# **APPENDIX 3F – NOISE MONITORING DATA**



#### **Noise Monitoring Locations**

Noise Monitoring Locations (Wollar)





# **Noise Monitoring Reports**



# Wilpinjong Coal

Environmental Noise Monitoring January 2016

Prepared for Wilpinjong Coal Pty Ltd



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 January 2016

Reference: 15474\_R01 Report date: 19 February 2016

**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: Joel Curran Chemical Engineer (Acoustics)

Khleekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved. Monitoring for January 2015 was carried out as per the draft NMP dated March 2014.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 18/19 January 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

#### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the January 2016 monitoring.

#### Low Frequency Assessment

During the January 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factor	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 18 January 2016	
5.1.2 N13, 19 January 2016	20
5.1.3 N14, 18 January 2016	21
5.1.4 N15, 18 January 2016	

5.1.5 N16, 18 January 2016	23
5.1.6 N17, 18 January 2016	24
5.1.7 N18, 19 January 2016	25
6 SUMMARY OF COMPLIANCE	26
6 SUMMARY OF COMPLIANCE	<b>26</b>

# **Appendices**

A STATUTORY REQUIREMENTS	27
B CALIBRATION CERTIFICATES	37

# 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 seven locations during the night of 18/19 January 2016. Figure 1 shows the regular monitoring locations.

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

# 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

#### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### **Figure 1: Attended Noise Monitoring Locations**

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

# 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
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
LA90	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

# 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day LAeq,15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

## Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a) wind speeds greater than 3 m/s at 10m above ground level;*
- *b) temperature inversion conditions between* 1.5°C *and* 3°C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

## 2.5 EPL Criteria and Weather Conditions

Criteria are 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 Wilpinjong Coal Project.

NMP Descriptor/ Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening LAeq,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

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 of 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<sup>°</sup>C per 100 metres.*

# 2.6 INP Modifying Factor

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

#### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

# 3 METHODOLOGY

# 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than LAeq 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

# 3.2 Attended Monitoring

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

#### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30921838	23/06/2017
Rion NC-73 acoustic calibrator	10527815	24/06/2017

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	18/01/2016 23:18	46	40	32	27	30	26	24	34
N13	19/01/2016 01:20	42	34	31	28	29	26	24	42
N14	18/01/2016 23:47	55	53	51	46	47	40	30	42
N15	18/01/2016 22:58	55	50	44	35	40	33	29	55
N16	18/01/2016 22:00	54	54	53	52	52	51	48	35
N17	18/01/2016 22:31	39	36	32	30	31	28	25	33
N18	19/01/2016 00:22	47	33	28	25	26	23	19	29

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – JANUARY 2016

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during January 2016.

#### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – JANUARY 2016

Conditions	Total for January 2016
Number of measurements	7
Number of measurements where met applied (in accordance with EPL and project approval)	6
Number of measurements where WCP was the only low- frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

# 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

#### Table 4.3: LAeq.15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	18/01/2016 23:18	0.0	2.8	35	Yes	IA	Nil
N13	19/01/2016 01:20	0.0	2.2	36	Yes	IA	Nil
N14	18/01/2016 23:47	0.0	3.0	35	Yes	IA	Nil
N15	18/01/2016 22:58	0.0	2.8	35	Yes	IA	Nil
N16	18/01/2016 22:00	0.6	0.2	35	Yes	IA	Nil
N17	18/01/2016 22:31	1.2	1.2	37	Yes	IA	Nil
N18	19/01/2016 00:22	0.0	5.0	35	No	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>A1,1mi</sub> n dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	18/01/2016 23:18	0.0	2.8	45	Yes	IA	Nil
N13	19/01/2016 01:20	0.0	2.2	45	Yes	IA	Nil
N14	18/01/2016 23:47	0.0	3.0	45	Yes	IA	Nil
N15	18/01/2016 22:58	0.0	2.8	45	Yes	IA	Nil
N16	18/01/2016 22:00	0.6	0.2	45	Yes	IA	Nil
N17	18/01/2016 22:31	1.2	1.2	45	Yes	IA	Nil
N18	19/01/2016 00:22	0.0	5.0	45	No	IA	Nil

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

# 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail L<sub>Aeq,15minute</sub> and L<sub>A1,1minute</sub> 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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	18/01/2016 23:18	0.0	2.8	35	Yes	IA	Nil
N13	19/01/2016 01:20	0.0	2.2	35	Yes	IA	Nil
N14	18/01/2016 23:47	0.0	3.0	35	Yes	IA	Nil
N15	18/01/2016 22:58	0.0	2.8	35	Yes	IA	Nil
N16	18/01/2016 22:00	0.6	0.2	35	Yes	IA	Nil
N17	18/01/2016 22:31	1.2	1.2	35	Yes	IA	Nil
N18	19/01/2016 00:22	0.0	5.0	35	No	IA	Nil

#### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JANUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	18/01/2016 23:18	0.0	2.8	45	Yes	IA	Nil
N13	19/01/2016 01:20	0.0	2.2	45	Yes	IA	Nil
N14	18/01/2016 23:47	0.0	3.0	45	Yes	IA	Nil
N15	18/01/2016 22:58	0.0	2.8	45	Yes	IA	Nil
N16	18/01/2016 22:00	0.6	0.2	45	Yes	IA	Nil
N17	18/01/2016 22:31	1.2	1.2	45	Yes	IA	Nil
N18	19/01/2016 00:22	0.0	5.0	45	No	IA	Nil

#### Table 4.6: LAI.Iminute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JANUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

# 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	18/01/2016 23:18	20	0.0	-	0
N13	19/01/2016 01:20	21	0.0	-	0
N14	18/01/2016 23:47	18	0.8	130	0
N15	18/01/2016 22:58	19	0.4	140	0
N16	18/01/2016 22:00	20	0.0	-	0
N17	18/01/2016 22:31	20	0.4	200	0
N18	19/01/2016 00:22	18	0.0	-	0

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JANUARY 2016

Notes:

1. Wind speed and direction measured 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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres <sup>2</sup>
18/01/2016 22:00	0.8	95	0.0
18/01/2016 22:15	0.6	118	0.2
18/01/2016 22:30	1.0	154	1.2
18/01/2016 22:45	1.2	154	1.2
18/01/2016 23:00	0.0	-	1.8
18/01/2016 23:15	0.0	-	2.8
18/01/2016 23:30	0.0	-	2.8
18/01/2016 23:45	0.0	-	2.6
19/01/2016 00:00	0.0	-	3.0
19/01/2016 00:15	0.0	-	4.2
19/01/2016 00:30	0.0	-	5.0
19/01/2016 00:45	0.7	340	5.6
19/01/2016 01:00	0.7	336	5.4
19/01/2016 01:15	0.0	-	3.8
19/01/2016 01:30	0.0	-	2.2
19/01/2016 01:45	0.0	-	1.8
19/01/2016 02:00	0.0	-	2.4
19/01/2016 02:15	0.0	-	2.0

Notes:

1. Data supplied by WCP;

2. Lapse rate sourced from the WCP inversion tower; and

3. "-" in wind direction column indicates that conditions were calm.

