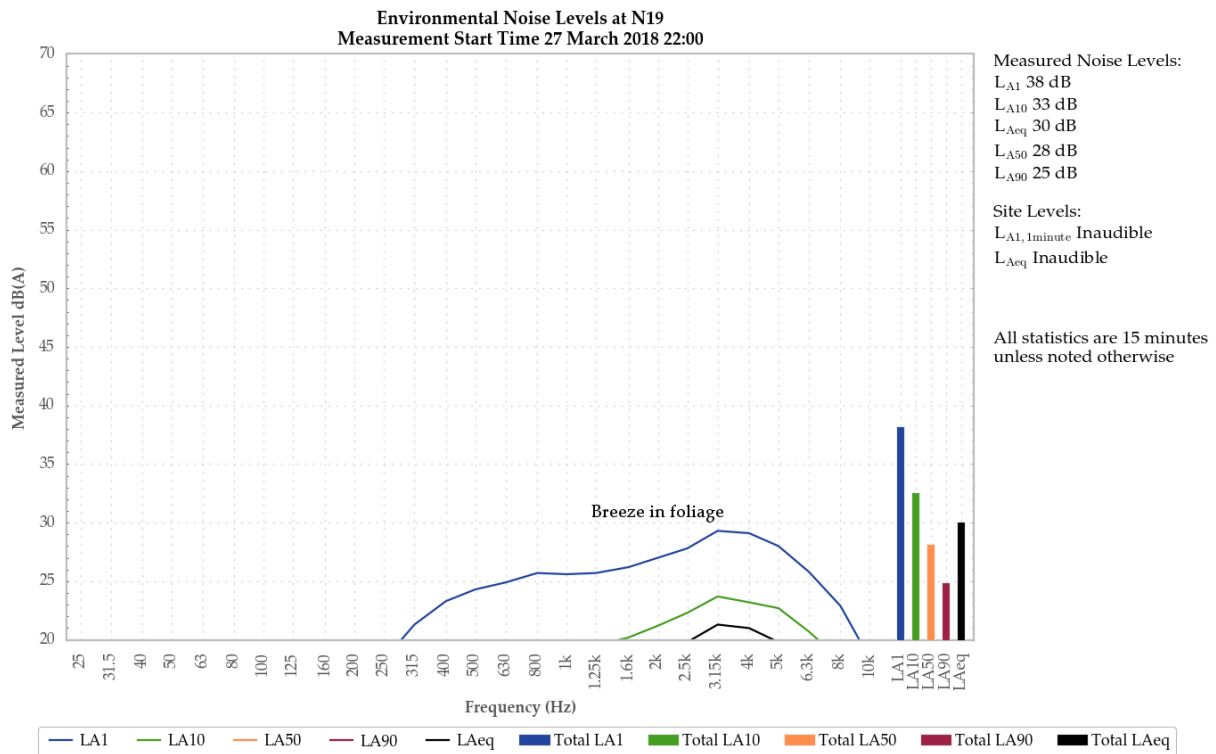


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible.

Breeze in foliage and on the microphone generated all measured levels.

Birds were also noted.

5.1.7 N20, 27 March 2018

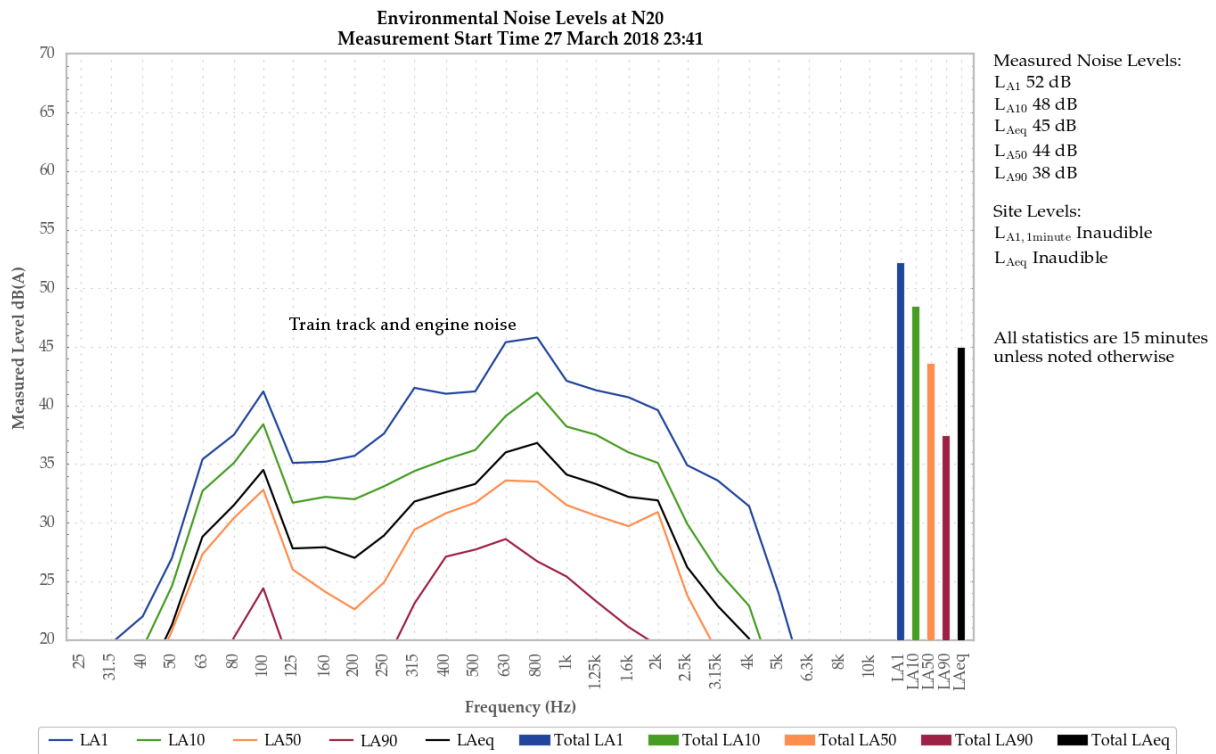


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

An idling train generated all measured levels.

Birds were also noted.

5.1.8 N21, 28 March 2018

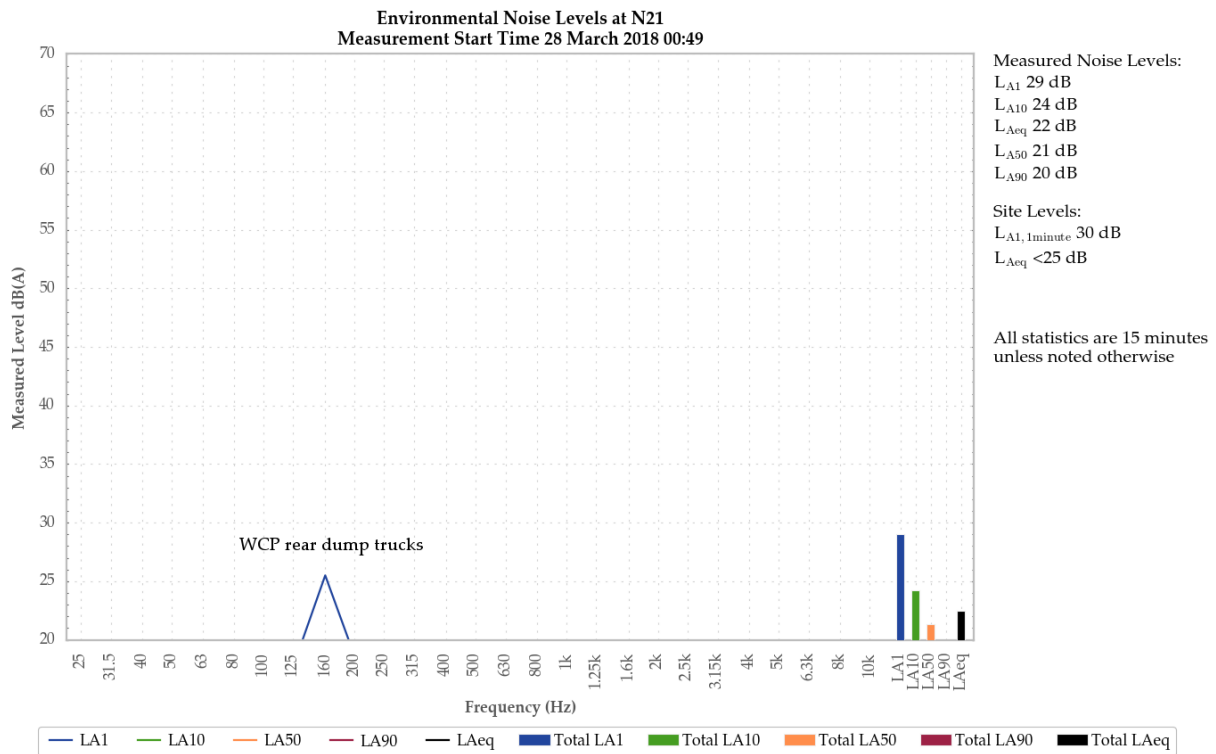


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

A continuum from WCP was audible throughout the measurement generating the site only LAeq of less than 25 dB. A rear dump truck engine surge generated the site only LA1,1minute of 30 dB.

WCP primarily generated all measured levels. Birds contributed to the measured LA1 and LA10.

Frogs and insects were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 27/28 March 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the March 2018 monitoring period.

6.2 Low Frequency Noise Assessment

A low frequency noise assessment was carried out in accordance with the EPA's NPfI. Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the March 2018 survey.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in January 2017.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated by the property identification numbers on Figure 4A Relevant Land Ownership Plan Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010. The property identification numbers are indicated on Figure 4B Relevant Land Ownership List Wilpinjong Coal Mine Mining Rate Modification Environmental Assessment 17 May 2010.

Location	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Night LA1(1 minute)
Wollar village	36	35	35	45
Goulburn River National Park	50	50	50	-
Munhorn Gap Nature Reserve	50	50	50	-
All other privately owned land (outside the village of Wollar)	35	35	35	45

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Temperature inversion conditions up to 3°C/100m and wind speeds greater than 2 metres/second at 10 metres above ground level; or
- c) Temperature inversion conditions greater than 3°C/100m.

L5.4 For the purpose of condition L5.3:

- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
- b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy.

L5.5 To determine compliance:

- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:

- i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
- ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
- iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve

- b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.

- c) With the noise limits in condition L5.1, the noise measurement equipment must be located:

- i) at the most affected point at a location where there is no dwelling at the location; or
- ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).

L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:

- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
- b) at a point other than the most affected point at a location.

L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the second round of quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

- a) an assessment of compliance with noise limits presented in Condition L5.1; and
- b) an outline of any management actions taken within the monitoring period to address any exceedences of the limits contained in Condition L5.1.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZe _q ,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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Labs Pty Ltd**

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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C17310

Client Details	Acoustic Research Labs Pty Ltd Level 7, Bld 2, 423 Pennant Hills Road Pennant Hills NSW 2120
-----------------------	--

Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	30921838
Microphone Serial Number :	04128
Pre-amplifier Serial Number :	11893

Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C	Ambient Temperature : 23°C
Relative Humidity : 44%	Relative Humidity : 44.1%
Barometric Pressure : 99.34kPa	Barometric Pressure : 99.31kPa

Calibration Technician : Lucky Jaiswal	Secondary Check: Riley Cooper
Calibration Date : 23/06/2017	Report Issue Date : 28/06/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	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.

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



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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17309

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Equipment Tested/ Model Number : ARL ND9
Instrument Serial Number : N435847

Atmospheric Conditions

Ambient Temperature : 21.8°C
Relative Humidity : 39.7%
Barometric Pressure : 100.96kPa

Calibration Technician : Lucky Jaiswal **Secondary Check:** Riley Cooper
Calibration Date : 26/06/2017 **Report Issue Date :** 28/06/2017

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	1000.18

The sound calibrator has been shown to conform to the class 1 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	Least Uncertainties of Measurement -	Environmental Conditions
Generated SPL	±0.11dB	Temperature
Short Term Fluct.	±0.02dB	Relative Humidity
Frequency	±0.01%	Barometric Pressure
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.

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

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Wilpinjong Coal

*Environmental Noise
Monitoring*

April 2018

Prepared for

Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring April 2018

Reference: 18133_R01

Report date: 16 May 2018

Prepared for

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Prepared: Tambalyn Durney
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QA Review: Amanda Borserio
Acoustics 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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 9 April 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Operational Noise Assessment

WCP complied with relevant noise limits at all monitoring locations during April 2018 monitoring.

Low Frequency Noise Assessment

A low frequency noise assessment was carried out in accordance with the EPA's NPfI. Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the April 2018 survey.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 9 April 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

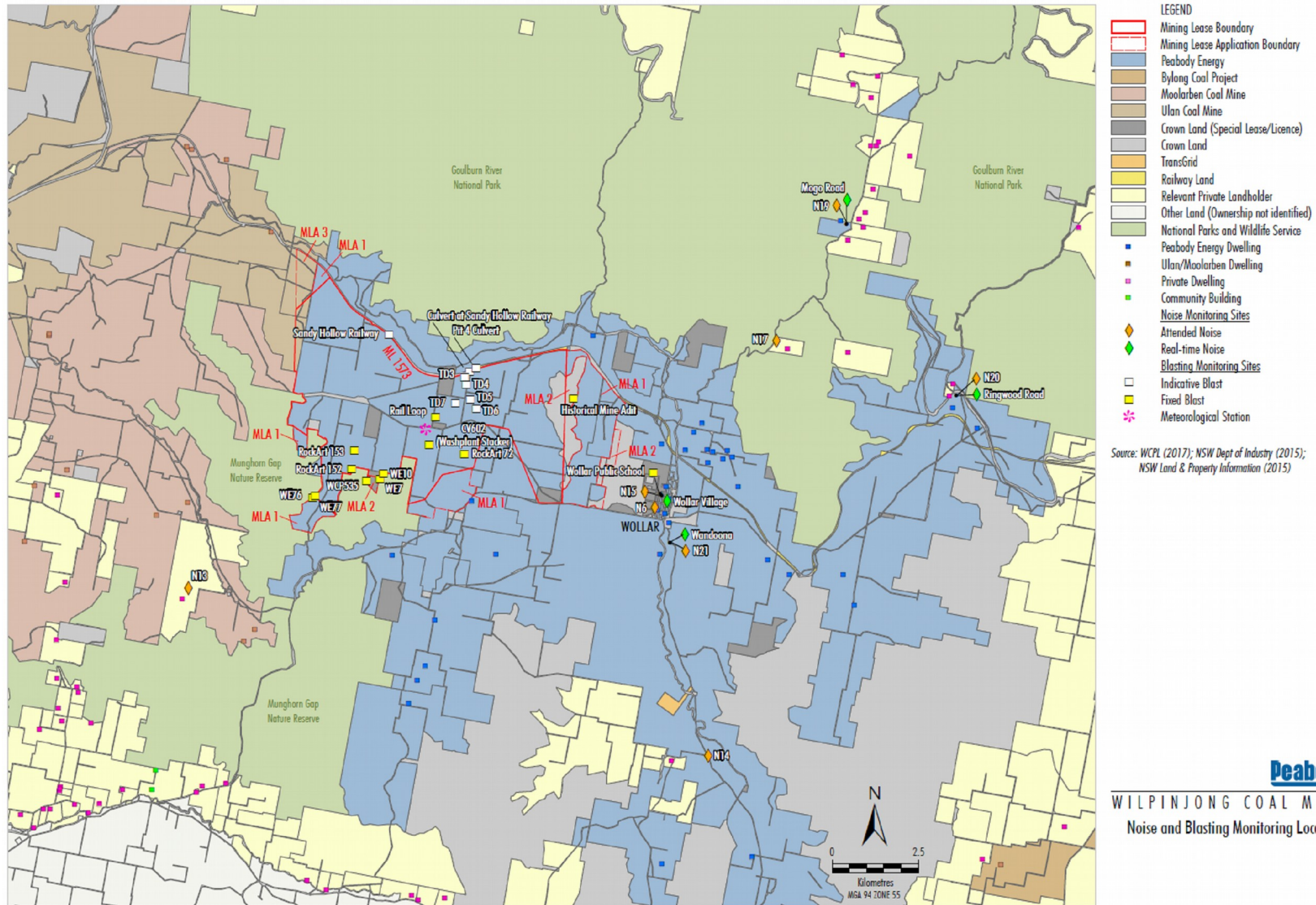


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria and Weather Conditions

Noise criteria are consistent between the Project Approval and EPL, as are the meteorological exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

In accordance with the NMP, as detailed in Appendix 6 of the WCP Extension project approval (SSD-6764), and also in accordance with EPL 12425, noise criteria apply under all meteorological conditions except for the following:

- a) *wind speeds greater than 3 m/s at 10m above ground level;*
- b) *stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or*
- c) *stability category G temperature inversion conditions.*

2.5 Modifying Factors

The EPA's 'Noise Policy for Industry' (NPfI, 2017) was approved for use in NSW in October 2017, and supersedes the 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.

2.5.1 Tonal 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.

There were no intermittent noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with the EPA guidelines and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken. Monitoring is undertaken once per month at each location. The duration of each measurement was 15 minutes.

Attended monitoring during this reporting period was undertaken by Jonathan Erasmus and Tambalyn Durney.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the

direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	1070590	28/06/2018
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar 106 acoustic calibrator	79631	30/03/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – APRIL 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	10/04/2018 00:43	52	42	37	32	34	28	25	48
N13	10/04/2018 00:57	42	30	26	25	25	23	21	46
N14	09/04/2018 23:59	49	41	33	28	31	25	23	33
N15	09/04/2018 22:54	48	37	28	18	26	17	16	36
N17	09/04/2018 22:25	53	36	32	29	30	27	25	49
N19	09/04/2018 22:00	57	44	39	34	36	29	26	51
N20	09/04/2018 23:23	59	41	36	30	34	25	21	56
N21	10/04/2018 00:24	54	45	42	38	39	35	33	59

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

4.2 Project Specific Criteria and Weather Conditions

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL. Modifying factors are considered in Section 4.4 of this report.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – APRIL 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	10/04/2018 00:43	3.1	E	37	No	IA	NA
N13	10/04/2018 00:57	3.1	D	35	No	NM	NA
N14	09/04/2018 23:59	1.9	E	35	Yes	IA	Nil
N15	09/04/2018 22:54	1.1	F	35	Yes	IA	Nil
N17	09/04/2018 22:25	1.3	E	35	Yes	<20	Nil
N19	09/04/2018 22:00	0.1	G	35	No	<20	NA
N20	09/04/2018 23:23	1.2	E	35	Yes	IA	Nil
N21	10/04/2018 00:24	2.7	E	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – APRIL 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ⁶
N6	10/04/2018 00:43	3.1	E	45	No	IA	NA
N13	10/04/2018 00:57	3.1	D	45	No	NM	NA
N14	09/04/2018 23:59	1.9	E	45	Yes	IA	Nil
N15	09/04/2018 22:54	1.1	F	45	Yes	IA	Nil
N17	09/04/2018 22:25	1.3	E	45	Yes	30	Nil
N19	09/04/2018 22:00	0.1	G	45	No	25	NA
N20	09/04/2018 23:23	1.2	E	45	Yes	IA	Nil
N21	10/04/2018 00:24	2.7	E	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, APRIL 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L _{Aeq} dB	Low pass (<630Hz) L _{Aeq} dB	Low pass (<630Hz) L _{A90} dB	
N15/SX33	09/04/2018 22:54	09/04/2018 23:00	33	27	19	IA
N19/SX32	09/04/2018 22:00	09/04/2018 22:00	33	30	26	<20
N20/SX30	09/04/2018 23:23	09/04/2018 23:30	33	24	22	IA
N21/SX31	10/04/2018 00:24	10/04/2018 00:30	38	29	25	IA

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this time period.

4.4 Low Frequency Noise Assessment

Measured WCP only levels were assessed for the applicability of low frequency modifying factors in accordance with the EPA's NPfL.

None of the measurements satisfied the conditions outlined in Section 3.3. Therefore no further assessment was undertaken.

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 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – APRIL 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	10/04/2018 00:43	23	1.4	30	0
N13	10/04/2018 00:57	19	0.9	50	0
N14	09/04/2018 23:59	20	1.1	50	0
N15	09/04/2018 22:54	20	0.0	-	0
N17	09/04/2018 22:25	22	0.5	100	0
N19	09/04/2018 22:00	24	1.8	150	0
N20	09/04/2018 23:23	23	1.9	50	0
N21	10/04/2018 00:24	21	3.1	60	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
09/04/2018 20:30	0.3	150	7.1
09/04/2018 20:45	0.2	286	6.2
09/04/2018 21:00	0.0	286	5.7
09/04/2018 21:15	0.0	286	7.1
09/04/2018 21:30	0.0	286	5.9
09/04/2018 21:45	0.7	339	4.5
09/04/2018 22:00	0.9	29	4.1
09/04/2018 22:00	0.9	29	4.1
09/04/2018 22:15	0.1	268	4
09/04/2018 22:30	1.3	202	3.1
09/04/2018 22:45	1.3	193	1.4
09/04/2018 23:00	0.6	123	3.8
09/04/2018 23:15	1.1	63	2.8
09/04/2018 23:30	1.1	41	0.9
09/04/2018 23:45	1.2	38	0.7
10/04/2018 00:00	1.7	48	0.3
10/04/2018 00:15	1.9	44	-0.2
10/04/2018 00:30	2.7	48	-0.5
10/04/2018 00:45	2.7	52	-0.5
10/04/2018 01:00	3.1	57	-0.5
10/04/2018 01:15	3.1	72	-0.7
10/04/2018 01:30	3	71	-0.7
10/04/2018 01:45	3.2	79	-0.7
10/04/2018 02:00	3.0	90	-0.7
10/04/2018 02:15	3.1	86	-0.7
10/04/2018 02:30	3.2	87	-0.7
10/04/2018 02:45	2.9	79	-0.7

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

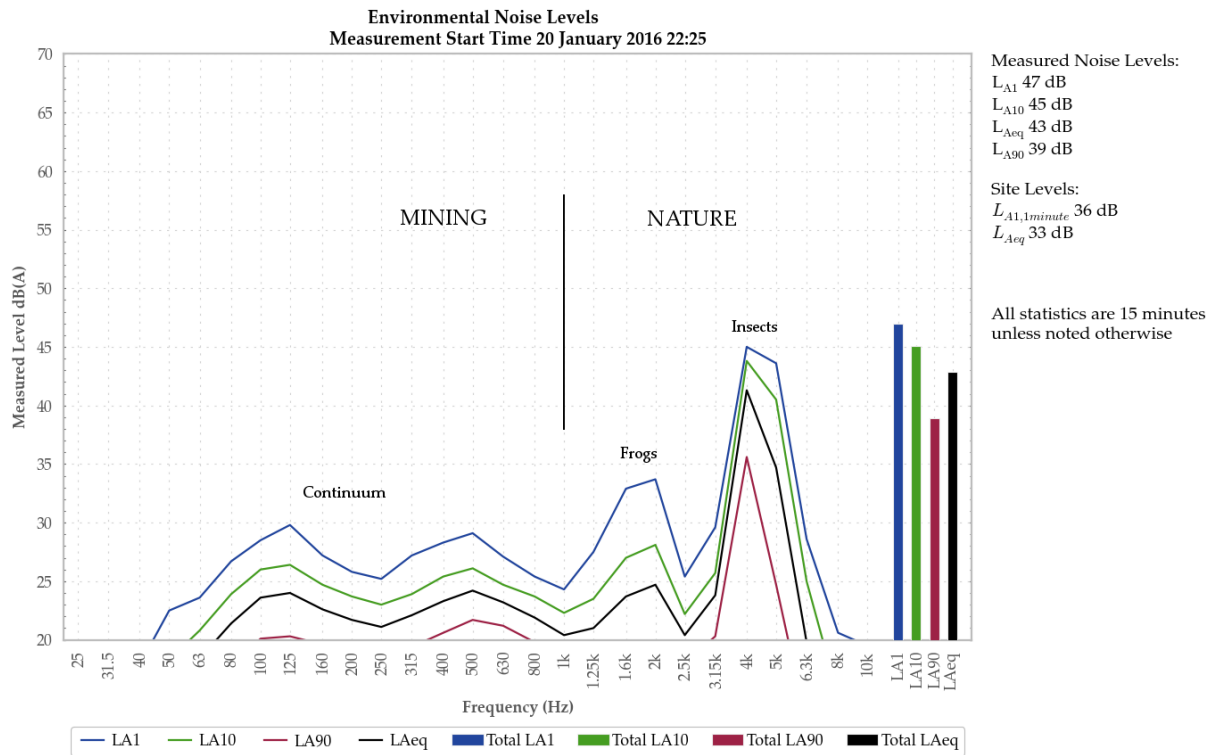
5.1 Noted Noise Sources

Section 4 presents data gathered during attended monitoring. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .



5.1.1 N6, 10 April 2018

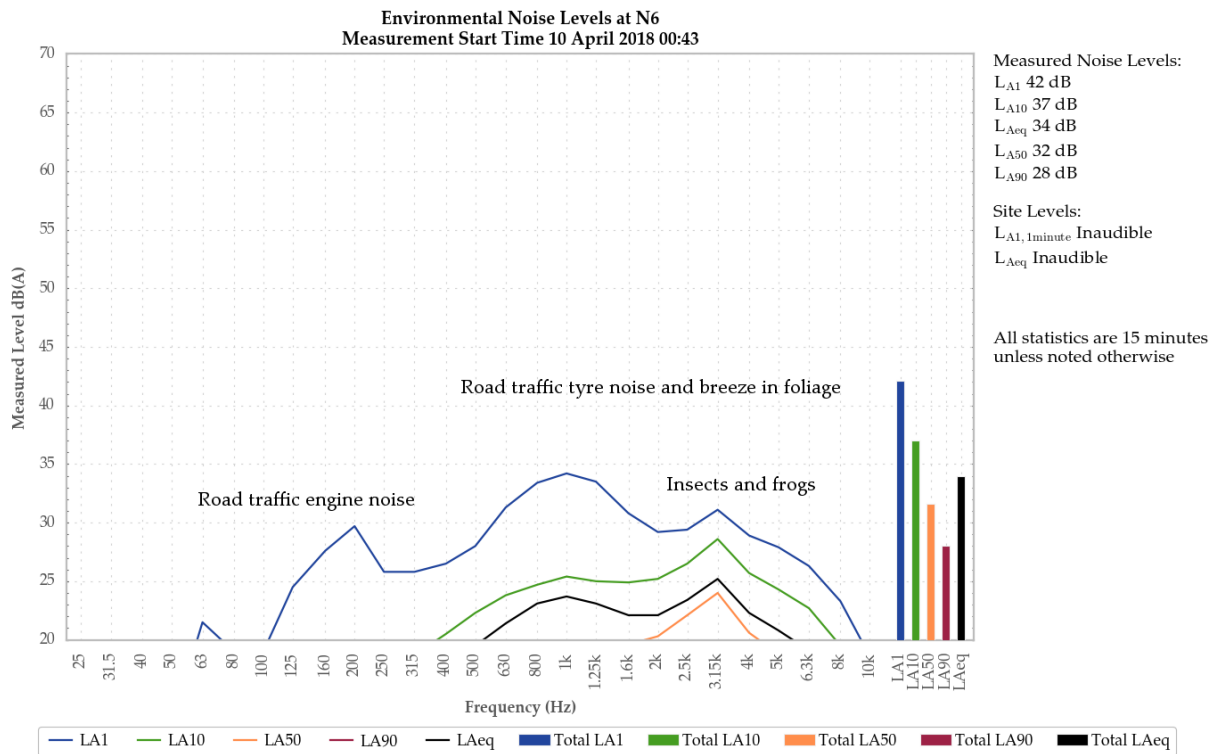


Figure 3: Environmental Noise Levels - N6, St Laurence O'Toole Catholic Church, Wollar Village

WCP was inaudible.

Road traffic noise primarily generated the measured LA1. Insects, frogs and breeze in foliage generated all other measured levels.

5.1.2 N13, 10 April 2018

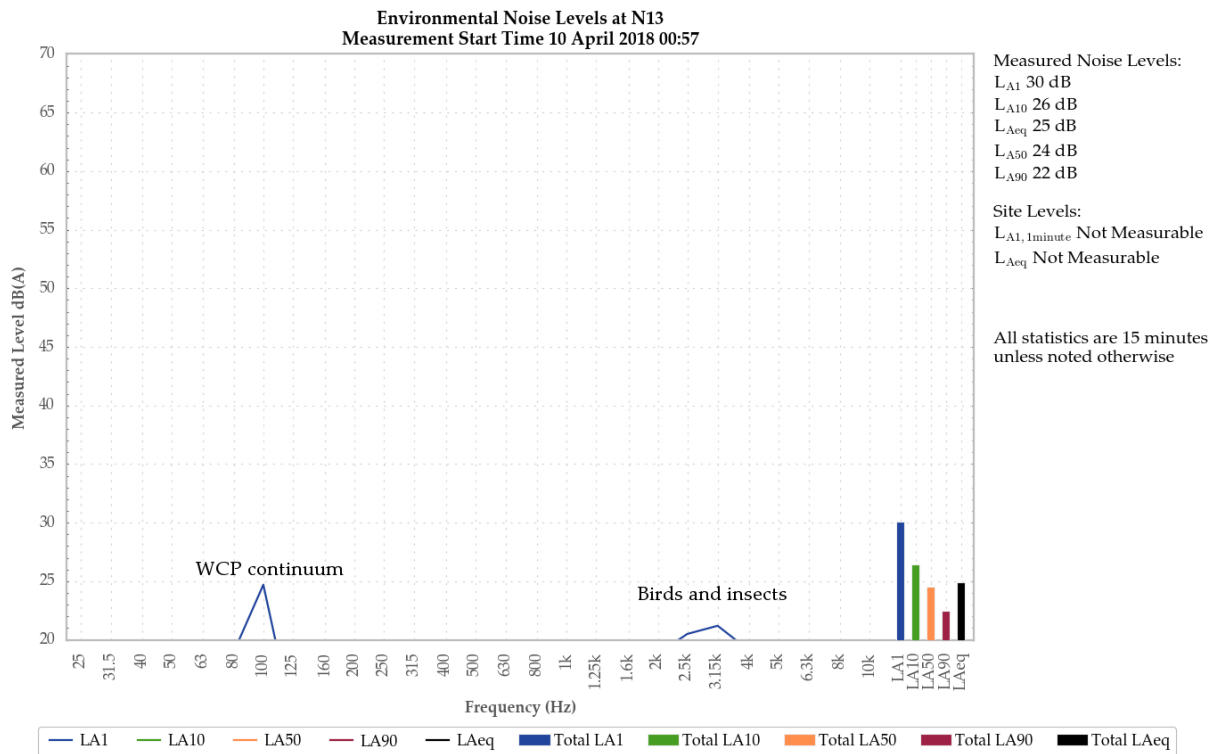


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP continuum was audible during the measurement, but this contribution was not measurable.

WCP continuum, birds, insects and breeze generated the measured levels.

Bats were also noted.

5.1.3 N14, 9 April 2018

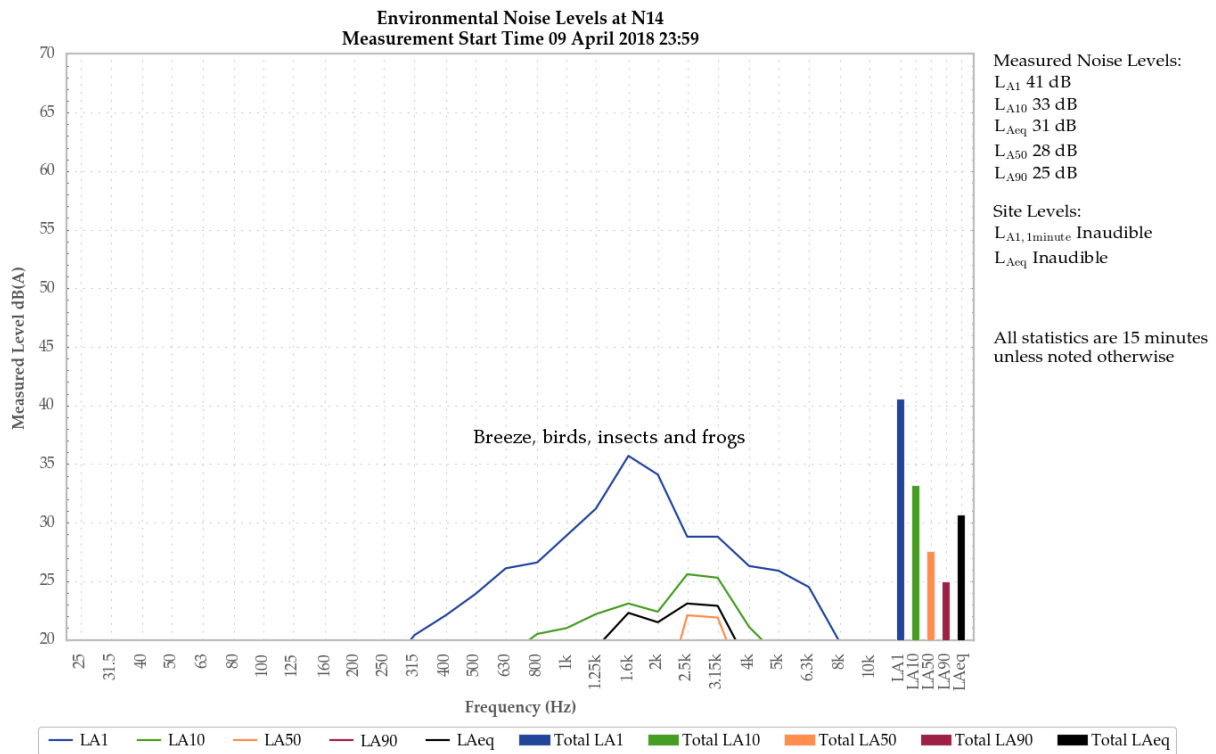


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Birds generated the measured LA1. Insects and frogs primarily generated all other levels.

Breeze was also noted.

5.1.4 N15, 9 April 2018

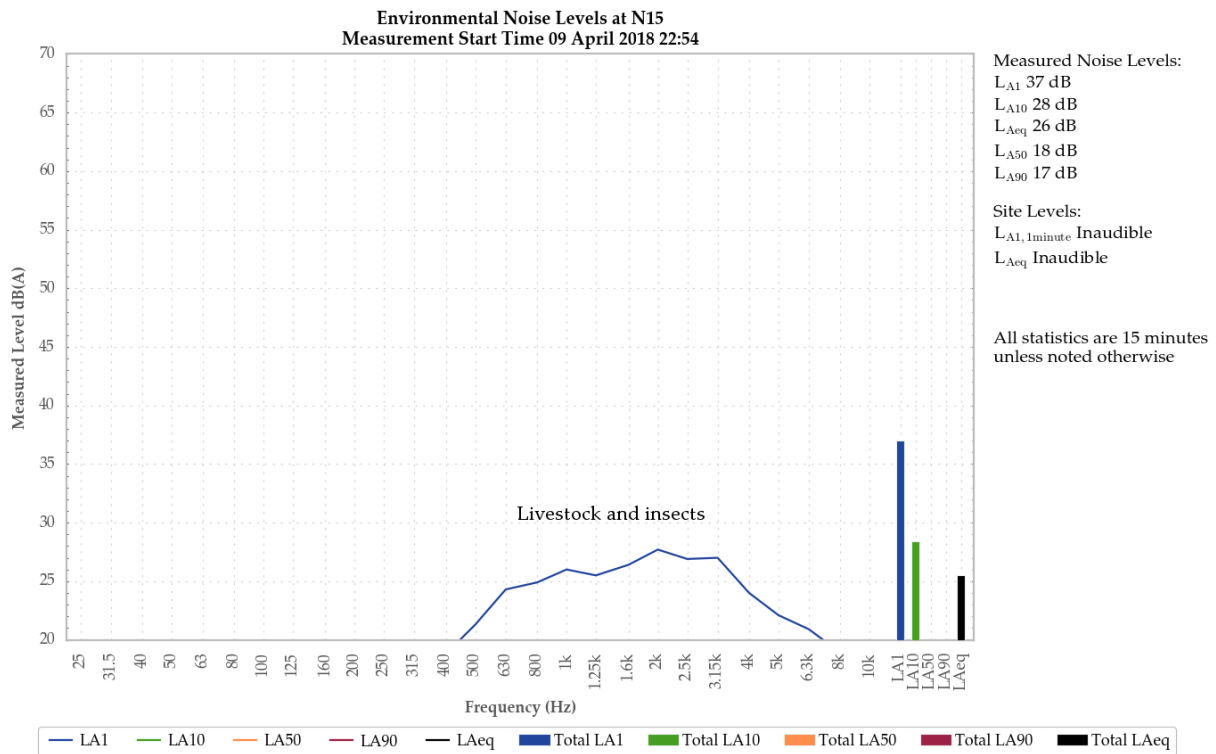


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Livestock, insects and the noise floor of the measurement instrument generated the measured levels.

5.1.5 N17, 9 April 2018

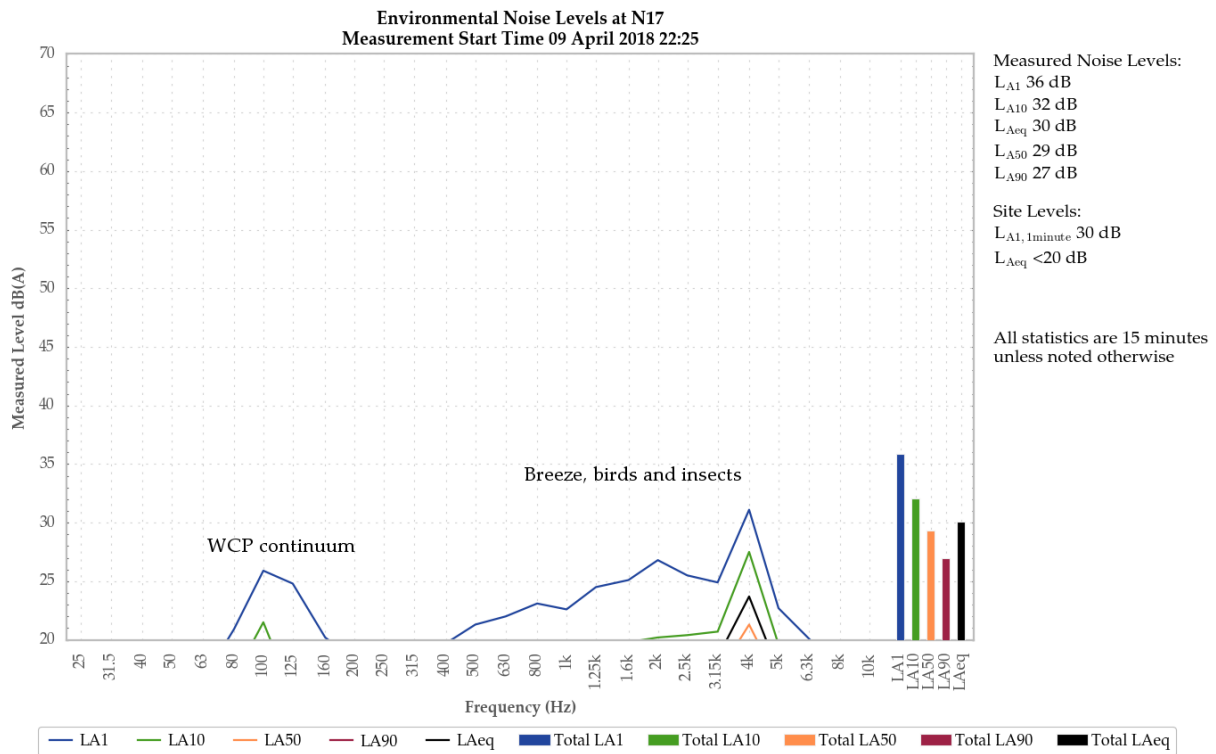


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

A continuum from WCP was audible during most of the measurement, generating a site only LAeq of less than 20 dB. A surge in the continuum generated the site only LA1,1minute of 30 dB.

WCP continuum, birds and insects generated the measured LA1. Insects generated all other measured levels.

Breeze was also noted.

5.1.6 N19, 9 April 2018

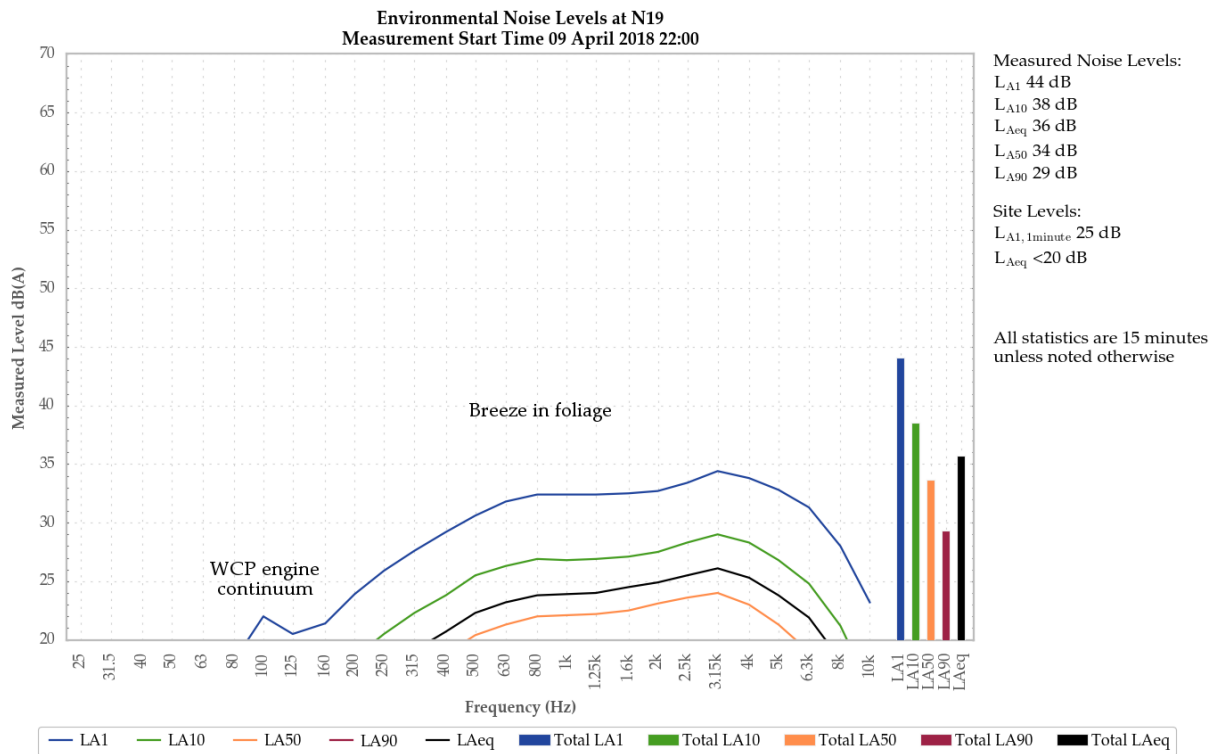


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was audible at times during the measurement as engine continuum, generating the site only L_{Aeq} of less than 20 dB and the site only L_{A1,minute} of 25 dB.

Breeze in foliage generated the measured levels.

Insects and aircraft were also noted.

5.1.7 N20, 9 April 2018

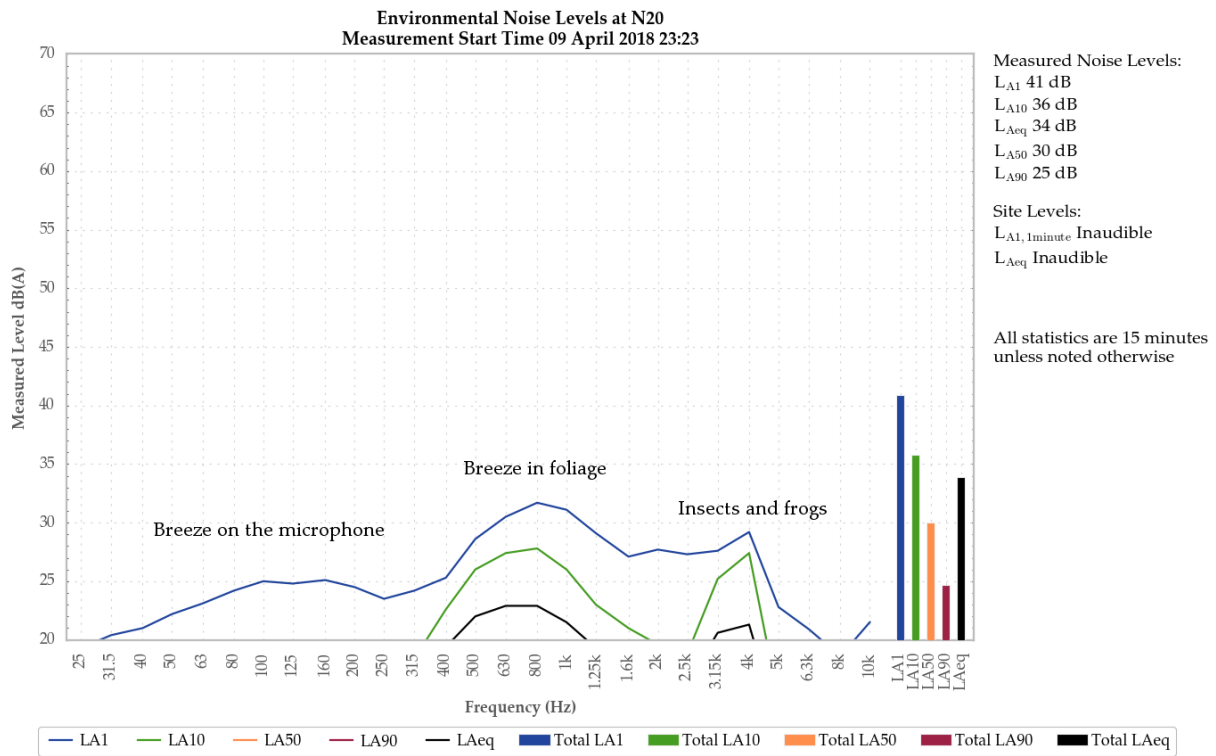


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

Breeze, insects and frogs generated the measured levels.