# 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 LAeq,15minute and LA1,1minute (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 9 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, 18 January 2016



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

WCP was inaudible.

Insects and frogs generated the  $L_{A1}$ ,  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ . Dogs generated the  $L_{Amax}$  and contributed to the  $L_{A1}$ .

Birds and cows were also noted.

## 5.1.2 N13, 19 January 2016



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

WCP was inaudible.

Cows generated the LAmax. Insects and frogs generated the measured LA1, LA10, LAeq and LA90.

Road traffic ad a low-level local continuum were also noted.

## 5.1.3 N14, 18 January 2016



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

WCP was inaudible.

Insects and frogs generated all measured levels.

A local continuum was also noted at low levels.

## 5.1.4 N15, 18 January 2016



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

WCP was inaudible.

Locomotive noise generated the measured  $L_{A1}$  and contributed to the  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects contributed to the  $L_{A10}$  and  $L_{Aeq}$  and were responsible for the  $L_{A90}$ .

Dogs and livestock were also noted.

## 5.1.5 N16, 18 January 2016



Figure 7: Environmental Noise Levels - N16, Araluen Road, off Ulan-Wollar Road

WCP was inaudible.

Insects and frogs generated all measured levels.

Distant road traffic was also noted.

## 5.1.6 N17, 18 January 2016



#### Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

WCP was inaudible.

Insects and frogs generated all measured levels.

Aircraft and birds were also noted.

## 5.1.7 N18, 19 January 2016



Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Cows generated the  $L_{Amax}$  and contributed to the  $L_{A1}$ . Insects were responsible for the  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 18/19 January 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

# 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the January 2016 monitoring period.

# 6.2 Low Frequency Assessment

During the January 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# APPENDIX

# A STATUTORY REQUIREMENTS

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

# A.1 Wilpinjong Coal Project Approval

# SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS ACQUISITION UPON REQUEST 1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4. Table 1: Land subject to acquisition upon request 30 – Gaffney Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### Noise Criteria

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

	Day Evening		Night		
Location	LAeq(15 minute)	LAeq(15 minute)	LAng(15 minute)	LA1(1 minute)	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use			

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.
#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

	-				-			×	-	
2			-	-	а.	100				
1		-	1.2	-	21		an a	-	IJ	
-	_	-	-	_			_	_	_	

#### 69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

 Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

### A.2 Environmental Protection Licence

#### 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	35	35	35	45
Goulburn River National Park	50	50	50	2
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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

 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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

### 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

### 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4, Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299. 9	6415716.9	Location based on the nearest non-mine owned residence to the West of the Mine
Coonaroo	N13	Attended Noise	763758. 9	6413471.9	Location based on the nearest non-mine owned residence to the West of the Mine
Tichular	N14	Attended Noise	778791. 9	6408624.7	Location based on the nearest non-mine owned residence to the South of the Mine
Wollar Village	N15	i Attended Noise	777452. 0	6416158.9	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787. 4	6417418.7	Location based on the nearest non-mine owned residence to the East of the Mine
Mogo Rd	N17	Attended Noise	780771. 0	6420641.0	Location based on the nearest non-mine owned residence to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033. 3	6398618.1	DP&I Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorolog y & Inversion	770630. 9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village		Real-Time Noise - Fixed	777608. 9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Arałuen Rd		Real-Time Noise - Fixed	778856. 4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
ocation	Site	Туре	Easting	Northing	Justification
/andoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine

#### Table 4: Noise Related Monitoring Locations

Notes to Table 4:

1. MGA94, Zone 55

Noise -

Mobile

4

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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

Mine

owned residence to the South-East of the

The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

### Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- · Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- · Implement remediation measures as directed by the Director-General; and
- · Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	Acoustic Research Labs Pry Lt Sour IE Calibra	Leve Penn Ph: + d ww nd Lev CC 6167.	17 Building 2 423 ant Hills NSW 7 61 29484 0800 A.E w.acousticrese vel Meter 2-3.2006 Certificat	Pennant Hills   AUSTRALIA 21 3.N. 65 160 399 1 earch.com.au	Rd 20 19 J	
	Client Det	tails AR 423 Per	L Hire Pennant Hills Rd mant Hills			2
Equipn	ent Tested/ Model Numb Instrument Serial Numb Microphone Serial Numb 're-amplifier Serial Numb	er: 309 er: Ric er: 041 er: 118	21838 n NA-28 28 93			6
Pre-Test Atı Ambient Tem Relative Barometric	nospheric Conditions perature : 20.8°C Humidity : 46.9% Pressure : 100.47kPa		Post-Test At Ambier Re Baro	mospheric Condi nt Temperature : lative Humidity : metric Pressure :	itions 22.4°C 43% 100.38kPa	
Calibration Techn Calibration	ician : Dennis Kim Date : 23/06/2015		Secondary Che Report Issue Da	ek: Kate Alchin te : 24/06/2015		8
	Approved Signato	ry: 📌	K D		Ken Williams	
Clause and Charact 10: Self-generated noise 11: Acoustical tests of a 12: Electrical tests of fr 13: Frequency and time The sound level meter sub	eristic Tested c I frequency weighting cquency weightings weightings at 1 kHz mitted for testing has successfully conditions un	Result Pass Pass Pass Pass Pass y completed der which th	Clause and Char 14: Level linearity o 15: Level linearity in 16: Toneburst respon 17: Peak C sound lev 18: Overload Indicat the class 1 periodic tests o e tests were performed.	acteristic Tested n the reference level tel, the level range of the ref ion rIEC 61672-3 2006, fo	Result           range         Pass           ontrol         Pass           Pass         Pass           Pass         Pass           Pass         Pass	17 E
As public evidence was performed in accordance IEC 61672-1:20	available, from an independent ter with IEC 61672-2 2003, to demor 02, the sound level meter submitte	sting organis astrate that the ed for testing	ation responsible for appro- te model of sound level mi conforms to the class 1 re	wing the results of patt eter fully conformed to quirements of IEC 616	the requirements in 72-1 2002	
Acoustic Tests 31.5 Hz to 8kHz 12 5kHz 10kHz Electrical Tests 31.5 Hz to 20 kHz	Least U +0.120dB +0.165dB +0.245dB +0.245dB +0.121dB All uncertainties are derived at	ncertainties Env the 95% cor	of Measurement - ironmental Conditions Temperature Relative Humidity Barometric Pressure thidence level with a cover-	+0.3°C +4.1% +0.1kPa nge factor of 2.		
	This calibration certificate is to Acoustic Research Labs Pty Lt Accredited for compliance with The results of the tests, calibrat Australian/National standards	be read in o d is NATA A 1SO/TEC 17 ions and/or t	onjunction with the calibra secredited Laboratory Nun 1025 measurements included in 1	tion test report iber 14172 his document are trace	able to PAGE 1 OF 1	

6	Acoustic Research Labs Pty Ltd Sound	evel 7 Building 2 423 Per Pennant Hills NSW AUS Ph: +61 2 9484 0800 A.B.N. www.acousticresear Calibrator	nnant Hills Rd TRALIA 2120 65 160 399 119 ch.com.au	
	C - L'h	60942-2004		
		C15283		
	Client Details	ARL Hire 423 Pennant Hills Road Pennant Hills NSW 2120		
Equipmer Ir	t Tested/ Model Number : strument Serial Number :	Rion NC-73 10527815		
	Atmospl Ambient Temperature : Relative Humidity : Barometric Pressure :	eric Conditions 23°C 38% 999.98kPa		
Calibration Technici Calibration Da	an : Dennis Kim te : 24/06/2015	Secondary Check: Report Issue Date :	Tim Williams 24/06/2015	
	Approved Signatory :	the second	vistia Tostad	Juan Aguero Result
5.2.2: Generated Sound Pr 5.2.3: Short Term Fluctual The sound calibrator has been the sound pressure le	essre Level P ion P shown to conform to the class 2 req (shown to conform to the class 2 req (s) and frequency(ies) stated, for t	435 5.3.2: Frequency General 435 5.5: Total Distortion 440 minutes for periodic testing, describ the environmental conditions under wh	red red in Annex B of IEC sich the tests were perf	Pass Pass 60942-2004 for formed
	Least Uncerta	inties of Measurement -		
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	±0.09dB =0.02dB =0.01% =0.26%	Environmental Conditions Temperature Relative Humadity Barometric Pressure	+B.3°C =4.1% +0.1kPa	
	Ill uncertainties are derived at the 9.	\$% confidence level with a coverage f	actor of 2	
22 C	5 e			
	This calibration certificate is to be re Acoustic Research Labs Pty Ltd is N Accredited for compliance with ISO	ad in conjunction with the calibration ATA Accredited Laboratory Number IEC 17025.	test report. 14172	
NATA			focument are traceable	to
	The results of the tests, calibrations a	nd/or measurements included in this of		

# Wilpinjong Coal

Environmental Noise Monitoring February 2016

Prepared for Wilpinjong Coal Pty Ltd



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 February 2016

Reference: 16032\_R01 Report date: 21 March 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

Ellectes

Prepared: Joel Curran Chemical Engineer (Acoustics)

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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

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

# **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.

A modification (MOD5) to the WCP consent was approved in November 2014. The environment protection licence (EPL) for WCP was issued in early 2006 with subsequent variations approved. Monitoring for December 2015 was carried out as per the draft NMP dated March 2014.

Attended monitoring was conducted in accordance with the documents detailed above, the NSW Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 10/11 February 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the February 2016 monitoring.

### Low Frequency Assessment

During the February 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factor	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	
3 METHODOLOGY	
3.1 Assessment Method	
3.2 Attended Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 10 February 2016	
5.1.2 N13, 11 February 2016	20
5.1.3 N14, 11 February 2016	21
5.1.4 N15, 10 February 2016	

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

5 1 5 N16 10 Eabruary 2016	23
<i>5.1.5</i> 1010, 10 February 2010	
5.1.6 N17, 10 February 2016	
5.1.7 N18, 11 February 2016	25
6 SUMMARY OF COMPLIANCE	26
6 SUMMARY OF COMPLIANCE	<b>26</b> 26

# **Appendices**

A STATUTORY REQUIREMENTS	27
B CALIBRATION CERTIFICATES	37

# 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 seven locations during the night of 10/11 February 2016. Figure 1 shows the regular monitoring locations.

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

### 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### Figure 1: Attended Noise Monitoring Locations

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

## 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
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	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
LA90	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
LAmin	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor/ Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a) wind speeds greater than 3 m/s at 10m above ground level;*
- *b) temperature inversion conditions between* 1.5°C *and* 3°C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

### 2.5 EPL Criteria and Weather Conditions

Criteria are 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 Wilpinjong Coal Project.

NMP Descriptor/ Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

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 of 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.

### 2.6 INP Modifying Factor

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

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 As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to applied *if the difference between the two levels is 15 dB or more*.

### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

# 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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 Joel Curran.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

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

## 3.2 Attended Monitoring

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

### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date	
Rion NA-28 sound level analyser	01070590	06/11/2017	
Pulsar acoustic calibrator	57413	23/12/2017	

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	10/02/2016 22:02	46	36	33	31	32	30	28	40
N13	11/02/2016 01:59	42	34	28	26	27	25	24	44
N14	11/02/2016 00:16	55	44	43	41	41	38	33	35
N15	10/02/2016 22:27	44	37	36	34	34	31	29	40
N16	10/02/2016 23:38	58	53	47	32	42	22	18	56
N17	10/02/2016 23:03	55	54	53	51	51	49	47	22
N18	11/02/2016 00:56	54	53	53	47	49	37	33	28

### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – FEBRUARY 2016

Note:

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

### 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during February 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – FEBRUARY 2016

Conditions	Total for February 2016
Number of measurements	7
Number of measurements where met applied (in accordance with EPL and project approval)	6
Number of measurements where WCP was the only low- frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

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

### 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	10/02/2016 22:02	1.7	-0.4	35	Yes	IA	Nil
N13	11/02/2016 01:59	0.6	1.0	36	Yes	20	Nil
N14	11/02/2016 00:16	0.0	2.2	35	Yes	<20	Nil
N15	10/02/2016 22:27	1.3	-0.2	35	Yes	IA	Nil
N16	10/02/2016 23:38	0.0	1.0	37	Yes	IA	Nil
N17	10/02/2016 23:03	0.0	0.8	35	Yes	IA	Nil
N18	11/02/2016 00:56	0.0	3.4	35	No	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP <sup>L</sup> A1,1mi n dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	10/02/2016 22:02	1.7	-0.4	45	Yes	IA	Nil
N13	11/02/2016 01:59	0.6	1.0	45	Yes	27	Nil
N14	11/02/2016 00:16	0.0	2.2	45	Yes	21	Nil
N15	10/02/2016 22:27	1.3	-0.2	45	Yes	IA	Nil
N16	10/02/2016 23:38	0.0	1.0	45	Yes	IA	Nil
N17	10/02/2016 23:03	0.0	0.8	45	Yes	IA	Nil
N18	11/02/2016 00:56	0.0	3.4	45	No	IA	Nil