5.1.8 N21, 10 April 2018

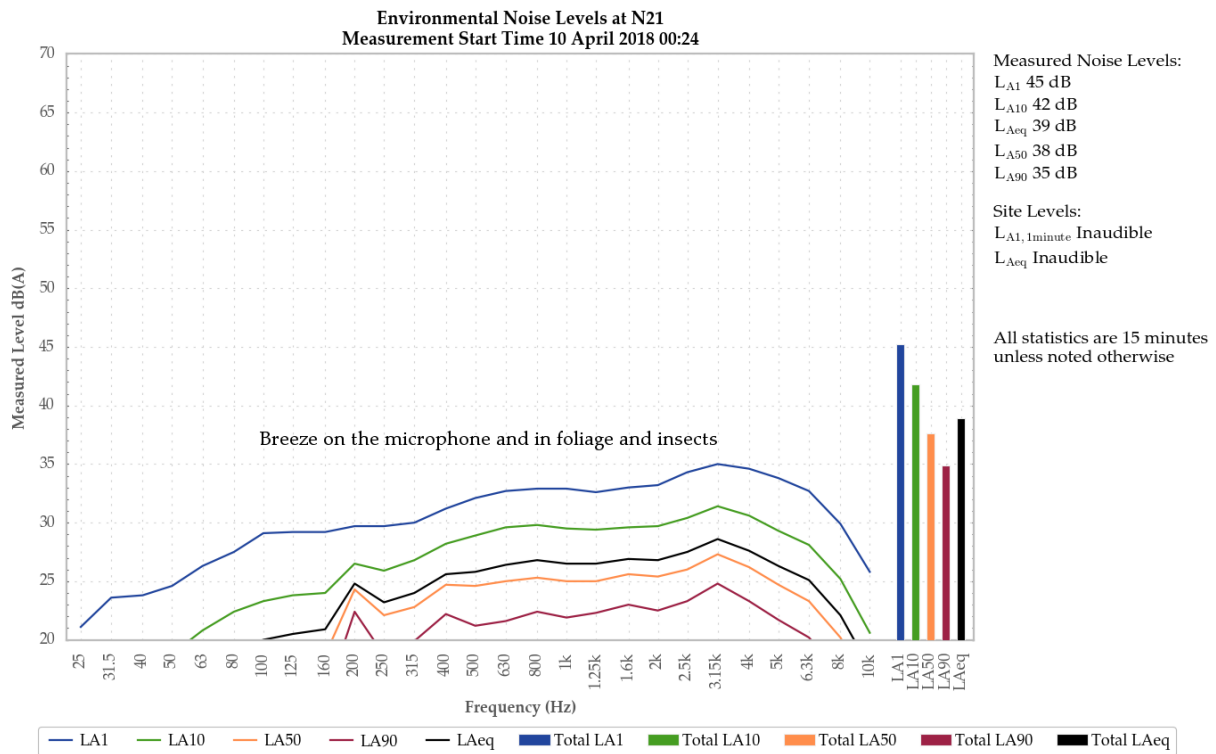


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was inaudible.

Breeze and insects generated all measured levels.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 9 April 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

6.1 Operational Noise Assessment

Wilpinjong Coal Project complied with noise limits at the monitoring locations during the April 2018 monitoring period.

6.2 Low Frequency Noise Assessment

A low frequency noise assessment was carried out in accordance with the EPA's NPfl. Low frequency modifying factors, where applicable, did not result in any exceedances of WCP noise limits during the April 2018 survey.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below..

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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Octave Band Filter
AS 4476:1997
Calibration Certificate

Calibration Number C16323A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Atmospheric Conditions

Ambient Temperature : 21.2°C
Relative Humidity : 35%
Barometric Pressure : 100.21kPa

Calibration Technician : Calvin
Simpfendorfer
Calibration Date : 28/06/2016

Secondary Check: Riley Cooper
Report Issue Date : 30/06/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests		Least Uncertainties of Measurement - Environmental Conditions	
< 16Hz	±0.19dB	Temperature	±0.3°C
16Hz - 100Hz	±0.11dB	Relative Humidity	±4.1%
100Hz-1000Hz	±0.09dB	Barometric Pressure	±0.1kPa
1000Hz-10kHz	±0.09dB		
>10kHz	±0.16dB		

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.

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

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Octave Band Filter
AS 4476:1997
Calibration Certificate

Calibration Number C17248A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Atmospheric Conditions

Ambient Temperature : 24.4°C
Relative Humidity : 39%
Barometric Pressure : 99.78kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests

< 16Hz ±0.19dB
16Hz-100Hz ±0.11dB
100Hz-1000Hz ±0.09dB
1000Hz-10kHz ±0.09dB
> 10kHz ±0.16dB

Least Uncertainties of Measurement -

Environmental Conditions
Temperature ±0.05°C
Relative Humidity ±0.46%
Barometric Pressure ±0.017kPa

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



WORLD RECOGNISED
ACCREDITATION

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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 Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions

Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :

Juan Aguero

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	1000.38

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	Least Uncertainties of Measurement -	Environmental Conditions	Least Uncertainties of Measurement -
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

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


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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

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

Least Uncertainties of Measurement - Environmental Conditions			
Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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

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Wilpinjong Coal

*Environmental Noise Monitoring
May 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



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Wilpinjong Coal

Environmental Noise Monitoring May 2018

Reference: 18172_R01

Report date: 22 June 2018

Prepared for

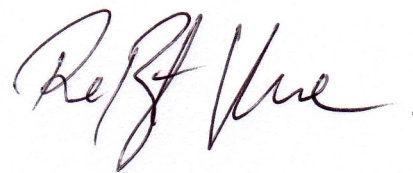
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Consultant



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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Noise Policy for Industry' (NPfI) guidelines and Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise'. The duration of each night measurement was 15 minutes. Results of monthly monitoring have been compared to relevant noise limits.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 May 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the May 2018 monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 May 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

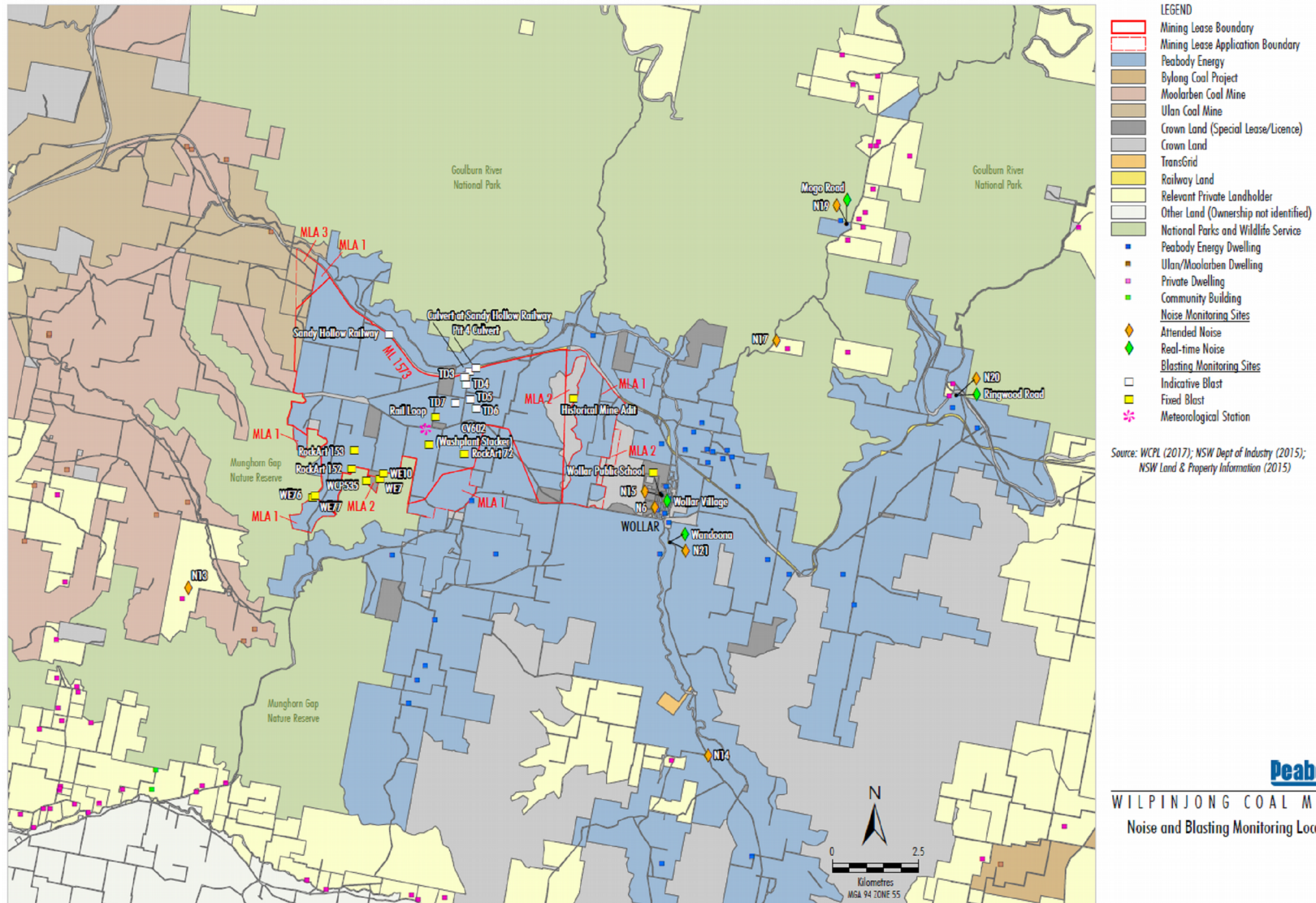


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with EPA guidelines and Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Jesse Tribby.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	16/11/2018
Pulsar 106 acoustic calibrator	81334	18/12/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP-only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – MAY 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	08/05/2018 00:46	48	41	35	31	33	28	24	54
N13	08/05/2018 01:22	38	28	26	25	25	23	20	54
N14	07/05/2018 23:23	44	34	26	24	25	22	20	54
N15	07/05/2018 22:56	43	39	34	27	30	25	22	53
N17	07/05/2018 22:24	32	21	17	14	15	14	13	54
N19	07/05/2018 22:00	33	28	27	23	24	20	16	54
N20	08/05/2018 00:19	31	24	20	16	17	14	14	54
N21	07/05/2018 23:50	36	31	29	26	27	25	22	52

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – MAY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ⁶
N6	08/05/2018 00:46	0.8	G	37	No	31	NA
N13	08/05/2018 01:22	0.5	G	35	No	IA	NA
N14	07/05/2018 23:23	0.6	G	35	No	<20	NA
N15	07/05/2018 22:56	0.5	G	37	No	30	NA
N17	07/05/2018 22:24	0.7	G	38	No	IA	NA
N19	07/05/2018 22:00	0.0	G	35	No	IA	NA
N20	08/05/2018 00:19	0.0	G	35	No	<20	NA
N21	07/05/2018 23:50	0.6	G	35	No	27	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: $L_{A1,1min}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – MAY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{A1,1min}$ dB ^{4,5}	Exceedance ⁶
N6	08/05/2018 00:46	0.8	G	45	No	40	NA
N13	08/05/2018 01:22	0.5	G	45	No	IA	NA
N14	07/05/2018 23:23	0.6	G	45	No	<20	NA
N15	07/05/2018 22:56	0.5	G	45	No	43	NA
N17	07/05/2018 22:24	0.7	G	45	No	IA	NA
N19	07/05/2018 22:00	0.0	G	45	No	IA	NA
N20	08/05/2018 00:19	0.0	G	45	No	<20	NA
N21	07/05/2018 23:50	0.6	G	45	No	33	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of Real Time and Attended Noise Results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, MAY 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L_{Aeq} dB	Low pass (<630Hz) L_{Aeq} dB	Low pass (<630Hz) L_{A90} dB	
N15/SX33	07/05/2018 22:56	07/05/2018 23:00	34	32	27	30
N19/SX32	07/05/2018 22:00	07/05/2018 22:00	27	23	19	IA
N20/SX30	08/05/2018 00:19	08/05/2018 00:15	22	16	10	<20
N21/SX31	07/05/2018 23:50	07/05/2018 23:45	30	29	27	27

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – MAY 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	08/05/2018 00:46	7	0.0	-	2
N13	08/05/2018 01:22	13	1.5	200	3
N14	07/05/2018 23:23	10	1.1	110	1
N15	07/05/2018 22:56	9	0.0	-	0
N17	07/05/2018 22:24	11	0.0	-	0
N19	07/05/2018 22:00	11	1.0	-	0
N20	08/05/2018 00:19	6	0.6	220	2
N21	07/05/2018 23:50	7	0.5	185	2

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained concurrently by the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
07/05/2018 22:00:00	0	-	6.4
07/05/2018 22:15:00	0	-	6
07/05/2018 22:30:00	0.7	313	6.4
07/05/2018 22:45:00	0.6	293	5.5
07/05/2018 23:00:00	0.5	326	6.2
07/05/2018 23:15:00	0	-	5.9
07/05/2018 23:30:00	0.6	306	5.5
07/05/2018 23:45:00	0.6	315	6
08/05/2018 00:00:00	0	-	6
08/05/2018 00:15:00	0	-	6.2
08/05/2018 00:30:00	0	-	6
08/05/2018 00:45:00	0.8	329	6.4
08/05/2018 01:00:00	0.5	271	5.7
08/05/2018 01:15:00	0.5	6	5.3
08/05/2018 01:30:00	0.7	323	4.8
08/05/2018 01:45:00	0.6	287	4
08/05/2018 02:00:00	0	-	5

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

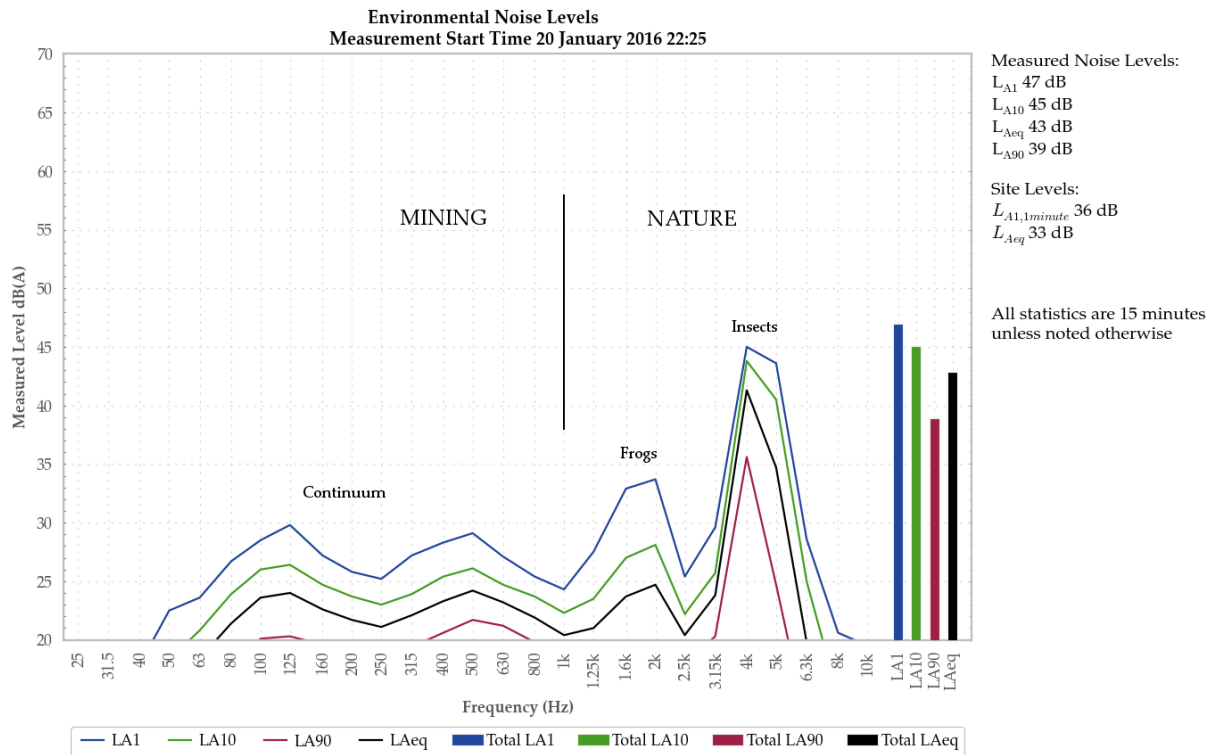


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 8 May 2018

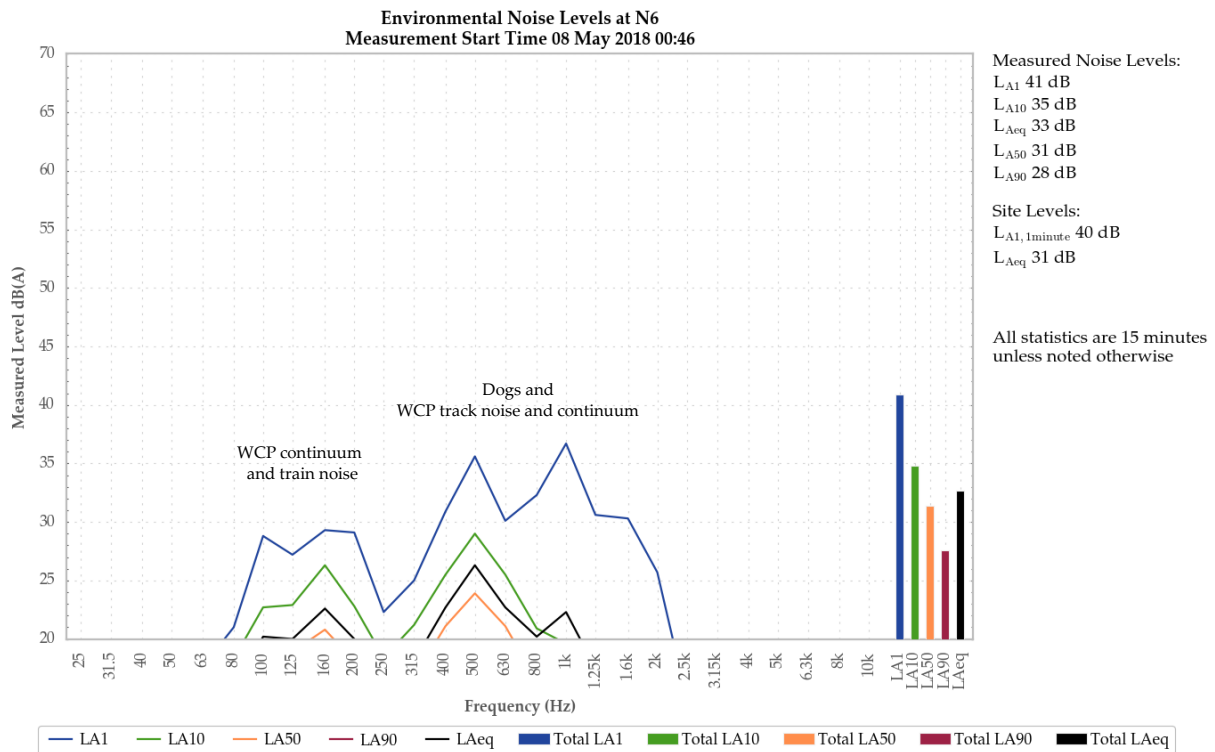


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A mining continuum from WCP was audible throughout the measurement and generated a site-only LAeq of 31 dB. Track noise and engine surges were responsible for the measured LA1,1minute of 40 dB.

Dogs generated the LA1 and contributed to the measured LAeq. WCP continuum was primarily responsible for the measured LA10, LAeq, LA50, and LA90. Train noise also contributed to the measured LA10 and LAeq.

5.1.2 N13, 8 May 2018

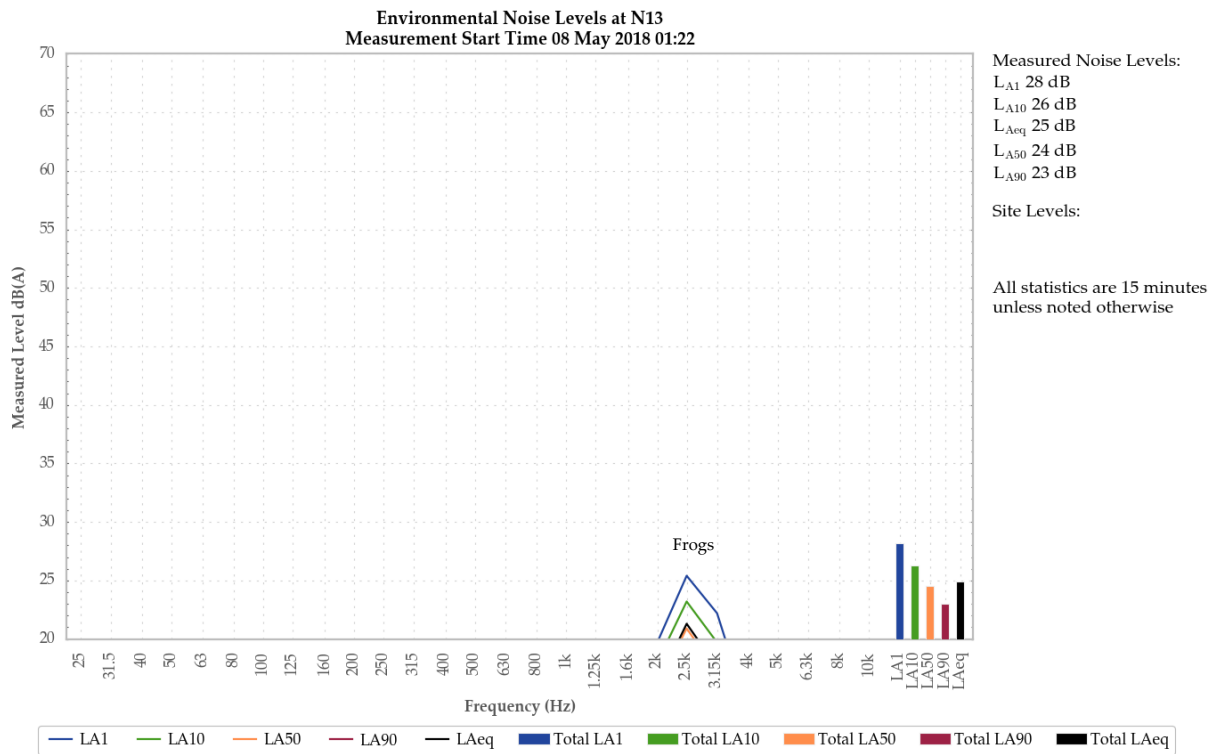


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Frogs were responsible for all measured noise levels.

Continuum from another mining operation, cows, and birds were also noted.

5.1.3 N14, 7 May 2018

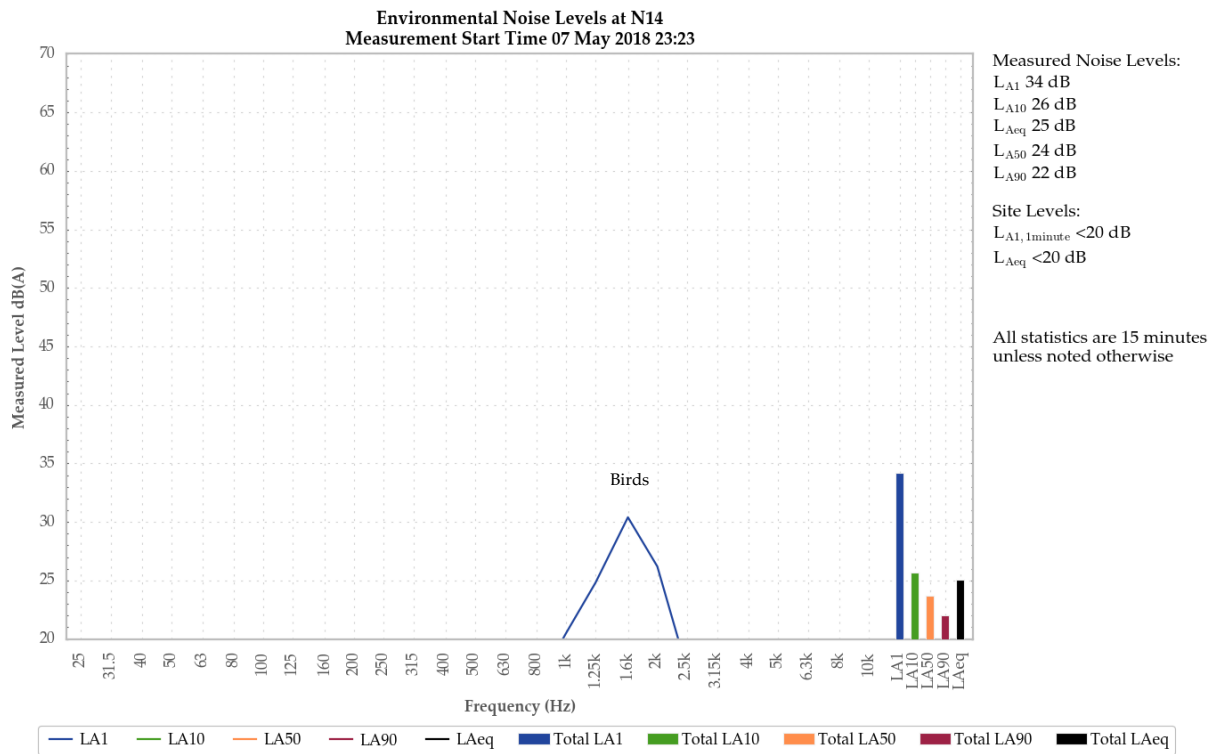


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site-only LAeq and LA1,1minute of less than 20 dB.

Birds generated the measured LA1. Breeze in the foliage and train noise were primarily responsible for the measured LA10, LAeq, LA50, and LA90. Substation noise and continuum from WCP also contributed to the measured LA50 and LA90.

Frogs were also noted.

5.1.4 N15, 7 May 2018

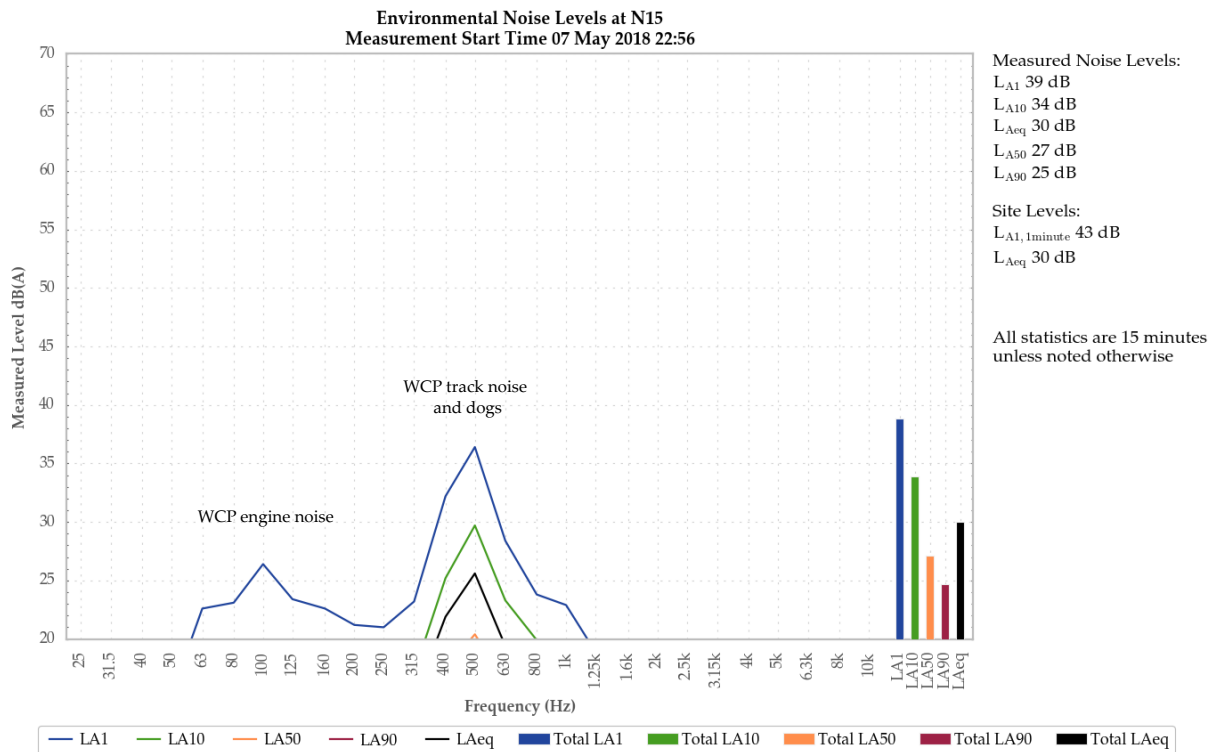


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

Engine and track noise from WCP was audible throughout during the measurement generating the site only LAeq of 30 dB and LA1,1minute of 43 dB.

Engine and track noise from WCP was responsible for all measured noise levels.

Dogs, birds and a distant train horn were also noted.

5.1.5 N17, 7 May 2018

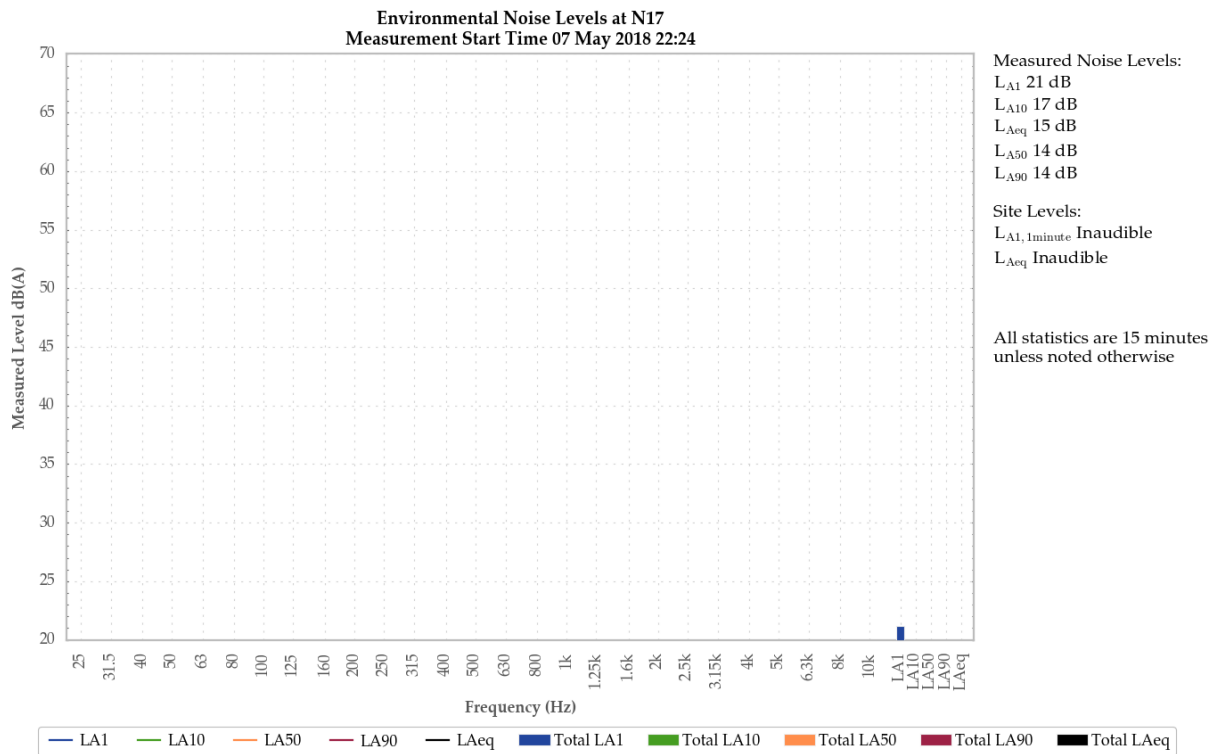


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

The noise floor of the measurement instrument was primarily responsible for all measured noise levels. Aircraft noise also contributed to the measured LA₁.

Bats and train horns were also noted.

5.1.6 N19, 7 May 2018

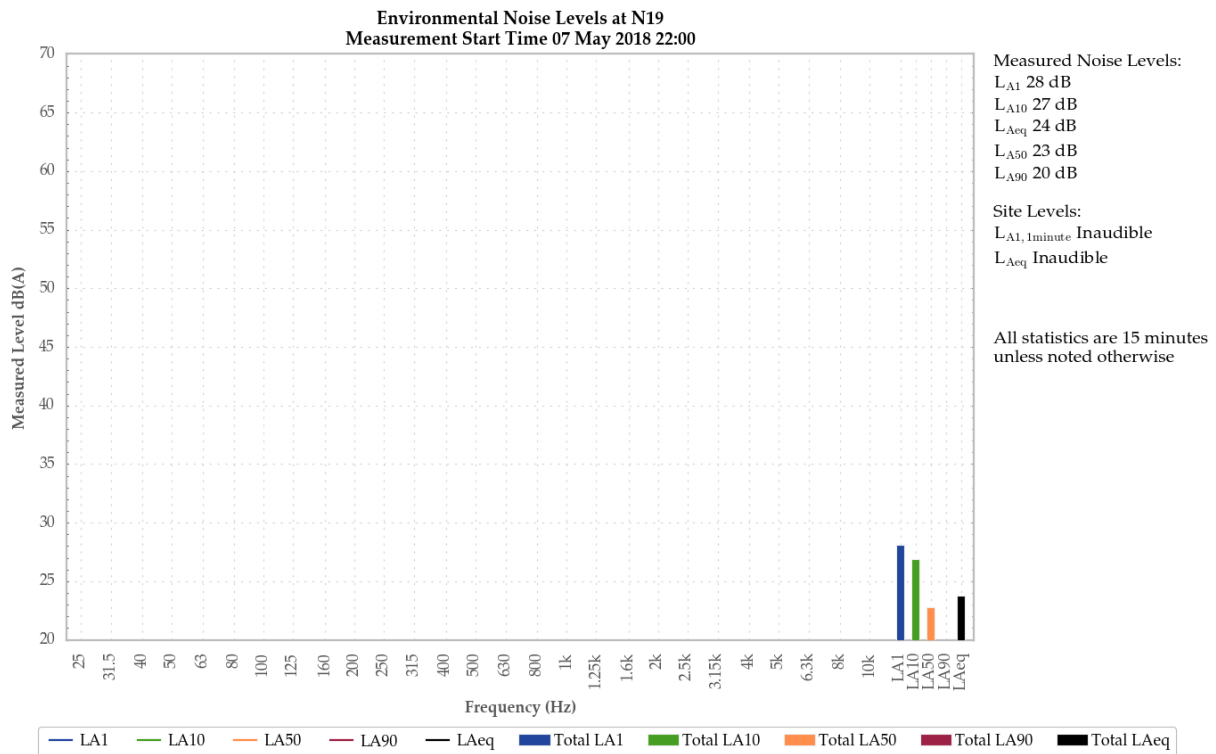


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible.

Breeze in the foliage was primarily responsible for all measured noise levels. The noise floor of the measurement instrument also contributed to the measured LA90.

Bats and aircraft noise were also noted.

5.1.7 N20, 8 May 2018

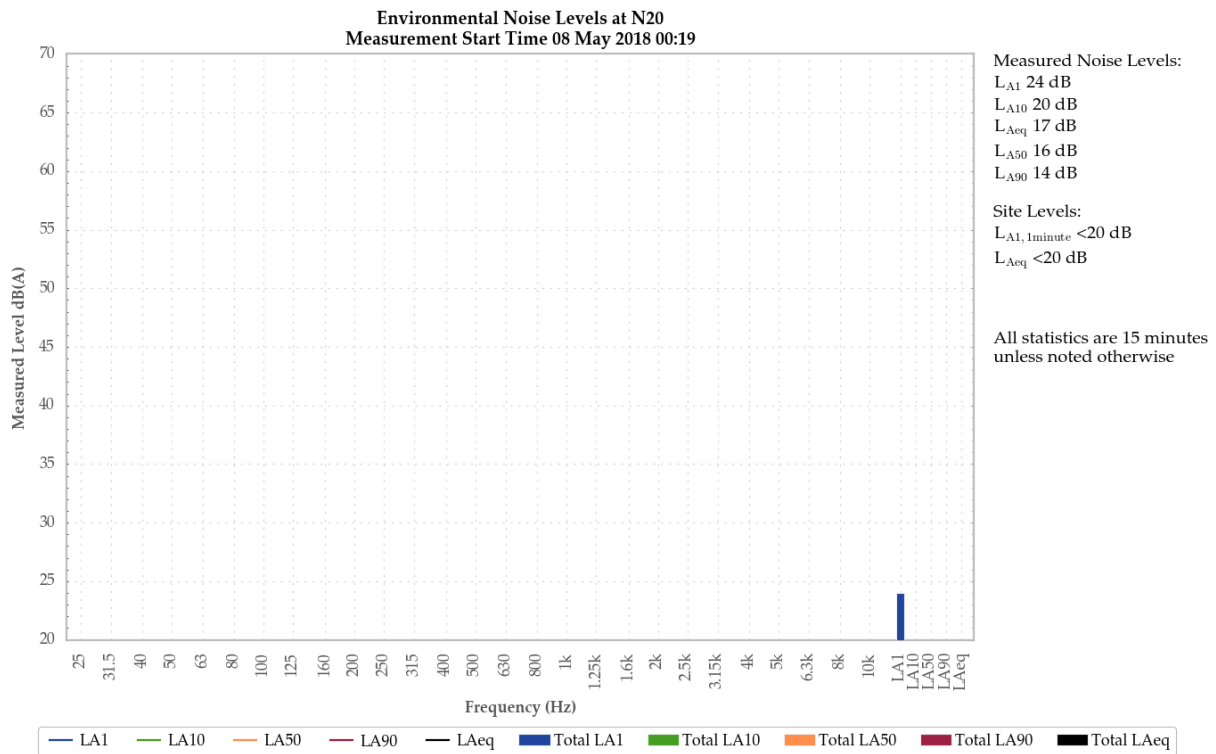


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

A low-level continuum from WCP was audible throughout the measurement generating a site-only LAeq and LA1,1minute of less than 20 dB.

Cows and aircraft noise generated the measured LA1. Continuum from WCP and the noise floor of the measurement instrument were responsible for the measured LA10, LAeq, LA50, and LA90.

Distant train noise was also noted.

5.1.8 N21, 7 May 2018

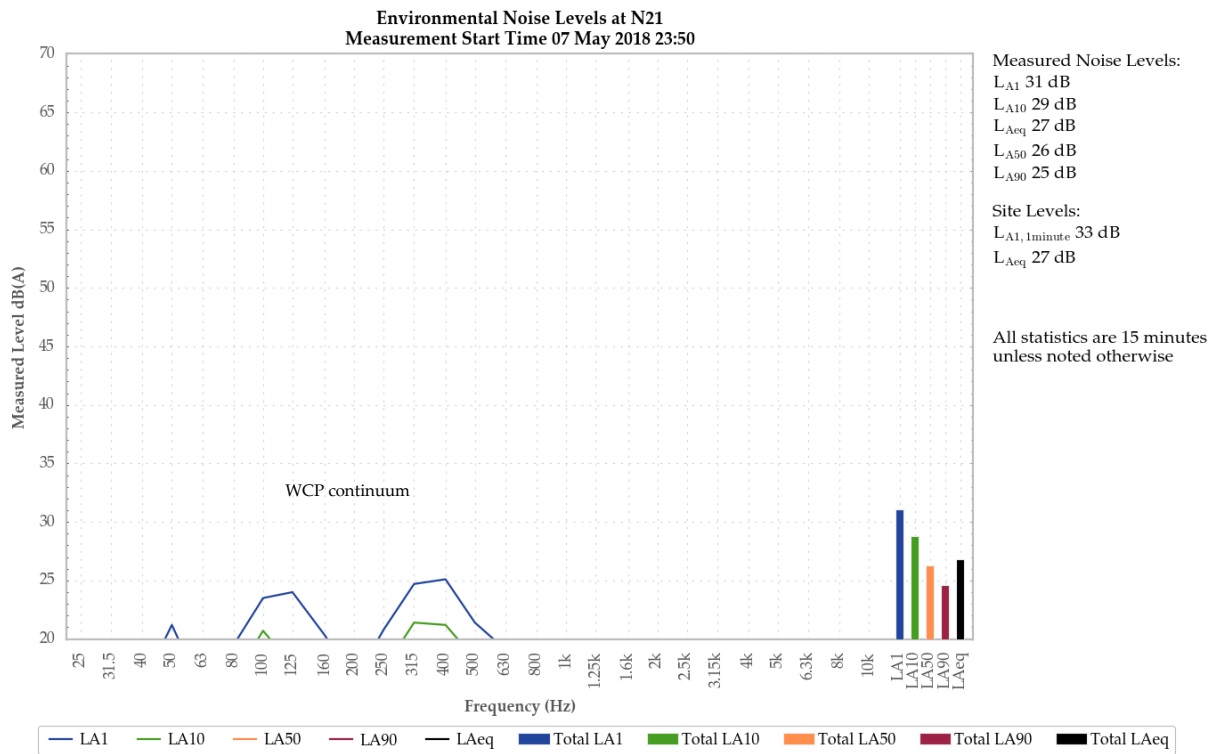


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

Mining continuum from WCP was audible during the measurement generating the site only L_{Aeq} of 27 dB. An engine surge from site was responsible for the site-only L_{A1,1minute} of 33 dB. Impacts were also noted.

Continuum from WCP generated all measured noise levels.

Dogs and bats were also noted.

6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 7/8 May 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the May 2018 monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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
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Sound Level Meter
IEC 61672-3.2006
Calibration Certificate

Calibration Number C16643

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 : 22.2°C
Relative Humidity : 46.6%
Barometric Pressure : 99.95kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 44.5%
Barometric Pressure : 99.95kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 16/11/2016

Secondary Check: Sandra Minto
Report Issue Date : 17/11/2016

Approved Signatory :

Juan Agüero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests	Environmental Conditions
31.5 Hz to 8kHz	Temperature
12.5kHz	Relative Humidity
16kHz	Barometric Pressure
Electrical Tests	
31.5 Hz to 20 kHz	

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.

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 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
Calibration Date : 18 Dec 2017
Secondary Check: Riley Cooper
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 - Environmental Conditions			
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.