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

### 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail L<sub>Aeq,15minute</sub> and L<sub>A1,1minute</sub> 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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	10/02/2016 22:02	1.7	-0.4	35	Yes	IA	Nil
N13	11/02/2016 01:59	0.6	1.0	35	Yes	20	Nil
N14	11/02/2016 00:16	0.0	2.2	35	Yes	<20	Nil
N15	10/02/2016 22:27	1.3	-0.2	35	Yes	IA	Nil
N16	10/02/2016 23:38	0.0	1.0	35	Yes	IA	Nil
N17	10/02/2016 23:03	0.0	0.8	35	Yes	IA	Nil
N18	11/02/2016 00:56	0.0	3.4	35	No	IA	Nil

### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – FEBRUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	10/02/2016 22:02	1.7	-0.4	45	Yes	IA	Nil
N13	11/02/2016 01:59	0.6	1.0	45	Yes	27	Nil
N14	11/02/2016 00:16	0.0	2.2	45	Yes	21	Nil
N15	10/02/2016 22:27	1.3	-0.2	45	Yes	IA	Nil
N16	10/02/2016 23:38	0.0	1.0	45	Yes	IA	Nil
N17	10/02/2016 23:03	0.0	0.8	45	Yes	IA	Nil
N18	11/02/2016 00:56	0.0	3.4	45	No	IA	Nil

### Table 4.6: LA11minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – FEBRUARY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

### 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	10/02/2016 22:02	24	0.0	-	0
N13	11/02/2016 01:59	20	0.6	250	0
N14	11/02/2016 00:16	20	0.9	150	0
N15	10/02/2016 22:27	22	0.0	-	0
N16	10/02/2016 23:38	23	0.0	-	0
N17	10/02/2016 23:03	24	0.0	-	0
N18	11/02/2016 00:56	21	0.0	-	0

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – FEBRUARY 2016

Notes:

1. Wind speed and direction measured 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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees	Lapse Rate Degrees / 100 metres <sup>2</sup>
10/02/2016 22:00	2.1	112	-0.4
10/02/2016 22:15	1.7	116	-0.4
10/02/2016 22:30	1.2	114	-0.4
10/02/2016 22:45	1.3	127	-0.2
10/02/2016 23:00	0.9	137	-0.2
10/02/2016 23:15	0.0	-	0.8
10/02/2016 23:30	0.0	-	1.2
10/02/2016 23:45	0.0	-	1.0
11/02/2016 00:00	0.0	-	1.2
11/02/2016 00:15	0.0	-	2.4
11/02/2016 00:30	0.0	-	2.2
11/02/2016 00:45	1.0	340	2.8
11/02/2016 01:00	0.0	-	3.2
11/02/2016 01:15	0.0	-	3.4
11/02/2016 01:30	0.0	-	1.4
11/02/2016 01:45	0.0	-	1.2
11/02/2016 02:00	0.6	353	1.0
11/02/2016 02:15	0.0	-	1.6

Notes:

1. Data supplied by WCP;

2. Lapse rate sourced from the WCP inversion tower; and

3. "-" in wind direction column indicates that conditions were calm.

# 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 LAeq,15minute and LA1,1minute (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 9 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, 10 February 2016



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

WCP was inaudible.

Insects generated measured levels.

Dogs, frogs and an air conditioner continuum were also noted.

### 5.1.2 N13, 11 February 2016



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

A low-level mining continuum and several instances of dozer track noise from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of 20 dB. Impact noise generated the  $L_{A1,1minute}$  of 27 dB.

WCP contributed to the  $L_{Aeq}$  and  $L_{A90}$ . Insects and frogs contributed to the  $L_{A1}$  and  $L_{A90}$  and generated the  $L_{A10}$  and  $L_{Aeq}$ .

Birds were also noted at low levels.
## 5.1.3 N14, 11 February 2016



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

A low-level exhaust continuum from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of less than 20 dB. Surges in exhaust noise generated the  $L_{A1,1minute}$  of 21 dB.

Insects generated measured levels.

Ducks and frogs were also noted.

#### 5.1.4 N15, 10 February 2016



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

WCP was inaudible.

Insects were responsible for all measured levels.

Dogs, frogs and a locomotive were also noted.

#### 5.1.5 N16, 10 February 2016



Figure 7: Environmental Noise Levels - N16, Araluen Road, off Ulan-Wollar Road

WCP was inaudible.

A locomotive was responsible for the  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Insects and frogs were responsible for the  $L_{A90}$ .

Dogs were also noted at low levels.

## 5.1.6 N17, 10 February 2016



#### Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

WCP was inaudible.

Insects generated all measured levels.

Frogs and an unknown animal were also noted.

## 5.1.7 N18, 11 February 2016



#### Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Insects generated all measured levels.

Cows and frogs were also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 10/11 February 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the February 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the February 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# APPENDIX

# A STATUTORY REQUIREMENTS

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

## A.1 Wilpinjong Coal Project Approval

# SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS ACQUISITION UPON REQUEST 1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4. Table 1: Land subject to acquisition upon request 30 – Gaffney Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### Noise Criteria

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

Table 2: Noise Impact assessment criteria dB(A)

	Day Evening		Night		
Location	LAeq(15 minute)	LAeq(15 minute) LAeq(15 minute)		LA1(1 minute)	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use			

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

	-				-			×	-	
2			-	-	а.	100				
1		-	1.2	-			an a	-	IJ	
-	_	-	-	_			_	_	_	

#### 69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### Applicable Meteorological Conditions

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s
  - at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

## A.2 Environmental Protection Licence

#### 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	35	35	35	45
Goulburn River National Park	50	50	50	2
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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

 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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