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PAGE 1 OF 1

Wilpinjong Coal

*Environmental Noise
Monitoring*

June 2018

Prepared for

Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring June 2018

Reference: 18220_R01
Report date: 11 July 2018

Prepared for

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Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Jason Cameron
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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 4/5 June 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the June 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 4/5 June 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

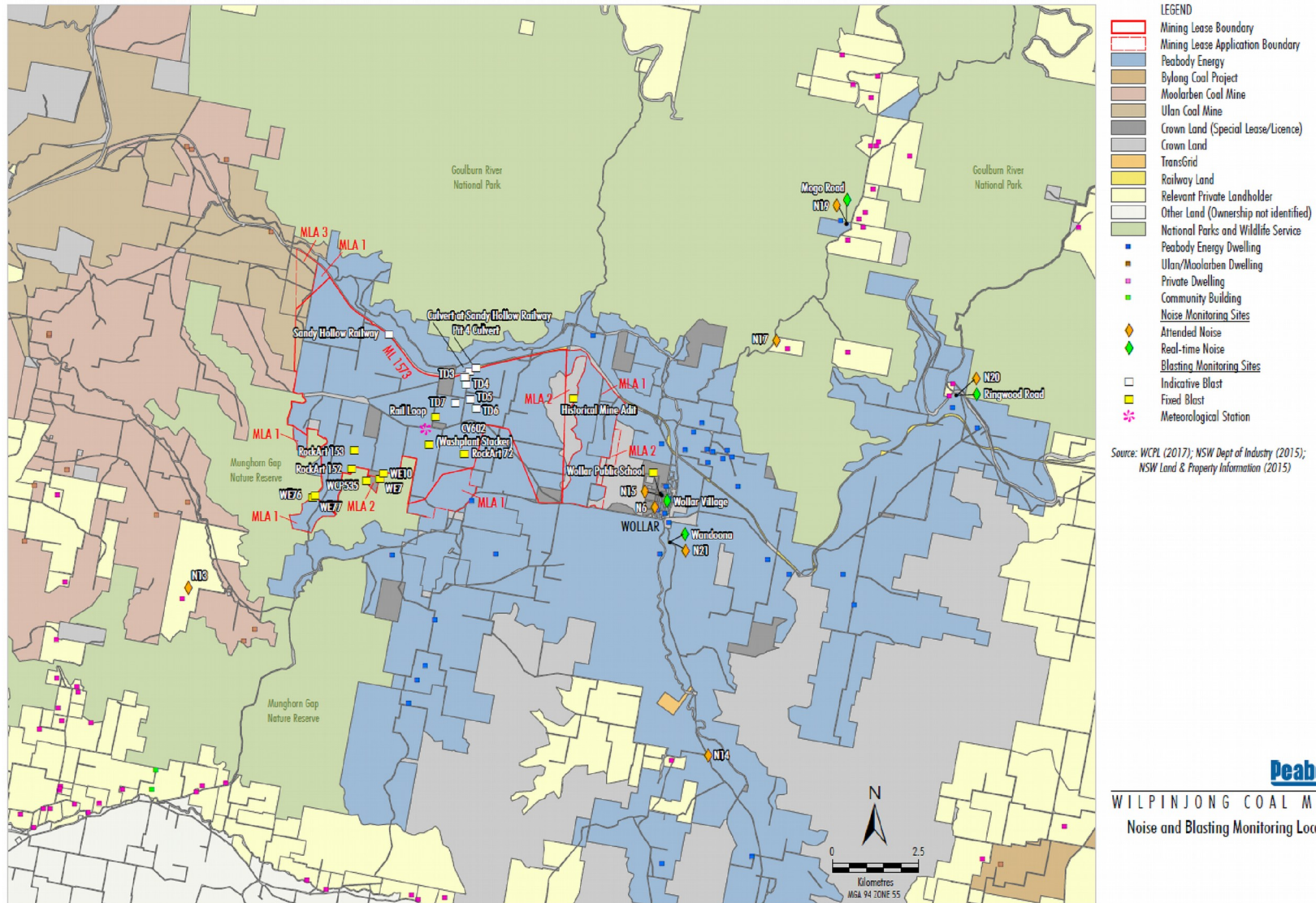


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
L _{A1}	The noise level which is exceeded for 1 per cent of the time
L _{A10}	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Jason Cameron.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30131882	14/03/2019
Rion NC-73 acoustic calibrator	11248300	10/10/2019
Rion NA-28 sound level analyser	01070590	28/06/2018
Pulsar 106 acoustic calibrator	79631	30/03/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent noise sources from site during the survey. In addition, there is no equipment on site that is likely to generate tonal noise as defined in the NPfI. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – JUNE 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	05/06/2018 01:31	40	24	20	19	19	18	17	54
N13	05/06/2018 00:31	39	30	28	26	27	25	23	46
N14	05/06/2018 00:31	39	27	20	19	20	18	16	54
N15	04/06/2018 23:12	35	24	22	20	20	18	15	54
N17	04/06/2018 22:31	39	26	20	15	18	14	14	54
N19	04/06/2018 22:00	34	23	20	16	17	15	14	54
N20	04/06/2018 23:46	39	26	18	15	18	15	14	54
N21	05/06/2018 01:06	53	51	38	29	38	22	19	54

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – JUNE 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	05/06/2018 01:31	0.5	F	37	Yes	IA	Nil
N13	05/06/2018 00:31	0.0	F	36	Yes	<20	Nil
N14	05/06/2018 00:31	0.0	F	35	Yes	IA	Nil
N15	04/06/2018 23:12	0.0	F	35	Yes	IA	Nil
N17	04/06/2018 22:31	0.7	F	35	Yes	IA	Nil
N19	04/06/2018 22:00	0.9	F	35	Yes	NM	Nil
N20	04/06/2018 23:46	0.8	G	35	No	IA	NA
N21	05/06/2018 01:06	0.6	F	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – JUNE 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	05/06/2018 01:31	0.5	F	45	Yes	IA	Nil
N13	05/06/2018 00:31	0.0	F	45	Yes	26	Nil
N14	05/06/2018 00:31	0.0	F	45	Yes	IA	Nil
N15	04/06/2018 23:12	0.0	F	45	Yes	IA	Nil
N17	04/06/2018 22:31	0.7	F	45	Yes	IA	Nil
N19	04/06/2018 22:00	0.9	F	45	Yes	NM	Nil
N20	04/06/2018 23:46	0.8	G	45	No	IA	NA
N21	05/06/2018 01:06	0.6	F	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, JUNE 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L_{Aeq} dB	Low pass (<630Hz) L_{Aeq} dB	Low pass (<630Hz) L_{A90} dB	
N15/SX33	04/06/2018 23:12	04/06/2018 2315	33	29	22	IA
N19/SX32	04/06/2018 22:00	04/06/2018 2200	19	10	9	NM
N20/SX30	04/06/2018 23:46	04/06/2018 2345	26	21	9	IA
N21/SX31	05/06/2018 01:06	05/06/2018 0100	47	46	24	IA

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – JUNE 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	05/06/2018 01:31	5	0.0	-	0
N13	05/06/2018 00:31	9	1.0	195	1
N14	05/06/2018 00:31	8	0.0	-	2
N15	04/06/2018 23:12	7	0.0	-	3
N17	04/06/2018 22:31	10	0.0	-	1
N19	04/06/2018 22:00	11	0.9	25	1
N20	04/06/2018 23:46	6	0.0	-	3
N21	05/06/2018 01:06	6	0.0	-	1

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
04/06/2018 21:00	0.8	97	3.2
04/06/2018 21:15	0.8	74	2.2
04/06/2018 21:30	1.2	59	2.0
04/06/2018 21:45	2.0	71	1.2
04/06/2018 22:00	1.7	65	2.4
04/06/2018 22:00	1.7	65	2.4
04/06/2018 22:15	0.9	75	3.0
04/06/2018 22:30	0.8	79	3.4
04/06/2018 22:45	0.7	65	2.6
04/06/2018 23:00	0.7	114	1.6
04/06/2018 23:15	1.0	125	2.0
04/06/2018 23:30	0.0	125	3.4
04/06/2018 23:45	0.9	340	4.0
05/06/2018 00:00	0.8	338	5.2
05/06/2018 00:15	0.5	244	4.6
05/06/2018 00:30	0.0	244	3.8
05/06/2018 00:45	0.0	244	3.4
05/06/2018 01:00	0.6	0	2.6
05/06/2018 01:15	0.6	309	3.4
05/06/2018 01:30	0.7	308	3.2
05/06/2018 01:45	0.5	330	3.2
05/06/2018 02:00	0.0	330	3.6
05/06/2018 02:15	0.6	304	2.8
05/06/2018 02:30	0.3	10	2.6
05/06/2018 02:45	0.0	10	2.4
05/06/2018 03:00	0.6	296	1.6
05/06/2018 03:15	0.5	336	2.0

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

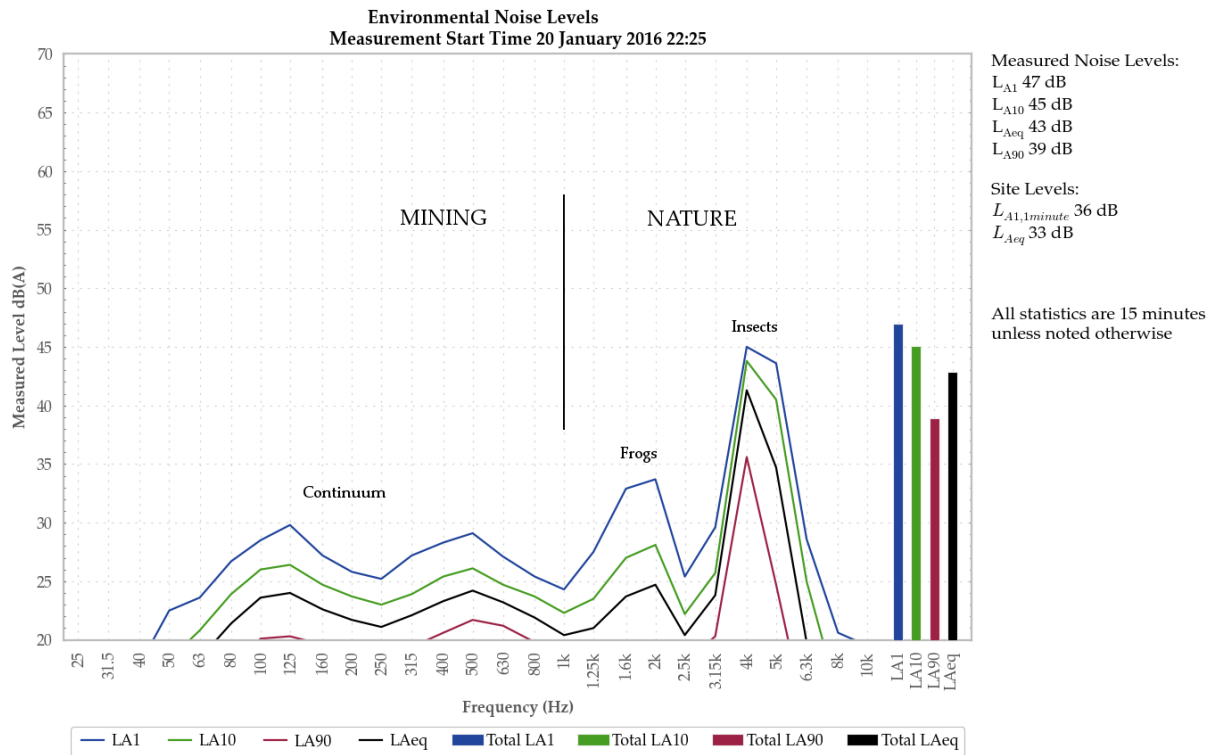


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 05 June 2018

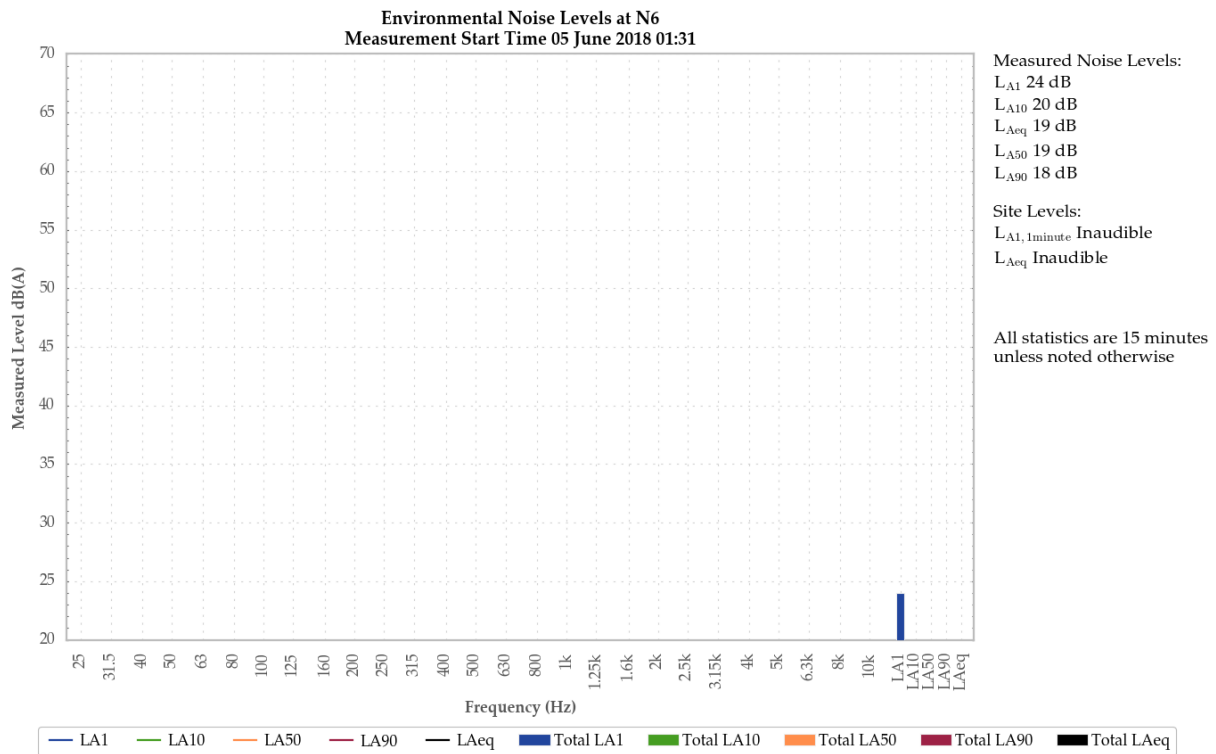


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Dogs generated the measured LA1. The noise floor of the measurement system was responsible for all other levels.

Cows, frogs, birds and residential noises were also noted.

5.1.2 N13, 05 June 2018

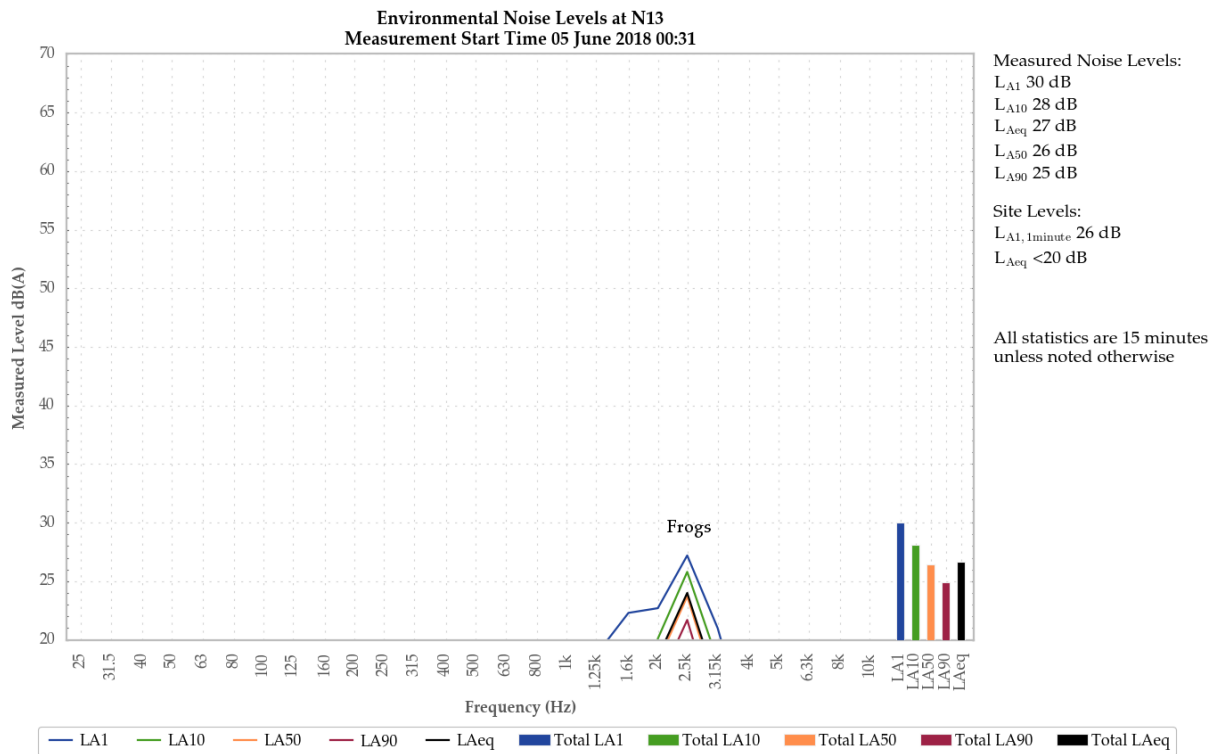


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

A WCP continuum was audible throughout the measurement and generated the site only LAeq of less than 20dB. Engine surges from WCP generated the site only LA1,1minute of 26dB.

Frogs generated measured levels.

Birds and livestock were also noted.

5.1.3 N14, 05 June 2018

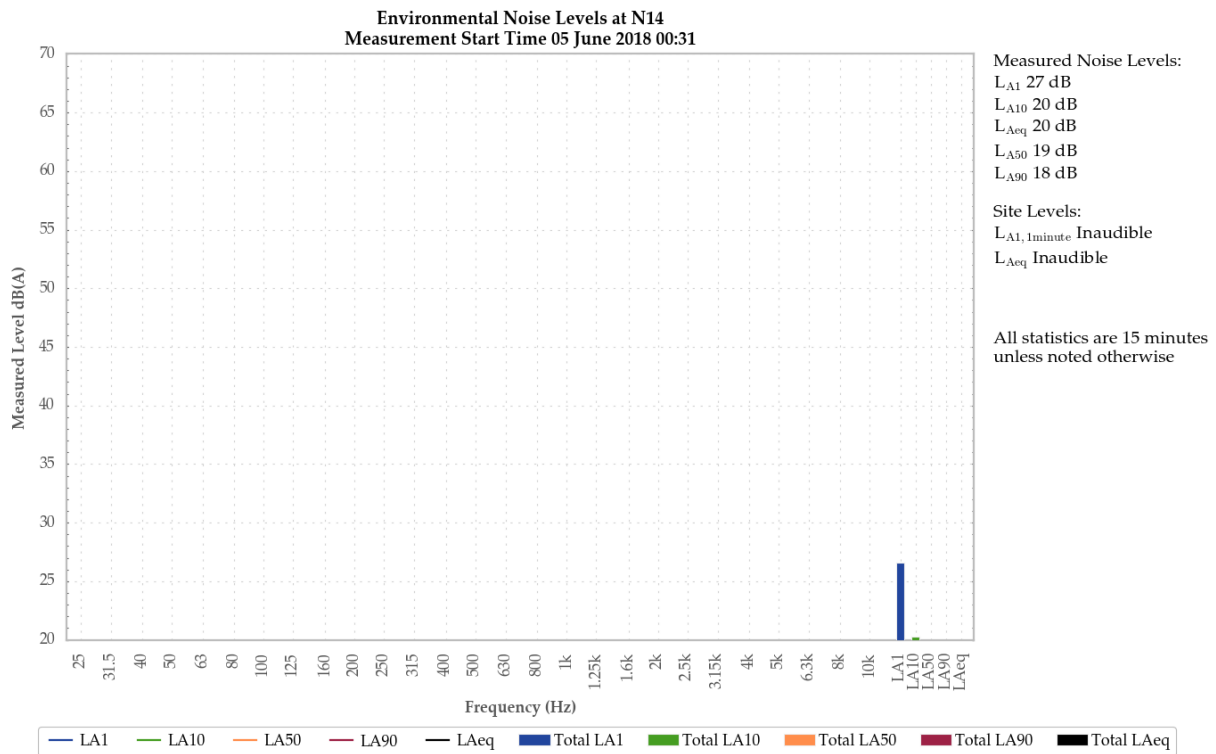


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Cows generated the overall LA1. The noise floor of the measurement system was responsible for all other levels.

Dogs, birds, frogs and local pump noise were also noted.

5.1.4 N15, 04 June 2018

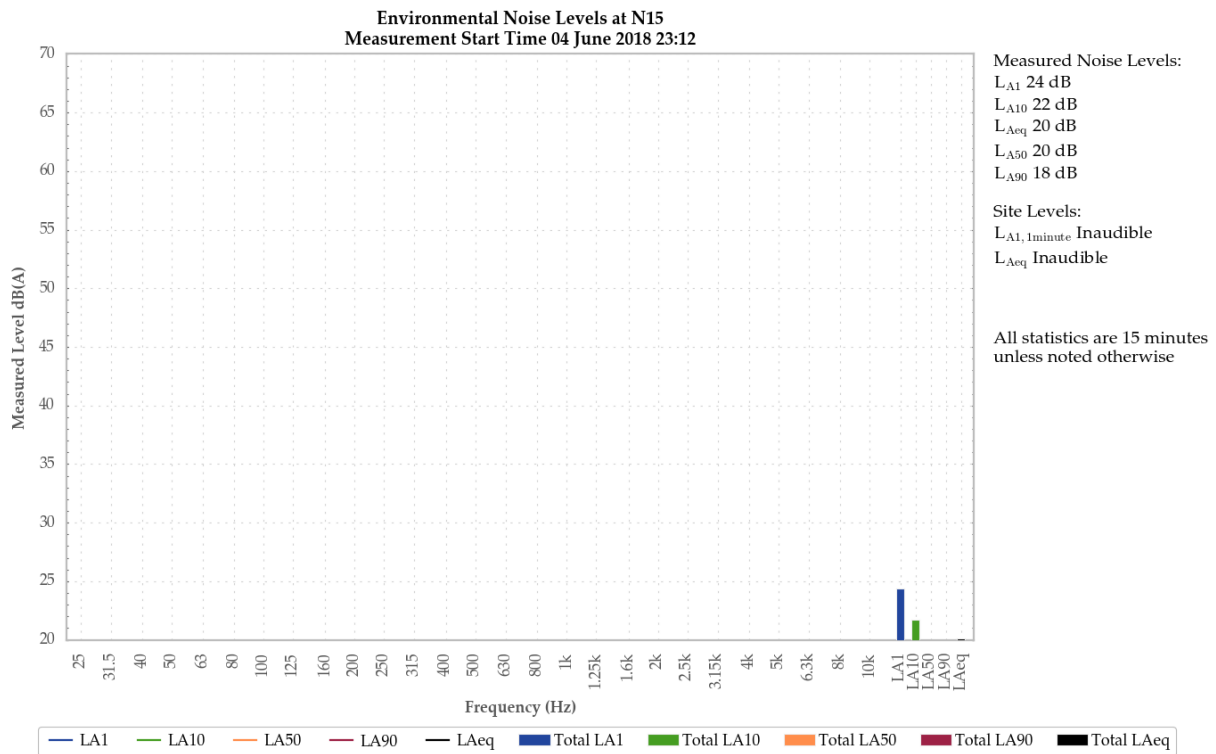


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Residential noises generated the measured LA1, LA10, LAeq and LA50. The noise floor of the measurement system was responsible for the overall LA90.

A train and cows were also noted.

5.1.5 N17, 04 June 2018

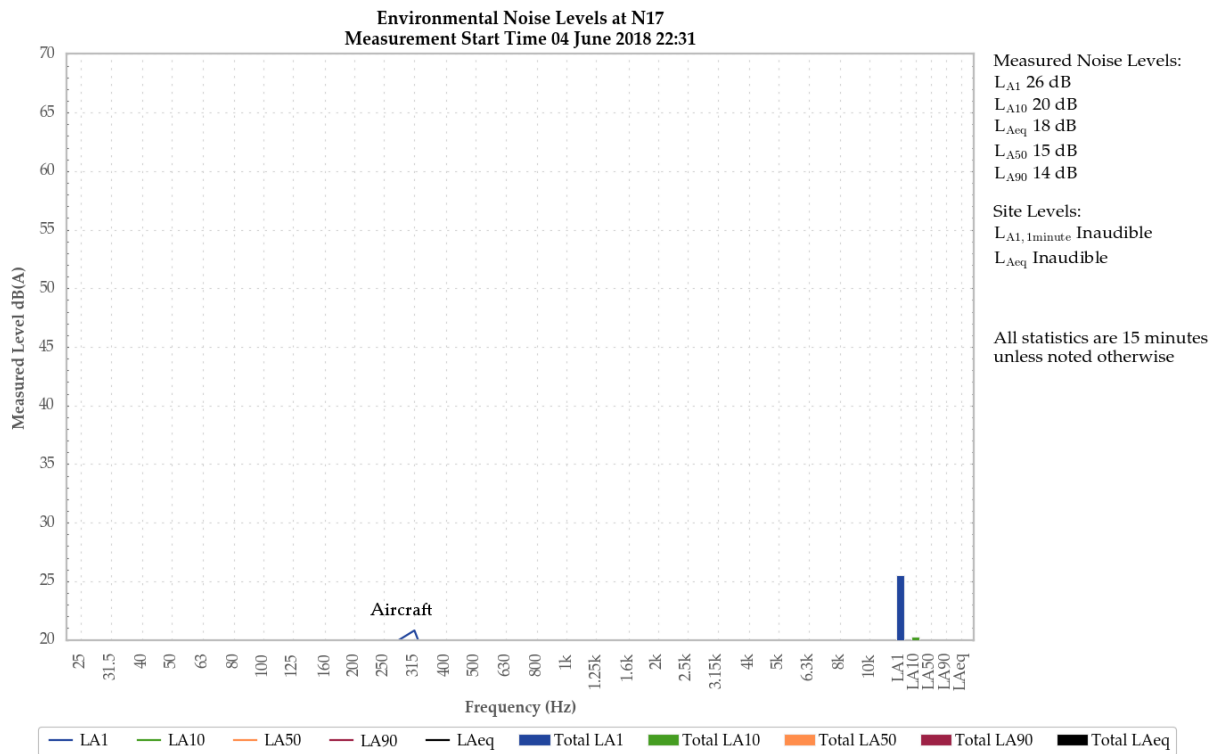


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

An aircraft generated the measured LA1 and LA10. The noise floor of the measurement system was responsible for the LAeq, LA50 and LA90.

A train was also noted.

5.1.6 N19, 04 June 2018

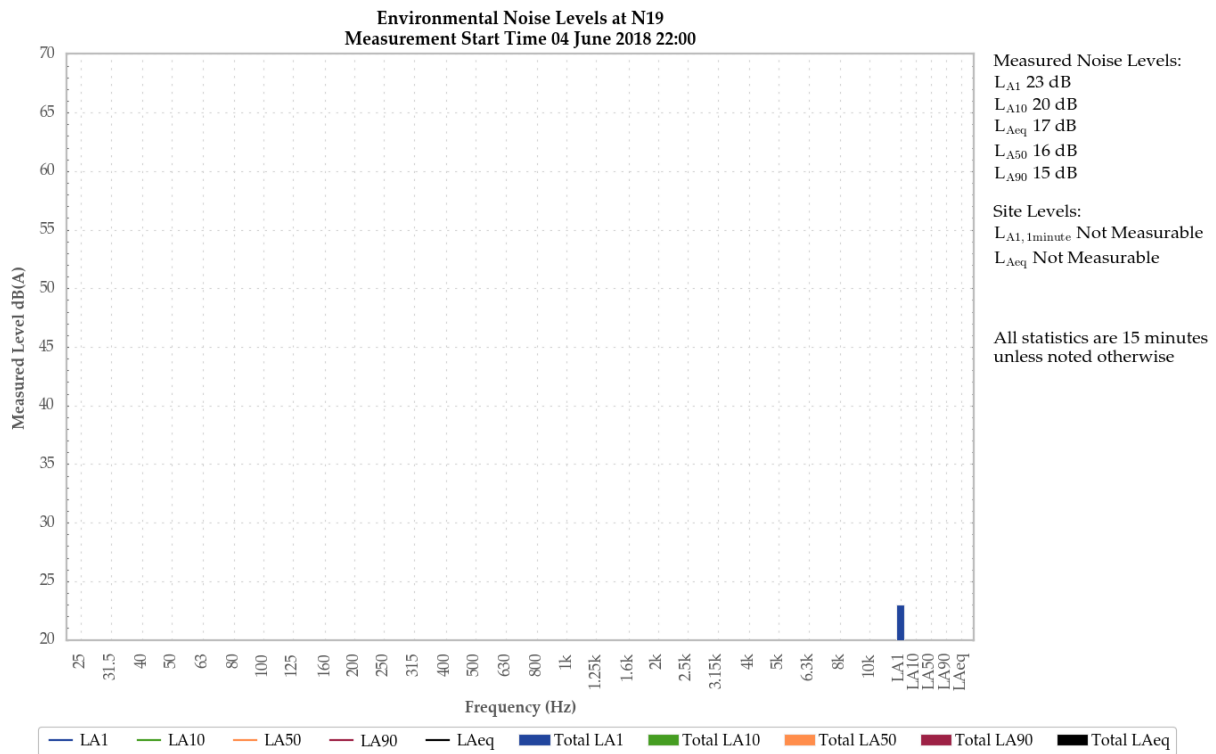


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was not measureable.

Frogs generated the measured LA1. The noise floor of the measurement system was responsible for all other levels.

Breeze in foliage and local fauna were also noted.

5.1.7 N20, 04 June 2018

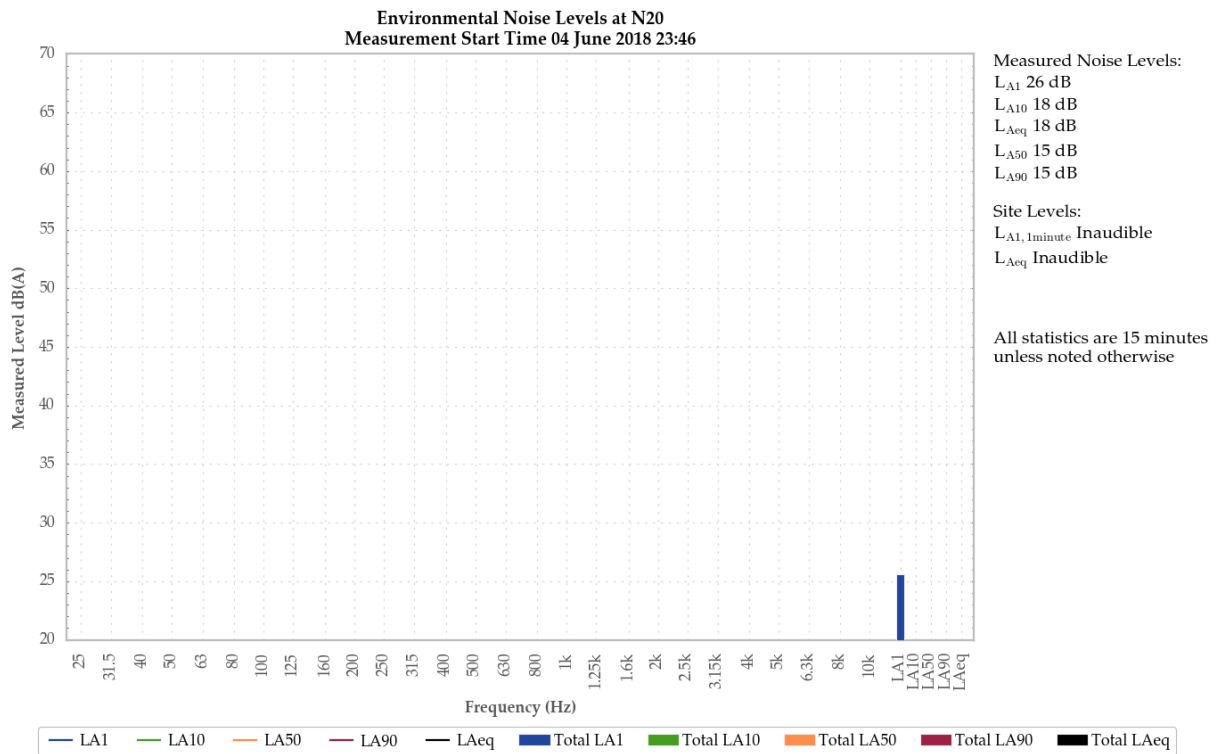


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

Cows generated the measured LA1. The noise floor of the measurement system was responsible for all other levels

Dogs and frogs were also noted.

5.1.8 N21, 05 June 2018

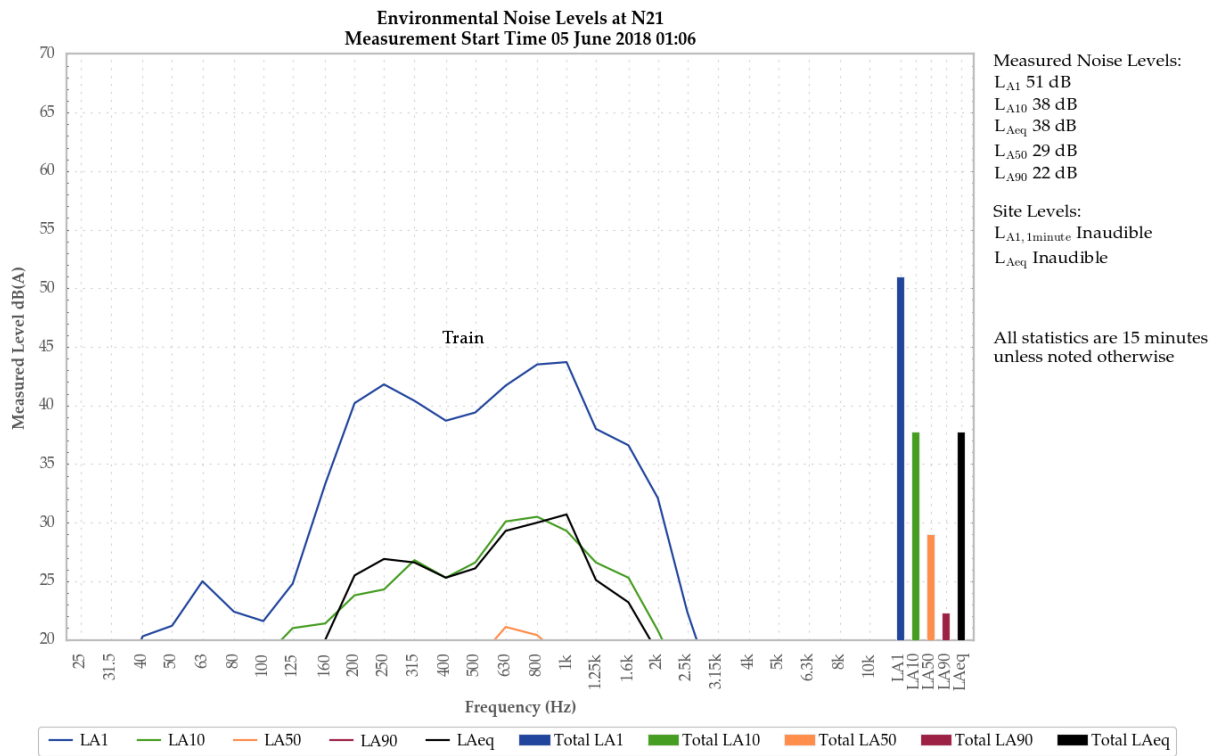


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was inaudible.

A train generated measured levels.

Cows were also noted.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 4/5 June 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the June 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZeq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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 61672-3:2006

Calibration Certificate

Calibration Number C16323

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

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Pre-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.19kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 21.4°C
Relative Humidity : 37.5%
Barometric Pressure : 100.23kPa

Calibration Technician : Calvin
Simpfendorfer
Calibration Date : 28/06/2016

Secondary Check: Riley Cooper

Report Issue Date : 30/06/2016

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	Pass	14: Level linearity on the reference level range	Pass
11: Acoustical tests of a frequency weighting	Pass	15: Level linearity incl. the level range control	Pass
12: Electrical tests of frequency weightings	Pass	16: Toneburst response	Pass
13: Frequency and time weightings at 1 kHz	Pass	17: Peak C sound level	Pass
		18: Overload Indication	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

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	±0.31dB	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.

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

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Level 7 Building 2 423 Pennant Hills Rd
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Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C17126

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

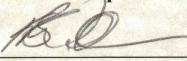
Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
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.

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 Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions

Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :

Juan Agüero

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	1000.38

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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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

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

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17511

Client Details Acoustic Research Labs Pty Ltd
Level 7, Bld 2, 423 Pennant Hills Road
Pennant Hills NSW 2120

Equipment Tested/ Model Number : Rion NC-73
Instrument Serial Number : 11248300

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 49.8%
Barometric Pressure : 99.46kPa

Calibration Technician : Jason Gomes
Calibration Date : 10/10/2017
Secondary Check: Riley Cooper
Report Issue Date : 11/10/2017

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	94.2	1004.10

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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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.

Wilpinjong Coal

*Environmental Noise Monitoring
July 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*

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

Wilpinjong Coal

Environmental Noise Monitoring July 2018

Reference: 18253_R01

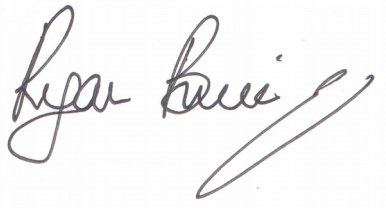
Report date: 3 August 2018

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Ryan Bruniges
Consultant



QA Review: Rob 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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 11/12 July 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the July 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 11/12 July 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

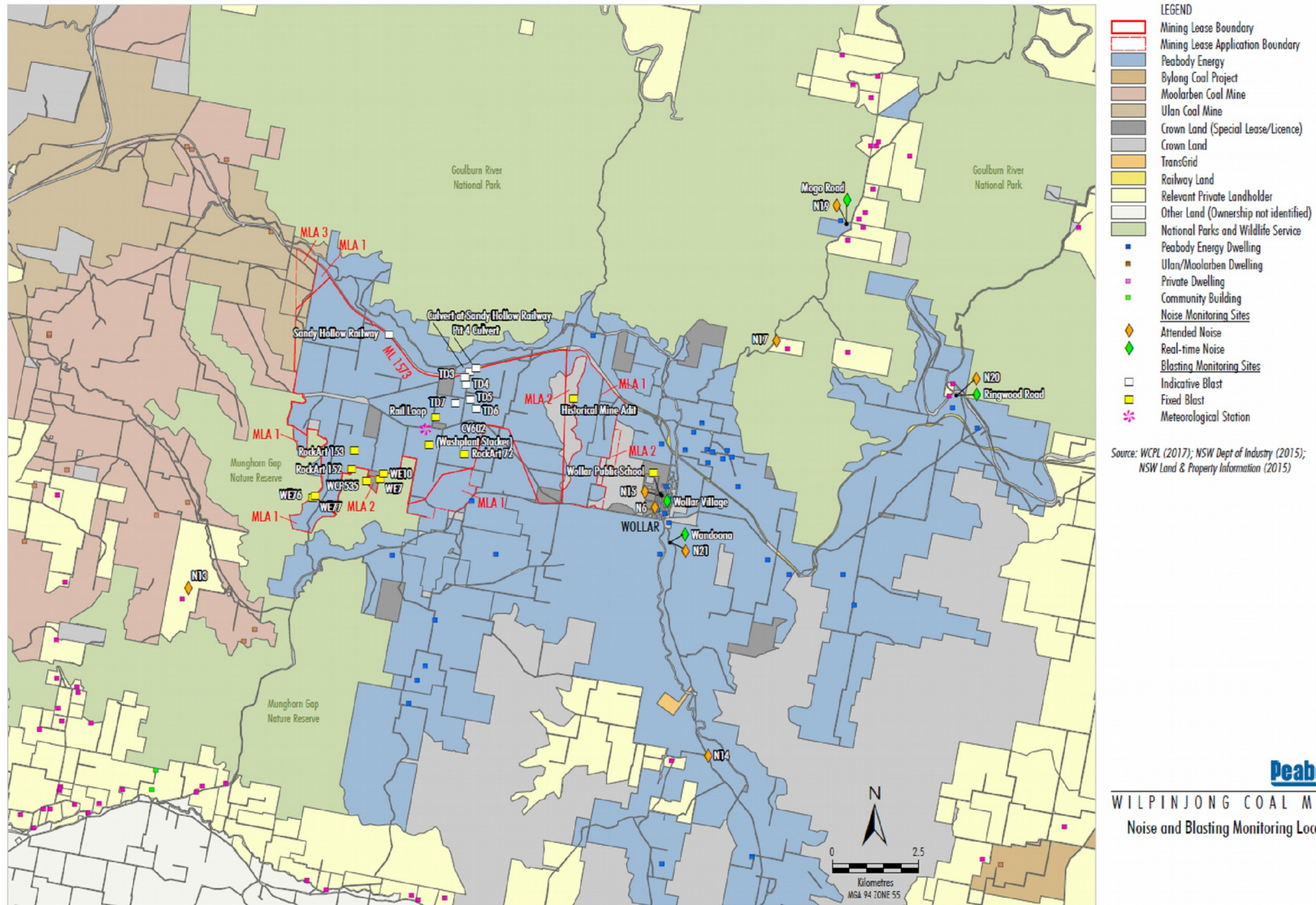


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	1070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	30/03/2019
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar 106 acoustic calibrator	78226	14/03/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – JULY 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	12/07/2018 01:10	40	23	21	20	20	19	18	54
N13	12/07/2018 00:40	40	34	29	25	26	23	20	48
N14	12/07/2018 00:19	45	29	23	20	21	18	17	46
N15	11/07/2018 23:03	34	26	21	17	19	16	15	54
N17	11/07/2018 22:29	44	37	28	16	25	15	14	54
N19	11/07/2018 22:00	54	36	27	16	25	15	14	54
N20	11/07/2018 23:37	44	27	23	17	20	15	15	54
N21	12/07/2018 00:47	50	41	38	23	32	21	19	54

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – JULY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	12/07/2018 01:10	0.6	F	37	Yes	<20	Nil
N13	12/07/2018 00:40	0.0	G	36	No	<25	NA
N14	12/07/2018 00:19	0.5	G	35	No	<20	NA
N15	11/07/2018 23:03	0.5	G	35	No	IA	NA
N17	11/07/2018 22:29	0.0	G	35	No	IA	NA
N19	11/07/2018 22:00	0.3	G	35	No	IA	NA
N20	11/07/2018 23:37	0.0	G	35	No	IA	NA
N21	12/07/2018 00:47	0.0	G	35	No	<25	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – JULY 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	12/07/2018 01:10	0.6	F	45	Yes	<20	Nil
N13	12/07/2018 00:40	0.0	G	45	No	27	NA
N14	12/07/2018 00:19	0.5	G	45	No	<25	NA
N15	11/07/2018 23:03	0.5	G	45	No	IA	NA
N17	11/07/2018 22:29	0.0	G	45	No	IA	NA
N19	11/07/2018 22:00	0.3	G	45	No	IA	NA
N20	11/07/2018 23:37	0.0	G	45	No	IA	NA
N21	12/07/2018 00:47	0.0	G	45	No	<25	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, JULY 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L_{Aeq} dB	Low pass (<630Hz) L_{Aeq} dB	Low pass (<630Hz) L_{A90} dB	WCP L_{Aeq} dB
N15/SX33	11/07/2018 23:03	11/07/2018 23:00	28	28	20	IA
N19/SX32	11/07/2018 22:00	11/07/2018 22:00	24	22	NR	IA
N20/SX30	11/07/2018 23:37	11/07/2018 23:30	26	23	11	IA
N21/SX31	12/07/2018 00:47	12/07/2018 00:45	38	37	26	<25

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – JULY 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	12/07/2018 01:10	1	0.0	-	0
N13	12/07/2018 00:40	5	1.6	215	0
N14	12/07/2018 00:19	3	0.8	160	0
N15	11/07/2018 23:03	2	0.0	-	0
N17	11/07/2018 22:29	5	0.0	-	0
N19	11/07/2018 22:00	8	0.0	-	0
N20	11/07/2018 23:37	0	0.0	-	0
N21	12/07/2018 00:47	0	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
11/07/2018 22:00	0	0	4.6
11/07/2018 22:15	0.3	50	4
11/07/2018 22:30	0.6	320	4.6
11/07/2018 22:45	0	0	4.2
11/07/2018 23:00	0.5	322	4.8
11/07/2018 23:15	0.5	317	4.2
11/07/2018 23:30	0.7	313	4.2
11/07/2018 23:45	0	-	4.2
12/07/2018 00:00	0	-	4
12/07/2018 00:15	0	-	4
12/07/2018 00:30	0.5	334	4
12/07/2018 00:45	0.4	320	4.2
12/07/2018 01:00	0	-	4.4
12/07/2018 01:15	0.6	341	4.2
12/07/2018 01:30	0.6	271	3.8
12/07/2018 01:45	0.6	292	4.2
12/07/2018 02:00	0.5	269	3.4

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

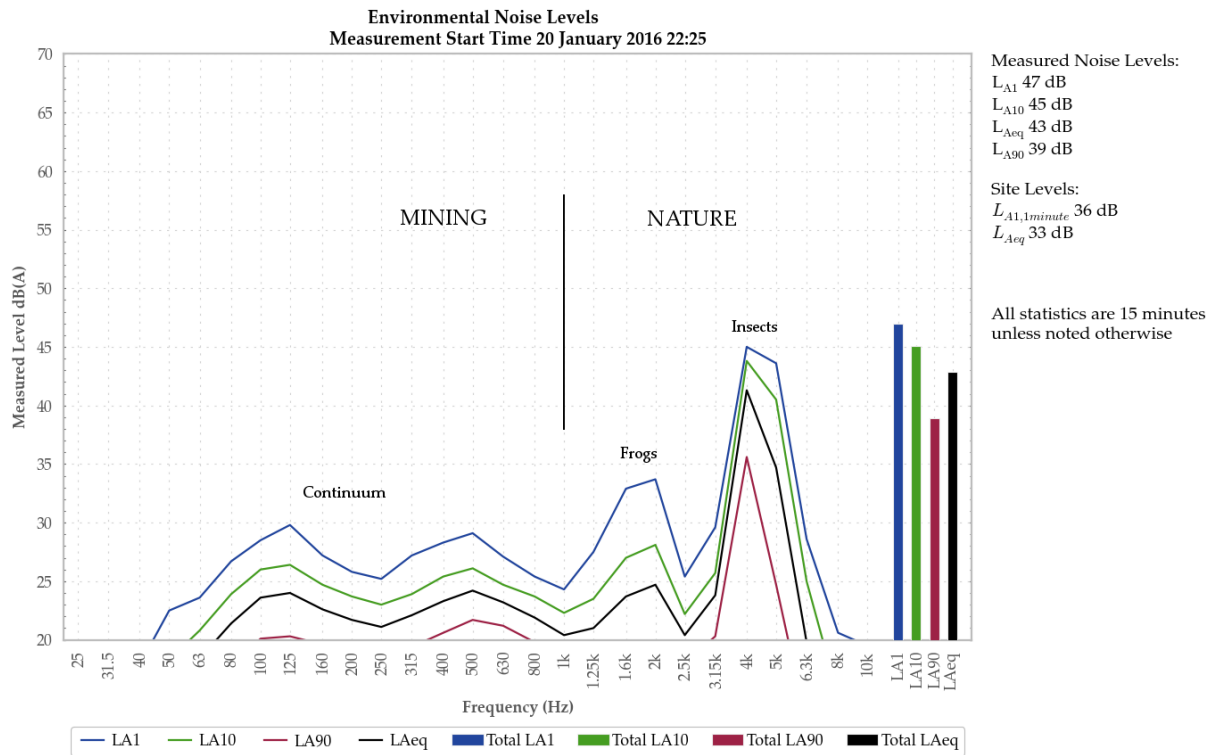


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 12 July 2018

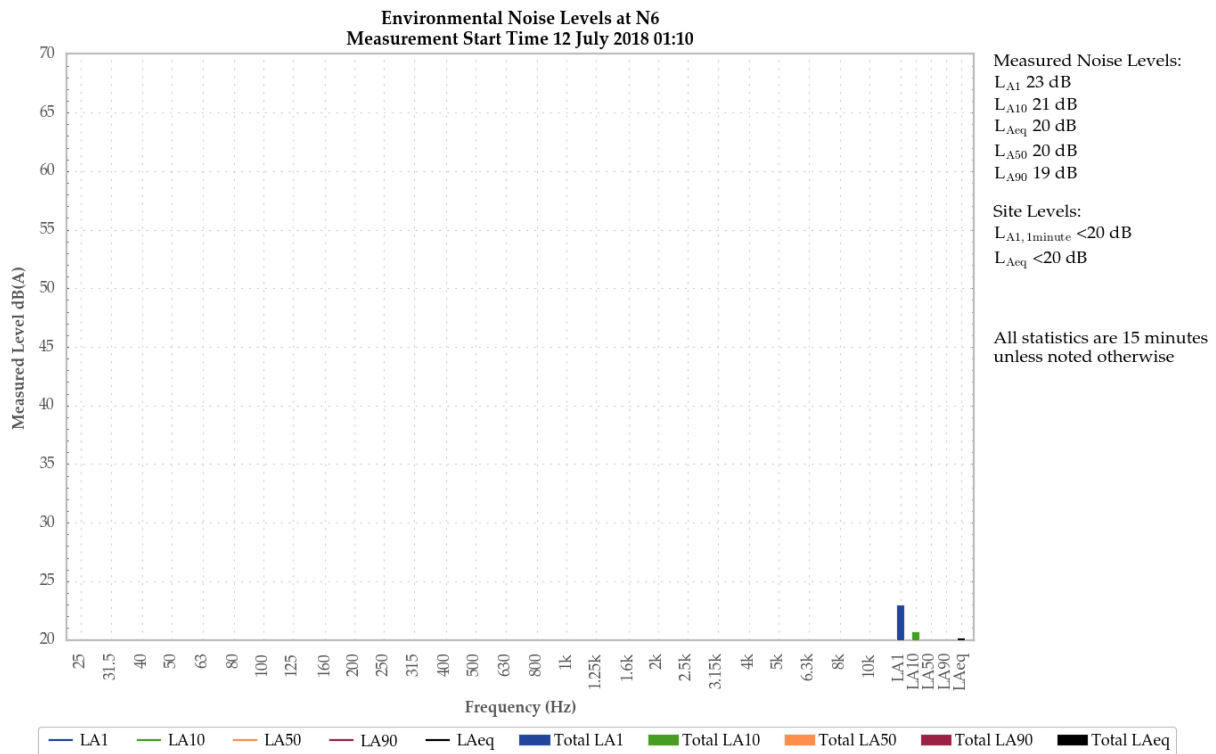


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low-level continuum from WCP was audible throughout the measurement and generated the site only LAeq and LA1,1minute of less than 20 dB.

The continuum from WCP combined with frogs, a local continuum and the noise floor of the sound level meter to generate all measured noise levels.