## 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

## 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299. 9	6415716.9	Location based on the nearest non-mine owned residence to the West of the Mine
Coonaroo	N13	Attended Noise	763758. 9	6413471.9	Location based on the nearest non-mine owned residence to the West of the Mine
Tichular	N14	Attended Noise	778791. 9	6408624.7	Location based on the nearest non-mine owned residence to the South of the Mine
Wollar Village	N15	Attended Noise	777452. 0	6416158.9	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787. 4	6417418.7	Location based on the nearest non-mine owned residence to the East of the Mine
Mogo Rd	N17	Attended Noise	780771. 0	6420641.0	Location based on the nearest non-mine owned residence to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033. 3	6398618.1	DP&I Recommendation (MOD5) - Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorolog y & Inversion	770630. 9	6418085.1	Location based on consideration of prevailing meteorological conditions
Wollar Village		Real-Time Noise - Fixed	777608. 9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Arałuen Rd		Real-Time Noise - Fixed	778856. 4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine

Table 4: Nois	e Related	Monitoring	Locations
10010 1. 11013	e multicle	renormediting	Locations

Location	Site	Туре	Easting	Northing	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4:

1. MGA94, Zone 55

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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

#### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

#### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

#### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

## Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- · Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

#### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- · Implement remediation measures as directed by the Director-General; and
- · Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	Acoustic Research Labs Pty Lt Sour E Calibra	Leve Penr Ph: + d ww nd Lev C 6167	17 Building 2 423 aant Hills NSW / 61 2 9484 0800 A.E w.acousticrese vel Meter 2-3.2006 Certificat	Pennant Hills AUSTRALIA 23 8.N. 65 160 399 3 earch.com.au	Rd 20 19 U	
	Client De	tails AR 423 Per	L Hire Pennant Hills Rd			-
Equipn	eent Tested/ Model Numb Instrument Serial Numb Microphone Serial Numb re-amplifier Serial Numb	er: 309 er: Ric er: 041 er: 118	021838 n NA-28 28 993			
Pre-Test Atr Ambient Tem Relative I Barometric	nospheric Conditions perature : 20.8°C tumidity : 46.9% Pressure : 100.47kPa		Post-Test At Ambier Re Baro	mospheric Cond it Temperature : lative Humidity : metric Pressure :	itions 22.4°C 43% 100.38kPa	-
Calibration Techn Calibration	ician : Dennis Kim Date : 23/06/2015		Secondary Che Report Issue Da	ck: Kate Alchir te : 24/06/2015		
	Approved Signato	ry:	8 -		Ken Williams	<u>-</u>
Clause and Charact 10: Self-generated noise 11: Acoustical tests of a 12: Electrical tests of fin 13: Frequency and time The sound level meter sub	eristic Tested frequency weighting equency weightings weightings at 1 kHz mutted for testing has successfull	Result Pass Pass Pass Pass	Clause and Char 14: Level linearity or 15: Level linearity if 16: Toneburst respon 17: Peak C sound lev 18: Overload Indicat the class 1 periodic tests of	acteristic Tested n the reference level icil, the level range c ise ref ion CIEC 61672-3 2006, f	Result           range         Pass           ontrol         Pass           Pass         Pass           Pass         Pass           or the environmental         Pass	-
As public evidence was performed in accordance	conditions un available, from an independent te with IEC 61672-2 2003, to demo	der which th sting organis astrate that th	e tests were performed ation responsible for appro- ne model of sound level me	wing the results of pat ter fully conformed to	tern evaluation test the requirements in	
HEC 61672-1.20	Least U	ncertainties	of Measurement -	functions of the ore	(7.4 ° 1	-
Acoustic Tests 31.5 Hz to 8kHz 12.5kHz 16kHz Electrical Tests 31.5 Hz to 20 kHz	<ul> <li>&lt;0.120dB</li> <li>&lt;0.165dB</li> <li>&lt;0.245dB</li> <li>&lt;0.245dB</li> <li>&lt;0.121dB</li> </ul>	Env	ironmental Conditions Temperature Relative Humidity Barometric Pressure	-0.3°C =4.1% =0.1kPp		
	This calibration certificate is to Acoustic Research Labs Pty Ln Accredited for compliance with The results of the tests, calibrat Australian/National standards	be read in c d is NATA / i ISO/IEC 12 ions and/or i	injunction with the calibra anjunction with the calibra tecredited Laboratory Nun 1025 measurements included in t	tion test report tiber 14172 his document are trace	table to Page 1 or 1	

6	Acoustic Research Labs Pty Ltd Sound IEC	Level 7 Building 2 423 Per Pennant Hills NSW AUS Ph: +61 2 9484 0800 A.B.N. www.acousticresearc d Calibrator 2 60942-2004	nnant Hills Rd TRALIA 2120 65 160 399 119 h.com.au	
	Calibrat	ion Certificate		
	Calibration Numbe	r C15283		
	Client Detail	423 Pennant Hills Road Pennant Hills NSW 2120		
Equipme I	nt Tested/ Model Number nstrument Serial Number	: Rion NC-73 : 10527815		
	Atmos Ambient Temperature Relative Humidity Barometric Pressure	pheric Conditions : 23°C : 38% : 999.98kPa		
Calibration Technic Calibration D	ian : Dennis Kim ate : 24/06/2015	Secondary Check: Report Issue Date :	Tim Williams 24/06/2015	
	Approved Signatory	: fright		luan Aguero
5.2.2: Generated Sound P 5.2.3: Short Term Fluctua The sound calibrator has bee the sound pressure I	ressre Level ation en shown to conform to the class 2 evel(s) and frequency(ies) stated, fo	Pass         5.3.2: Frequency Generat           Pass         5.5: Total Distortion           requirements for periodic testing, describ         return of the environmental conditions under wh	ed ed in Annex B of IEC ( ich the tests were perfo	Pass Pass 50942-2004 for srmed
	Least Unce	rtainties of Measurement -		
		Environmental Conditions	+0.3°C =4.1%	
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	x0.09dB ±0.02dB ±0.01% ±0.26%	Relative Humidity Barometric Pressure	+0_1kPa	
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	20.09dB 20.02dB 20.02dB 20.01% 20.26% All uncertainties are derived at the	Relative Humidity Barometric Pressure 95% confidence level with a coverage fo	+0.1kPa actor of 2	
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	20.09dB 20.02dB 20.01% 20.26% All uncertainties are derived at the	Relative Humidity Barometric Pressure 95% confidence level with a coverage fo	+0_lkPa ictor of 2	
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	=0.09dB =0.02dB =0.01% =0.26% All uncertainties are derived at the This calibration certificate is to be Acoustic Research Labe Pro Ltd 10	Relative Hundity Barometric Pressure 95% confidence level with a coverage fo read in conjunction with the calibration to NATA Accredited Laboratory Number	+0.1kPa actor of 2 est report. 14172	
Specific Tests Generated SPL Short Term Fluct Frequency Distortion	=0.09dB =0.02dB =0.02dB =0.02dB =0.26% All uncertainties are derived at the All uncertainties are derived at the This calibration certificate is to be Acoustic Research Labs Pty Ltd is Accredited for compliance with IS	Relative Humdity Barometric Pressure 95% confidence level with a coverage fo read in conjunction with the calibration to NATA Accredited Laboratory Number O/IEC 17025.	+0.1kPa actor of 2. est report. 14172.	
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	<ul> <li>a) 0.09dB</li> <li>a) 0.2dB</li> <li>a) 0.2dB</li> <li>a) 0.1%</li> <li>a) 26%</li> <li>All uncertainties are derived at the</li> </ul> This calibration certificate is to be Acoustic Research Labs Pty Ltd is Accredited for compliance with IS The results of the tests, calibration Australian/National standards.	Relative Hundity Barometric Pressure 95% confidence level with a coverage fo read in conjunction with the calibration to NATA Accredited Laboratory Number O/IEC 17025. s and/or measurements included in this d	+0.1kPa actor of 2 est report. 14172. ocument are traceable i	