5.1.2 N13, 12 July 2018

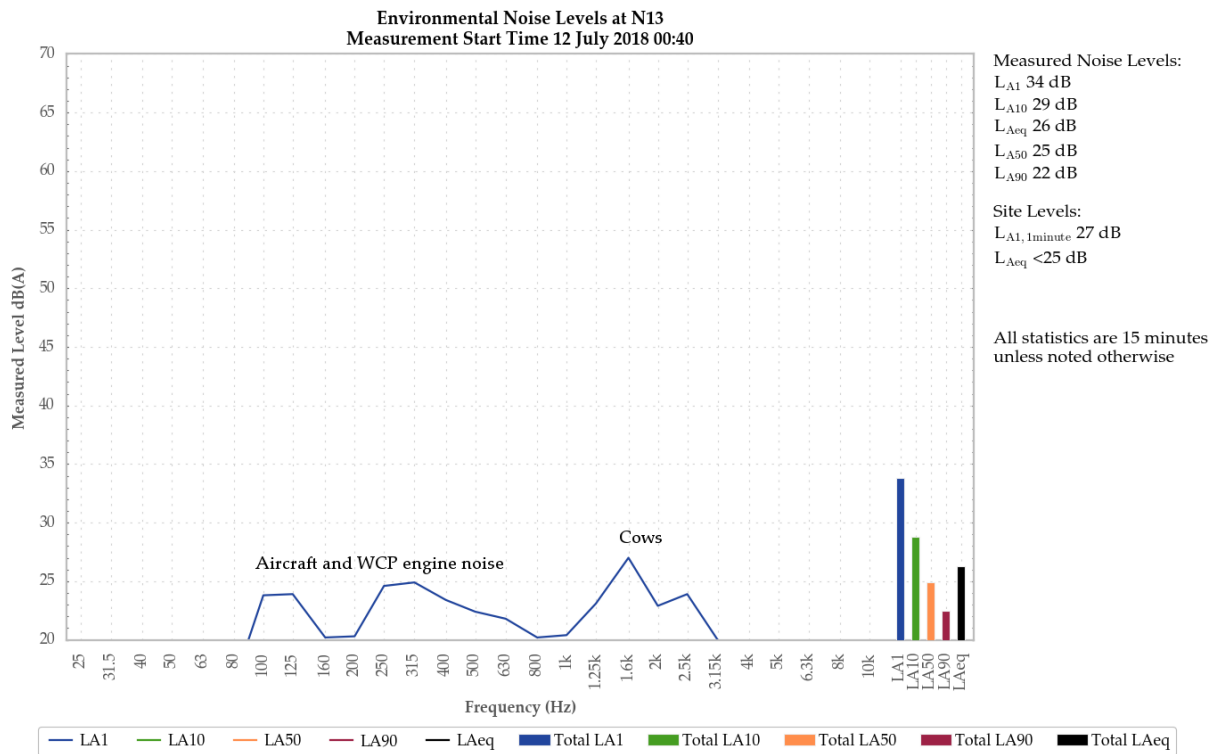


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

Engine and exhaust noise from WCP was audible throughout the measurement and generated the site only LAeq of less than 25 dB and LA1,1minute of 27 dB.

Aircraft and cows combined with the WCP engine and exhaust noise to generate the measured LA1, LA10 and LAeq. Insects, frogs and WCP engine and exhaust noise was responsible for the measured LA90.

Breeze in the foliage was also noted.

5.1.3 N14, 12 July 2018

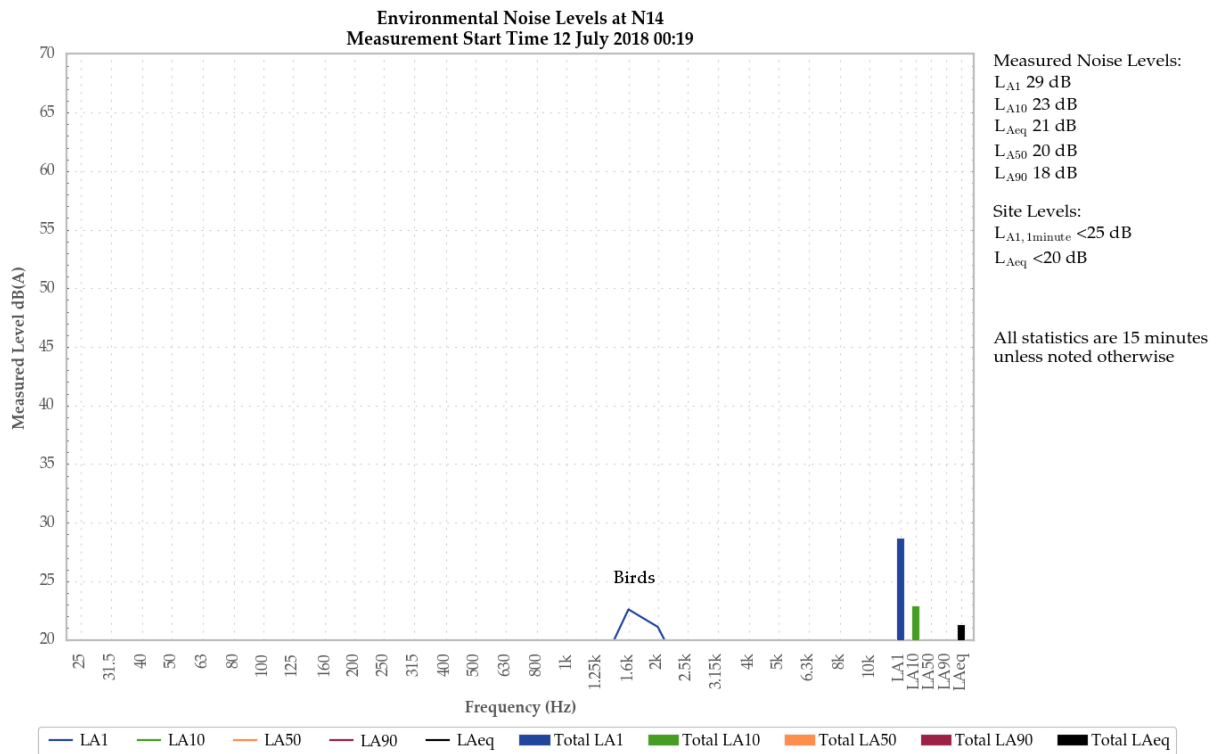


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site only LAeq of less than 20 dB and LA1,1minute of less than 25 dB.

Birds generated the measured LA1. The continuum from WCP combined with frogs and breeze in the foliage to generate the measured LA10, LAeq, LA50 and LA90.

5.1.4 N15, 11 July 2018

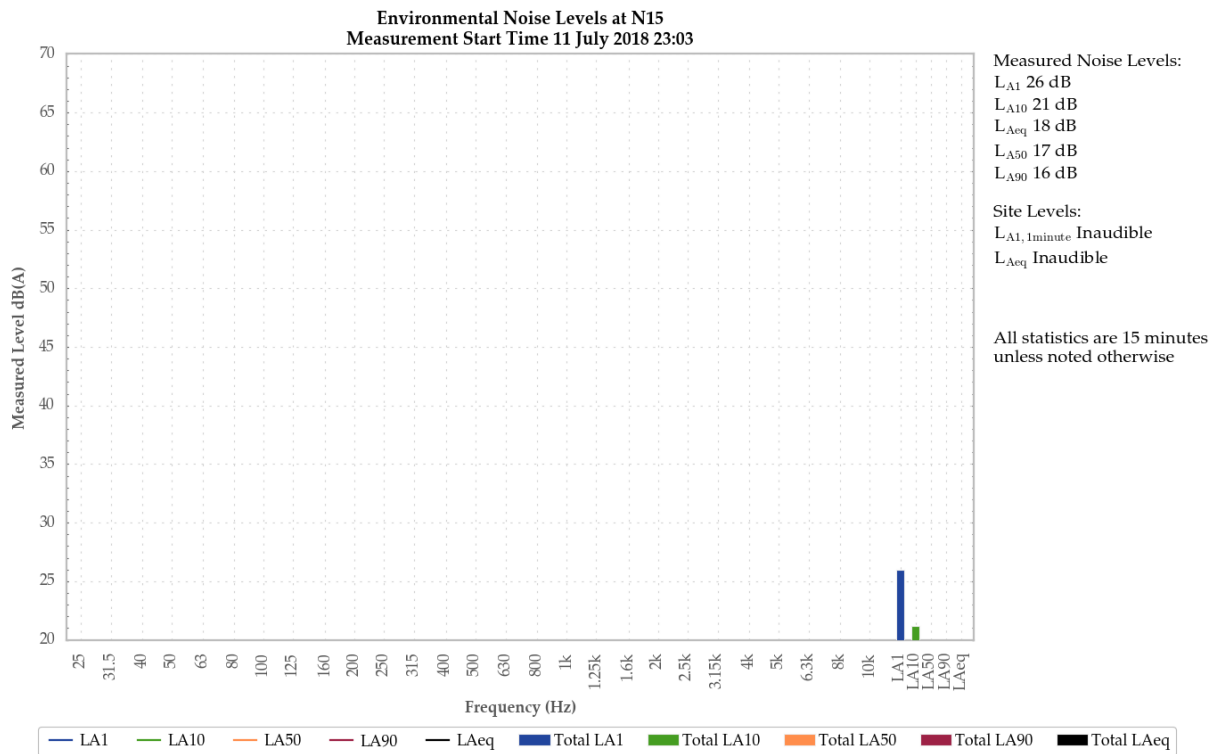


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible during the measurement.

Dogs and a distant train combined to generate the measured LA1 and LA10. A low-level local continuum and the noise floor of the sound level meter combined to generate the measured LAeq, LA50 and LA90.

Birds were also noted.

5.1.5 N17, 11 July 2018

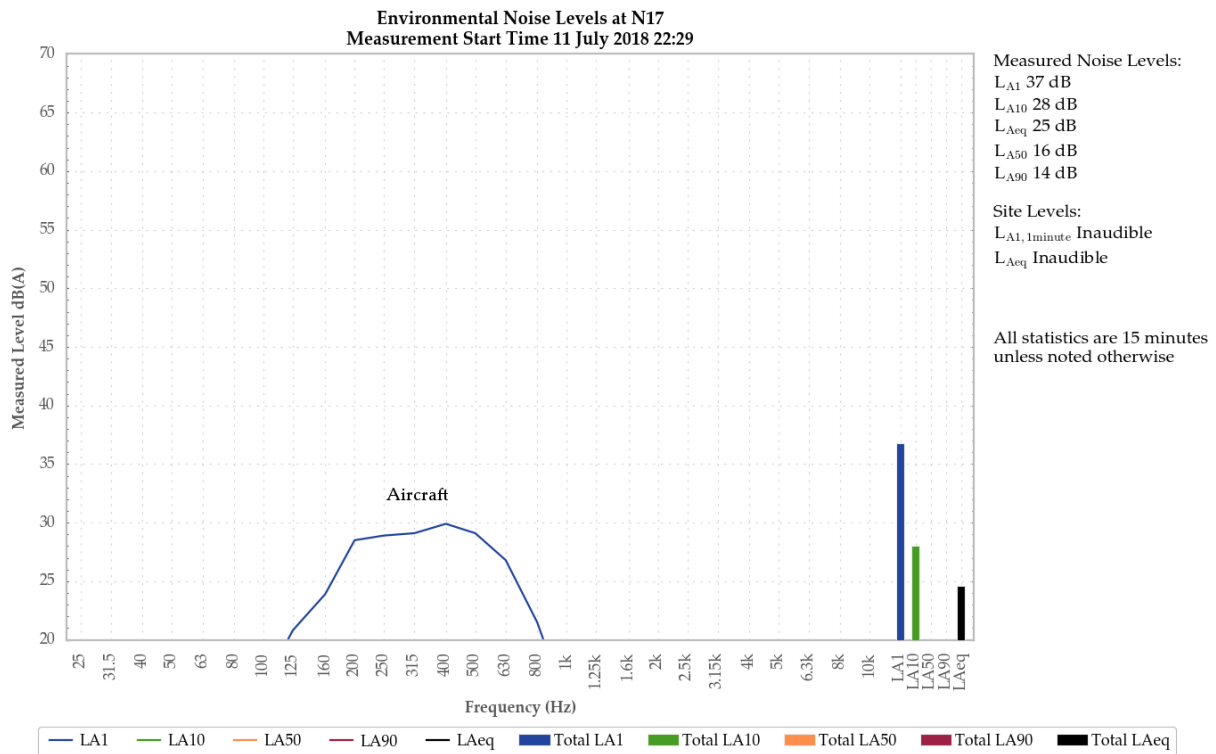


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible during the measurement.

Aircraft were responsible for the measured LA1, LA10 and LAeq. The noise floor of the sound level meter generated the measured LA50 and LAeq.

Distant road traffic tyre noise, dogs and a train were also noted.

5.1.6 N19, 11 July 2018

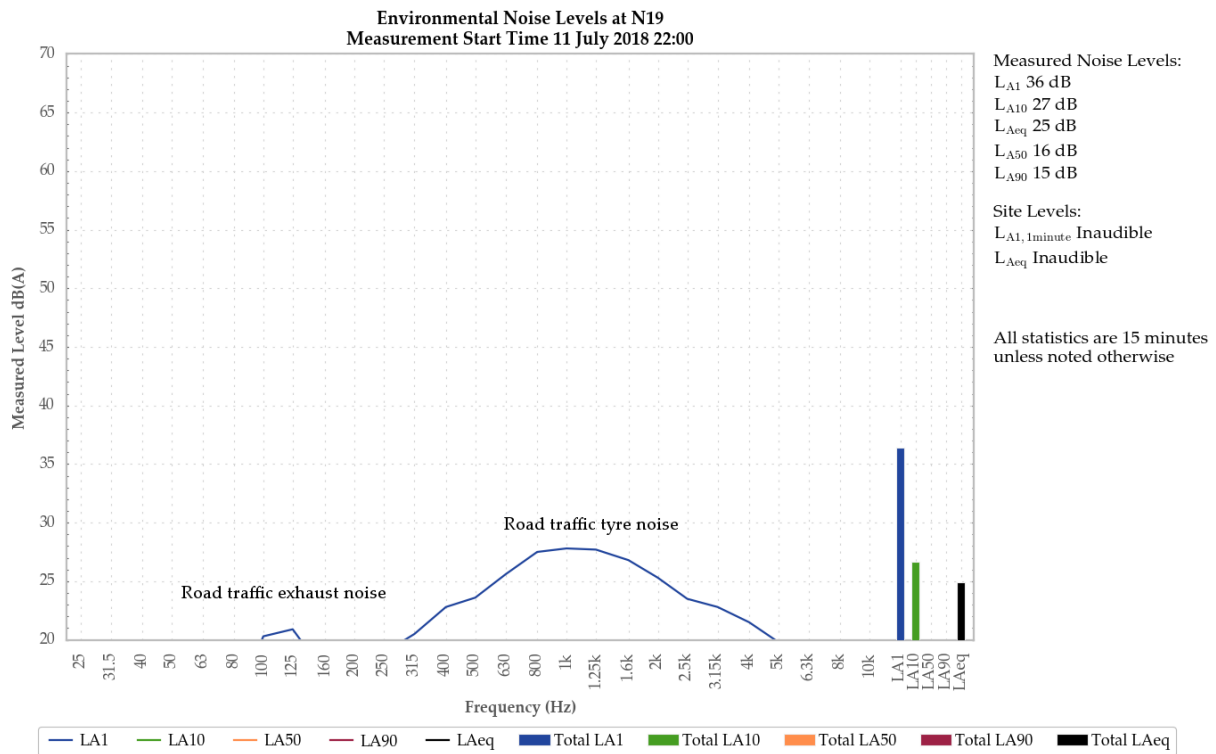


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible during the measurement.

Road traffic noise was responsible for the measured LA1, LA10 and LAeq. The noise floor of the sound level meter generated the measured LA50 and LA90.

Animals in the foliage and dogs were also noted.

5.1.7 N20, 11 July 2018

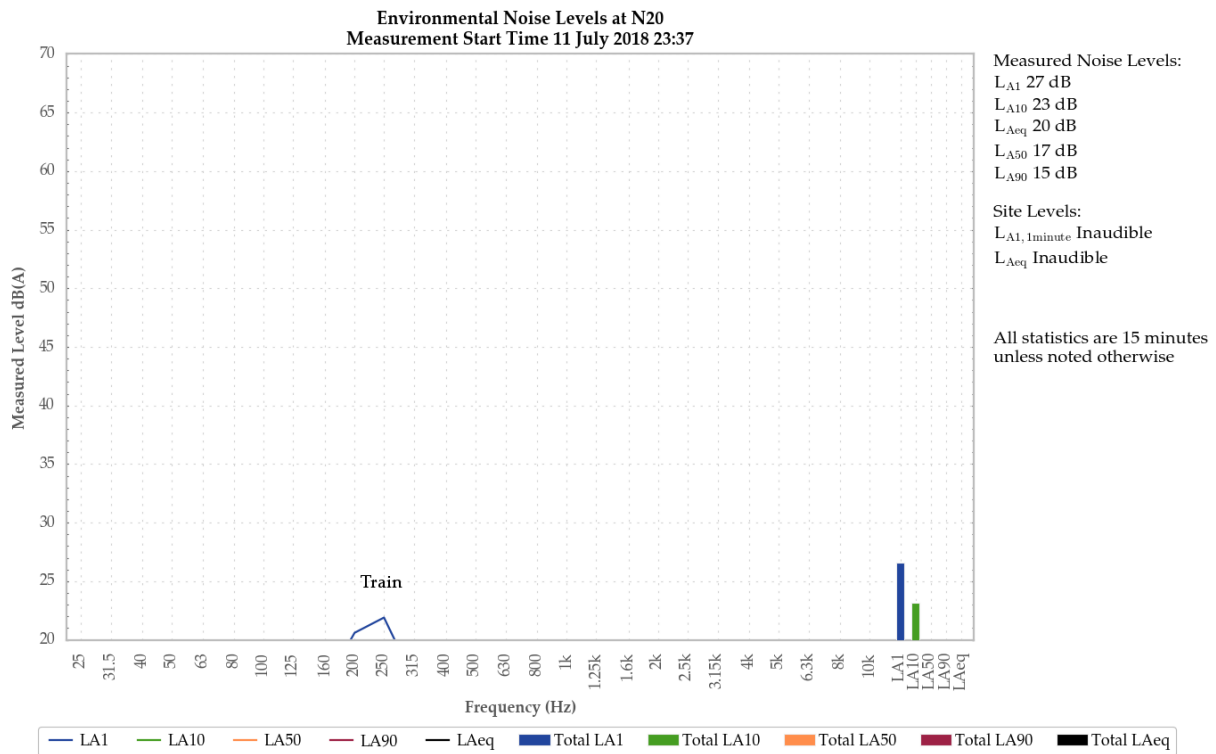


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible during the measurement.

A train was responsible for the measured LA1, LA10 and LAeq. The noise floor of the sound level meter generated the measured LA50 and LA90.

5.1.8 N21, 12 July 2018

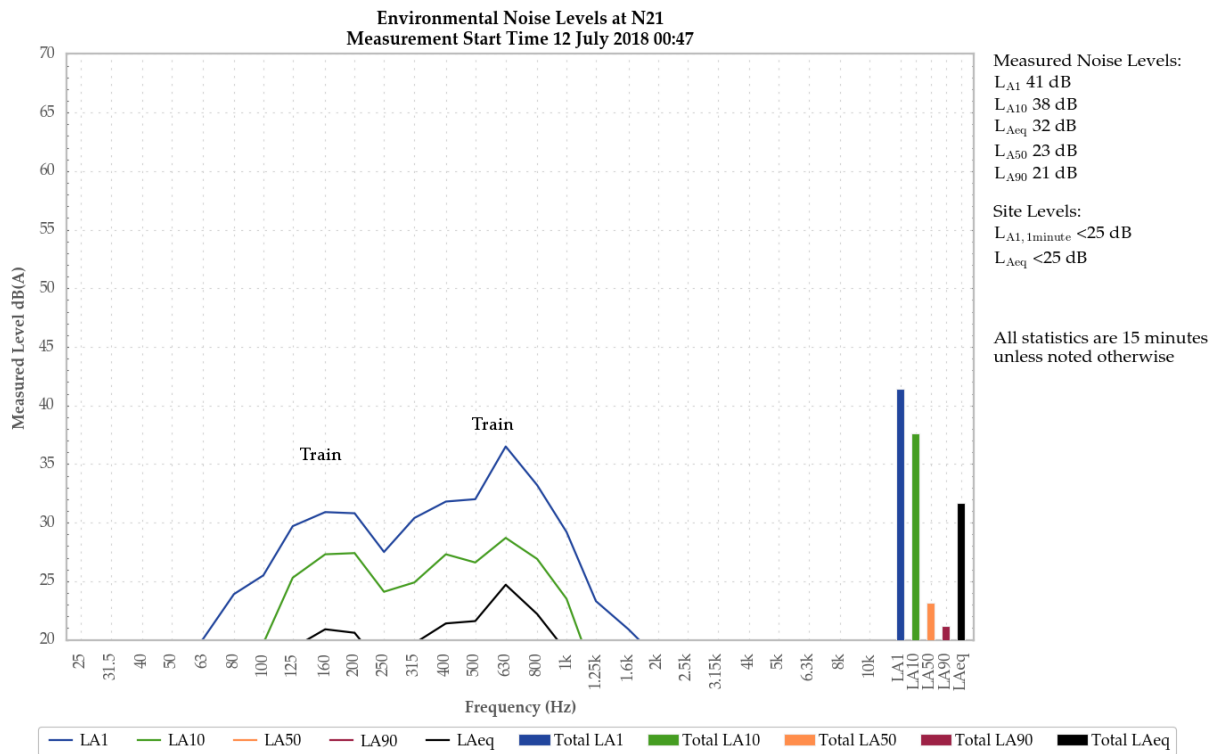


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

A low-level continuum from WCP was audible during the measurement generating the site only LAeq and LA1,1minute of less than 25 dB.

A train was responsible for the measured LA1, LA10 and LAeq. Frogs and the continuum from WCP combined to generate the measured LA50 and LA90.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 11/12 July 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the July 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZe _q ,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



Level 7 Building 2 423 Pennant Hills Rd
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Octave Band Filter AS 4476:1997 Calibration Certificate

Calibration Number C18363A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 37.7%
Barometric Pressure : 100.82kPa

Calibration Technician : Lucky jaiswal **Secondary Check:** Lewis Boorman
Calibration Date : 25 Jun 2018 **Report Issue Date :** 25 Jun 2018

Approved Signatory :

Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

<p>Electrical Tests</p> <p>< 16Hz: ±0.19dB 16Hz-100Hz: ±0.11dB 100Hz-1000Hz: ±0.09dB 1000Hz-10kHz: ±0.09dB > 10kHz: ±0.16dB</p>	<p>Least Uncertainties of Measurement - Environmental Conditions</p> <p>Temperature: ±0.03°C Relative Humidity: ±2.3% Barometric Pressure: ±0.017kPa</p>
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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.

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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17149

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number : Instrument Serial Number :	Pulsar 106 79631
Atmospheric Conditions	
Ambient Temperature :	21.9°C
Relative Humidity :	54.6%
Barometric Pressure :	98.84kPa
Calibration Technician : Vicky Jaiswal Calibration Date : 30/03/2017	Secondary Check: Riley Cooper Report Issue Date : 31/03/2017
Approved Signatory :	Juan Agüero

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	1000.38

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 -		Environmental Conditions	
Specific Tests		Temperature	±0.05°C
Generated SPL	±0.11dB	Relative Humidity	±0.46%
Short Term Fluct.	±0.02dB	Barometric Pressure	±0.017kPa
Frequency	±0.01%		
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.

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Level 7 Building 2 423 Pennant Hills Rd
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Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C17126

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 : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	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.

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

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17127

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

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

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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	1000.32

The sound calibrator has been shown to conform to the class 1 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.

Specific Tests		Least Uncertainties of Measurement - Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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

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Wilpinjong Coal

*Environmental Noise Monitoring
August 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring August 2018

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EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 August 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the August 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 7/8 August 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

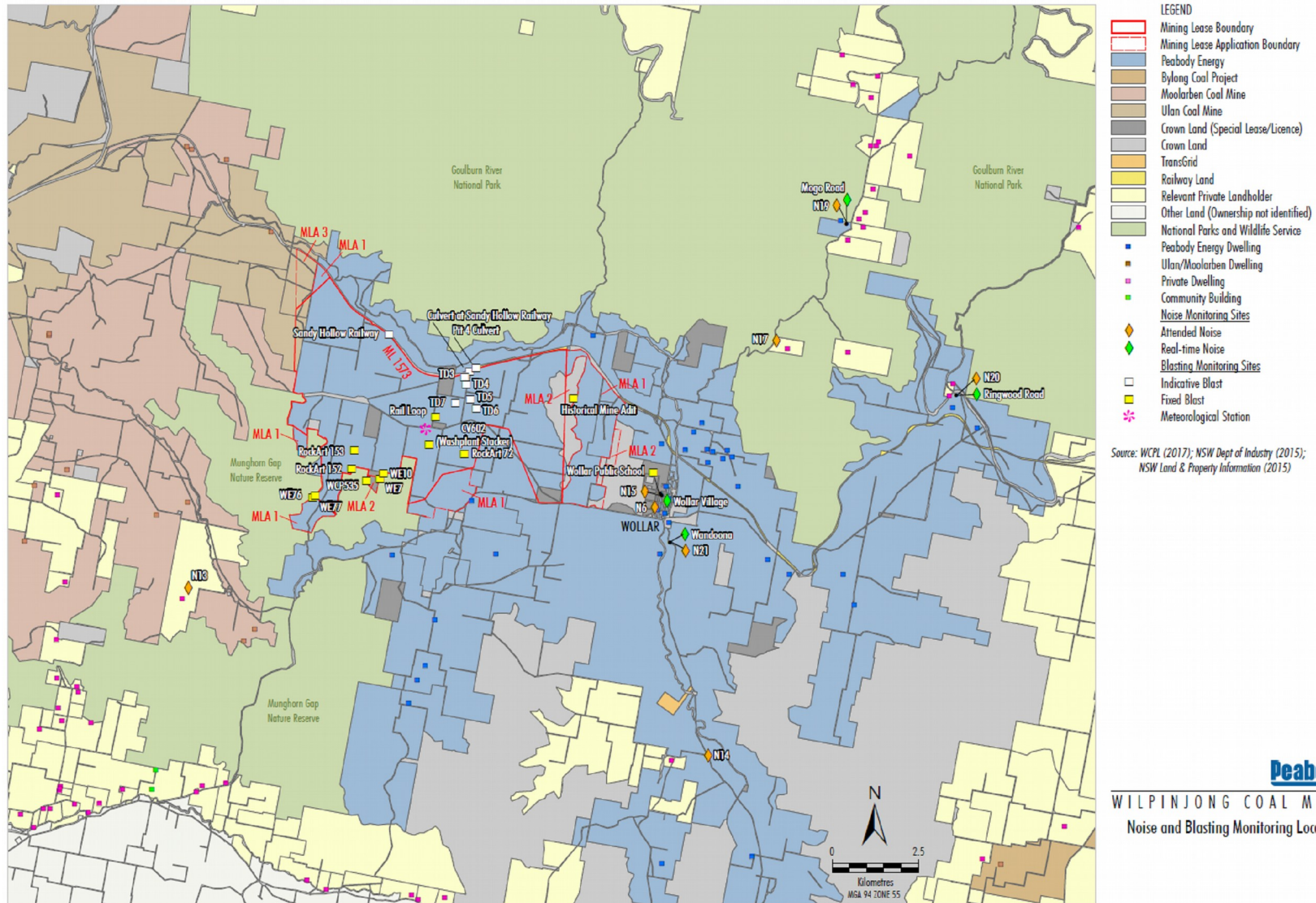


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar model 105 acoustic calibrator	78226	14/03/2019
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar model 106 acoustic calibrator	74813	05/06/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – AUGUST 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	08/08/2018 01:13	43	38	35	29	31	26	24	53
N13	08/08/2018 02:02	34	27	21	18	20	17	16	54
N14	08/08/2018 00:23	61	33	24	22	26	21	20	53
N15	07/08/2018 23:10	44	32	29	27	28	26	23	49
N17	07/08/2018 22:37	45	37	31	26	28	22	20	53
N19	07/08/2018 22:02	43	27	20	18	19	17	15	54
N20	07/08/2018 23:43	55	31	22	19	23	18	16	54
N21	08/08/2018 00:52	53	31	28	26	27	24	22	49

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – AUGUST 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	08/08/2018 01:13	0.8	F	37	Yes	31	Nil
N13	08/08/2018 02:02	0.5	G	36	No	IA	NA
N14	08/08/2018 00:23	0.9	F	35	Yes	<25	Nil
N15	07/08/2018 23:10	0.4	G	35	No	27	NA
N17	07/08/2018 22:37	0.7	G	35	No	<25	NA
N19	07/08/2018 22:02	2.1	G	35	No	IA	NA
N20	07/08/2018 23:43	0.4	G	35	No	<20	NA
N21	08/08/2018 00:52	0.3	F	35	Yes	<25	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – AUGUST 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	08/08/2018 01:13	0.8	F	45	Yes	43	Nil
N13	08/08/2018 02:02	0.5	G	45	No	IA	NA
N14	08/08/2018 00:23	0.9	F	45	Yes	<25	Nil
N15	07/08/2018 23:10	0.4	G	45	No	33	NA
N17	07/08/2018 22:37	0.7	G	45	No	<25	NA
N19	07/08/2018 22:02	2.1	G	45	No	IA	NA
N20	07/08/2018 23:43	0.4	G	45	No	<20	NA
N21	08/08/2018 00:52	0.3	F	45	Yes	29	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, AUGUST 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L_{Aeq} dB	Low pass (<630Hz) L_{Aeq} dB	Low pass (<630Hz) L_{A90} dB	WCP L_{Aeq} dB
N15/SX33	07/08/2018 23:10	07/08/2018 23:15	28	27	25	27
N19/SX32	07/08/2018 22:02	7/08/2018 22:00	22	17	13	IA
N20/SX30	07/08/2018 23:43	07/08/2018 23:45	24	21	18	<20
N21/SX31	08/08/2018 00:52	08/08/2018 00:45	44	42	27	<25

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – AUGUST 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	08/08/2018 01:13	0	0.0	-	0
N13	08/08/2018 02:02	2	0.0	-	0
N14	08/08/2018 00:23	1	0.0	-	0
N15	07/08/2018 23:10	2	0.0	-	0
N17	07/08/2018 22:37	4	0.0	-	0
N19	07/08/2018 22:02	6	0.0	-	0
N20	07/08/2018 23:43	1	0.5	250	0
N21	08/08/2018 00:52	2	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
07/08/2018 21:00	0.8	277	5.6
07/08/2018 21:15	0.5	338	5.0
07/08/2018 21:30	1.2	260	4.6
07/08/2018 21:45	0.9	312	5.6
07/08/2018 22:00	2.1	266	8.4
07/08/2018 22:15	2.1	275	8.0
07/08/2018 22:30	0.6	5	9.0
07/08/2018 22:45	0.7	17	9.2
07/08/2018 23:00	0.5	264	6.6
07/08/2018 23:15	0.0	0	4.8
07/08/2018 23:30	0.4	210	5.8
07/08/2018 23:45	0.6	352	7.2
08/08/2018 00:00	0.4	139	4.6
08/08/2018 00:15	0.0	0	3.6
08/08/2018 00:30	0.8	193	3.4
08/08/2018 00:45	0.9	196	2.6
08/08/2018 01:00	0.3	186	2.6
08/08/2018 01:15	0.5	71	2.6
08/08/2018 01:30	0.8	0	3.0
08/08/2018 01:45	0.5	344	4.6
08/08/2018 02:00	0.5	232	4.8
08/08/2018 02:15	0.5	316	4.4
08/08/2018 02:30	0.7	263	3.8
08/08/2018 02:45	0.0	0	3.8
08/08/2018 03:00	0.5	24	5.4

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

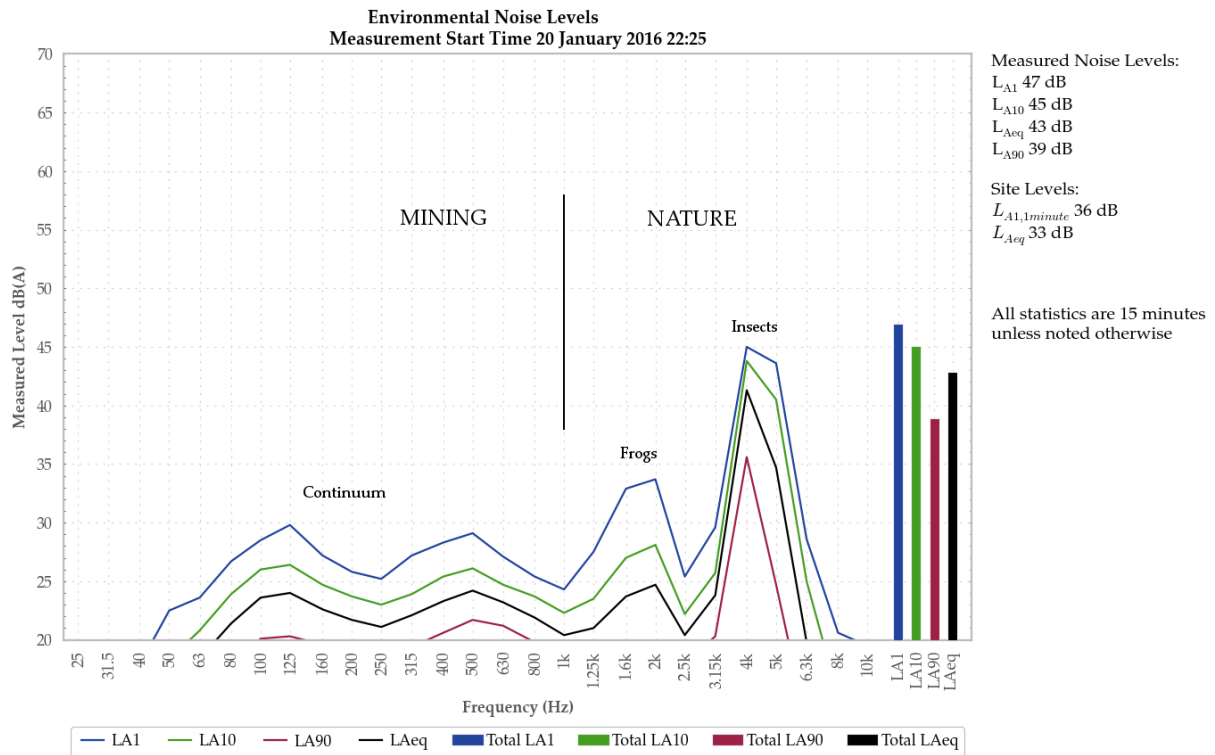


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 8 August 2018

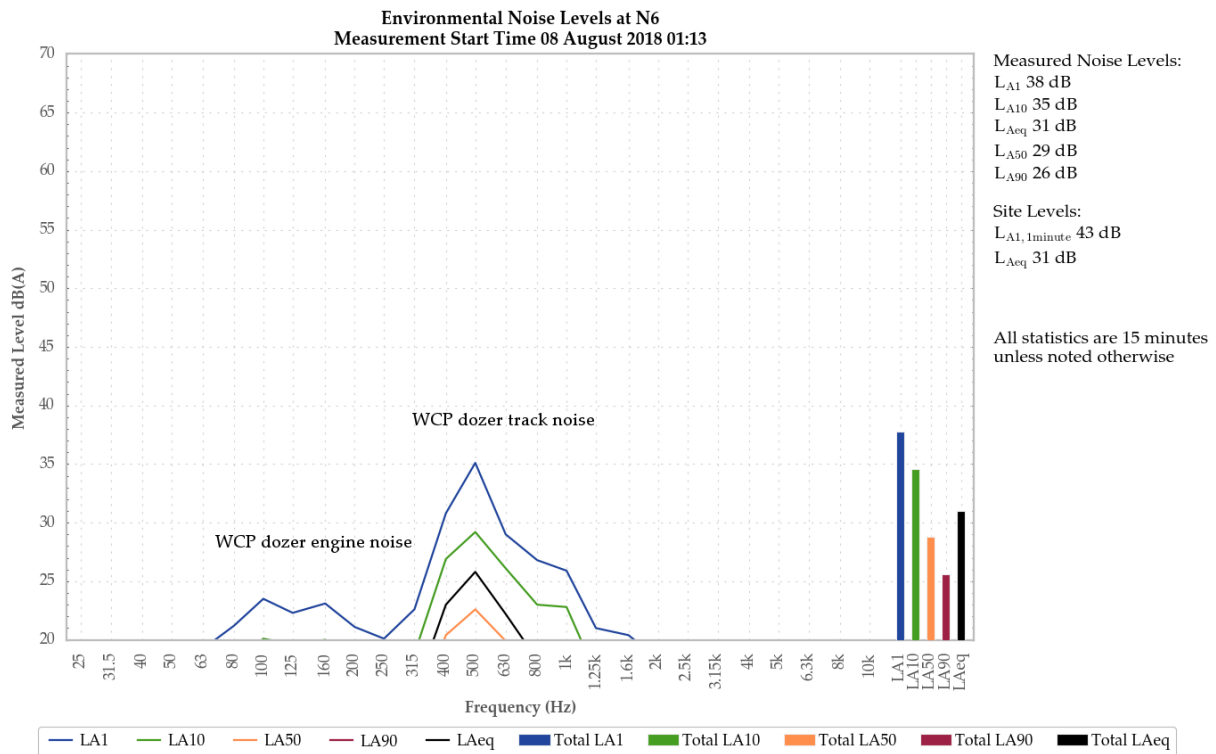


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

Dozer engine, fan and track noise from WCP was audible throughout the measurement and generated the site only L_{Aeq} of 31 dB and L_{A1,1minute} of 43 dB.

The continuum from WCP was responsible for all measured noise levels.

Dogs and insects were also noted.

5.1.2 N13, 8 August 2018

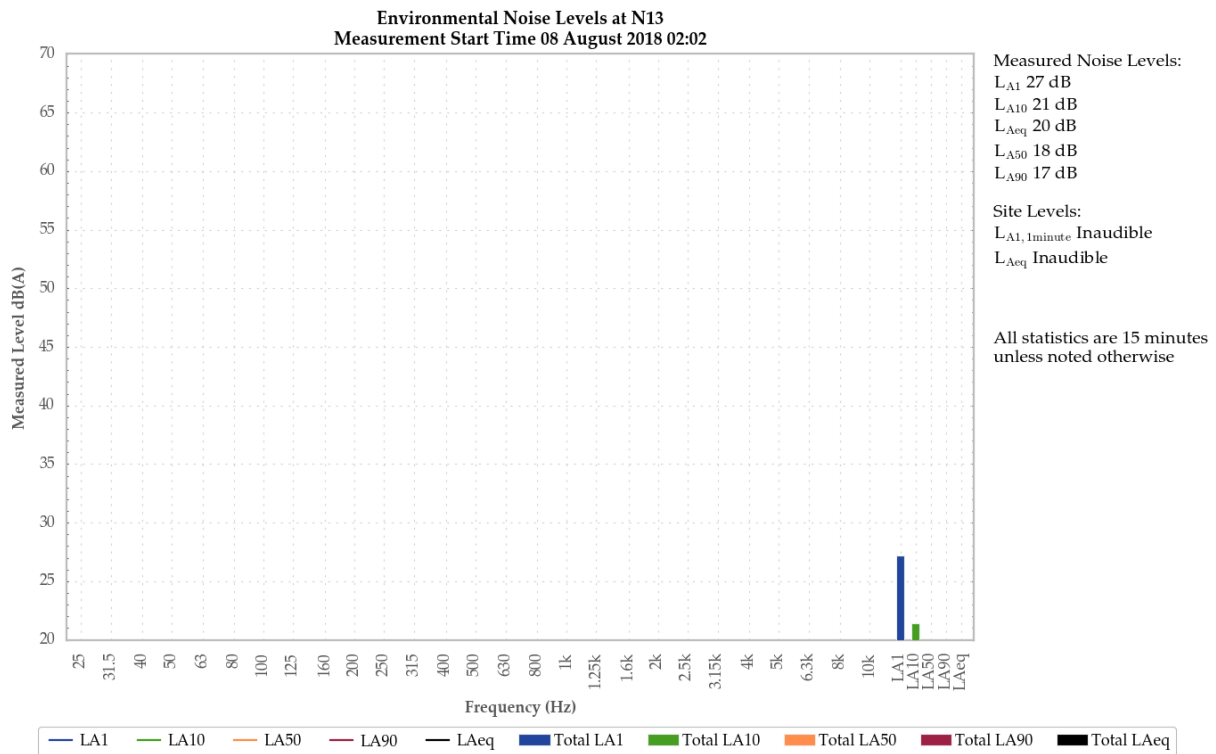


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Frogs, insects, farm animals and the noise floor of the sound level meter were responsible for all measured noise levels.

5.1.3 N14, 8 August 2018

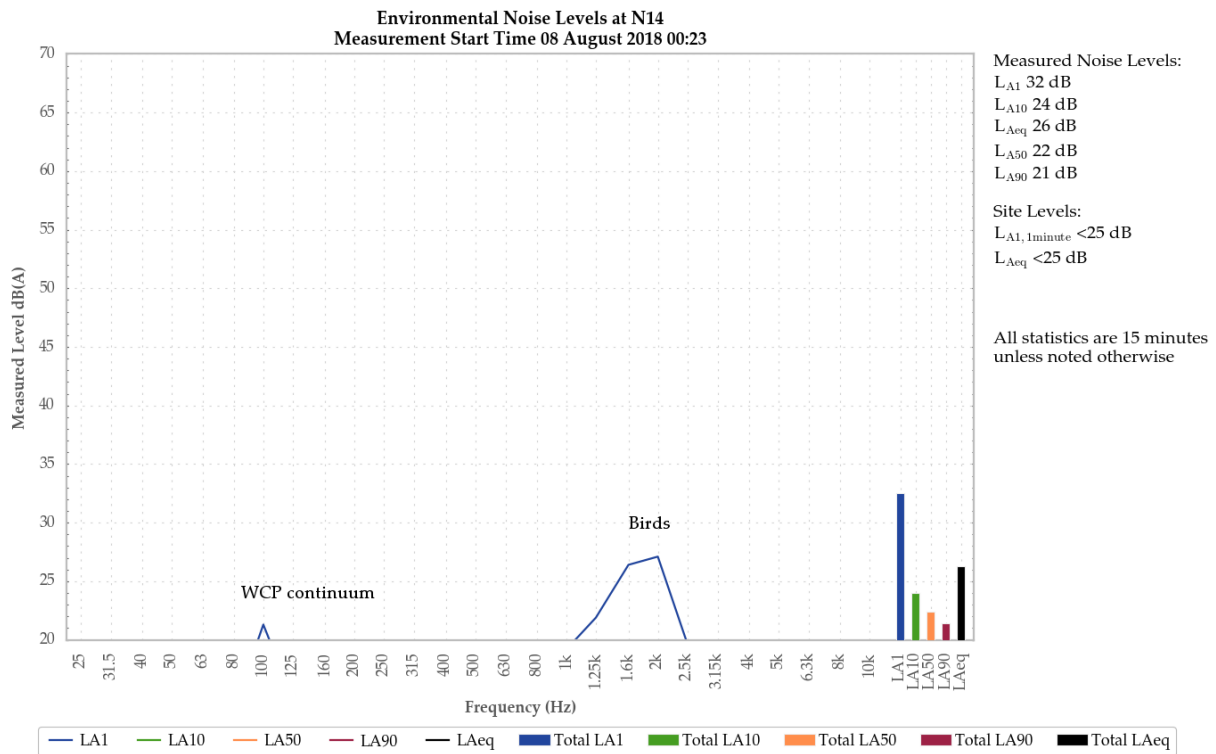


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating the site only LAeq and LA1,1minute of less than 25 dB.

Birds generated the measured LA1 and contributed to the measured LA10 and LAeq. The continuum from WCP contributed to the measured LA10, LAeq, LA50 and LA90. Insects also contributed to the measured LA90.

5.1.4 N15, 7 August 2018

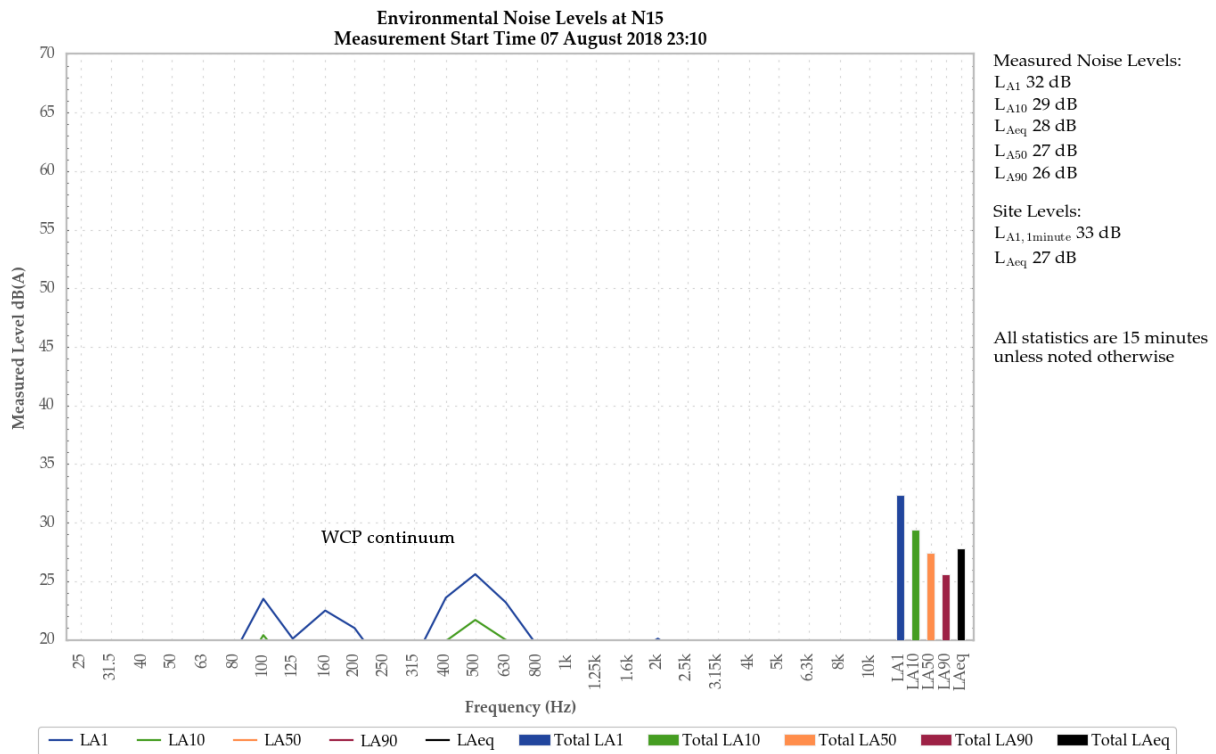


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A continuum from WCP was audible throughout the measurement generating the site only LAeq of 27 dB and LA1,1minute of 33 dB.

The continuum from WCP was primarily responsible for all measured noise levels. Insects were a minor contributor to the measured LAeq, LA50 and LA90.

Cows were also noted.