# Wilpinjong Coal

Environmental Noise Monitoring March 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

## Wilpinjong Coal

## Environmental Noise Monitoring March 2016

Reference: 16070\_R01 Report date: 24 March 2016

#### **Prepared for**

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

#### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

Oma inejou ski

Prepared: Ronni Maciejowski Acoustics Technician

2/2

QA Review: Amanda Borserio Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 02/03 March 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

#### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the March 2016 monitoring.

#### Low Frequency Assessment

During the March 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factor	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	8
3.2 Attended Monitoring	9
4 RESULTS	10
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	10
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	17
5.1.1 N6, 2 March 2016	
5.1.2 N13, 3 March 2016	20
5.1.3 N14, 2 March 2016	21
5.1.4 N15, 2 March 2016	22

# **Appendices**

A STATUTORY REQUIREMENTS	
B CALIBRATION CERTIFICATES	

# 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 seven locations during the night of 02/03 March 2016. Figure 1 shows the regular monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

#### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### **Figure 1: Attended Noise Monitoring Locations**

## 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	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
LA90	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening LAeq,15minute	Night L <sub>Aeq,</sub> 15minute / L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

## Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a) wind speeds greater than 3 m/s at 10m above ground level;*
- *b) temperature inversion conditions between* 1.5°C *and* 3°C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3°*C*/00*m*.

## 2.5 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq,</sub> 15minute <sup>/</sup> L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

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 of 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.

## 2.6 INP Modifying Factor

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

#### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

# 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

## 3.2 Attended Monitoring

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

#### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	06/11/2017
Pulsar acoustic calibrator	57413	23/12/2017

## 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	02/03/16 23:19	51	43	38	24	33	23	22	35
N13	03/03/16 01:23	50	36	32	31	31	30	28	42
N14	02/03/16 23:47	50	40	38	36	36	32	28	38
N15	02/03/16 22:58	57	37	35	34	34	30	26	36
N16	02/03/16 22:31	48	46	41	37	38	35	31	46
N17	02/03/16 22:00	55	53	53	52	52	51	49	50
N18	03/03/16 00:23	52	47	46	45	45	43	38	44

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – MARCH 2016<sup>1</sup>

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during March 2016.

#### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – MARCH 2016

Conditions	Total for March 2016
Number of measurements	7
Number of measurements where met applied (in accordance with EPL and project approval)	7
Number of measurements where WCP was the only low- frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.
## 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

#### Location Start Date and Wind VTG Criterion WCP Exceedance <sup>6</sup> Criterion Time Speed °C per dB Applies? 2,3 LAeq,15min m/s<sup>1,2</sup> 100m<sup>1,2</sup> dB 4,5 N6 02/03/16 23:19 1.1 -0.2 35 Yes IA Nil N13 03/03/16 01:23 0.0 1.6 36 Yes <25 Nil N14 02/03/16 23:47 0.6 0.2 35 IA Nil Yes N15 02/03/16 22:58 1.2 0.0 35 Yes IA Nil N16 02/03/16 22:31 1.6 -0.437 IA Nil Yes N17 02/03/16 22:00 2.7 -1 35 Yes IA Nil N18 03/03/16 00:23 1.7 0.2 35 IA Nil Yes

## Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/03/16 23:19	1.1	-0.2	45	Yes	IA	Nil
N13	03/03/16 01:23	0.0	1.6	45	Yes	30	Nil
N14	02/03/16 23:47	0.6	0.2	45	Yes	IA	Nil
N15	02/03/16 22:58	1.2	0.0	45	Yes	IA	Nil
N16	02/03/16 22:31	1.6	-0.4	45	Yes	IA	Nil
N17	02/03/16 22:00	2.7	-1.0	45	Yes	IA	Nil
N18	03/03/16 00:23	1.7	0.2	45	Yes	IA	Nil

## Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MARCH 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5 °C and 3 °C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3 °C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/03/16 23:19	1.1	-0.2	35	Yes	IA	Nil
N13	03/03/16 01:23	0.0	1.6	35	Yes	<25	Nil
N14	02/03/16 23:47	0.6	0.2	35	Yes	IA	Nil
N15	02/03/16 22:58	1.2	0.0	35	Yes	IA	Nil
N16	02/03/16 22:31	1.6	-0.4	35	Yes	IA	Nil
N17	02/03/16 22:00	2.7	-1.0	35	Yes	IA	Nil
N18	03/03/16 00:23	1.7	0.2	35	Yes	IA	Nil

## Table 4.5: LAea, 15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – MARCH 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/03/16 23:19	1.1	-0.2	45	Yes	IA	Nil
N13	03/03/16 01:23	0.0	1.6	45	Yes	30	Nil
N14	02/03/16 23:47	0.6	0.2	45	Yes	IA	Nil
N15	02/03/16 22:58	1.2	0.0	45	Yes	IA	Nil
N16	02/03/16 22:31	1.6	-0.4	45	Yes	IA	Nil
N17	02/03/16 22:00	2.7	-1.0	45	Yes	IA	Nil
N18	03/03/16 00:23	1.7	0.2	45	Yes	IA	Nil

## Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – MARCH 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	02/03/16 23:19	26	-	-	0
N13	03/03/16 01:23	24	0.6	220	1
N14	02/03/16 23:47	23	-	-	0
N15	02/03/16 22:58	26	-	-	0
N16	02/03/16 22:31	25	-	-	0
N17	02/03/16 22:00	28	0.5	340	0
N18	03/03/16 00:23	20	-	-	1

## Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – MARCH 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
02/03/2016 22:00	3.0	86	-1.0
02/03/2016 22:15	2.7	95	-1.0
02/03/2016 22:30	1.6	109	-0.2
02/03/2016 22:45	1.6	116	-0.4
02/03/2016 23:00	1.8	110	-0.4
02/03/2016 23:15	1.2	110	0.0
02/03/2016 23:30	1.1	68	-0.2
02/03/2016 23:45	0.9	75	-0.2
03/03/2016 00:00	0.6	81	-0.2
03/03/2016 00:15	1.4	107	-0.2
03/03/2016 00:30	1.7	105	-0.4
03/03/2016 00:45	1.7	104	0.2
03/03/2016 01:00	0.9	101	0.6
03/03/2016 01:15	1.3	107	0.0
03/03/2016 1:30	0.8	105	0.4
03/03/2016 1:45	0.0	-	1.6
03/03/2016 2:00	0.0	-	1.8

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm; and

3. Lapse rate sourced from the 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 LAeq,15minute and LA1,1minute (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 9 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, 2 March 2016



WCP was inaudible during the measurement.

Insects and dogs generated the measured levels.

Page 19

## 5.1.2 N13, 3 March 2016



A low-level mining continuum from WCP was audible during the measurement, generating the site only  $L_{Aeq}$  of less than 25 dB. Impact noise generated the  $L_{A1,1minute}$  of 30 dB.

Insects primarily generated all measured levels. Livestock contributed to the LA1.

Birds were also noted.

## 5.1.3 N14, 2 March 2016



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

WCP was inaudible during the measurement.

Insects primarily generated the measured levels.

Livestock and birds were also noted.

## 5.1.4 N15, 2 March 2016



WCP was inaudible during the measurement.

Insects were responsible for all measured levels.

Dogs were also noted.

## 5.1.5 N16, 2 March 2016



WCP was inaudible during the measurement.

A train primarily generated the  $L_{A1}$  and contributed to the  $L_{A10}$ . Insects were primarily responsible for the  $L_{A10}$  and generated the  $L_{Aeq}$  and  $L_{A90}$ .

An aircraft was also noted.

## 5.1.6 N17, 2 March 2016



WCP was inaudible during the measurement.

Insects generated all measured levels.

Breeze in foliage was also noted.

## 5.1.7 N18, 3 March 2016



WCP was inaudible during the measurement.

Insects generated all measured levels.

Livestock were also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 02/03 March 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the March 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the March 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

7	able	2.1	Noise	Impact	assessment	criteria	dB(A	1
	abro	£	10130	mpace	000000000000000000000000000000000000000	Gritoria	up n	

	Day	Evening	Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID
69, 129, 135 and 137

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
    - (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 approval;
    - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
    - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
    - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

## A.2 Environmental Protection Licence

### 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	35	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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

 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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

## 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

## 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4, Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence	N6	Attended	777299.	6415716.9	Location based on the nearest non-mine
O'Toole Church		Noise	9		owned residence to the West of the Mine
Coonaroo	N13	Attended	763758.	6413471.9	Location based on the nearest non-mine
		Noise	9		owned residence to the West of the Mine
Tichular	N14	Attended	778791.	6408624.7	Location based on the nearest non-mine
		Noise	9		owned residence to the South of the Mine
Wollar Village	N15	Attended	777452.	6416158.9	Location based on the nearest non-mine
		Noise	0		owned residence to the South-East of the
					Mine
Araluen Rd	N16	Attended	778787.	6417418.7	Location based on the nearest non-mine
		Noise	4		owned residence to the East of the Mine
Mogo Rd	N17	Attended	780771.	6420641.0	Location based on the nearest non-mine
		Noise	0		owned residence to the North-East of the
					Mine
Barrigan	N18	Attended	780033.	6398618.1	DP&I Recommendation (MOD5) - Location
Valley <sup>2</sup>		Noise	3		approximately 20 km to the south of the Mine
WCPL Rail		Meteorolog	770630.	6418085.1	Location based on consideration of prevailing
Loop		y&	9		meteorological conditions
		Inversion			
Wollar		Real-Time	777608.	6415996.8	Location based on the nearest non-mine
Village		Noise -	9		owned residence to the South-East of the
		Fixed			Mine
Araluen Rd		Real-Time	778856.	6417401.3	Location based on the nearest non-mine
		Noise -	4		owned residence to the East of the Mine
		Fixed			

Table 4: Noise	Related	Monitoring	Locations
10010 4.110130	Nuldrud	1. IOI III OI III A	Locations

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4: 1. MGA94, Zone 55

> 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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

 The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

## 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

## 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

## 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

## Table C. Definition of an Europeday

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

#### 6.3.6 **Response to Exceedance**

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

	Pennant Hills NSW AUSTRALIA 2120
	Research Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
	Sound Level Meter
	IEC 61672-3.2006 Calibration Cartificate
	Calibration Number C15583
	Client Details Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipn	nent Tested/ Model Number : Rion NA-28 Instrument Serial Number : 01070590 Microphone Serial Number : 00533
Pre-Test Ati	Pre-amplifier Serial Number : 70607 mospheric Conditions Post-Test Atmospheric Conditions
Ambient Tem Relative I Barometric	apperature :20.6°CAmbient Temperature :21.2°CHumidity :56.3%Relative Humidity :62.4%Pressure :98.64kPaBarometric Pressure :98.56kPa
Calibration Techn Calibration	ician : Corey Stewart Secondary Check: Kate Alchin Date : 06/11/2015 Report Issue Date : 10/11/2015
	Approved Signatory : Ken Williams
Clause and Charact	teristic Tested Result Clause and Characteristic Tested Result
11: Acoustical tests of a 12: Electrical tests of fr 13: Frequency and time	a frequency weighting       Pass       15: Level linearity incl. the level range control       Pass         requency weightings       Pass       16: Toneburst response       Pass         e weightings at 1 kHz       Pass       17: Peak C sound level       Pass         18: Overload Indication       Pass       18: Overload Indication       Pass
The sound level meter sub	bmitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental
As public evidence was performed in accordance IEC 61672-1:20	available, from an independent testing organisation responsible for approving the results of pattern evaluation test with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in 002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.
Acoustic Tests	Least Uncertainties of Measurement - Environmental Conditions
31.5 Hz to 8kHz 12.5kHz 16kHz	±0.120dB Temperature ±0.3°C ±0.165dB Relative Humidity ±4.1% +0.215dB Barometric Pressure +0.1kPa
Electrical Tests 31.5 Hz to 20 kHz	±0.121dB
	All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
	This calibration certificate is to be read in conjunction with the calibration test report.
NATA	Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.
WORLD RECOGNISED	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.
	PAGE 1 OF 1