5.1.5 N17, 7 August 2018

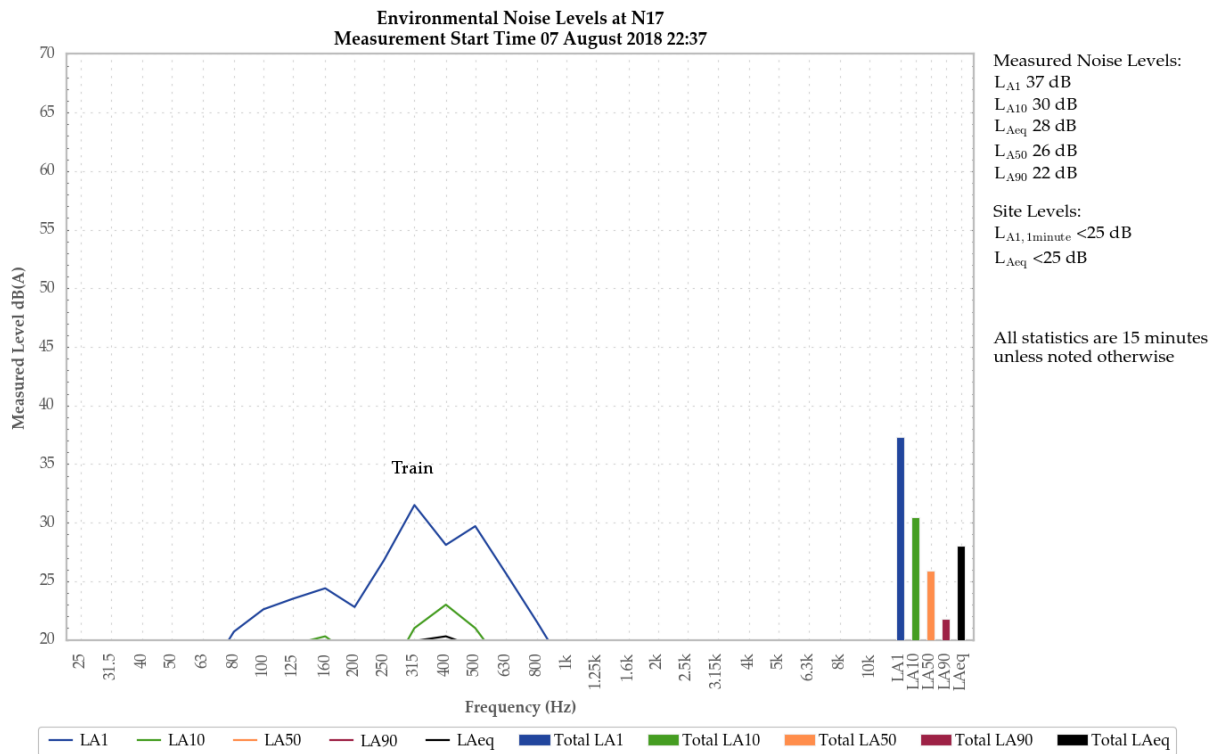


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

A low-level continuum from WCP was audible throughout the measurement generating the site only LAeq and LA1,1minute of less than 25 dB.

A train generated the measured LA1 and LA10 and was primarily responsible for the measured LA50 and LAeq. The continuum from WCP generated the measured LA90 and was a minor contributor to the measured LAeq and LA50.

Animals in foliage were also noted.

5.1.6 N19, 7 August 2018

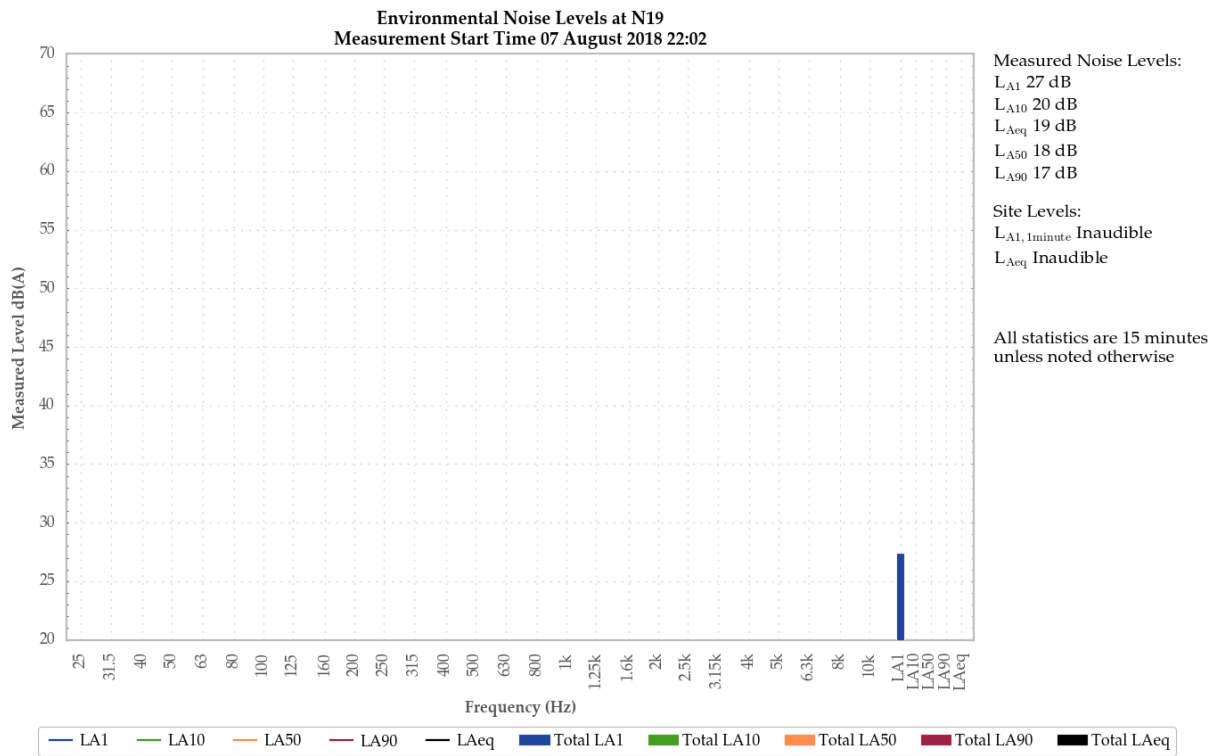


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible.

Insects, birds, breeze in the foliage and the noise floor of the sound level meter combined to generate measured noise levels.

5.1.7 N20, 7 August 2018

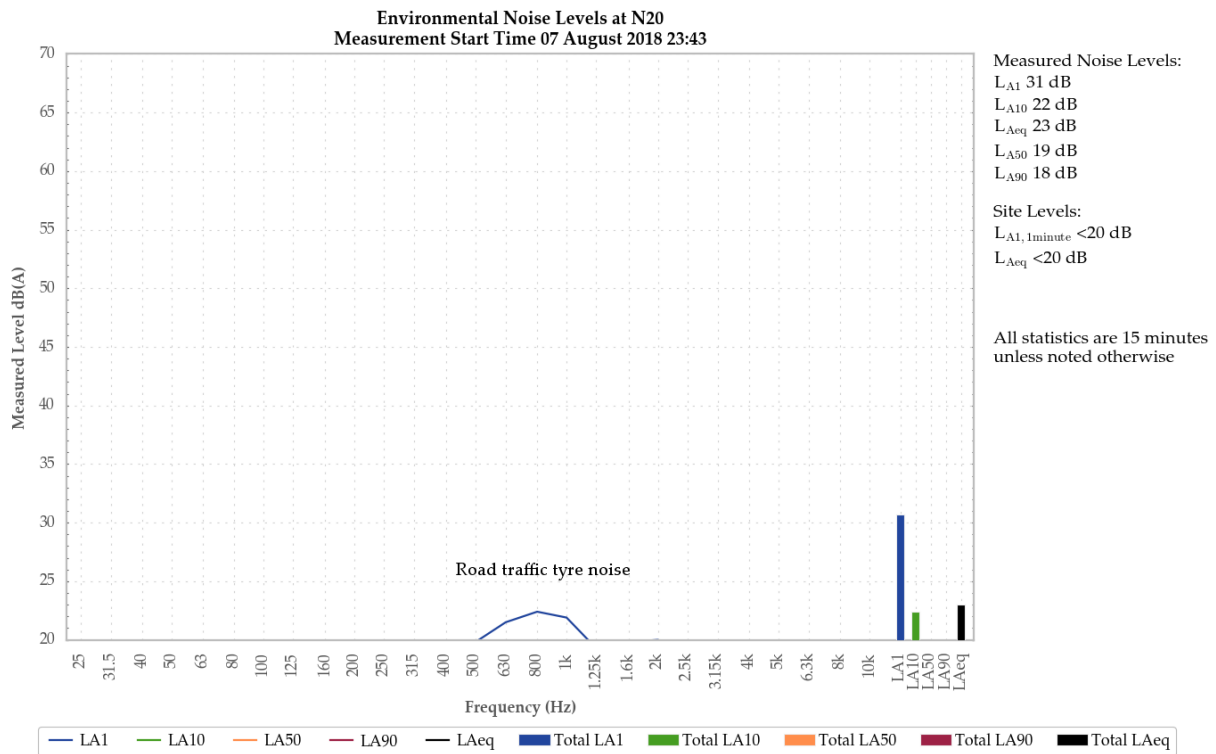


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

A low-level continuum from WCP was audible throughout the measurement generating the site only L_{Aeq} and L_{A1,1minute} of less than 20 dB.

Road traffic noise generated the measured L_{A1} contributed to the measured L_{Aeq}. The continuum from WCP, breeze in the foliage, insects and the noise floor of the sound level meter contributed to the measured L_{Aeq} and combined to generate the measured L_{A10}, L_{A50} and L_{A90}.

Dogs and birds were also noted.

5.1.8 N21, 8 August 2018

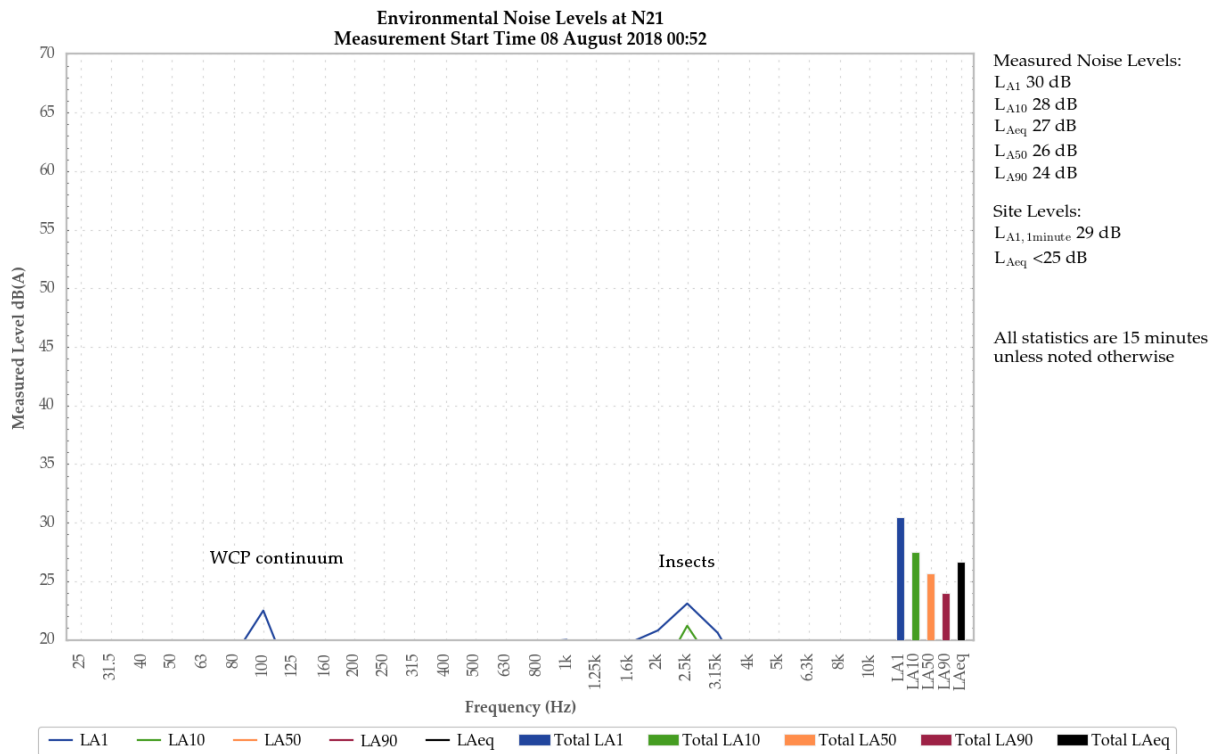


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

A continuum from WCP was audible during the measurement generating the site only LAeq of less than 25 dB. Dozer track noise was audible on two occasions and generated the site only LA1,1minute of 29 dB.

The continuum from WCP and insects were primarily responsible for all measured noise levels. A train contributed to the measured LA1, LA10 and LAeq.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 7/8 August 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the August 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZe _q ,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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 C17126

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 : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
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.

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 Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17127

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

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

Atmospheric Conditions

Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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	1000.32

The sound calibrator has been shown to conform to the class 1 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

Generated SPL ±0.11dB
Short Term Fluct. ±0.02dB
Frequency ±0.01%
Distortion ±0.5%

Environmental Conditions

Temperature ±0.05°C
Relative Humidity ±0.46%
Barometric Pressure ±0.017kPa

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.

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Accredited for compliance with ISO/IEC 17025.

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

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Sound Level Meter

IEC 61672-3:2013

Calibration Certificate

Calibration Number C17248

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 : 24.3°C	Ambient Temperature : 24.4°C
Relative Humidity : 40%	Relative Humidity : 39.5%
Barometric Pressure : 100.05kPa	Barometric Pressure : 100kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
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.

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 Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

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

Least Uncertainties of Measurement - Environmental Conditions			
Specific Tests		Environmental Conditions	
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.



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Wilpinjong Coal

*Environmental Noise Monitoring
September 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring September 2018

Reference: 18326_R01

Report date: 8 November 2018

Prepared for

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EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 20/21 September 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the September 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 20/21 September 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

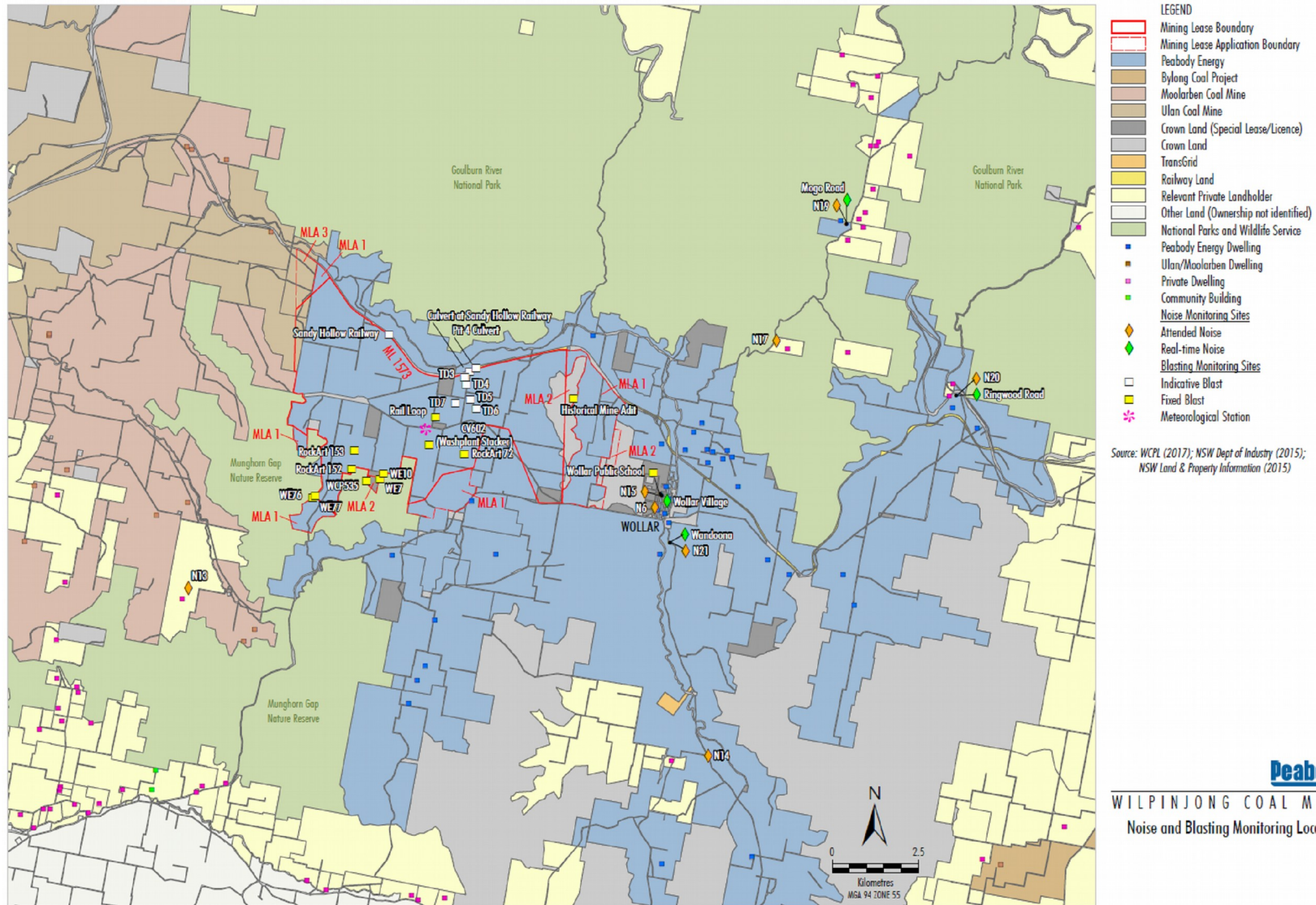


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L_{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site-only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site-only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Jason Cameron and Jesse Tribby.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low-frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019
Rion NA-28 sound level analyser	1070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	30/03/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low-frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – SEPTEMBER 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	21/09/2018 00:48	36	29	24	17	20	16	15	54
N13	21/09/2018 01:06	48	41	29	25	29	22	18	54
N14	21/09/2018 00:02	37	24	21	18	19	17	16	54
N15	20/09/2018 22:59	41	37	26	18	25	17	16	54
N17	20/09/2018 22:31	45	26	22	19	21	18	17	48
N19	20/09/2018 22:05	30	25	23	21	21	20	19	54
N20	20/09/2018 23:28	30	24	22	17	18	16	15	54
N21	21/09/2018 00:28	47	30	20	17	21	16	15	54

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – SEPTEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	21/09/2018 00:48	0.6	F	37	Yes	IA	Nil
N13	21/09/2018 01:06	0.5	F	36	Yes	26	Nil
N14	21/09/2018 00:02	0.6	F	35	Yes	<20	Nil
N15	20/09/2018 22:59	0.0	F	35	Yes	<20	Nil
N17	20/09/2018 22:31	0.7	E	35	Yes	<20	Nil
N19	20/09/2018 22:05	0.7	E	35	Yes	20	Nil
N20	20/09/2018 23:28	0.9	F	35	Yes	IA	Nil
N21	21/09/2018 00:28	0.7	G	35	No	<20	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – SEPTEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	21/09/2018 00:48	0.6	F	45	Yes	IA	Nil
N13	21/09/2018 01:06	0.5	F	45	Yes	31	Nil
N14	21/09/2018 00:02	0.6	F	45	Yes	<20	Nil
N15	20/09/2018 22:59	0.0	F	45	Yes	<20	Nil
N17	20/09/2018 22:31	0.7	E	45	Yes	27	Nil
N19	20/09/2018 22:05	0.7	E	45	Yes	24	Nil
N20	20/09/2018 23:28	0.9	F	45	Yes	IA	Nil
N21	21/09/2018 00:28	0.7	G	45	No	<20	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, SEPTEMBER 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L _{Aeq} dB	Low pass (<630Hz) L _{Aeq} dB	Low pass (<630Hz) L _{A90} dB	WCP L _{Aeq} dB
N15/SX33	20/09/2018 22:59	20/09/2018 23:00	30	27	21	<20
N19/SX32	20/09/2018 22:05	20/09/2018 22:00	24	23	NA ²	20
N20/SX30	20/09/2018 23:28	20/09/2018 23:30	25	17	9	IA
N21/SX31	21/09/2018 00:28	21/09/2018 00:30	25	24	21	<20

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. "NA" indicates that this statistic was temporarily unavailable in the Sentinex data.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – SEPTEMBER 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	21/09/2018 00:48	4	0.0	-	0
N13	21/09/2018 01:06	4	0.7	185	0
N14	21/09/2018 00:02	5	0.9	150	0
N15	20/09/2018 22:59	8	0.0	-	0
N17	20/09/2018 22:31	9	0.0	-	0
N19	20/09/2018 22:05	13	0.0	-	0
N20	20/09/2018 23:28	4	0.9	265	0
N21	21/09/2018 00:28	4	0.6	205	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
20/09/2018 22:00	0.0	-	1.4
20/09/2018 22:15	0.7	135	0.2
20/09/2018 22:30	0.5	134	1.0
20/09/2018 22:45	0.7	182	1.4
20/09/2018 23:00	0.5	145	2.0
20/09/2018 23:15	0.0	-	3.0
20/09/2018 23:30	1.1	338	3.0
20/09/2018 23:45	0.9	339	3.0
21/09/2018 00:00	0.0	-	4.2
21/09/2018 00:15	0.6	359	3.2
21/09/2018 00:30	0.7	353	2.6
21/09/2018 00:45	0.7	318	4.2
21/09/2018 01:00	0.6	296	3.4
21/09/2018 01:15	0.5	293	2.2
21/09/2018 01:30	0.0	-	2.6
21/09/2018 01:45	0.0	-	2.2
21/09/2018 02:00	0.7	352	2.8
21/09/2018 02:15	0.7	302	2.6
21/09/2018 02:30	0.7	297	2.2
21/09/2018 02:45	0.0	-	2.4
21/09/2018 03:00	0.8	307	3.0
21/09/2018 03:15	0.7	305	2.4
21/09/2018 03:30	0.8	307	2.6
21/09/2018 03:45	0.6	308	3.0
21/09/2018 04:00	0.0	-	3.0
21/09/2018 04:15	0.0	-	3.2
21/09/2018 04:30	0.0	-	2.8

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

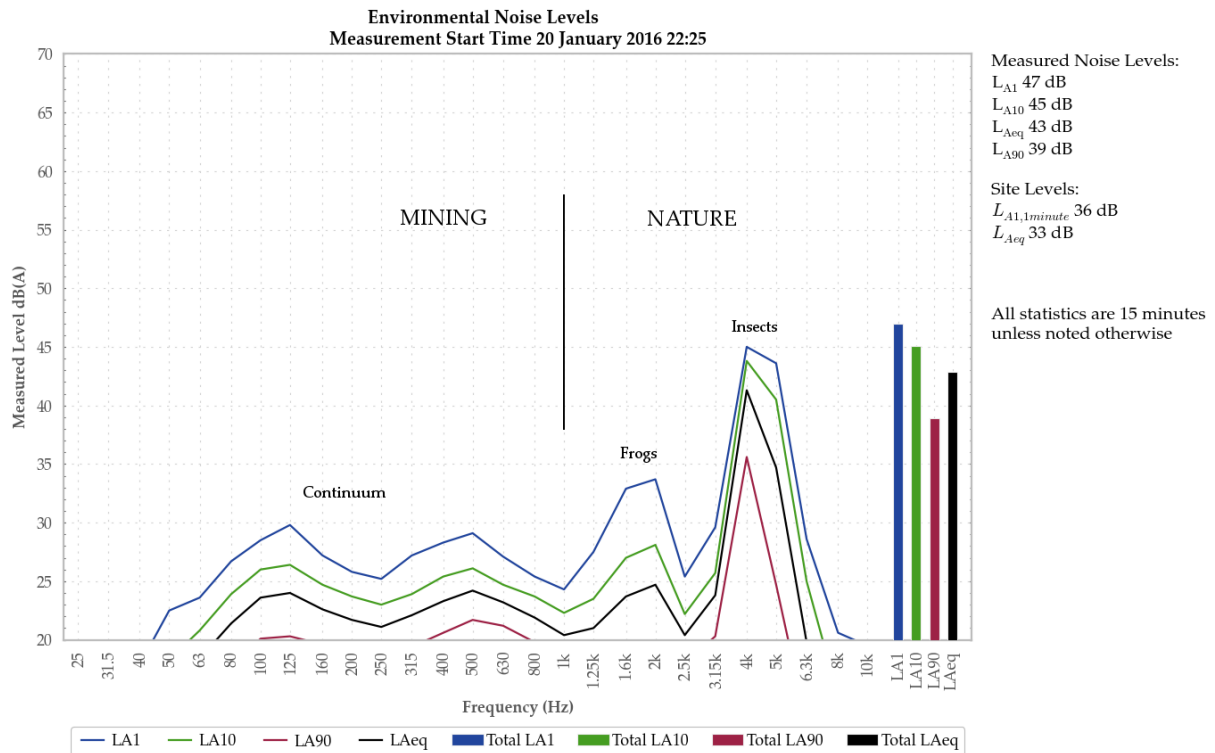


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 21 September 2018

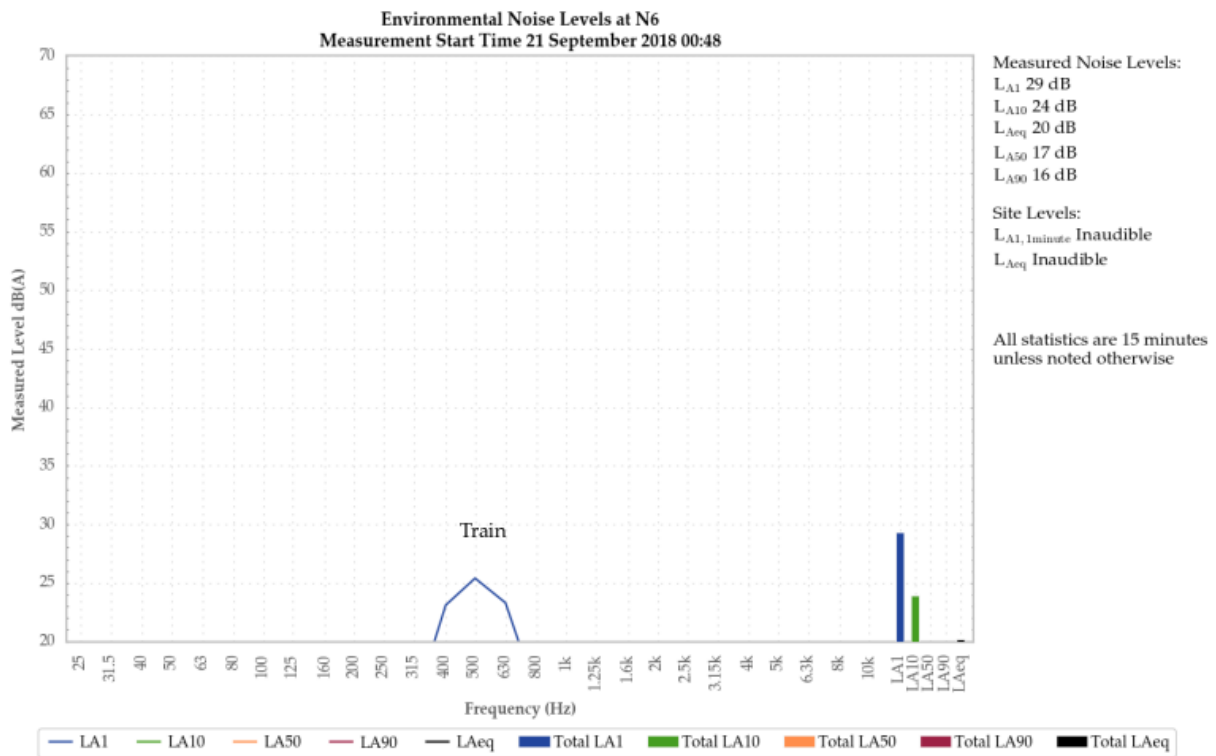
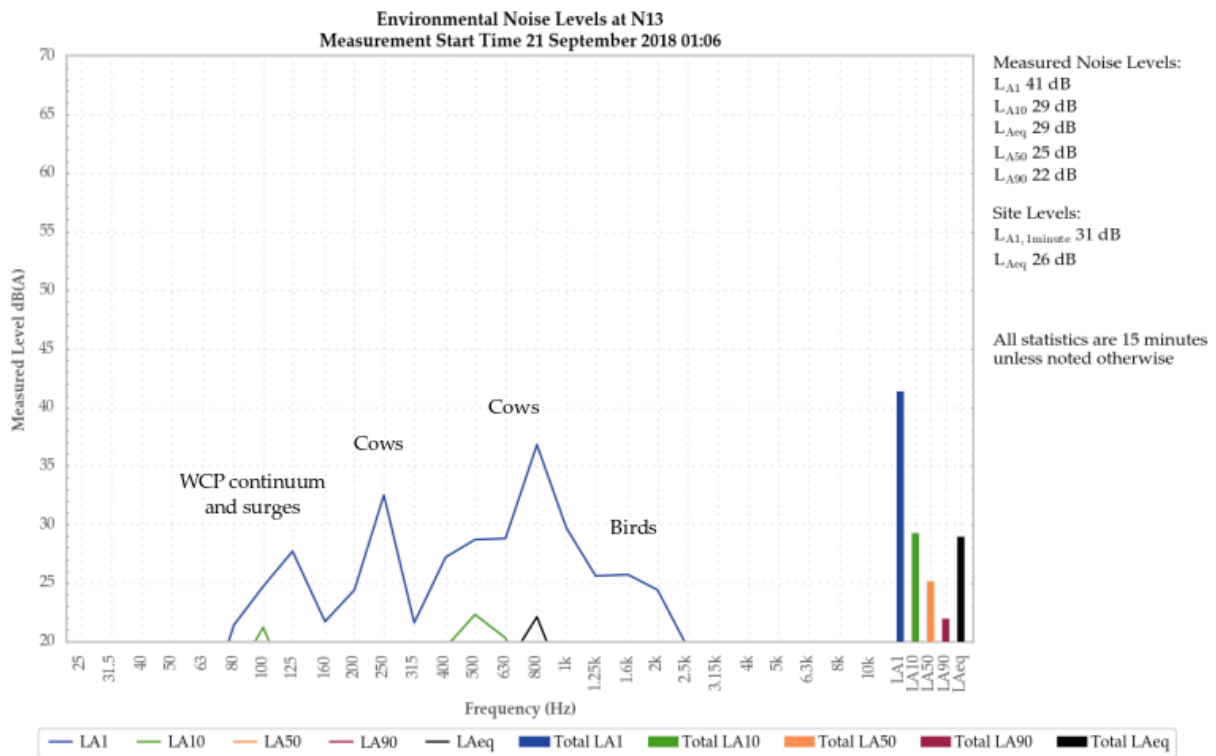


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

A train generated the measured LA1, LA10 and LAeq. The noise floor of the measurement instrument was responsible for the measured LA50 and LA90.

5.1.2 N13, 21 September 2018



WCP engine continuum was audible throughout the measurement, generating the site-only LAeq of 26 dB and site-only LA1,1minute of 31 dB. Track noise was also noted.

Cows primarily generated the measured LA1, LA10 and LAeq. WCP contributed to the measured LA10 and LAeq and generated the measured LA50 and LA90.

Birds were also noted.

5.1.3 N14, 21 September 2018

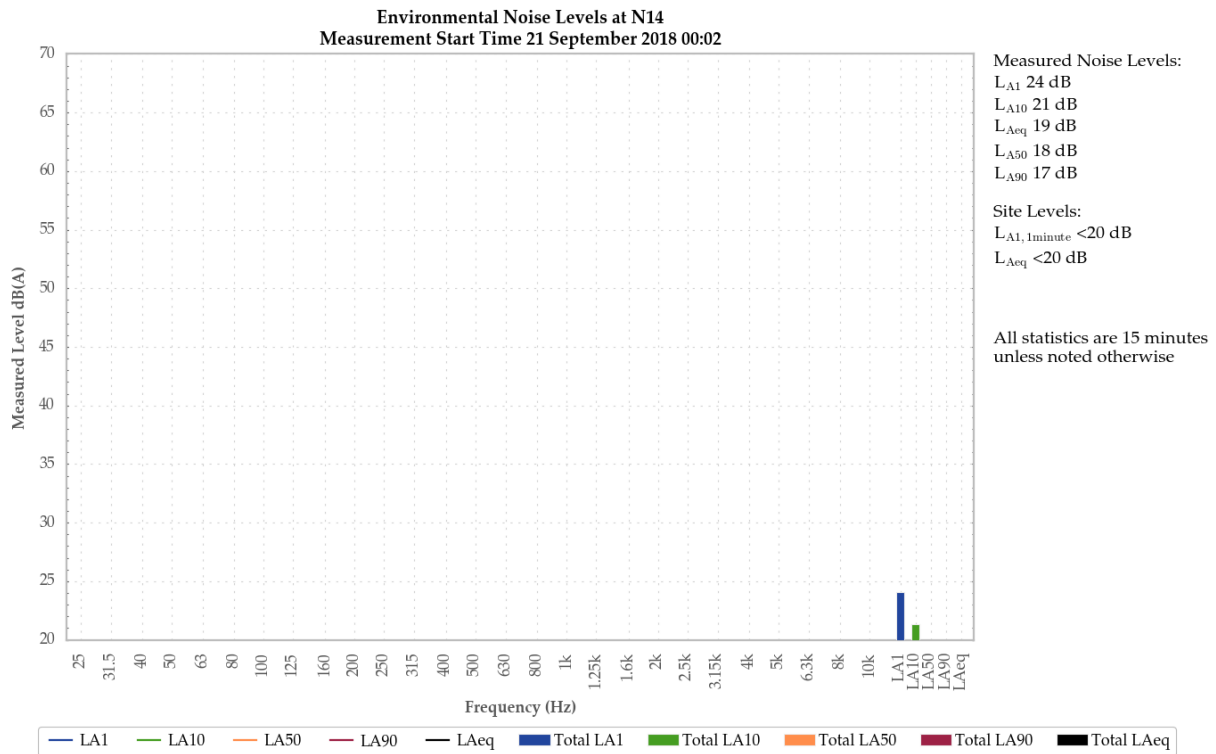


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was audible as low-level continuum throughout the measurement, generating the site-only LAeq and LA1,1minute of less than 20 dB.

A nearby substation and train noise generated the LA1, LA10 and LAeq. The noise floor of the instrument and WCP continuum generated the measured LA50 and LA90.

Birds and cows were also noted.

5.1.4 N15, 20 September 2018

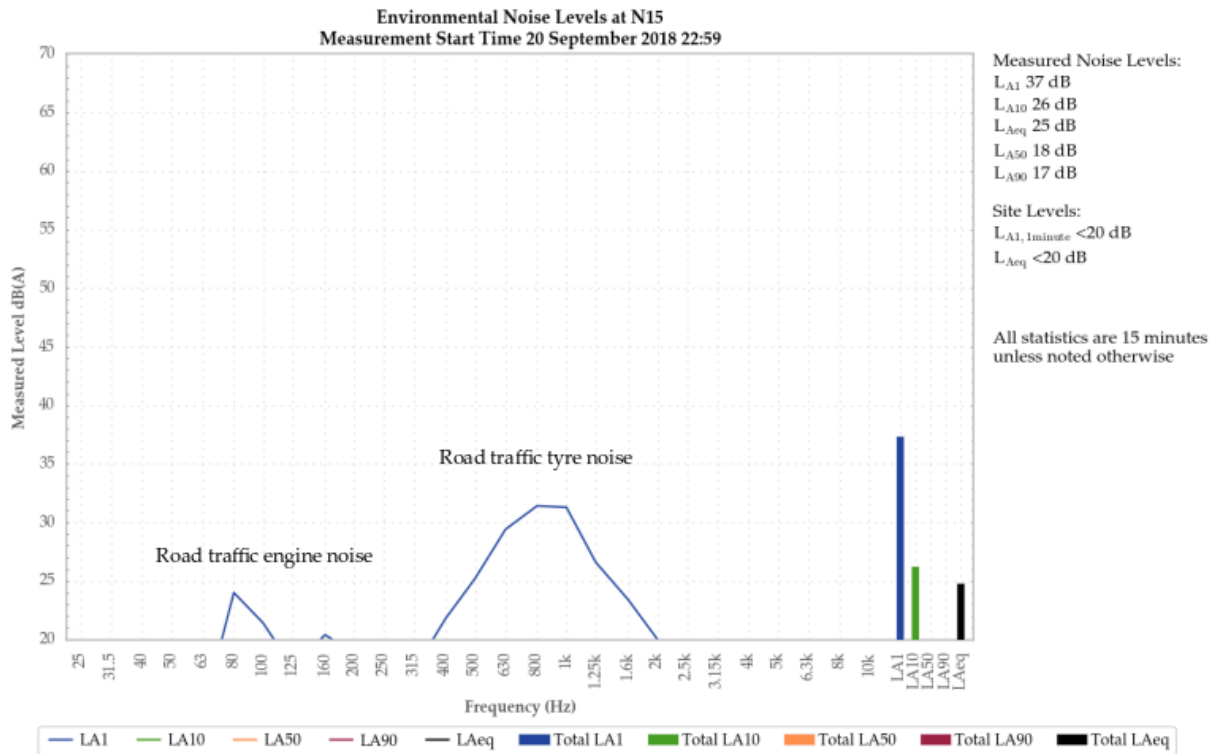


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was audible as low-level continuum during the measurement, generating the site-only LAeq and LA1,1minute of less than 20 dB.

Road traffic noise generated measured LA1, LA10 and LAeq. The noise floor of the instrument and WCP continuum generated the measured LA50 and LA90.

Frogs, dogs and local impacts were also noted.

5.1.5 N17, 20 September 2018

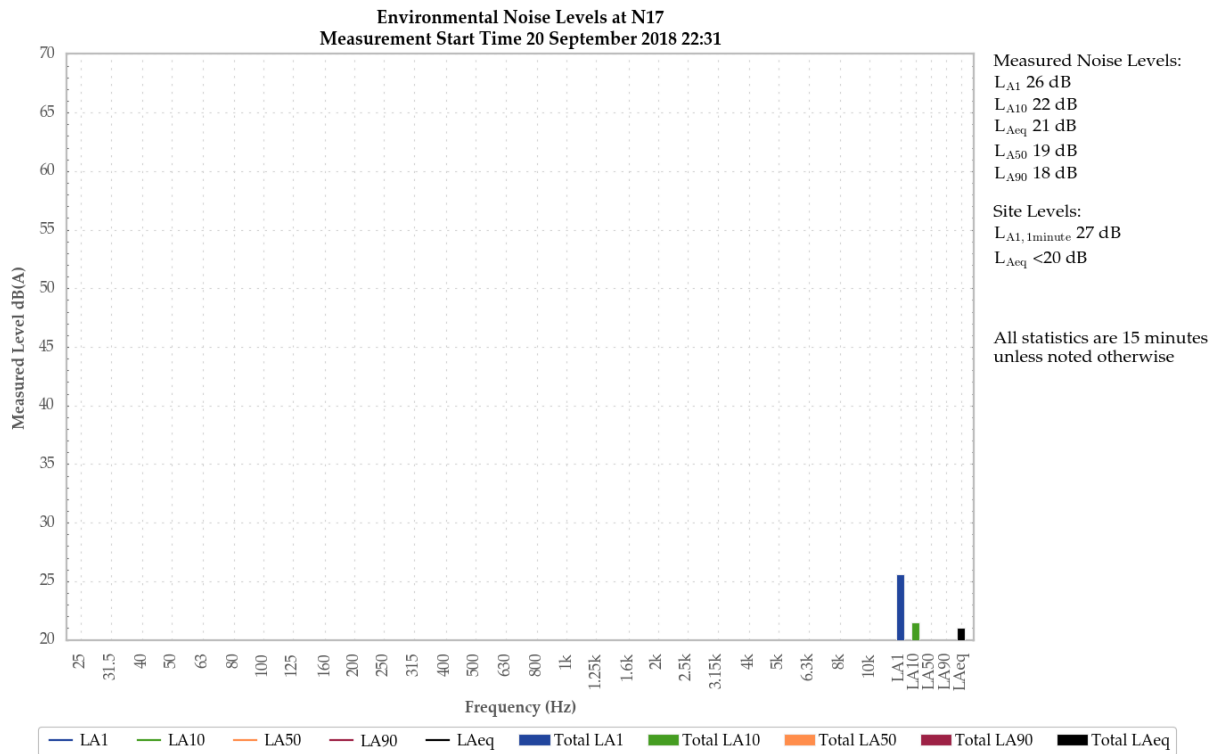


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP general mining continuum was audible at low levels throughout the measurement, generating the site-only LAeq of less than 20 dB. An impact noise generated the site-only LA1,1minute of 27 dB. Continuum surges and horns were also noted.

WCP sources primarily generated the measured LA1 and LA10. Birds, WCP noise sources and the noise floor of the instrument combined to generate the measured LAeq. WCP noise sources and the noise floor of the instrument combined to generate the measured LA50 and LA90.

5.1.6 N19, 20 September 2018

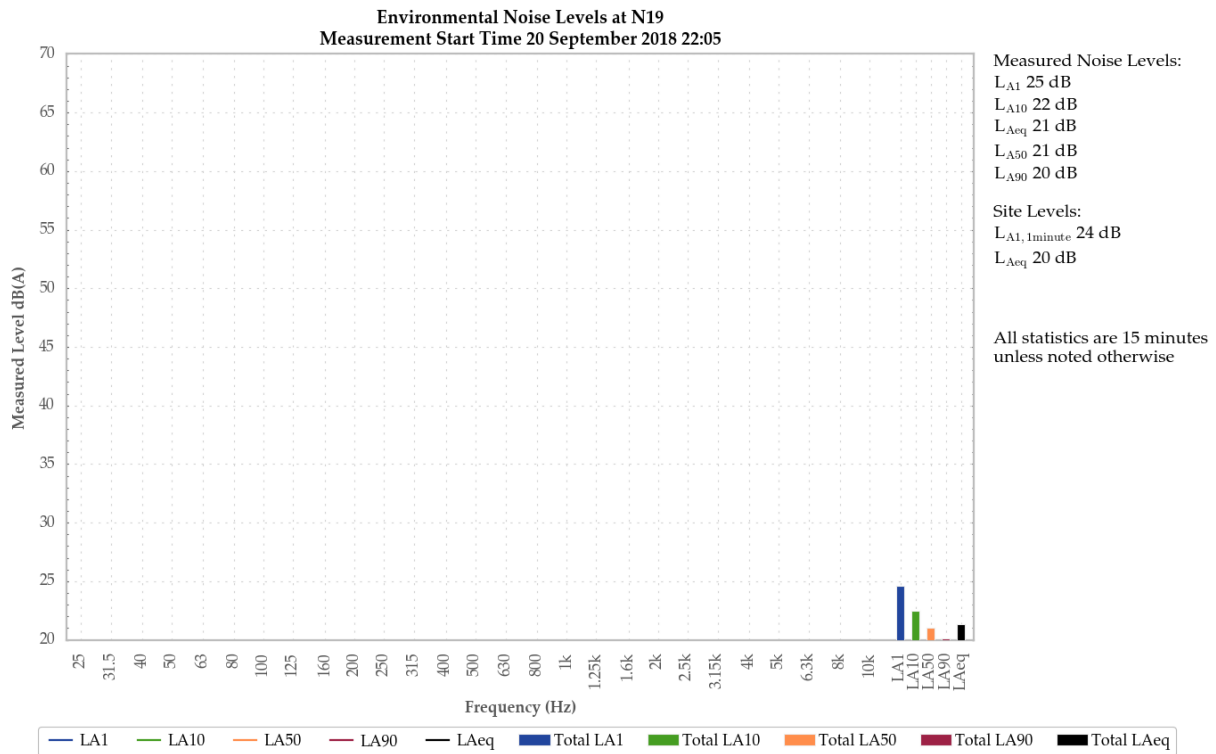


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP general mining continuum was audible at low levels throughout the measurement, generating the site-only L_{Aeq} of 20 dB. A surge in the WCP continuum generated the site-only L_{A1,1minute} of 24 dB. Impacts were also noted.

WCP primarily generated the measured levels. A local continuum was audible throughout the measurement and was a minor contributor to the measured levels.

5.1.7 N20, 20 September 2018

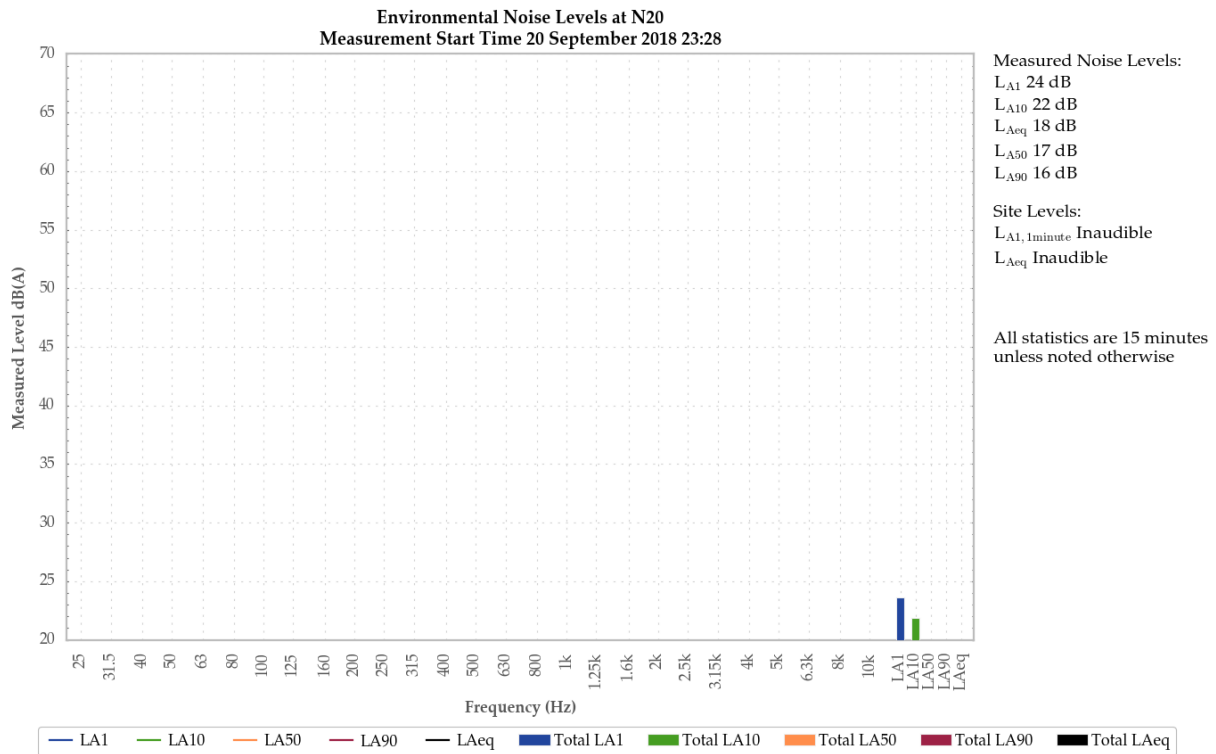


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

A distant train generated the measured LA1 and LA10 and combined with birds to generate the measured LAeq. The noise floor of the instrument generated the measured LA50 and LA90.

Cows were also noted.

5.1.8 N21, 20 September 2018

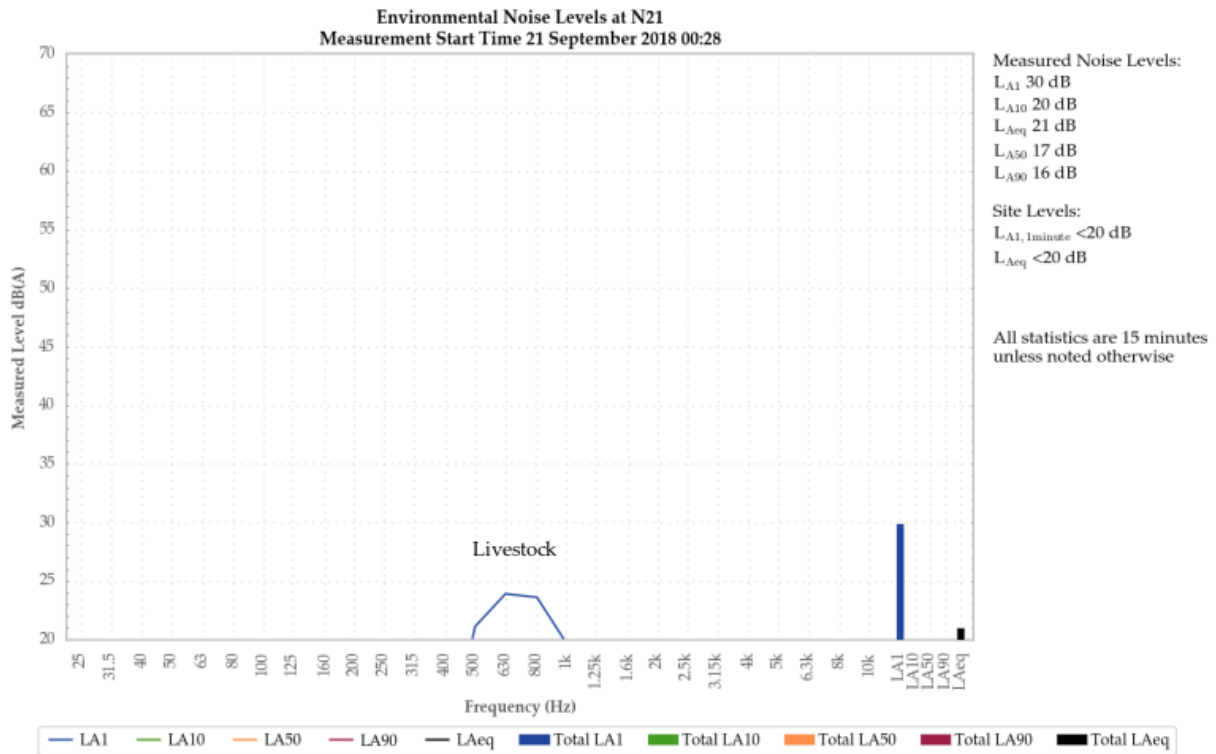


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was audible as low-level continuum throughout the measurement, generating the site-only LAeq and LA1,1minute of less than 20 dB.

Livestock generated the measured LA1 and LAeq. Breeze in foliage generated the measured LA10. WCP noise sources combined with the noise floor of the measurement instrument to generate the measured LA50 and LA90.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 20/21 September 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the September 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave L _Z eq,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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Octave Band Filter

AS 4476:1997

Calibration Certificate

Calibration Number C17248A_Reissued

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Atmospheric Conditions

Ambient Temperature : 24.4°C
Relative Humidity : 39%
Barometric Pressure : 99.78kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Riley Cooper
Report Issue Date : 29/06/2018

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests

< 16Hz $\pm 0.19dB$
16Hz-100Hz $\pm 0.11dB$
100Hz-1000Hz $\pm 0.1dB$
1000Hz-10kHz $\pm 0.1dB$
> 10kHz $\pm 0.16dB$

Least Uncertainties of Measurement -

Environmental Conditions

Temperature $\pm 0.3^{\circ}C$
Relative Humidity $\pm 2.5\%$
Barometric Pressure $\pm 0.017kPa$

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 Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.



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Octave Band Filter AS 4476:1997 Calibration Certificate

Calibration Number C18363A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 37.7%
Barometric Pressure : 100.82kPa

Calibration Technician : Lucky jaiswal **Secondary Check:** Lewis Boorman
Calibration Date : 25 Jun 2018 **Report Issue Date :** 25 Jun 2018

Approved Signatory :  Juan Agüero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Least Uncertainties of Measurement -

Electrical Tests		Environmental Conditions	
< 16Hz	±0.19dB	Temperature	±0.03°C
16Hz-100Hz	±0.11dB	Relative Humidity	±2.5%
100Hz-1000Hz	±0.09dB	Barometric Pressure	±0.017kPa
1000Hz-10kHz	±0.09dB		
> 10kHz	±0.16dB		

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

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions

Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :  Juan Aguero

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	1000.38

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 ±0.11dB	Temperature ±0.05°C
Short Term Fluct. ±0.02dB	Relative Humidity ±0.46%
Frequency ±0.01%	Barometric Pressure ±0.017kPa
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.

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Wilpinjong Coal

*Environmental Noise Monitoring
October 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring October 2018

Reference: 18363_R01

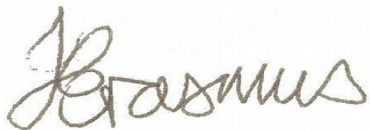
Report date: 8 November 2018

Prepared for


Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
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Prepared: Jonathan Erasmus
Consultant



QA Review: Amanda Borserio
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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 18/19 October 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the October 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 18/19 October 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

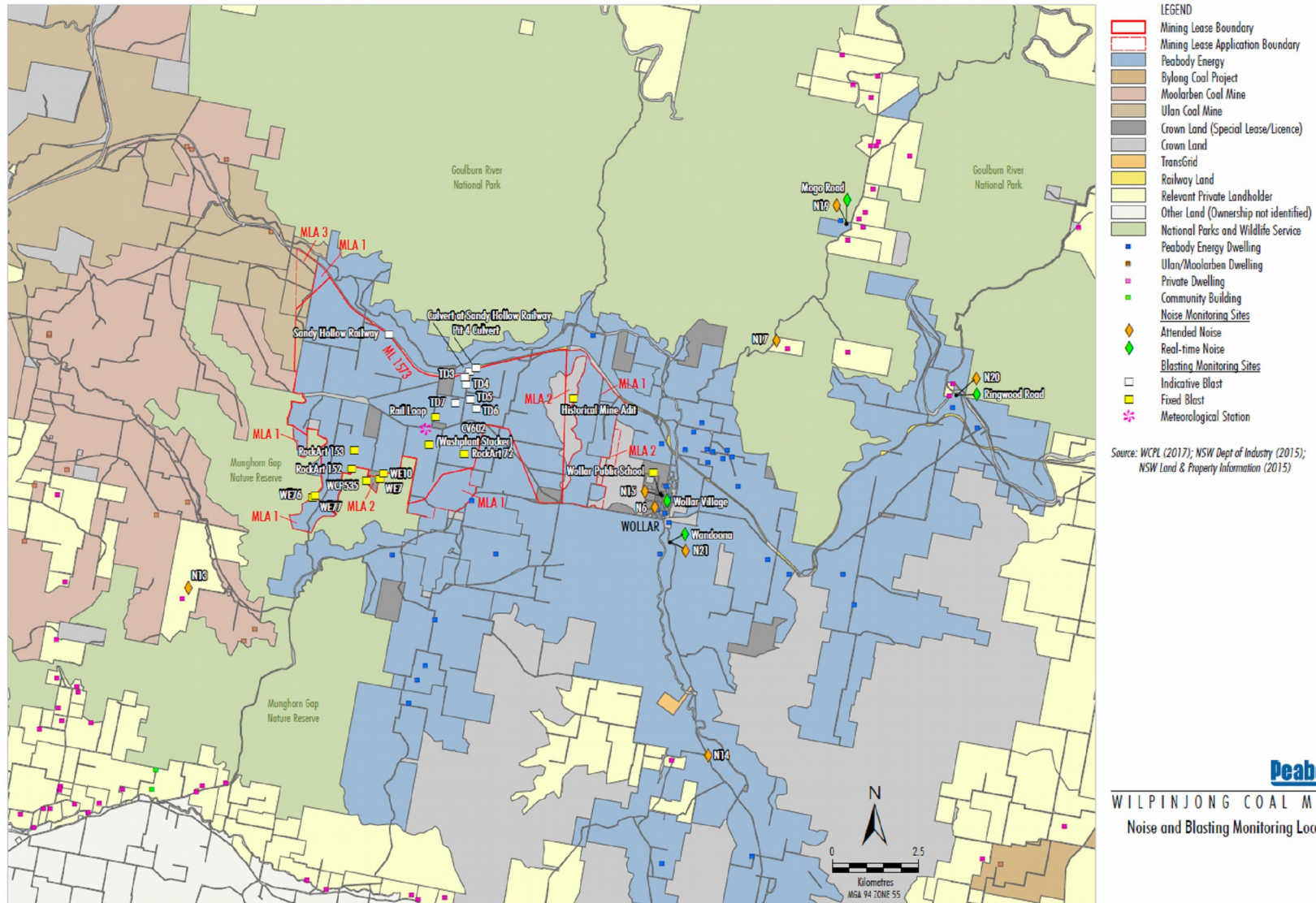


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L_{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site-only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site-only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Jonathan Erasmus and Tambalyn Durney.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the

direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low-frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019
Rion NA-28 sound level analyser	1070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	30/03/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low-frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.2 Attended Noise Monitoring

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

Table 4.1: MEASURED NOISE LEVELS – OCTOBER 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	19/10/2018 00:53	51	45	32	27	32	25	23	54
N13	19/10/2018 00:34	47	40	35	31	33	29	25	53
N14	19/10/2018 00:06	66	54	32	25	41	23	21	53
N15	18/10/2018 22:57	44	35	32	30	30	28	23	54
N17	18/10/2018 22:26	44	39	28	19	26	17	16	54
N19	18/10/2018 22:00	47	30	26	20	23	18	17	54
N20	18/10/2018 23:28	82	72	58	34	58	25	20	63
N21	19/10/2018 00:34	43	37	32	25	28	23	21	53

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – OCTOBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	19/10/2018 00:53	0.6	E	37	Yes	IA	Nil
N13	19/10/2018 00:34	0.3	E	35	Yes	<25	Nil
N14	19/10/2018 00:06	0.0	E	35	Yes	IA	Nil
N15	18/10/2018 22:57	1.2	F	37	Yes	IA	Nil
N17	18/10/2018 22:26	0.6	F	38	Yes	IA	Nil
N19	18/10/2018 22:00	1.8	E	35	Yes	IA	Nil
N20	18/10/2018 23:28	0.6	E	35	Yes	IA	Nil
N21	19/10/2018 00:34	0.3	E	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – OCTOBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	19/10/2018 00:53	0.6	E	45	Yes	IA	Nil
N13	19/10/2018 00:34	0.3	E	45	Yes	<25	Nil
N14	19/10/2018 00:06	0.0	E	45	Yes	IA	Nil
N15	18/10/2018 22:57	1.2	F	45	Yes	IA	Nil
N17	18/10/2018 22:26	0.6	F	45	Yes	IA	Nil
N19	18/10/2018 22:00	1.8	E	45	Yes	IA	Nil
N20	18/10/2018 23:28	0.6	E	45	Yes	IA	Nil
N21	19/10/2018 00:34	0.3	E	45	Yes	IA	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.3 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) LAeq and LA90 are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, OCTOBER 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total LAeq dB	Low pass (<630Hz) LAeq dB	Low pass (<630Hz) LA90 dB	
N15/SX33	18/10/2018 22:57	18/10/2018 23:00	38	36	20	IA
N19/SX32	18/10/2018 22:00	18/10/2018 22:00	28	19	13	IA
N20/SX30	18/10/2018 23:28	18/10/2018 23:30	40	37	21	IA
N21/SX31	19/10/2018 00:34	19/10/2018 00:30	34	26	22	IA

Notes:

1. Levels in this table are not necessarily the result of activity at WCP.

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – OCTOBER 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	19/10/2018 00:53	16	0.7	190	0
N13	19/10/2018 00:34	16	0.0	-	1
N14	19/10/2018 00:06	17	0.6	150	2
N15	18/10/2018 22:57	17	0.5	180	4
N17	18/10/2018 22:26	20	0.0	-	7
N19	18/10/2018 22:00	26	0.0	-	7
N20	18/10/2018 23:28	20	0.0	-	3
N21	19/10/2018 00:34	17	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees ²	Lapse Rate Degrees / 100 metres ³
18/10/2018 22:00	1.5	121	0.0
18/10/2018 22:15	1.8	151	0.8
18/10/2018 22:30	1.2	178	1.4
18/10/2018 22:45	0.6	26	1.6
18/10/2018 23:00	1.4	81	1.4
18/10/2018 23:15	1.2	131	1.6
18/10/2018 23:30	0.0	-	0.8
18/10/2018 23:45	0.6	29	0.6
19/10/2018 00:00	0.8	125	0.8
19/10/2018 00:15	0.0	-	1.0
19/10/2018 00:30	0.0	-	1.2
19/10/2018 00:45	0.3	99	0.8
19/10/2018 01:00	0.0	-	0.8
19/10/2018 01:15	0.6	234	0.6
19/10/2018 01:30	0.0	-	1.2
19/10/2018 01:45	0.0	-	1.4
19/10/2018 02:00	0.8	346	1.4
19/10/2018 02:15	0.0	-	1.6
19/10/2018 02:30	0.0	-	1.2
19/10/2018 02:45	0.0	-	1.8
19/10/2018 03:00	0.6	283	2.0
19/10/2018 03:15	0.6	242	1.6

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

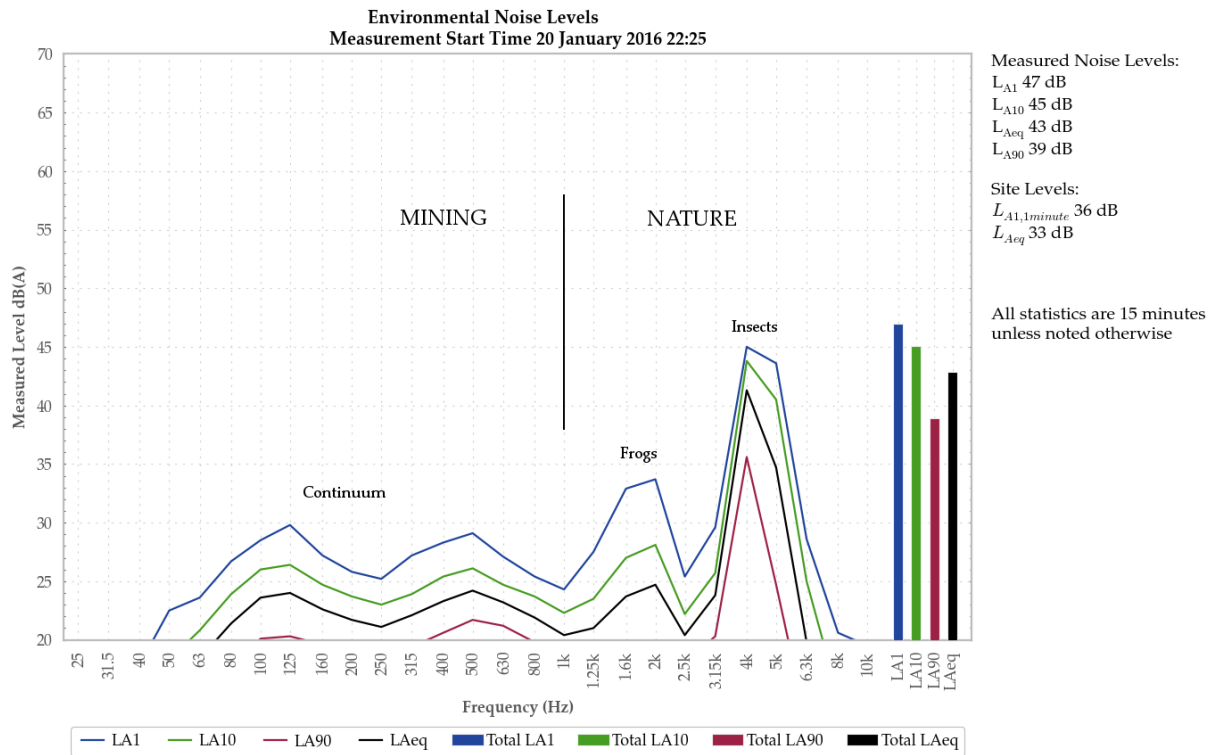


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6, 19 October 2018

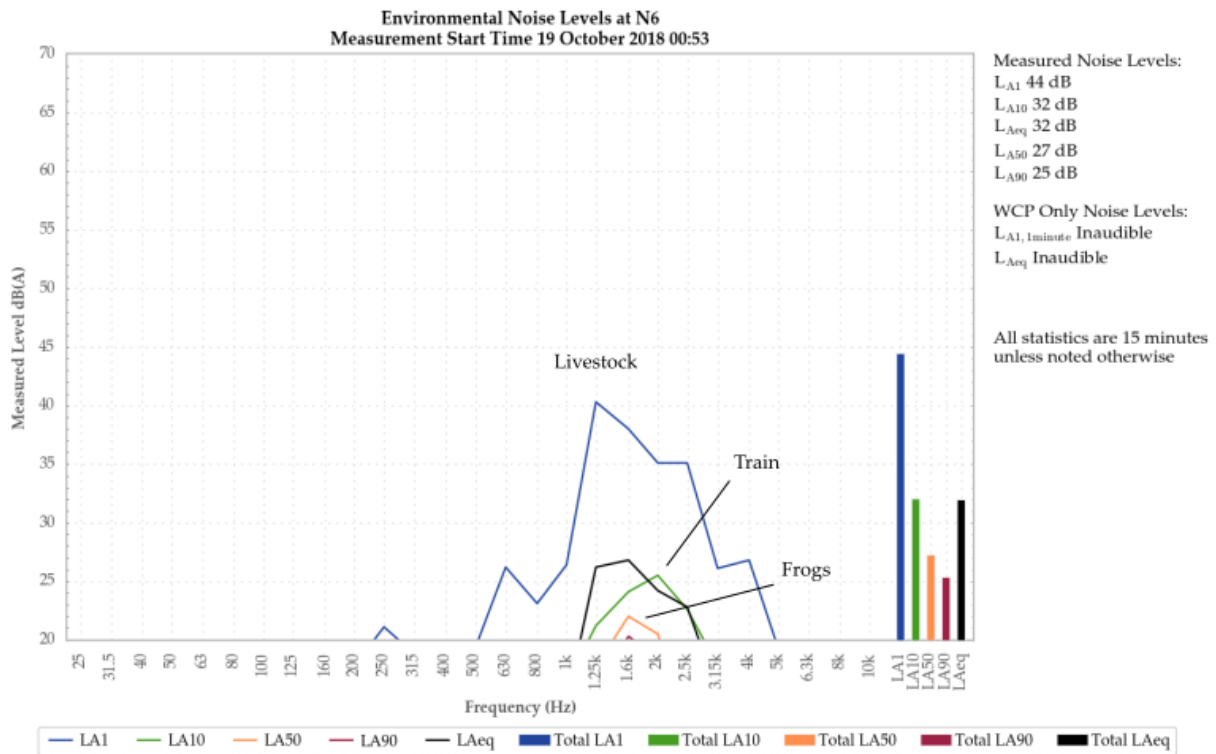


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

WCP was inaudible.

Livestock generated the measured LA1 and primarily generated the measured LAeq. A train contributed to the measured LAeq and generated the measured LA10. Frogs generated the measured LA50 and LA90.

5.1.2 N13, 19 October 2018

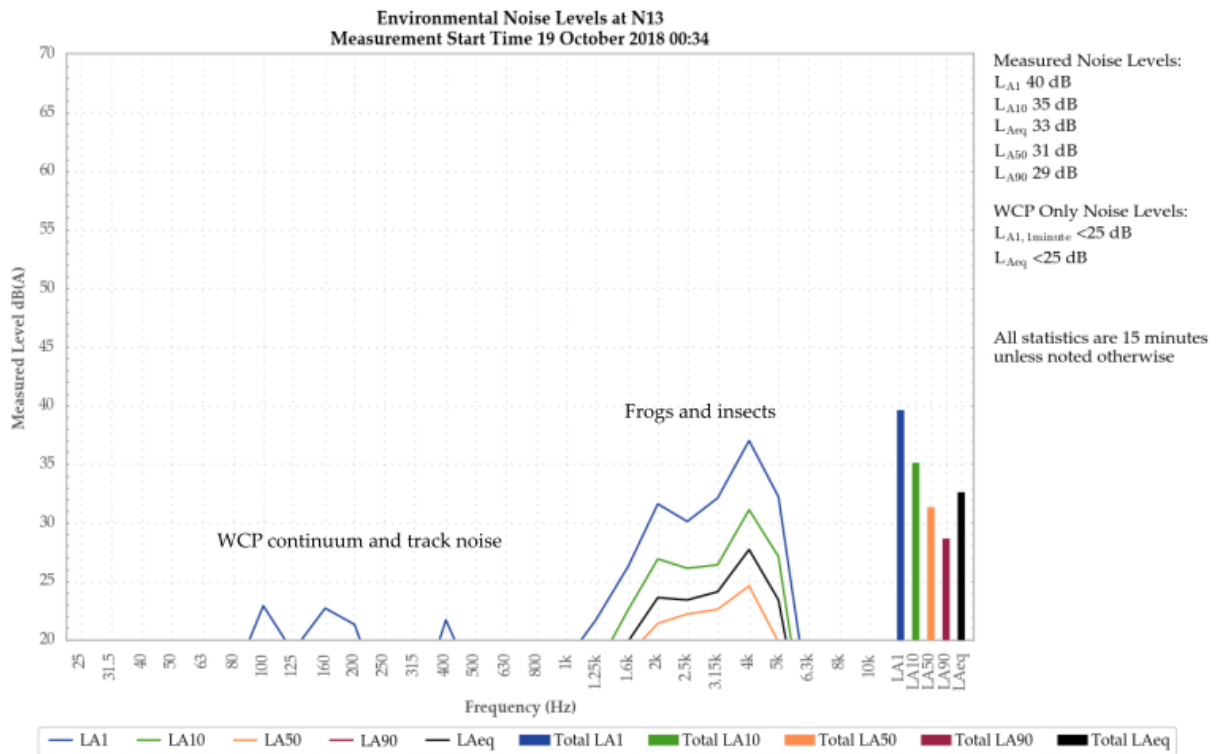


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was audible as a low level continuum throughout the measurement, generating the site-only LAeq and LA1,1minute of less than 25 dB. Track noise was also noted.

Frogs and insects generated measured levels.

Birds, livestock, and bats were also noted.

5.1.3 N14, 19 October 2018

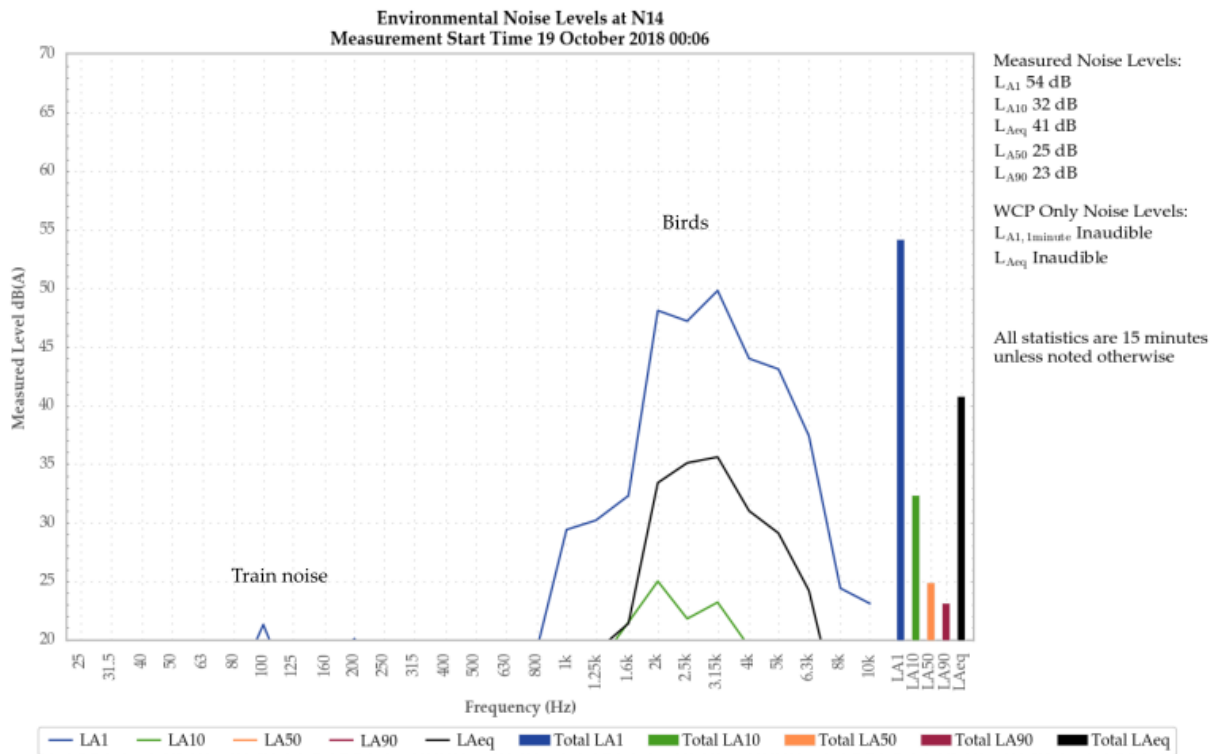


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

WCP was inaudible.

Birds generated the measured LA1 and LAeq. Frogs and insects generated the measured LA10, LA50, and the LA90.

A train was also noted.

5.1.4 N15, 18 October 2018

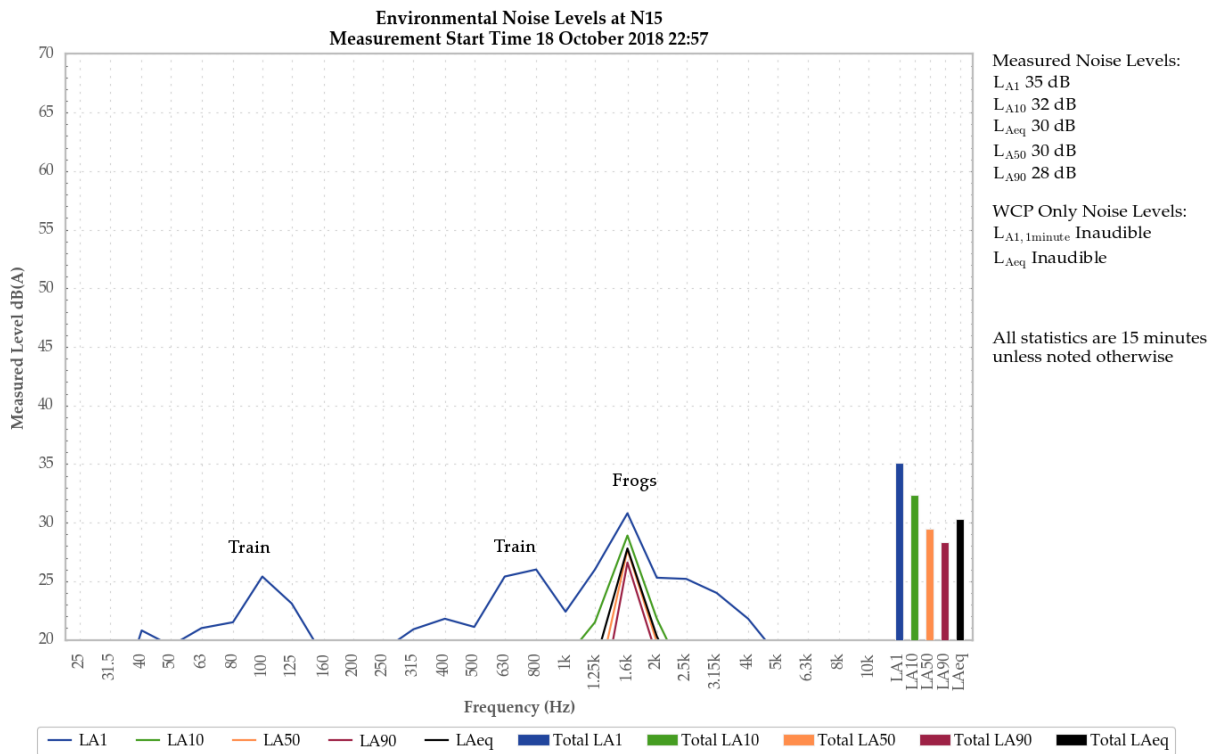


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

WCP was inaudible.

Frogs and a train generated the measured LA1. Frogs generated the measured LA10, LAeq, LA50, and LA90.

Birds and insects were also noted.

5.1.5 N17, 18 October 2018

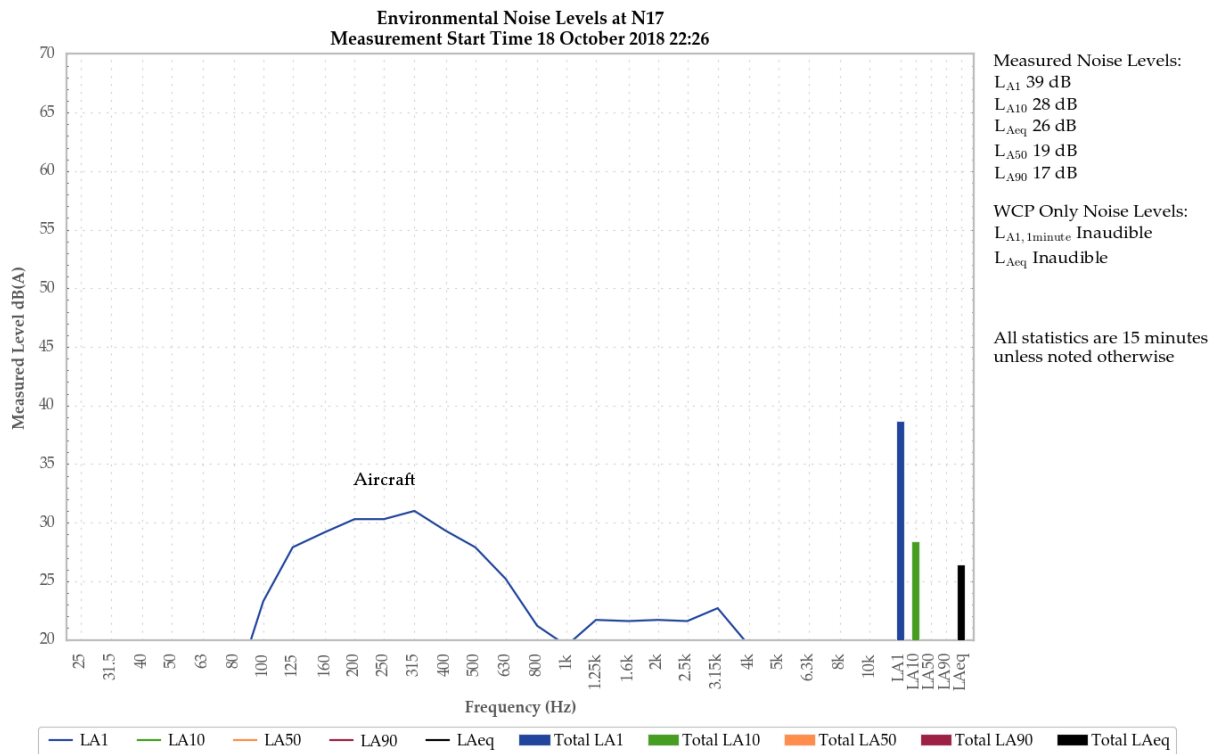


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

WCP was inaudible.

An aircraft generated the measured LA1, LA10, and LAeq. The noise floor of the sound level meter primarily generated the LA50 and LA90.

Birds, insects and frogs were also noted.

5.1.6 N19, 18 October 2018

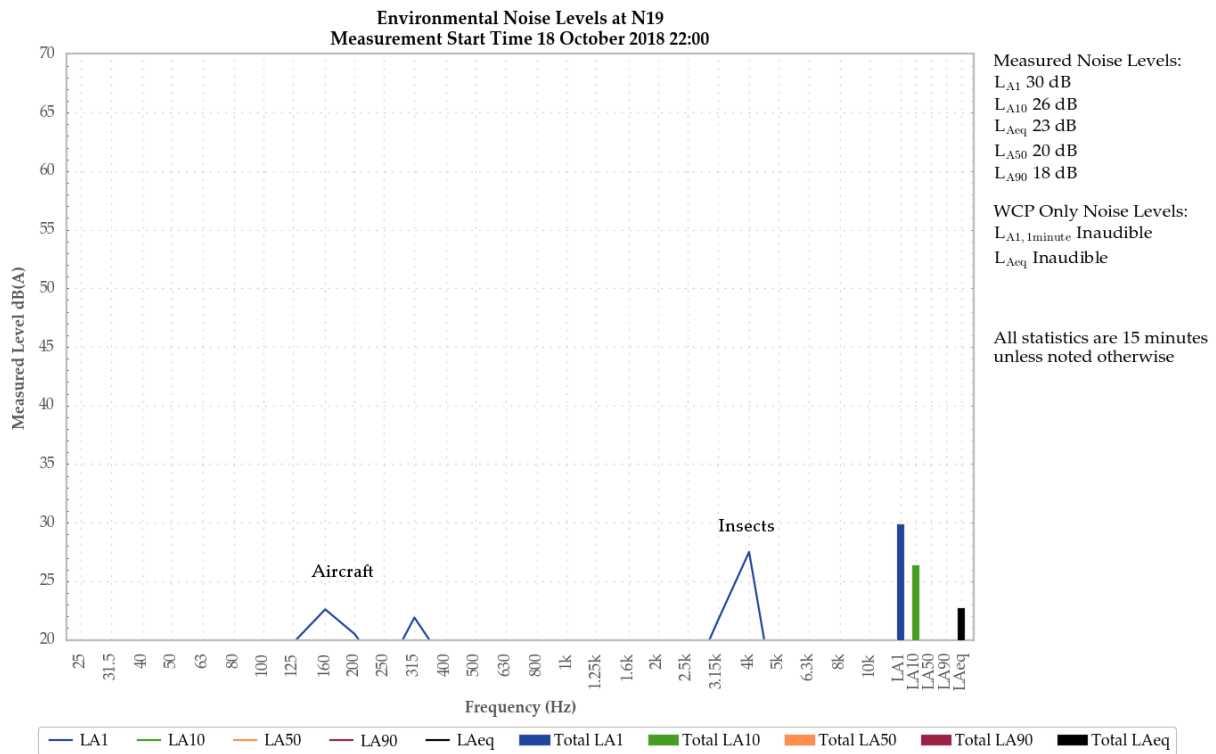


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

WCP was inaudible.

An aircraft and insects generated the measured LA1. Insects generated the measured LAeq, LA10, and LA50. The noise floor of the sound level meter primarily generated the LA90.

Frogs were also noted.

5.1.7 N20, 18 October 2018

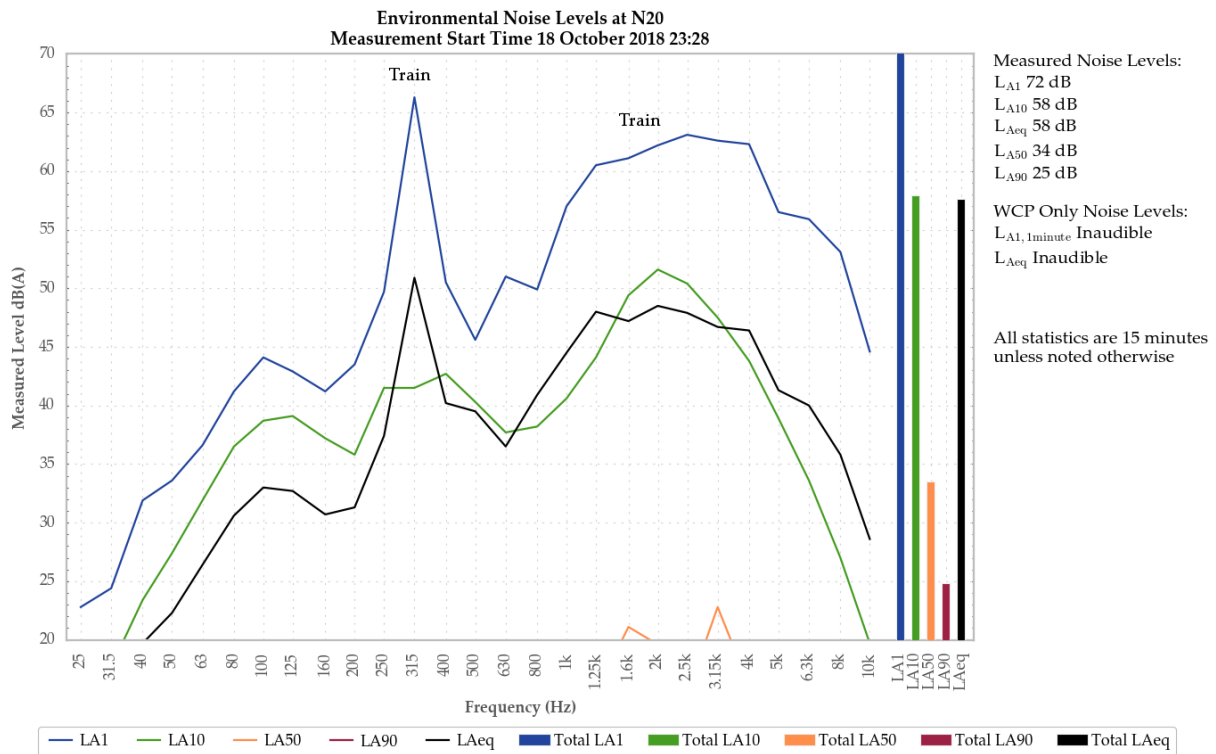


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

A train generated the measured L_{A1}, L_{A10}, and L_{Aeq}. Frogs and insects generated the measured L_{A50} and L_{A90}.

5.1.8 N21, 19 October 2018

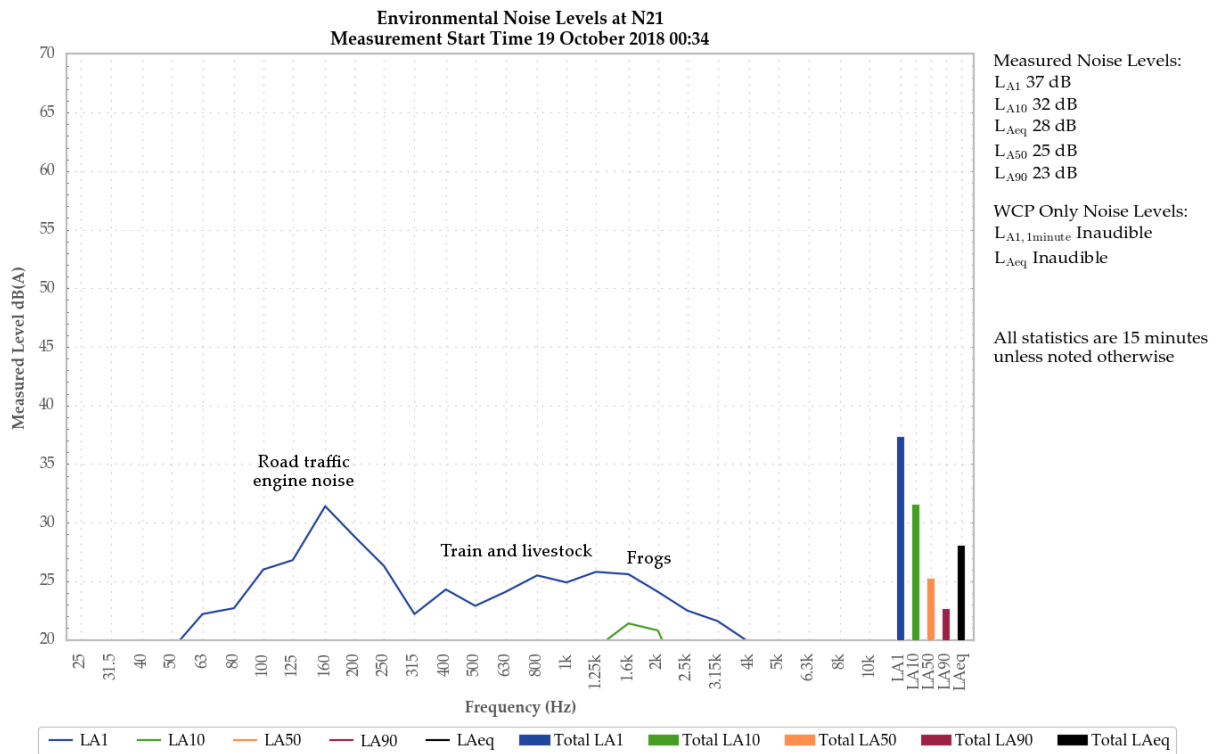


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

WCP was inaudible.

Road traffic engine noise, livestock, and frogs generated the measured L_{A1} and with a train, generated the measured L_{Aeq}. A train primarily generated the measured L_{A50}. Frogs generated the measured L_{A10} and L_{A90}.

Insects and birds were also noted.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 18/19 October 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the October 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZe _q ,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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Octave Band Filter
AS 4476:1997

Calibration Certificate

Calibration Number C17248A_Reissued

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Atmospheric Conditions

Ambient Temperature : 24.4°C
Relative Humidity : 39%
Barometric Pressure : 99.78kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Riley Cooper
Report Issue Date : 29/06/2018

Approved Signatory :

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests

< 16Hz $\pm 0.19dB$
16Hz-100Hz $\pm 0.11dB$
100Hz-1000Hz $\pm 0.1dB$
1000Hz-10kHz $\pm 0.1dB$
> 10kHz $\pm 0.16dB$

Least Uncertainties of Measurement -

Environmental Conditions
Temperature $\pm 0.3^{\circ}C$
Relative Humidity $\pm 2.5\%$
Barometric Pressure $\pm 0.017kPa$

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.



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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
Distortion	±0.5%		

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

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Octave Band Filter AS 4476:1997 Calibration Certificate

Calibration Number C18363A

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

Filter Model Number : Rion NA-28
Filter Serial Number : N/A
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Atmospheric Conditions

Ambient Temperature : 22.8°C
Relative Humidity : 37.7%
Barometric Pressure : 100.82kPa

Calibration Technician : Lucky jaiswal
Calibration Date : 25 Jun 2018
Secondary Check: Lewis Boorman
Report Issue Date : 25 Jun 2018

Approved Signatory :  Juan Agüero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
4.4 & 5.3: 1/1 Octave relative attenuation	Pass	4.6 & 5.5: Linear operating range	Pass
4.4 & 5.3: 1/3 Octave relative attenuation	Pass	4.8 & 5.7: Anti-alias filters	Pass
		4.10 & 5.9: Flat frequency response	Pass

The fractional octave band meter under test has been shown to conform to the class 1 requirements for periodic testing as described in AS 4476:1997 for the tests stated above.

Electrical Tests		Least Uncertainties of Measurement - Environmental Conditions	
< 16Hz	±0.19dB	Temperature	±0.03°C
16Hz-100Hz	±0.11dB	Relative Humidity	±2.5%
100Hz-1000Hz	±0.09dB	Barometric Pressure	±0.017kPa
1000Hz-10kHz	±0.09dB		
> 10kHz	±0.16dB		

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.



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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions

Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :  Juan Aguero

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	1000.38

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 ±0.11dB	Temperature ±0.05°C
Short Term Fluct. ±0.02dB	Relative Humidity ±0.46%
Frequency ±0.01%	Barometric Pressure ±0.017kPa
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.

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Wilpinjong Coal

*Environmental Noise Monitoring
November 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring November 2018

Reference: 18384_R01

Report date: 8 January 2019

Prepared for

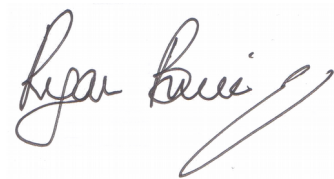
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Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 5/6 November 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the November 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 5/6 November 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

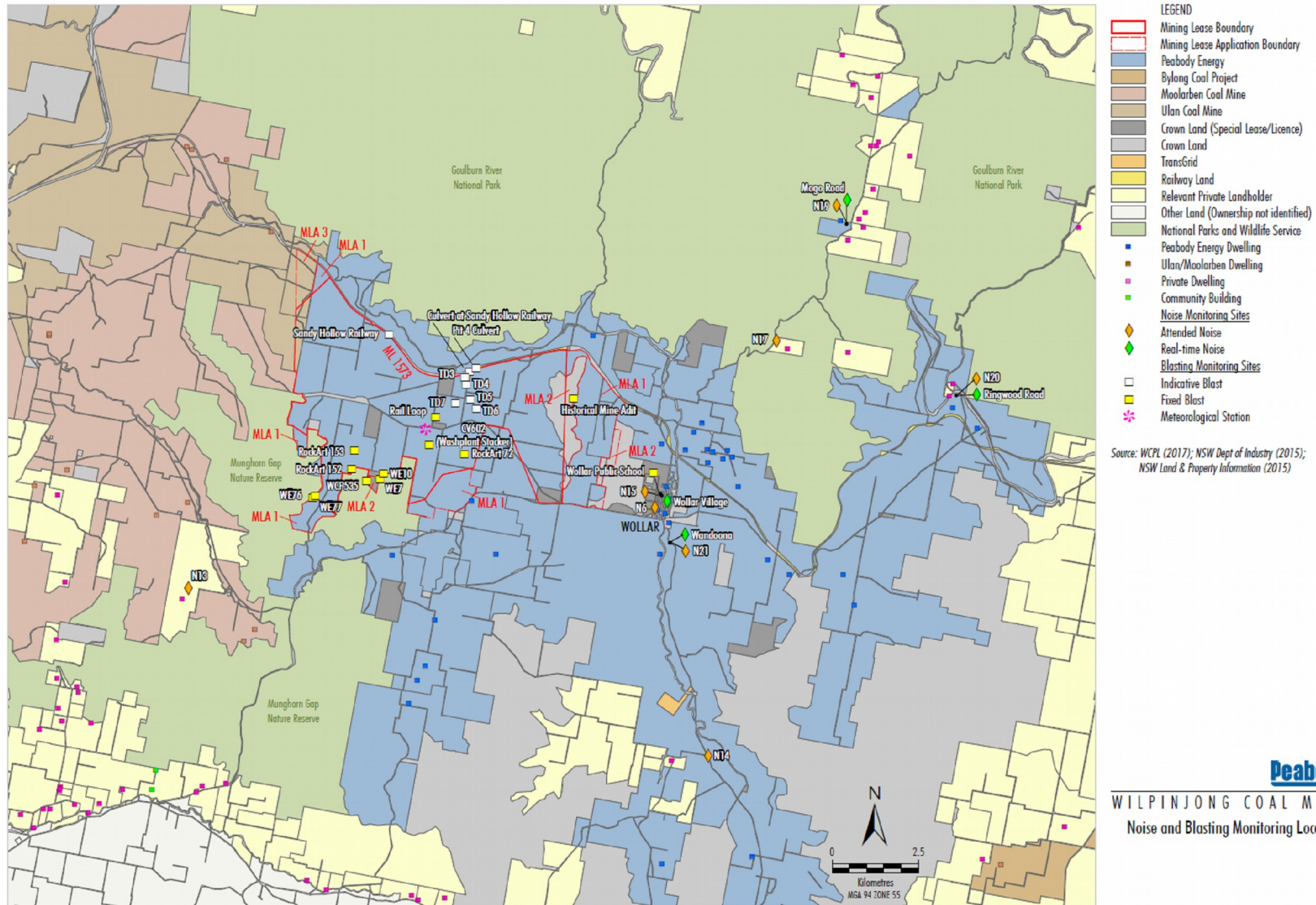


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L _{A50}	The noise level which is exceeded for 50 per cent of the time
L _{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site-only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site-only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low-frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	30/03/2019
Rion NA-28 sound level analyser	00701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Total Measured Noise Levels

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

Table 4.1: MEASURED NOISE LEVELS – NOVEMBER 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	06/11/2018 01:16	38	33	29	23	25	20	19	54
N13	06/11/2018 01:19	58	36	30	28	29	27	25	46
N14	06/11/2018 00:25	45	37	28	25	27	22	20	54
N15	05/11/2018 23:10	44	34	31	25	27	23	22	54
N17	05/11/2018 22:38	45	44	43	41	41	39	38	54
N19	05/11/2018 22:12	50	46	45	45	44	42	40	51
N20	05/11/2018 23:45	40	35	33	30	30	24	21	53
N21	06/11/2018 00:55	65	35	29	24	32	22	20	48

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

4.2 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low-frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.3 Attended Noise Monitoring

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – NOVEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	06/11/2018 01:16	1.0	F	37	Yes	<20	Nil
N13	06/11/2018 01:19	1.0	F	36	Yes	NM	Nil
N14	06/11/2018 00:25	0.5	F	35	Yes	<25	Nil
N15	05/11/2018 23:10	0.8	E	35	Yes	<25	Nil
N17	05/11/2018 22:38	0.5	F	35	Yes	<25	Nil
N19	05/11/2018 22:12	0.0	F	35	Yes	<25	Nil
N20	05/11/2018 23:45	0.7	F	35	Yes	<20	Nil
N21	06/11/2018 00:55	0.0	F	35	Yes	<20	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – NOVEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	06/11/2018 01:16	1.0	F	45	Yes	<20	Nil
N13	06/11/2018 01:19	1.0	F	45	Yes	NM	Nil
N14	06/11/2018 00:25	0.5	F	45	Yes	32	Nil
N15	05/11/2018 23:10	0.8	E	45	Yes	<25	Nil
N17	05/11/2018 22:38	0.5	F	45	Yes	<25	Nil
N19	05/11/2018 22:12	0.0	F	45	Yes	28	Nil
N20	05/11/2018 23:45	0.7	F	45	Yes	<20	Nil
N21	06/11/2018 00:55	0.0	F	45	Yes	<25	Nil

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.4 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) L_{Aeq} and L_{A90} are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, NOVEMBER 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total L_{Aeq} dB	Low pass (<630Hz) L_{Aeq} dB	Low pass (<630Hz) L_{A90} dB	WCP L_{Aeq} dB
N15/SX33	05/11/2018 23:10	05/11/2018 23:15	35	26	22	<25
N19/SX32	05/11/2018 22:12	05/11/2018 22:15	36	23	21	<25
N20/SX30	05/11/2018 23:45	05/11/2018 23:45	40	28	22	<20
N21/SX31	06/11/2018 00:55	06/11/2018 01:00	39	35	25	<20

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

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 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – NOVEMBER 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	06/11/2018 01:16	20	0.5	210	0
N13	06/11/2018 01:19	20	1.2	240	5
N14	06/11/2018 00:25	21	0.0	-	0
N15	05/11/2018 23:10	23	0.0	-	0
N17	05/11/2018 22:38	23	0.0	-	0
N19	05/11/2018 22:12	25	0.0	-	0
N20	05/11/2018 23:45	23	0.0	-	0
N21	06/11/2018 00:55	19	0.7	210	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees ²	Lapse Rate Degrees / 100 metres ³
05/11/2018 22:00	0.9	33	3.0
05/11/2018 22:15	0.9	303	2.6
05/11/2018 22:30	0.0	-	3.0
05/11/2018 22:45	0.7	240	2.2
05/11/2018 23:00	0.5	261	1.6
05/11/2018 23:15	1.6	30	2.2
05/11/2018 23:30	0.8	173	1.0
05/11/2018 23:45	0.9	197	1.4
06/11/2018 00:00	0.7	215	1.8
06/11/2018 00:15	0.4	299	2.0
06/11/2018 00:30	0.8	347	2.4
06/11/2018 00:45	0.5	167	2.2
06/11/2018 01:00	0.0	-	1.6
06/11/2018 01:15	0.0	-	2.6
06/11/2018 01:30	1.0	338	2.6
06/11/2018 01:45	1.1	352	3.0
06/11/2018 02:00	0.2	235	2.8
06/11/2018 02:15	0.8	45	2.2
06/11/2018 02:30	0.5	119	2.0
06/11/2018 02:45	0.9	161	1.0
06/11/2018 03:00	1.1	57	1.8
06/11/2018 03:15	0.5	48	1.0
06/11/2018 03:30	0.7	340	1.6
06/11/2018 03:45	0.7	325	2.2
06/11/2018 04:00	0.6	48	2.2
06/11/2018 04:15	0.8	154	2.4
06/11/2018 04:30	0.8	51	1.8

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

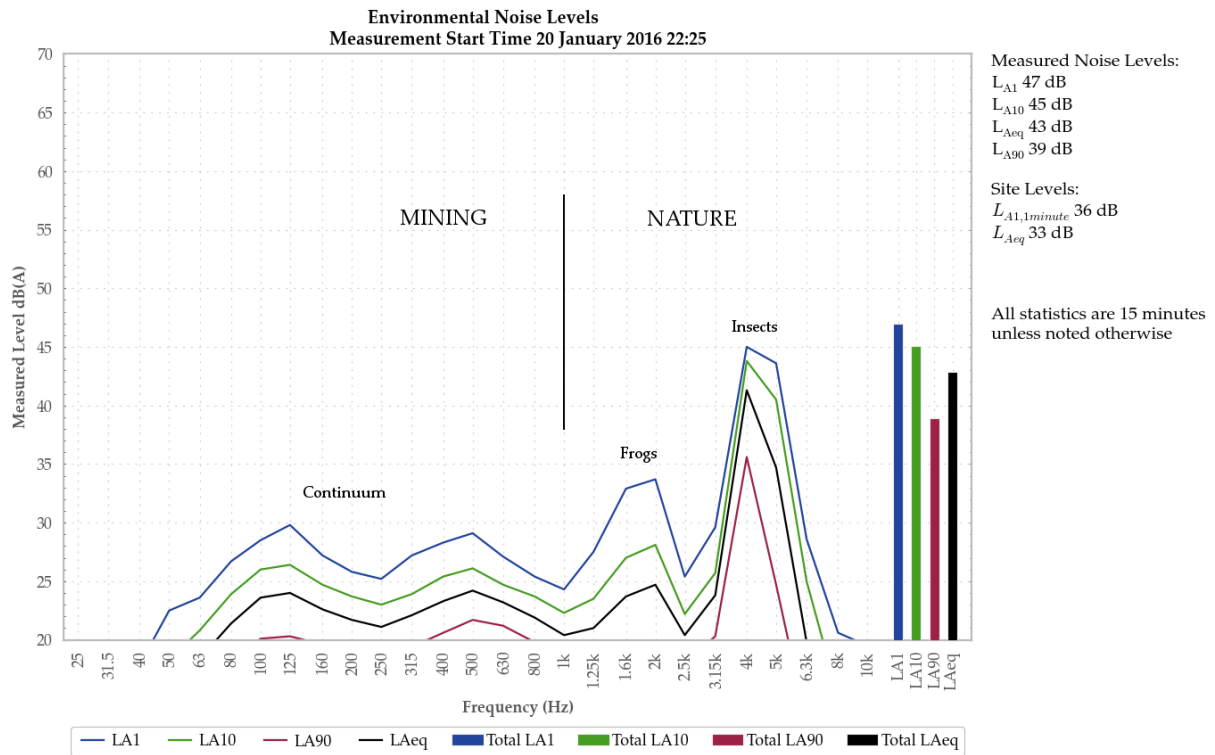


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6

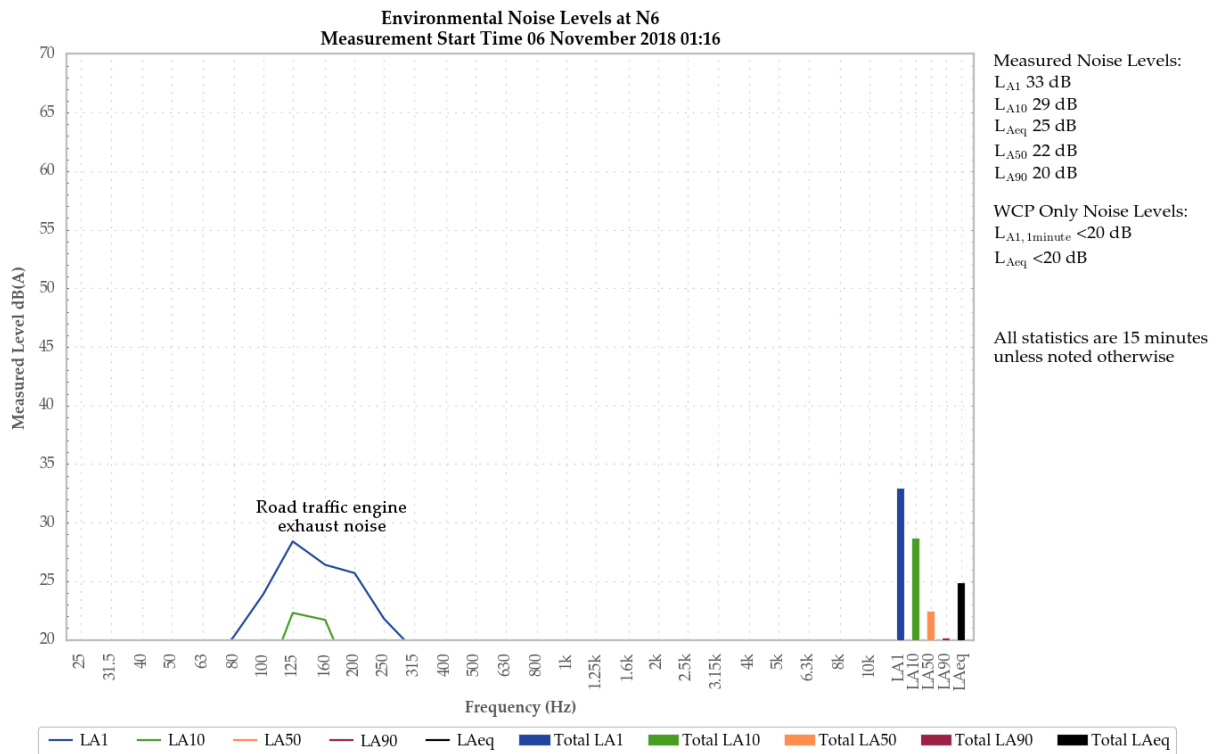


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A low level continuum from WCP was audible throughout the measurement and resulted in a site only LAeq and LA1,1minute of less than 20 dB.

Road traffic generated all measured levels.

Birds, cows, a train and insects were also noted.

5.1.2 N13

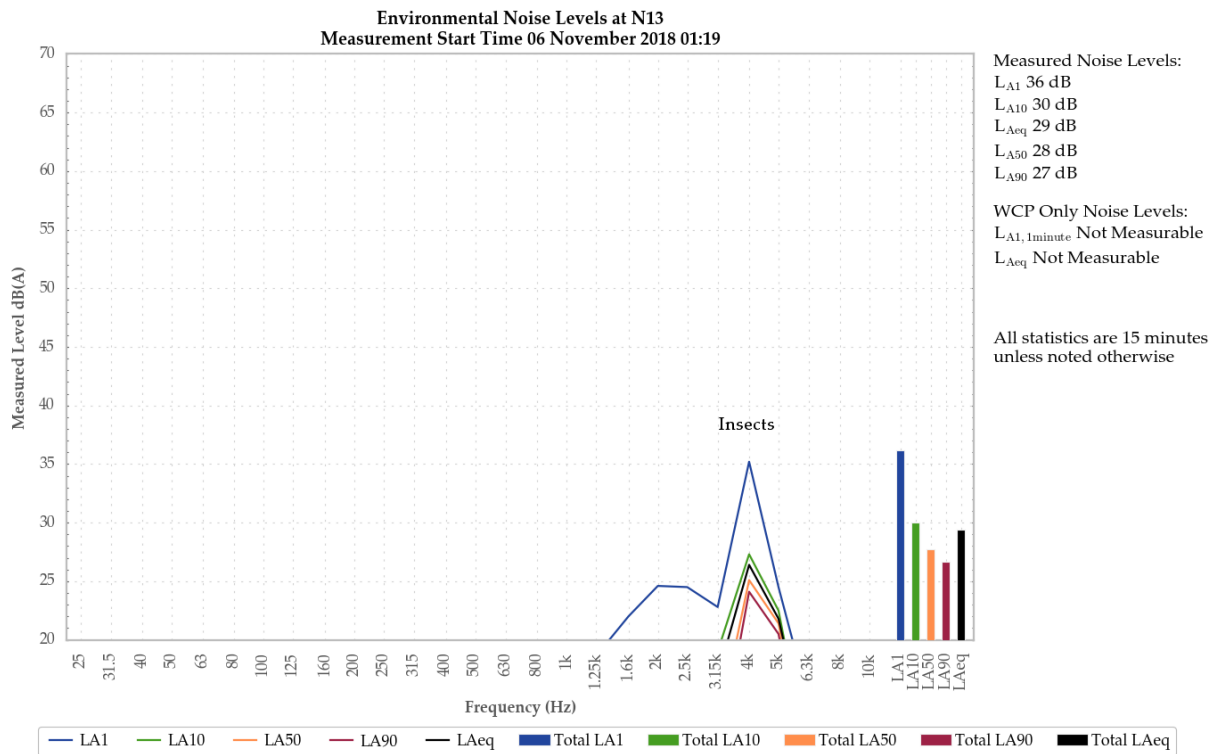


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

A low level continuum from WCP was audible at times during the measurement but was not measurable.

Insects generated measured levels.

Livestock were also noted.

5.1.3 N14

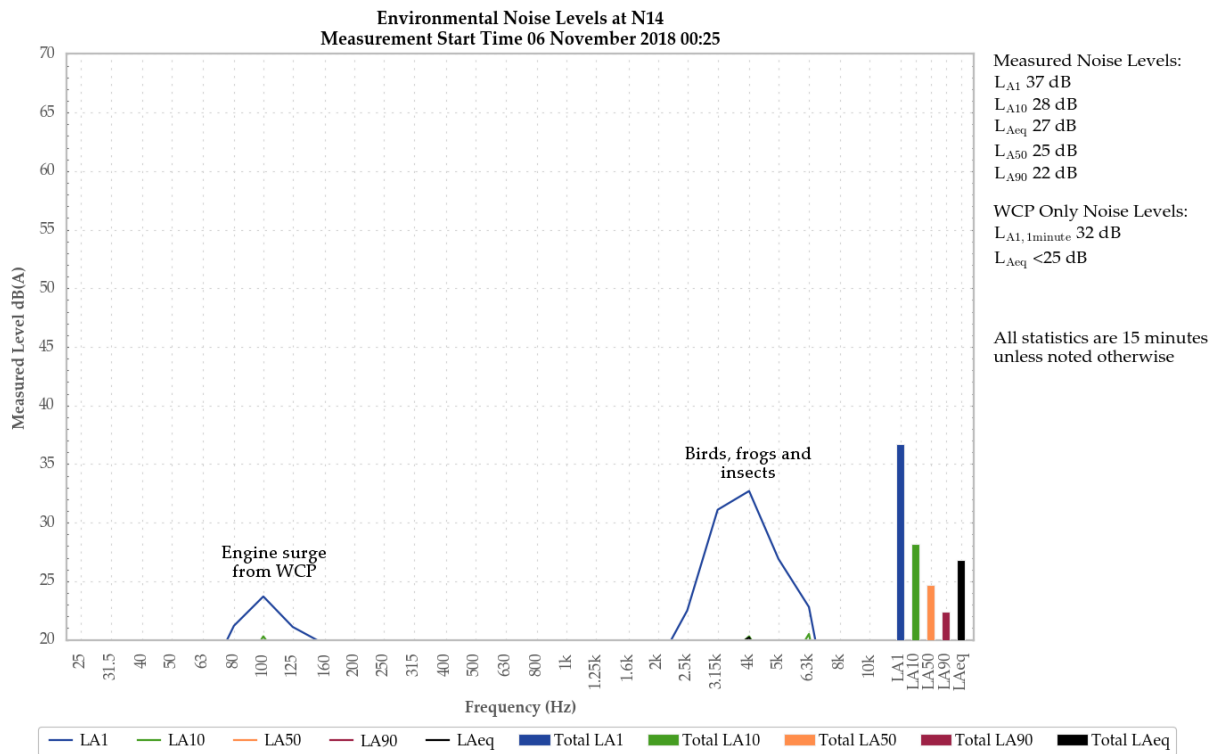


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site-only LAeq,15minute of less than 25 dB. An engine surge generated the site-only LA1,1minute of 32 dB.

Birds, frogs and insects were primarily responsible for all measured levels. Mining noise sources from WCP were a minor contributor to the measured LA90 and LAeq. LA1 and LA10

5.1.4 N15

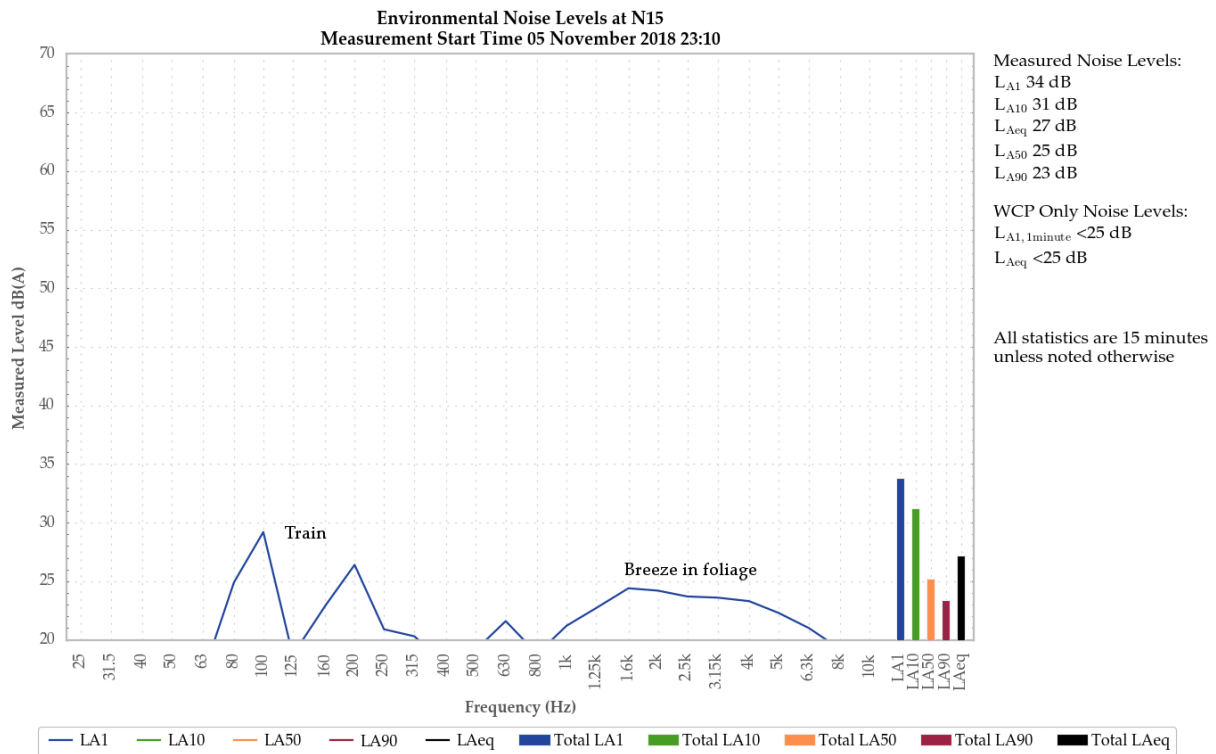


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute and LA1,1minute of less than 25 dB.

Breeze in foliage was primarily responsible for all measured levels. A train contributed to the measured LA1 and LA10.

Insects, road traffic noise and bats were also noted.

5.1.5 N17

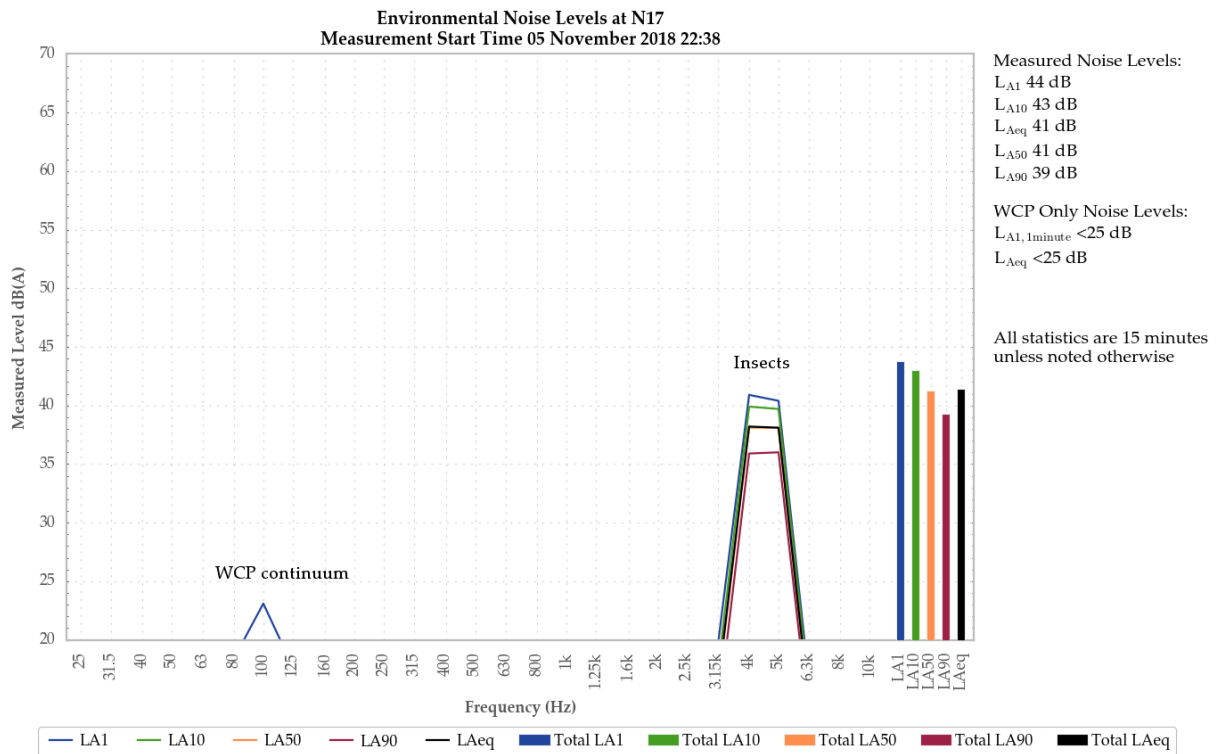


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

A continuum from WCP was audible throughout the measurement and resulted in a site-only LAeq and LA1,1minute of less than 25 dB.

Insects generated measured levels.

Birds were also noted.

5.1.6 N19

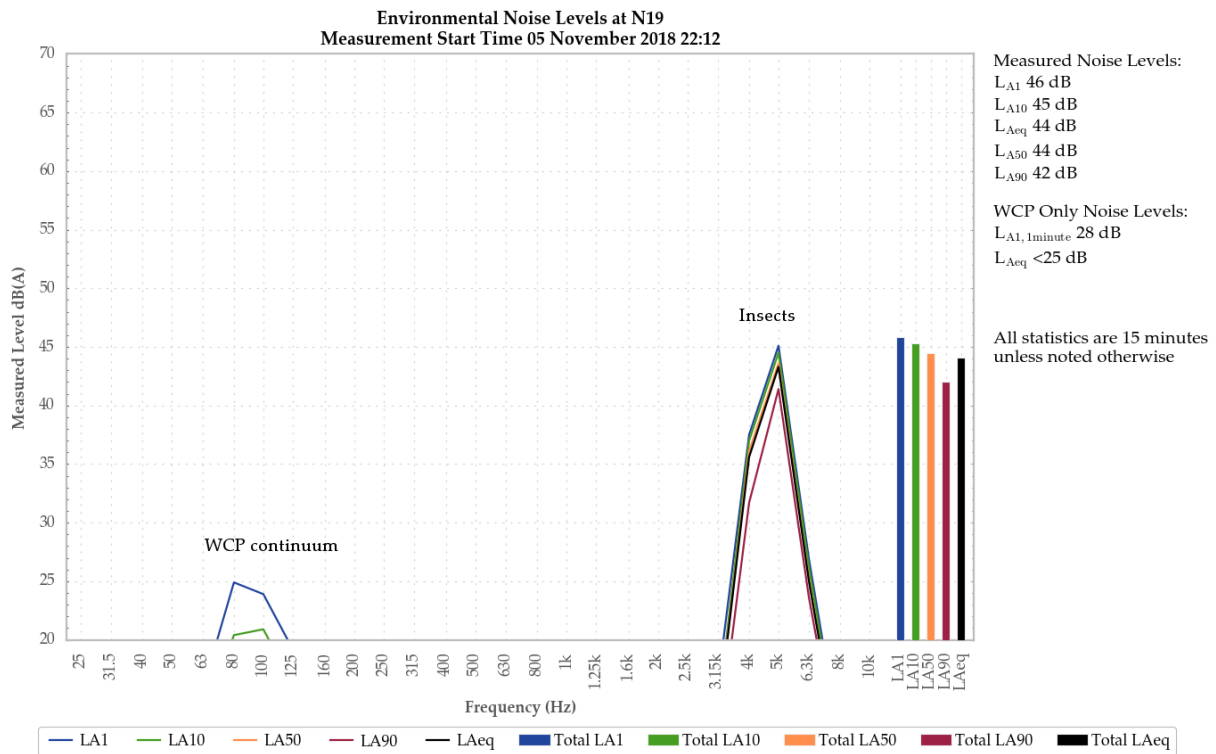


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

A continuum form WCP was audible throughout the measurement and resulted in a site-only LAeq of less than 25 dB and LA1,1minute of 28 dB.

Insects generated measured levels.

Birds and bats were also noted.

5.1.7 N20

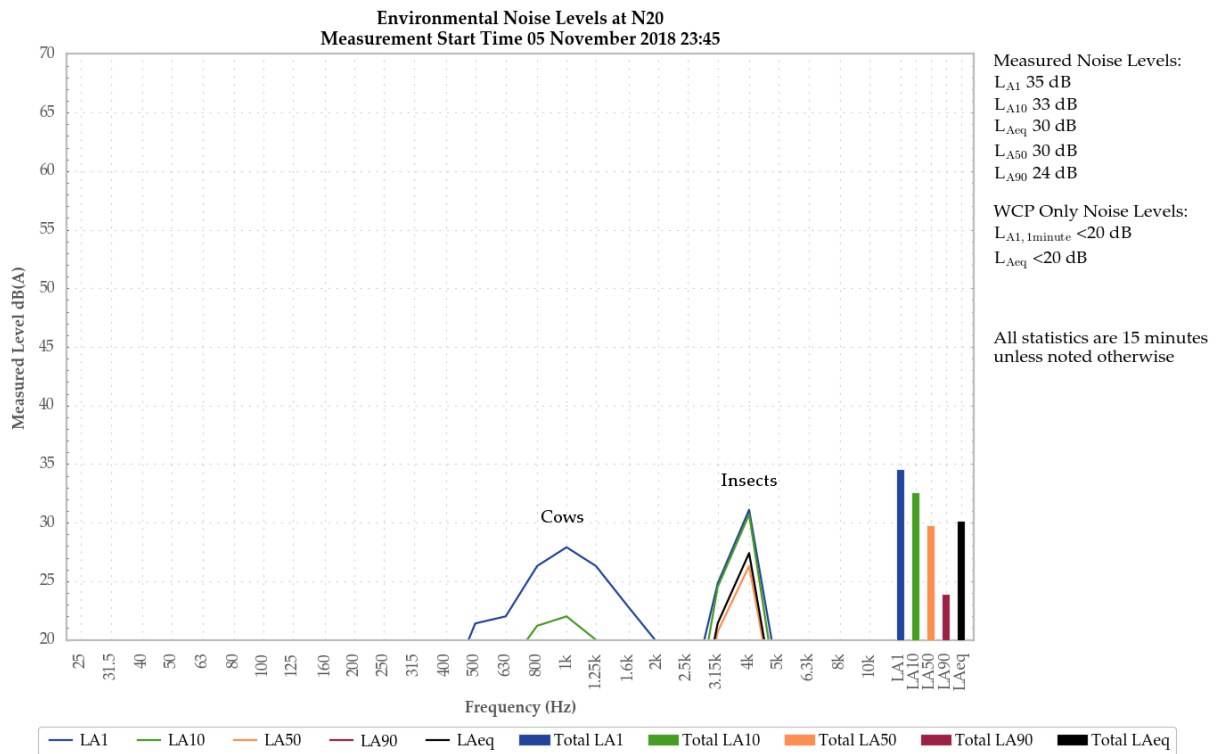


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

A low level continuum from WCP was audible throughout the measurement and resulted in a site-only LAeq and LA1,1minute of less than 20 dB.

Insects contributed to the measured LA1 and LA10, and generated the measured LAeq, LA50 and LA90. Cows contributed to the measured LA1 and LA10.

5.1.8 N21

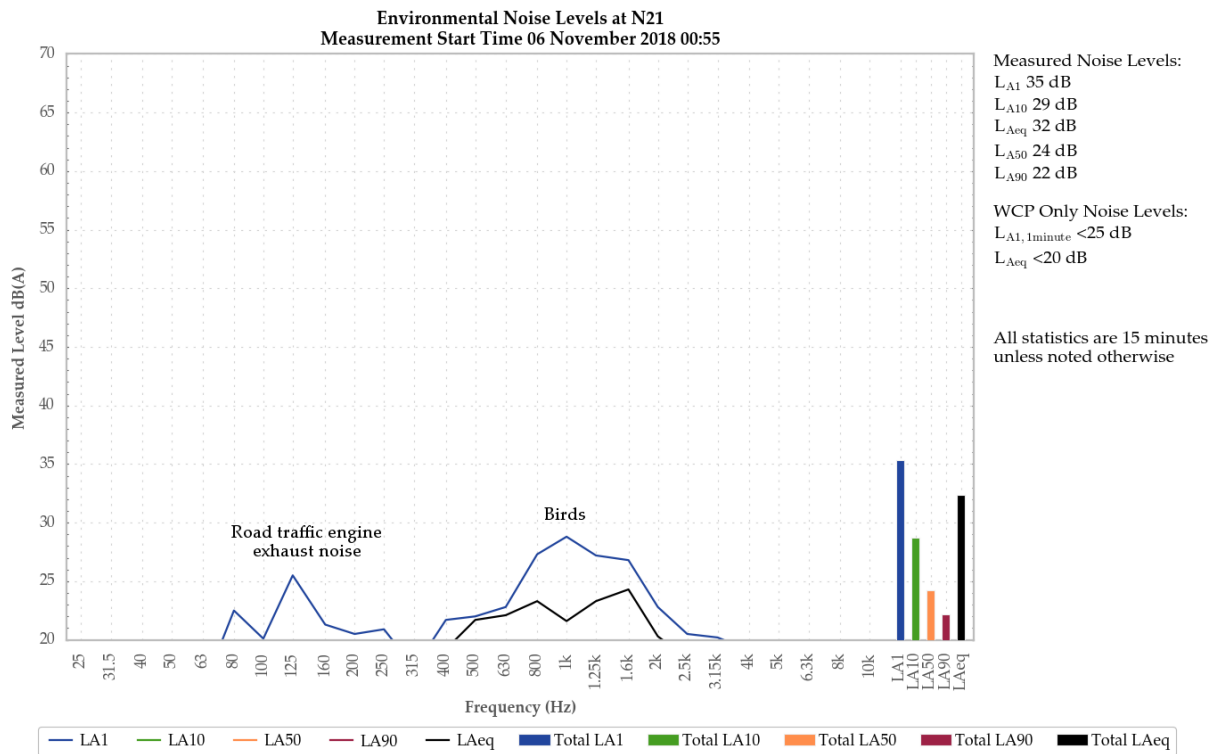


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute of less than 20 dB and LA1,1minute of less than 25 dB.

Birds were primarily responsible for all measured levels. Road traffic noise contributed to the measured LA1. The continuum from WCP was a minor contributor to the measured LA90.

Breeze in foliage and gunshots were also noted.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 5/6 November 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the November 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

environmental noise – General procedures'. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



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 C18363

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

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 01070590
Microphone Serial Number : 08184
Pre-amplifier Serial Number : 52329

Pre-Test Atmospheric Conditions
Ambient Temperature : 21.3°C
Relative Humidity : 41.7%
Barometric Pressure : 100.95kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.7°C
Relative Humidity : 39.2%
Barometric Pressure : 100.89kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 25 Jun 2018

Secondary Check: Lewis Boorman
Report Issue Date : 25 Jun 2018

Approved Signatory :

Juan Agüero

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	
51.5 Hz to 9kHz	±0.12dB	Temperature	±0.05°C
12.5kHz	±0.18dB	Relative Humidity	±0.46%
16kHz	±0.31dB	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.

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**Sound Level Meter
IEC 61672-3:2013**

Calibration Certificate

Calibration Number C17248

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
Ambient Temperature : 24.3°C
Relative Humidity : 40%
Barometric Pressure : 100.05kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 39.5%
Barometric Pressure : 100kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	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.



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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17149

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

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

Atmospheric Conditions

Ambient Temperature : 21.9°C
Relative Humidity : 54.6%
Barometric Pressure : 98.84kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 30/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 31/03/2017

Approved Signatory :

Juan Agüero

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	1000.38

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

Generated SPL ±0.11 dB
Short Term Fluct. ±0.02 dB
Frequency ±0.01%
Distortion ±0.5%

Environmental Conditions

Temperature ±0.05°C
Relative Humidity ±0.46%
Barometric Pressure ±0.017kPa

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.

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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.
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Wilpinjong Coal

*Environmental Noise Monitoring
December 2018*

*Prepared for
Wilpinjong Coal Pty Ltd*



Noise and Vibration Analysis and Solutions

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Wilpinjong Coal

Environmental Noise Monitoring December 2018

Reference: 18419_R01

Report date: 9 January 2019

Prepared for

Wilpinjong Coal Pty Ltd
Locked Bag 2005
Mudgee NSW 2850

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Jason Cameron
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

EXECUTIVE SUMMARY

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

The current WCP development consent was approved in April 2017. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved.

Attended monitoring was conducted in accordance with the documents detailed above, Australian Standard AS 1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. The duration of each night measurement was 15 minutes.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 3/4 December 2018. The purpose of attended noise monitoring was to quantify and describe the acoustic environment around WCP and compare results with specified limits.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the December 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken at eight locations during the night period of 3/4 December 2018. Figure 1 shows the monitoring locations.

The purpose of the attended noise monitoring survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Monitoring Locations

There were eight monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the site Noise Monitoring Program (NMP).

Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road, Moolarben
N14	'Tichular', intersection of Tichular and Barigan Roads, Tichular
N15	Track off Barigan Street near Wollar Public School, Wollar Village
N17	Mogo Road, off Araluen Road, Wollar
N19	North Mogo Road, Mogo
N20	Ringwood Road, off Wollar Road, Wollar
N21	'Wandoona', Barigan Road, Wollar

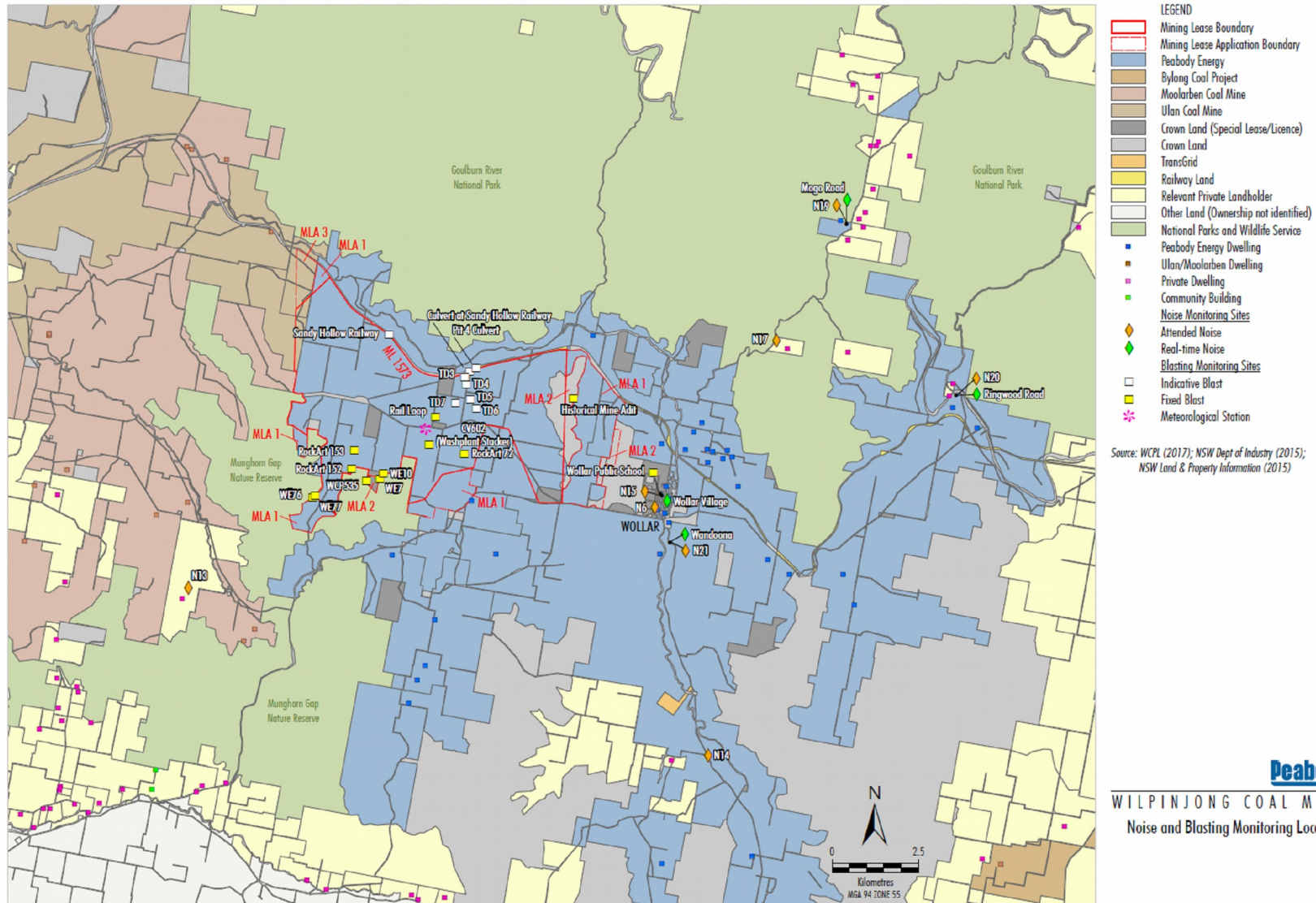


Figure 1: WCP Attended Noise Monitoring Locations (Source: WCP NMP, 2017)

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
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
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 per cent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. 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 or for an event
L_{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. From Wilpinjong Coal inversion tower data
SC	Stability Class. Based on Wilpinjong Coal inversion tower data
IA	Inaudible. When site-only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site-only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, 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 STATUTORY REQUIREMENTS AND CRITERIA

2.1 Project Approval

Approval was granted for the Wilpinjong Extension Project (SSD-6764) in April 2017, which covers all current operations and has now replaced the previous consent (05-0021). The relevant noise conditions from the current project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

The EPL (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent on 23 March 2018. Relevant noise sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in June 2017. Chapter 6 of the NMP provides details on the noise monitoring program including locations and an attended monitoring methodology. The relevant sections are reproduced in Appendix A.

2.4 Project Specific Criteria

Criteria in the project approval and EPL are consistent as are the met exclusion rules determining when criteria apply. Criteria shown in Table 2.1 have been selected as the most appropriate for each monitoring location.

Table 2.1: WCP PROJECT SPECIFIC CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L _{Aeq,15minute}	Evening L _{Aeq,15minute}	Night L _{Aeq,15minute} / L _{A1,1minute}
N6 ¹	St Laurence O'Toole Catholic Church	36	37	37/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	37	37/45
N17 ²	Mogo Road, off Araluen Road	36	36	38/45
N19	North Mogo Road	35	35	35/45
N20	Ringwood Road, off Wollar Road	35	35	35/45
N21	'Wandoona', Barigan Road	35	35	35/45

Notes:

- N6 noise limits have been assumed to be as detailed for 'Wollar Village – Residential' in the PA, as the church is no longer a place of worship; and
- N17 noise limits have been determined based on the assumption that N17 is property 102 in accordance with Appendix 5 Figure 1 of Development Consent SSD-6764.

2.5 Modifying Factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) 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.

2.5.1 Tonal 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.

2.5.2 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 Assessment Method

Attended monitoring was conducted in accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW EPA requirements. Atmospheric condition measurement was also undertaken during each fifteen minute measurement. Monitoring is undertaken once per month at each location.

Attended monitoring during this reporting period was undertaken by Ryan Bruniges.

If the exact contribution from WCP 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 levels, for example, L_{A10} , L_{A50} or L_{A90} . 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 as per section 7.1 of the NPfI (e.g. measuring at an intermediate location and using relevant calculation) 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 or reasonable to employ NPfI methods such as using an intermediate location. 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 $L_{A1,1\text{minute}}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or $L_{A\text{max}}$, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15-minute measurement).

As indicated in L5.5 (a) and (b) of the EPL, the $L_{A1,1\text{minute}}$ measurement should be undertaken at one (1) metre from the dwelling façade and the $L_{A\text{eq}}$ measurement within 30 metres of the dwelling. However, the direct measurement of noise at 1 metre from the façade is not practical during monitoring for this project. In

most cases, monitoring near the residence is impractical due to barking dogs or issues with obtaining access. In all cases, measurements for this survey were undertaken at a suitable and representative location.

Low-frequency noise has been assessed using the NPfI method, detailed in Section 2.5 of this report.

3.2 Attended Noise Monitoring

The equipment used to measure environmental noise levels are listed in Table 3.1. Calibration certificates are included as Appendix B.

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	05/06/2019
Pulsar 106 acoustic calibrator	74813	05/06/2019
Rion NA-28 sound level analyser	30131882	14/03/2019
Pulsar 105 acoustic calibrator	78226	14/03/2019

3.3 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 WCP 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 WCP 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 WCP 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
- WCP was the dominant low-frequency noise source.

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

3.4 Attended Real-Time Noise Monitor Comparison

WCP only noise levels from four attended monitoring locations are compared to results from nearby Sentinex units. Start times of attended and real-time measurements do not directly overlap. Real-time measurement with the most overlap with attended monitoring times are selected for comparison.

Attended monitoring locations and the real-time monitoring locations they represent are listed in Table 3.2. Attended and real-time monitor locations are shown in Figure 1.

Table 3.2: ATTENDED AND REAL-TIME MONITORING LOCATIONS FOR COMPARISON

Report Descriptor for Attended monitoring location	Real-Time Monitor ID	Monitoring Location
NA15	SX33-N1	Wollar Village
NA19	SX32-N1	North Mogo Road
NA20	SX30-N1	Ringwood Road, off Wollar Road
NA21	SX31-N1	'Wandoona', Barigan Road

4 RESULTS

4.1 Total Measured Noise Levels

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

Table 4.1: MEASURED NOISE LEVELS – DECEMBER 2018¹

Location	Start Date and Time	L _{Amax} dB	L _{A1} dB	L _{A10} dB	L _{A50} dB	L _{Aeq} dB	L _{A90} dB	L _{Amin} dB	L _{Ceq} dB
N6	04/12/2018 01:09	47	45	40	21	34	18	16	56
N13	04/12/2018 00:42	43	40	37	25	31	21	19	54
N14	04/12/2018 00:17	40	30	26	22	23	19	16	54
N15	03/12/2018 23:02	48	32	28	23	25	21	20	53
N17	03/12/2018 22:28	45	44	43	41	41	39	36	48
N19	03/12/2018 22:01	48	45	44	42	42	41	39	54
N20	03/12/2018 23:36	72	66	45	26	52	20	18	62
N21	04/12/2018 00:46	47	42	38	26	32	20	17	56

Note:

- Noise levels in this table are not necessarily the result of activities at WCP.

4.2 Modifying Factors

Measured WCP only levels were assessed for the applicability of modifying factors in accordance with the EPA's NPfI.

There were no intermittent or tonal noise sources, as defined in the NPfI, audible from site during the survey. None of the measurements satisfied the conditions outlined in Section 3.3 when assessing low-frequency noise.

Therefore no further assessment of modifying factors was undertaken.

4.3 Attended Noise Monitoring

Table 4.2 and Table 4.3 detail $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ noise levels from WCP in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval and EPL.

Table 4.2: $L_{Aeq,15\text{minute}}$ GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – DECEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP $L_{Aeq,15\text{min}}$ dB ^{4,5}	Exceedance ^{5,6}
N6	04/12/2018 01:09	0.0	G	37	No	<20	NA
N13	04/12/2018 00:42	0.0	G	36	No	IA	NA
N14	04/12/2018 00:17	0.0	G	35	No	<20	NA
N15	03/12/2018 23:02	1.1	G	35	No	<20	NA
N17	03/12/2018 22:28	1.8	F	35	Yes	<20	Nil
N19	03/12/2018 22:01	2.2	E	35	Yes	<20	Nil
N20	03/12/2018 23:36	1.4	G	35	No	IA	NA
N21	04/12/2018 00:46	0.0	G	35	No	<20	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

Table 4.3: LA1,1minute GENERATED BY WCP AGAINST PROJECT SPECIFIC CRITERIA – DECEMBER 2018

Location	Start Date and Time	Wind Speed m/s ^{1,2}	Stability Class ^{1,2}	Criterion dB	Criterion Applies? ^{2,3}	WCP LA1,1min dB ^{4,5}	Exceedance ^{5,6}
N6	04/12/2018 01:09	0.0	G	45	No	<20	NA
N13	04/12/2018 00:42	0.0	G	45	No	IA	NA
N14	04/12/2018 00:17	0.0	G	45	No	<25	NA
N15	03/12/2018 23:02	1.1	G	45	No	<20	NA
N17	03/12/2018 22:28	1.8	F	45	Yes	<20	Nil
N19	03/12/2018 22:01	2.2	E	45	Yes	<20	Nil
N20	03/12/2018 23:36	1.4	G	45	No	IA	NA
N21	04/12/2018 00:46	0.0	G	45	No	<20	NA

Notes:

1. Wind speed is sourced from the WCP weather station, stability class is determined based on WCP inversion tower data;
2. Criterion may or may not apply due to rounding of meteorological data values;
3. Noise emission limits apply for all meteorological conditions, except for the following: wind speeds greater than 3 m/s above ground level; or stability category F temperature inversions and wind speeds greater than 2 m/s at 10m above ground level; or stability category G temperature inversion conditions;
4. These are results for WCP in the absence of all other noise sources;
5. Bold results in red are those greater than the relevant criterion (if applicable); and
6. NA in exceedance column means atmospheric conditions have determined that criterion is not applicable.

4.4 Comparison of real time and attended noise results

A summary of attended monitoring data and that measured by the four real-time Sentinex units (omni-directional) is shown in Table 4.4. Low pass (<630 Hz) LAeq and LA90 are typically good indicators of mining noise levels.

Table 4.4: REAL-TIME AND ATTENDED NOISE LEVELS, DECEMBER 2018¹

Location/ Sentinex	Attended Start Date and Time	Sentinex Start Date and Time	Sentinex Data ¹			Attended measurement
			Total LAeq dB	Low pass (<630Hz) LAeq dB	Low pass (<630Hz) LA90 dB	WCP LAeq dB
N15/SX33	03/12/2018 23:02	03/12/2018 23:00	27	26	23	<20
N19/SX32	03/12/2018 22:01	NR	NR	NR	NR	<20
N20/SX30	03/12/2018 23:36	03/12/2018 23:30	32	25	21	IA
N21/SX31	04/12/2018 00:46	04/12/2018 00:45	30	30	22	<20

Notes:

1. Levels in this table are not necessarily the result of activity at WCP; and
2. NR – no Sentinex data recorded for this period.

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 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – DECEMBER 2018

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	04/12/2018 01:09	17	0.0	-	0
N13	04/12/2018 00:42	16	0.0	-	0
N14	04/12/2018 00:17	17	0.7	30	0
N15	03/12/2018 23:02	19	0.6	320	0
N17	03/12/2018 22:28	21	0.0	-	0
N19	03/12/2018 22:01	22	0.0	-	0
N20	03/12/2018 23:36	20	0.8	200	0
N21	04/12/2018 00:46	18	0.0	-	0

Notes:

1. Wind speed and direction measured at 1.8 metres; and
2. "-" denotes calm conditions at 1.8 metres.

Data obtained from the WCP meteorological station and tower is used to determine compliance with specified noise criteria and is provided in Table 4.6.

Table 4.6: WCP METEOROLOGICAL STATION DATA¹

Date and End Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres ²
03/12/2018 21:00	3.2	213	1.2
03/12/2018 21:15	3.2	209	1.2
03/12/2018 21:30	3.1	222	1.2
03/12/2018 21:45	2.9	220	1.0
03/12/2018 22:00	2.0	218	1.4
03/12/2018 22:15	2.2	228	1.2
03/12/2018 22:30	1.4	260	1.4
03/12/2018 22:45	1.8	282	2.2
03/12/2018 23:00	1.3	303	4.8
03/12/2018 23:15	1.1	312	5.8
03/12/2018 23:30	2.0	259	4.4
03/12/2018 23:45	1.4	239	4.6
04/12/2018 00:00	0.0	-	6.0
04/12/2018 00:15	0.9	261	5.2
04/12/2018 00:30	0.0	-	5.4
04/12/2018 00:45	0.0	-	4.4
04/12/2018 01:00	0.0	-	5.0
04/12/2018 01:15	0.0	-	6.4
04/12/2018 01:30	0.0	-	6.2
04/12/2018 01:45	0.0	-	5.4
04/12/2018 02:00	0.9	12	6.0
04/12/2018 02:15	0.8	340	4.4
04/12/2018 02:30	0.0	-	5.6
04/12/2018 02:45	0.8	24	4.4
04/12/2018 03:00	0.7	300	5.6

Notes:

1. Data supplied by WCP;
2. "-" indicates calm conditions and therefore no wind direction; and
3. Lapse rate calculated using data sourced from WCP inversion tower.

5 DISCUSSION

5.1 Noted Noise Sources

Data gathered during attended monitoring is shown in tables in Section 4. These noise levels 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 WCP's contribution, if any, to measured levels. At each receptor location, WCP's $L_{Aeq,15\text{minute}}$ and $L_{A1,1\text{minute}}$ (in the absence of any other noise) was, where possible, measured directly, or, determined by frequency analysis. Time variations of noise sources in each measurement, their temporal characteristics, are taken into account via statistical descriptors.

From these observations summaries have been derived for each location. The following chapter sections provide these summaries. Statistical 1/3 octave band analysis of environmental noise was undertaken, and Figure 3 to Figure 10 display the frequency ranges for various noise sources at each location for L_{A1} , L_{A10} , L_{A90} and L_{Aeq} . 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; mining noise is at frequencies less than 1000 Hz (this 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; this can be 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} .

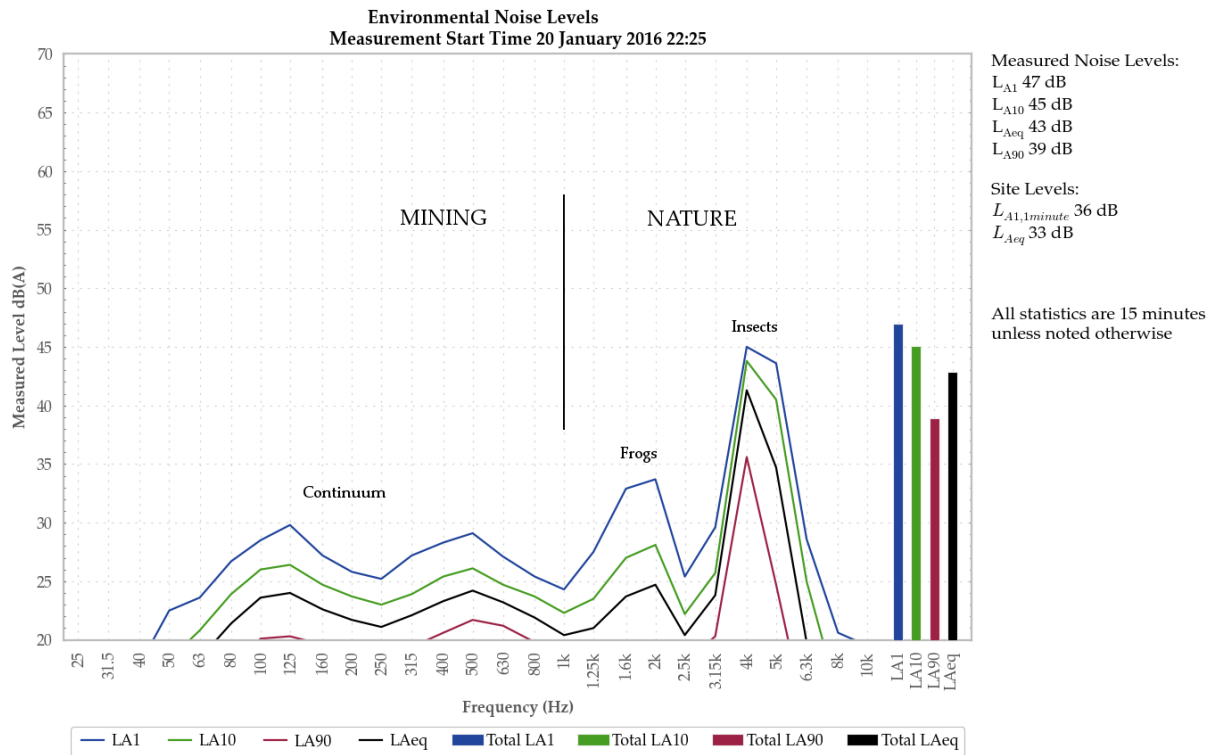


Figure 2: Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N6

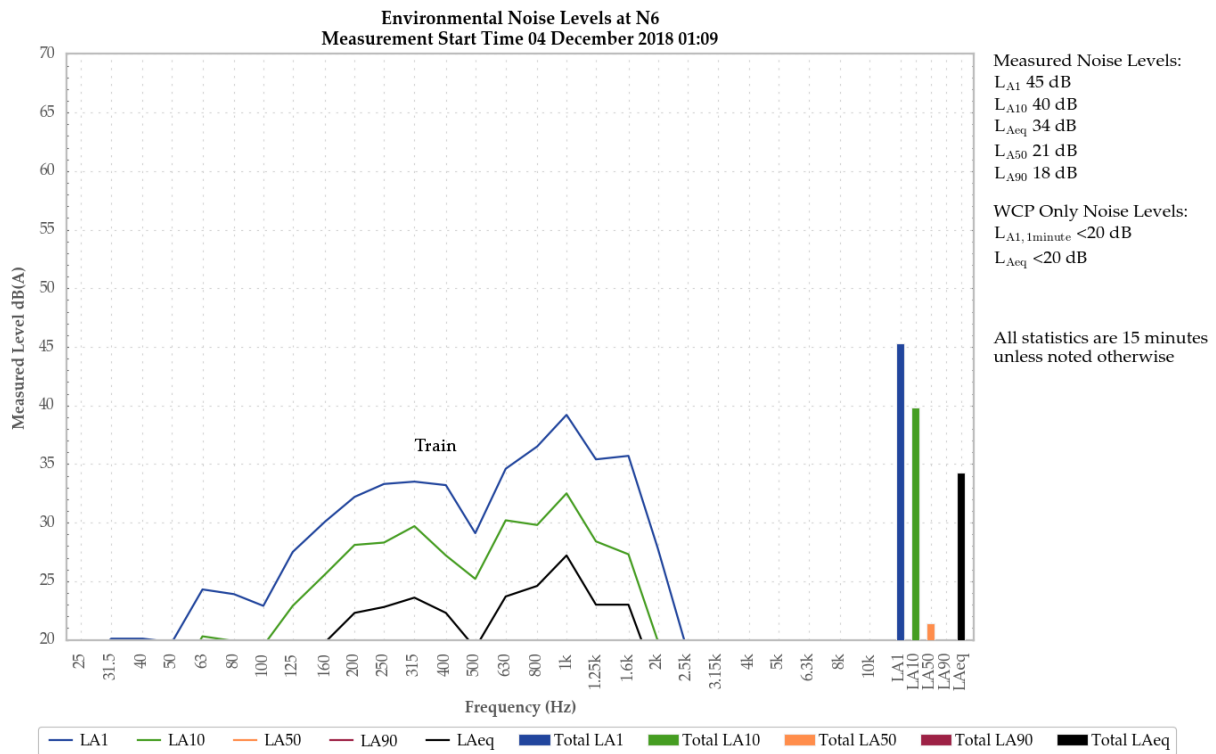


Figure 3: Environmental Noise Levels - N6, St Laurence O’Toole Catholic Church, Wollar Village

A continuum from WCP was audible throughout the measurement and resulted in a site-only LAeq and LA1,1minute of less than 20 dB.

A train generated the measured LA1, LA10 and LAeq. The noise floor of the instrument was responsible for the measured LA50 and LA90.

Dogs and insects were also noted.

5.1.2 N13

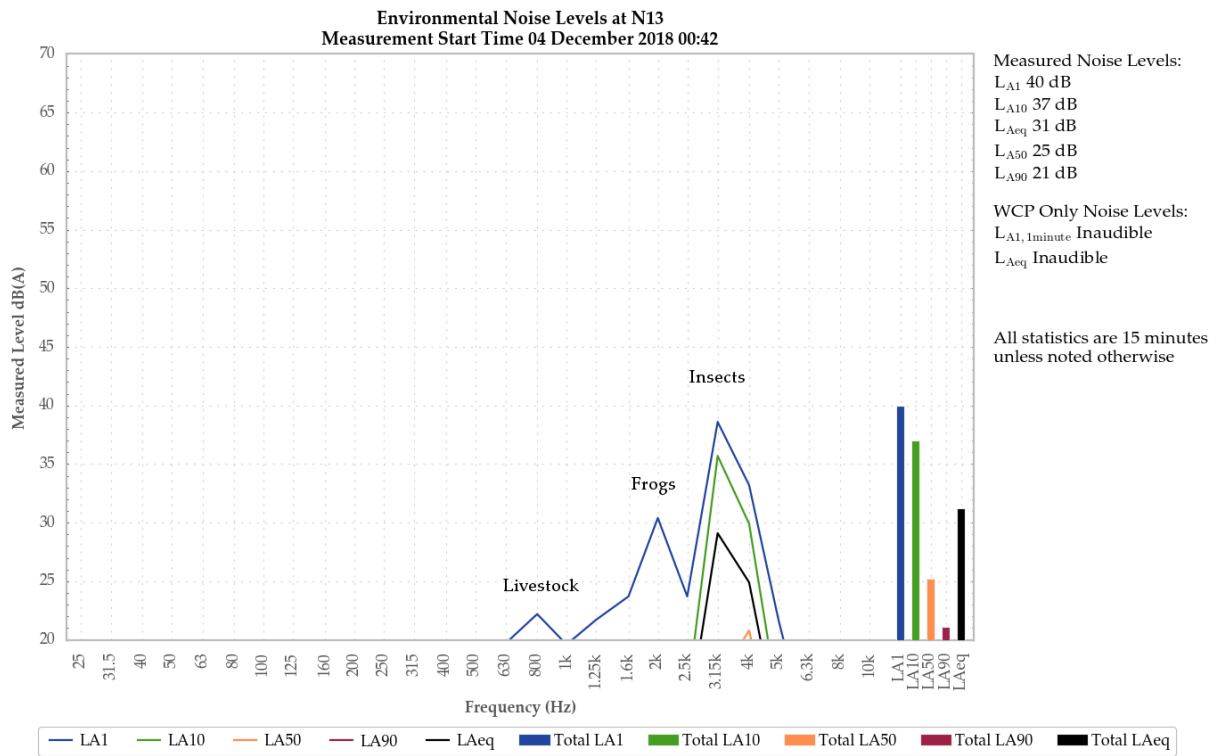


Figure 4: Environmental Noise Levels – N13, 'Coonaroo' off Moolarben Road

WCP was inaudible.

Insects generated measured levels. Frogs and livestock were a minor contributor to the measured LA1

5.1.3 N14

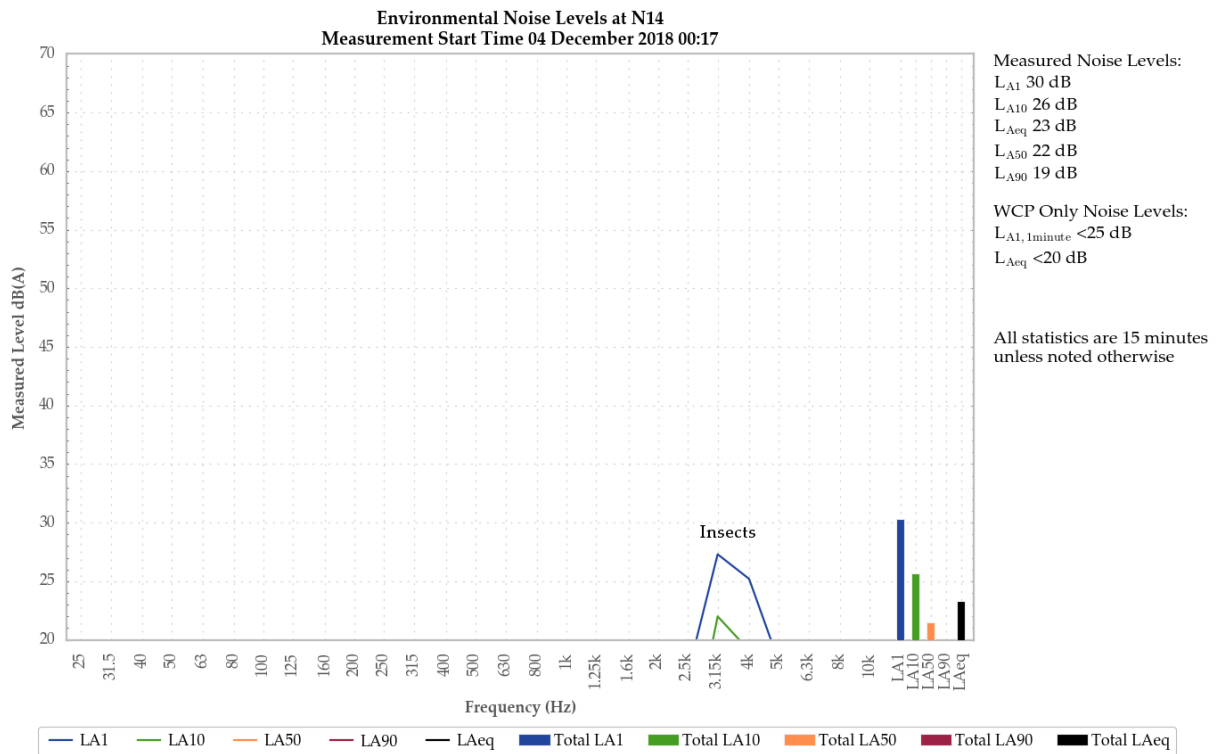


Figure 5: Environmental Noise Levels - N14, 'Tichular', intersection of Tichular and Barigan Roads

A low-level continuum from WCP was audible throughout the measurement generating a site-only LAeq,15minute of less than 20 dB and LA1,1minute of less than 25 dB.

Insects generated measured levels.

Cows, birds and bats were also noted.

5.14 N15

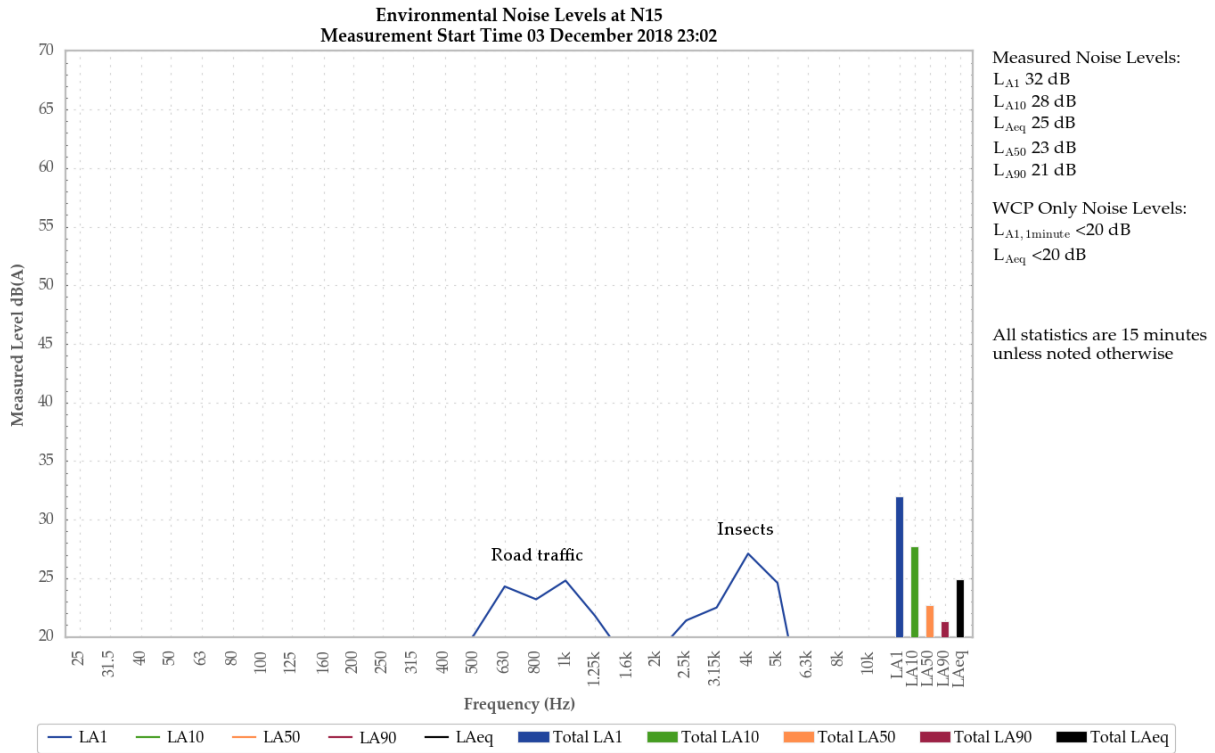


Figure 6: Environmental Noise Levels - N15, Track off Barigan Street near Wollar School, Wollar Village

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute and LA1,1minute of less than 20 dB.

Insects primarily generated measured levels. Road traffic contributed to the measured LA1, LA10 and LAeq.

Dogs, a plane and birds were also noted.

5.1.5 N17

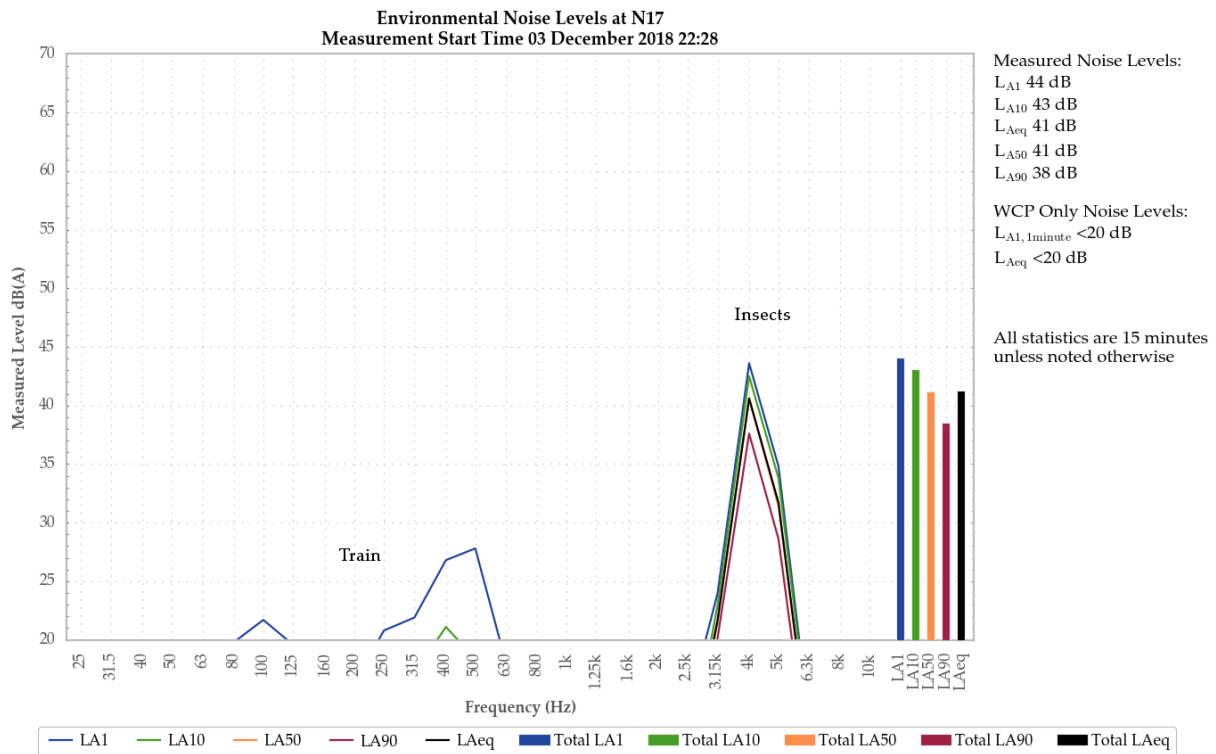


Figure 7: Environmental Noise Levels – N17 Mogo Road, off Araluen Road

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute and LA1,1minute of less than 20 dB.

Insects generated measured levels.

A train was also noted.

5.1.6 N19

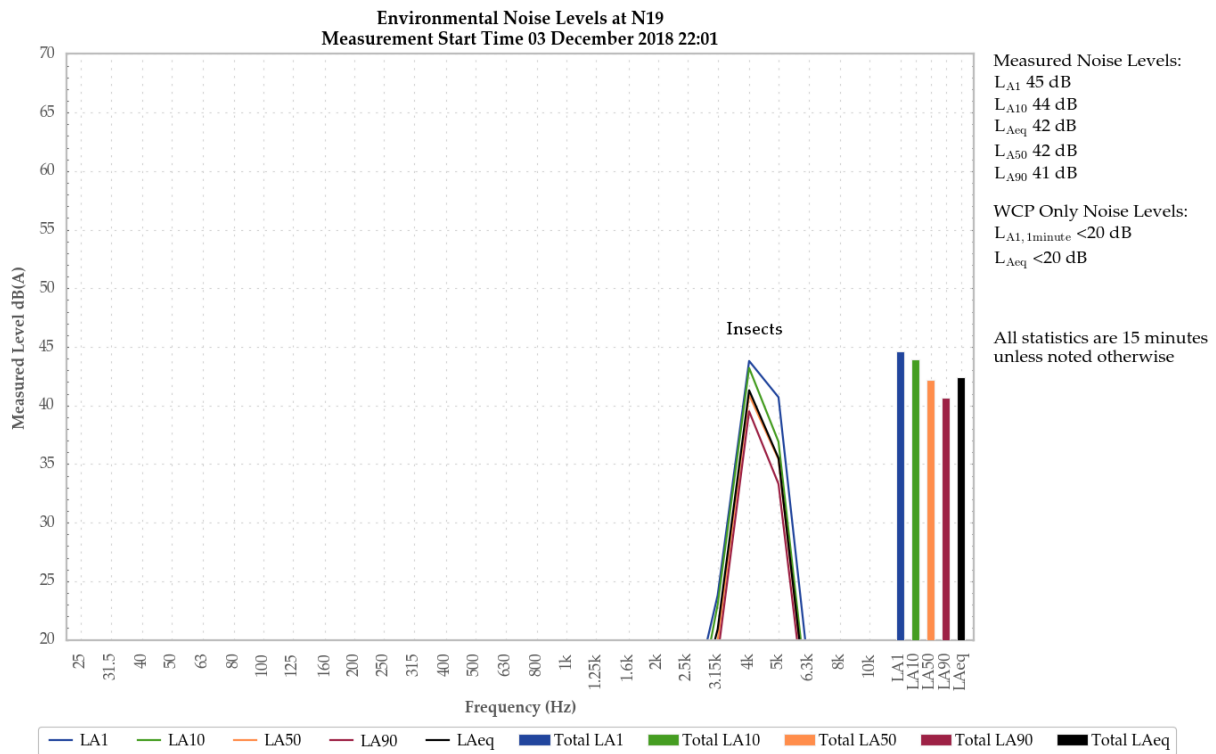


Figure 8: Environmental Noise Levels – N19, Upper Mogo Road

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute and LA1,1minute of less than 20 dB.

Insects generated measured levels.

Wildlife noises were also noted.

5.1.7 N20

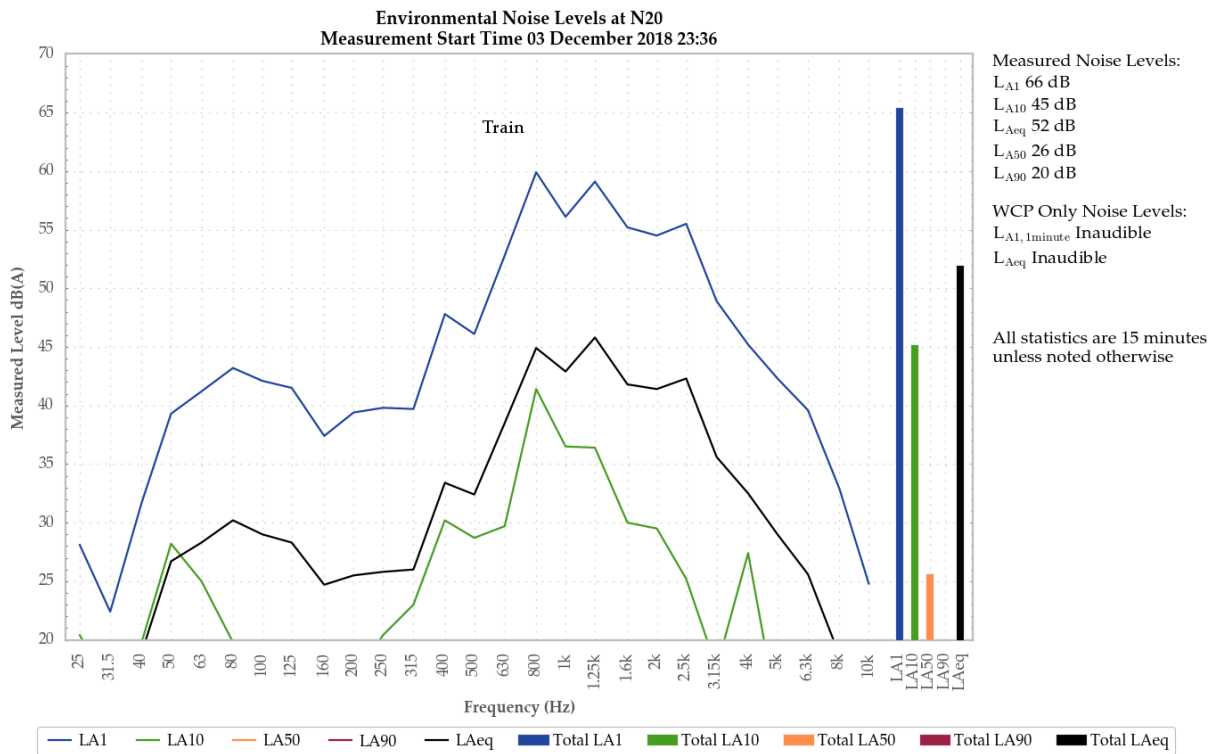


Figure 9: Environmental Noise Levels, N20 – Ringwood Road

WCP was inaudible.

A train was responsible for the measured LA1, LA10 and LAeq. Insects primarily generated the measured LA50 and LA90

Road traffic was also noted.

5.1.8 N21

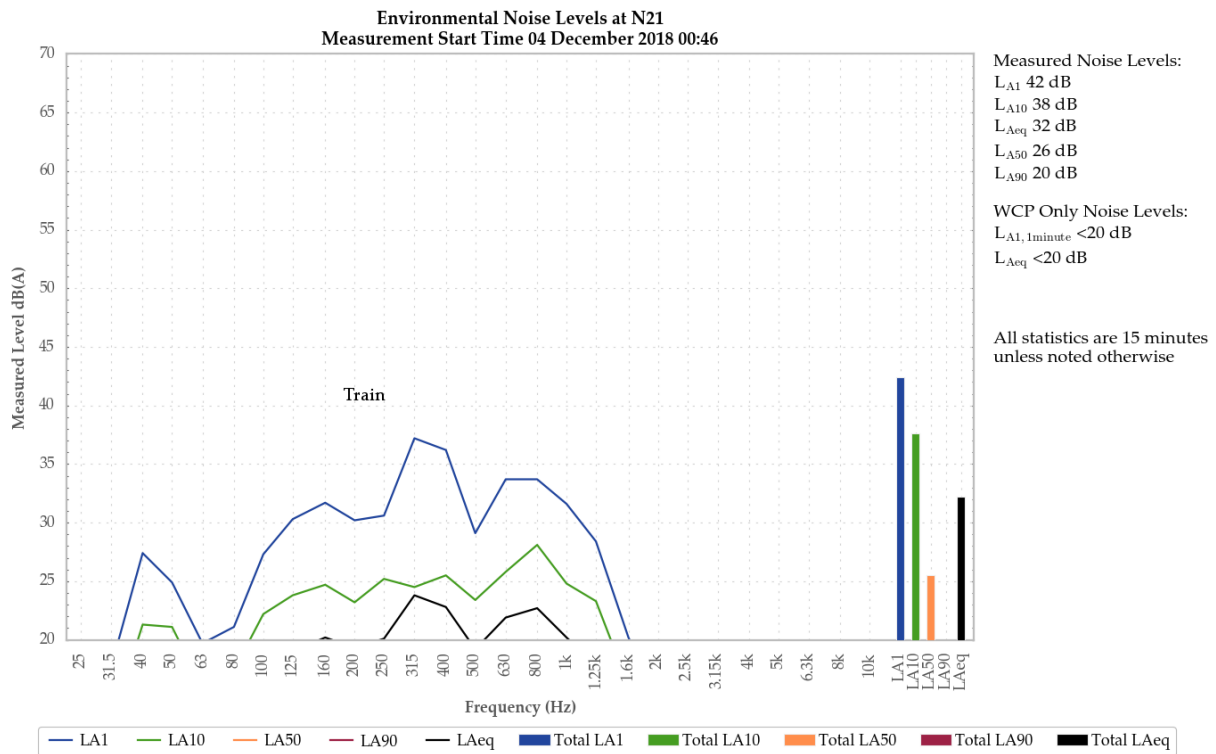


Figure 10: Environmental Noise Levels, N21 – 'Wandoona', Barigan Road

A low-level continuum from WCP was audible during the measurement generating the site-only LAeq,15minute and LA1,1minute of less than 20 dB.

A train generated measured levels.

Insects and bats were also noted.

6 SUMMARY OF COMPLIANCE

Global Acoustics was engaged by Wilpinjong Coal Pty Ltd to conduct a noise survey around Wilpinjong Coal Project (WCP), an open cut coal mine located approximately 40 kilometres north east of Mudgee.

Environmental noise monitoring described in this report was undertaken during the night period of 3/4 December 2018. Attended noise monitoring was conducted at eight sites. The duration of all measurements was 15 minutes.

Noise levels from WCP complied with relevant noise limits at all monitoring locations during the December 2018 monitoring. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

Several documents specify noise criteria that apply to the Wilpinjong operation. The noise sections of the relevant consent, licence and NMP are reproduced below.

A.1 Wilpinjong Coal Extension Project Approval (SSD-6764)

NOISE

Noise Criteria

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land or at the other specified locations.

Table 3: Noise criteria dB(A)

Location	Day	Evening	Night	
	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{Aeq}(15 \text{ minute})$	$L_{A1}(1 \text{ minute})$
102	36	36	38	45
Wollar Village – Residential	36	37	37	45
All other privately owned land	35	35	35	45
901 – Wollar School	35 (internal) 45 (external) When in use			-
150A – St Luke's Anglican Church	40 (internal) When in use			-
900 – St Laurence O'Toole Catholic Church				

Note: To interpret the locations referred to in Table 3, see the applicable figures in Appendix 5.

Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time). Appendix 6 sets out the meteorological conditions under which these criteria apply along with any modifications to the *NSW Industrial Noise Policy* and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence of land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

4. The Applicant must:
 - (a) implement all reasonable and feasible measures to minimise the construction, operational, low frequency, road and rail noise of the development;
 - (b) operate a comprehensive noise management system 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) minimise the noise impacts of the development during meteorological conditions when the noise limits in this consent do not apply (see Appendix 6);
 - (d) only use locomotives and rolling stock that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL;
 - (e) co-ordinate noise management at the site with the noise management at Moolarben and Ulan mines to minimise cumulative noise impacts; and
 - (f) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this consent.

Noise Management Plan

5. Prior to carrying out any development under this consent, unless the Secretary agrees otherwise, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - (a) be prepared in consultation with the EPA;
 - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this consent;
 - (c) describe the proposed noise management system in detail; and
 - (d) include a monitoring program that:
 - evaluates and reports on:
 - the effectiveness of the noise management system;
 - compliance against the noise criteria in this consent; and
 - compliance against the noise operating conditions;
 - includes a program to calibrate and validate the real-time noise monitoring results with the attended monitoring results over time (so the real-time noise monitoring program can be used as a better indicator of compliance with the noise criteria in this consent and trigger for further attended monitoring); and
 - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.
6. The Applicant must implement the approved Noise Management Plan for the development.

APPENDIX 6 NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

1. The noise criteria in Table 3 of schedule 3 are to apply under all meteorological conditions except the following:
 - (a) wind speeds greater than 3 m/s at 10 m above ground level; or
 - (b) stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
 - (c) stability category G temperature inversion conditions.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station located on the site.

Compliance Monitoring

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent.
4. This monitoring must be carried out at least 12 times a year, unless the Secretary directs otherwise.
5. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
 - (a) monitoring locations for the collection of representative noise data;
 - (b) meteorological conditions during which collection of noise data is not appropriate;
 - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
 - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

6. The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:
- where any of the 1/3 octave noise levels in Table 6-1 are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
 - where any of the 1/3 octave noise levels in Table 6-1 are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 6-1: One-third octave low frequency noise thresholds

Hz/dB(Z)	One-third octave $L_{Zeq,15minute}$ 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

A.2 Environmental Protection Licence

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations. Relevant extracts are shown below.

L5 Noise limits

L5.1 Noise generated at the premises must not exceed the noise limits presented in the table below. The locations referred to in the table below are indicated in Appendix 5 - Figures 1 and 2 of Development

Consent number SSD-6764 dated 24 April 2017.

Location	Day	Evening	Night	Night
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
Wollar village - residential	36	37	37	45
All other privately owned land	35	35	35	45
102	36	36	38	45
Wollar school	35 (internal), 45 (external) when in use			
St Luke's Anglican Church & St Laurence O'Toole Catholic Church	40 (internal) when in use			

Note: The above noise limits do not apply at properties where the licensee has a written agreement with the landowner to exceed the noise limits.

L5.2 For the purpose of condition L5.1;

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

L5.3 The noise limits set out in condition L5.1 apply under all meteorological conditions except for the following:

- a) Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- b) Stability category F temperature inversions and wind speeds greater than 2m/s at 10m above ground level; or
- c) Stability category G temperature inversion conditions.

- L5.4 For the purpose of condition L5.3:
- a) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station identified as EPA identification Point 21 in condition P1.1; and
 - b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.
- L5.5 To determine compliance:
- a) With the Leq(15 minute) noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - ii) within 30 metres of a dwelling façade, but not closer than 3 metres where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - iii) within approximately 50 metres of the boundary of a National Park or Nature Reserve
 - b) With the LA1(1 minute) noise limits in condition L5.1, the noise measurement equipment must be located within 1 metre of a dwelling façade.
 - c) With the noise limits in condition L5.1, the noise measurement equipment must be located:
 - i) at the most affected point at a location where there is no dwelling at the location; or
 - ii) at the most affected point within an area at a location prescribed by conditions L5.5(a) or L5.5(b).
- L5.6 A non-compliance of condition L5.1 will still occur where noise generated from the premises in excess of the appropriate limit is measured:
- a) at a location other than an area prescribed by conditions L5.5(a) and L5.5(b); and/or
 - b) at a point other than the most affected point at a location.
- L5.7 For the purpose of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

A.3 Noise Management Plan

The relevant sections of the WCP Noise Management Plan, dated June 2017 are reproduced below.

WCPL utilise a combination of operator-attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria from Development Consent (SSD-6467). Operator-attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 6**. Unattended real-time noise monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered so mining operations can be modified where noise levels are influenced by noise from the Project.

6.1 Monitoring Locations

Operator-attended noise monitoring locations have been chosen considering the following criteria:

- In any given direction, the site is as close as reasonably practical to the nearest Private Receiver;
- There is no closer Private Receiver that is not monitored;
- The site is unlikely to cause concern to any person residing on nearby private property; and
- The site can be safely accessed by the persons carrying out the noise monitoring.

WCPL will undertake operator-attended noise monitoring as identified in **Table 7 (Figure 3 and Figure 4)**. Real-time noise monitoring units are relocated from time to time, to assist with additional targeted noise monitoring and in response to community complaints. Real-time noise monitoring locations will be reviewed and modified as necessary in response to monitoring results, changes to the operation, or as a result of community consultation.

Table 7: Noise Monitoring Locations

Location	Site	Type	Easting ¹	Northing ¹	Justification
St Laurence O'Toole Church	N6	Operator-attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Operator-attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Operator-attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Operator-attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Mogo Rd	N17	Operator-attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Mogo Rd	N19	Operator-attended Noise	782644.5	6424151.1	Location based on the nearest and residential community structure to the North-East of the Mine

Location	Site	Type	Easting ⁺	Northing ⁺	Justification
Ringwood Road	N20	Operator-attended Noise	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine.
Wandoona	N21	Operator-attended Noise	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP in May 2017.
WCPL Rail Loop	-	Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village ⁴	-	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine N15 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Mogo Rd ⁴	-	Real-Time Noise - Fixed	782644.5	6424151.1	Location based on the nearest non-mine owned residence to the East of the Mine N19 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Ringwood Road	-	Real-Time Noise - Fixed	785964.2	6419050.6	Location based near to community residence in discussions with DP&E and EPA on the 23 May 2017 to the East of the Mine. N20 operator-attended Noise Monitoring (validation of real-time noise monitoring)
Wandoona ³	-	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on recommendations from noise specialist (SLR) review of this NMP. N21 operator-attended Noise Monitoring (validation of real-time noise monitoring)

Notes:

1. MGA94, Zone 55
2. Monitoring will be undertaken at this location until it can be demonstrated that the noise contribution from the Mine is negligible. At this point, WCPL will notify DP&E and EPA of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.
3. The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.
4. Where continuous monitors are located at compliance locations (e.g. privately owned receivers), WCPL will conduct a review of the identification/characterisation of mine-related noise by the real-time monitoring system at that location by comparing against observed mine-related noise identified during operator-attended monitoring (i.e. validate the identification of mine related noise and filtering of extraneous noise sources by the real-time system). Refer to **Section 6.5**.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 7** with consideration to the above criteria. WCPL will update this NMP, in consultation with DP&E and the EPA.

6.3.3 Methodology

Operator-attended noise monitoring will be undertaken at the locations and frequency as outlined in **Table 8** by an independent acoustic consultant and guided by the requirements of the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine operator-attended noise monitoring will be undertaken during night-time periods (10 pm - 7 am).

If any of the Noise Criteria are exceeded, a second measurement will be taken at the same location within 75 minutes of the first measurement. If the second measurement does not exceed the Noise Criteria, as defined in **Table 6**, then the result will be recorded and the attended noise monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria, then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) Upon confirming the exceedances are deemed a non-compliance in accordance with the **Figure 5**, WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance (**Section 9.0**).

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional operator-attended noise monitoring to occur at that site within 1 week; and
- c) Deploy the mobile real-time noise monitor to measure and record the noise at that site for at least a 1 week period.

WCPL will also investigate any changes to the mine operations, and may revisit the noise model on the basis of the noise measurements recorded at the site.

The acoustic noise consultant will consider the modification factors in Section 4 of the INP (EPA, 2000) during the evaluation of attending monitoring results.

The assessment of excessive levels of low frequency noise generated by the mine shall be as follows: Measure/assess C- and A-weighted Leq,T levels over same time period. Where the C minus A level is 15dB or more and:

- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by up to 5dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period.
- Where any of the 1/3 octave noise levels in **Table 9** are exceeded by more than 5dB 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 positive adjustment applies for the daytime period.

Table 9 One-third Octave Low Frequency Noise Thresholds

Hz/dB(Z)	One-third octave LZe _q ,15minute 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

6.3.6 Applicable Meteorological Conditions

The Noise Criteria in **Table 6** are to be applied under all meteorological conditions except for the following:

- Wind speeds greater than 3 m/s at 10 m above ground level; or
- Stability category F temperature inversions and wind speeds greater than 2 m/s at 10 m above ground level; or
- Stability category G temperature inversion conditions.

APPENDIX

B CALIBRATION CERTIFICATES



**Acoustic
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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
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**Sound Level Meter
IEC 61672-3:2013**

Calibration Certificate

Calibration Number C17248

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
Ambient Temperature : 24.3°C
Relative Humidity : 40%
Barometric Pressure : 100.05kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 24.4°C
Relative Humidity : 39.5%
Barometric Pressure : 100kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017

Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.16dB	Temperature	±0.05°C
12.5kHz	±0.2dB	Relative Humidity	±0.46%
16kHz	±0.29dB	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.

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 C17126

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 : 22.4°C
Relative Humidity : 55.6%
Barometric Pressure : 99.91kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22.6°C
Relative Humidity : 58.1%
Barometric Pressure : 99.85kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017

Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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 61672-3:2006, 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 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.05°C
31.5 Hz to 8kHz	±0.16dB	Relative Humidity	±0.46%
12.5kHz	±0.2dB	Barometric Pressure	±0.017kPa
16kHz	±0.29dB		
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.



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**Sound Calibrator
IEC 60942-2004**

Calibration Certificate

Calibration Number C17249

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

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

Atmospheric Conditions

Ambient Temperature : 24.3°C
Relative Humidity : 38.9%
Barometric Pressure : 99.96kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 05/06/2017
Secondary Check: Nick Williams
Report Issue Date : 06/06/2017

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	93.8	1000.33

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 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	Uncertainty	Environmental Conditions	Uncertainty
Generated SPL	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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Sound Calibrator
IEC 60942-2004

Calibration Certificate

Calibration Number C17127

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

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

Atmospheric Conditions
Ambient Temperature : 22.3°C
Relative Humidity : 55.6%
Barometric Pressure : 99.9kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 14/03/2017
Secondary Check: Riley Cooper
Report Issue Date : 15/03/2017

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	1000.32

The sound calibrator has been shown to conform to the class 1 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	±0.11dB	Temperature	±0.05°C
Short Term Fluct.	±0.02dB	Relative Humidity	±0.46%
Frequency	±0.01%	Barometric Pressure	±0.017kPa
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.

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