6	Acoustic Research Labs Pty Ltd Sound IEC	Level 7 Building 2 423 P Pennant Hills NSW AU Ph: +61 2 9484 0800 A.B.I www.acousticresea I Calibrator 60942-2004	Pennant Hills Rd JSTRALIA 2120 N. 65 160 399 119 arch.com.au	
	Calibration Number	C15670		
	Client Details	Global Acoustics 12/16 Huntingdale Drive Thornton NSW 2322		
Equipr	nent Tested/ Model Number : Instrument Serial Number :	Pulsar 106 57413		·
112 132 131 132	Atmosp Ambient Temperature : Relative Humidity : Barometric Pressure :	heric Conditions 22°C 54.8% 99.85kPa		
Calibration Techn Calibration	ician : Corey Stewart Date : 23/12/2015 Approved Signatory :	Secondary Check Report Issue Date	: Tim Williams : 23/12/2015 Ken	n Williams
Clause and Charact 5.2.2: Generated Sound 5.2.3: Short Term Fluct	teristic Tested R I Pressure Level I tuation I	esult Clause and Charac Pass 5.3.2: Frequency Gene 5.5: Total Distortion	cteristic Tested	Result Pass Pass
Nominal Level	Nominal Frequency	Measured Level	Measured Freq	uency
The sound calibrator has the sound pressur Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	been shown to conform to the class 2 re e level(s) and frequency(ies) stated, for Least Uncert ±0.09dB ±0.02dB ±0.01% ±0.51% All uncertainties are derived at the S	quirements for periodic testing, desc the environmental conditions under ainties of Measurement - Environmental Conditions <i>Temperature</i> <i>Relative Humidity</i> <i>Barometric Pressure</i> 15% confidence level with a coverage	ribed in Annex B of IEC 605 which the tests were perform $\pm 0.3$ °C $\pm 4.1\%$ $\pm 0.1 kPa$ e factor of 2.	942:2004 for ned
NATA	Acoustic Research Labs Pty Ltd is N Accredited for compliance with ISO	JATA Accredited Laboratory Numbe /IEC 17025.	er 14172.	
WORLD RECOGNISED	The results of the tests, calibrations a Australian/National standards.	and/or measurements included in this	s document are traceable to PAG	e 1 of 1

# Wilpinjong Coal

Environmental Noise Monitoring April 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

## Wilpinjong Coal

Environmental Noise Monitoring April 2016

Reference: 16121\_R01 Report date: 13 May 2016

## **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: Joel Curran Chemical Engineer (Acoustics)

Khleekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 6/7 April 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

## **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the April 2016 monitoring.

## Low Frequency Assessment

During the April 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factor	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 6 April 2016	
5.1.2 N13, 7 April 2016	
5.1.3 N14, 7 April 2016	21
5.1.4 N15, 6 April 2016	

5.1.5 N16, 6 April 2016	
5.1.6 N17, 6 April 2016	
5.1.7 N18, 3 March 2016	25
6 SUMMARY OF COMPLIANCE	26
6 SUMMARY OF COMPLIANCE	<b>26</b> 
6 SUMMARY OF COMPLIANCE 6.1 Operational Noise Assessment 6.2 Low Frequency Assessment	<b>26</b> 26 

# **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	37

# 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 seven locations during the night of 6/7 April 2016. Figure 1 shows the regular monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

## Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



## Figure 1: Attended Noise Monitoring Locations
# 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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
ΙΑ	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

# 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day LAeq,15minute	Evening L <sub>Aeq,15</sub> minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

## Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b) temperature inversion conditions between* 1.5<sup>°</sup>C *and* 3<sup>°</sup>C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

## 2.5 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 Wilpinjong Coal Project.

Table 2.2: W	VILPINJONG	COAL PROJECT	SPECIFIC CRIT	ERIA, dB
--------------	------------	--------------	---------------	----------

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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 of 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<sup>°</sup>C per 100 metres.

## 2.6 INP Modifying Factor

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

## 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

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 As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

## **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

# 3 METHODOLOGY

# 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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 Joel Curran.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

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

# 3.2 Attended Monitoring

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

## Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	29/05/2017
Larson Davis CAL150 acoustic calibrator	3333	06/08/2017

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	06/04/2016 22:00	37	33	30	27	28	26	23	47
N13	07/04/2016 02:07	51	37	29	20	26	19	17	39
N14	07/04/2016 00:32	50	36	27	25	27	23	21	43
N15	06/04/2016 22:25	47	44	38	30	34	28	25	52
N16	06/04/2016 23:53	38	29	26	24	25	22	20	46
N17	06/04/2016 23:08	43	36	33	29	30	26	21	37
N18	07/04/2016 01:08	42	33	27	22	24	21	19	38

### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – APRIL 2016<sup>1</sup>

Note:

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

# 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during April 2016.

## Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – APRIL 2016

Conditions	Total for April 2016
Number of measurements	6
Number of measurements where met applied (in accordance with EPL and project approval)	6
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

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

# 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

## Table 4.3: LAeq, 15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – APRIL 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	06/04/2016 22:00	0.0	6.6	35	No	26	NA
N13	07/04/2016 02:07	0.9	4.8	36	No	IA	NA
N14	07/04/2016 00:32	0.7	5.6	35	No	NM	NA
N15	06/04/2016 22:25	1.8	7.2	35	No	28	NA
N16	06/04/2016 23:53	1.8	4.8	37	No	NM	NA
N17	06/04/2016 23:08	1.8	1.6	35	Yes	NM	Nil
N18	07/04/2016 01:08	1.1	6.0	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	06/04/2016 22:00	0.0	6.6	45	No	35	NA
N13	07/04/2016 02:07	0.9	4.8	45	No	IA	NA
N14	07/04/2016 00:32	0.7	5.6	45	No	23	NA
N15	06/04/2016 22:25	1.8	7.2	45	No	36	NA
N16	06/04/2016 23:53	1.8	4.8	45	No	32	NA
N17	06/04/2016 23:08	1.8	1.6	45	Yes	NM	Nil
N18	07/04/2016 01:08	1.1	6.0	45	No	IA	NA

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – APRIL 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,</sub> 15min dB 4,5	Exceedance <sup>6</sup>
N6	06/04/2016 22:00	0.0	6.6	35	No	26	NA
N13	07/04/2016 02:07	0.9	4.8	35	No	IA	NA
N14	07/04/2016 00:32	0.7	5.6	35	No	NM	NA
N15	06/04/2016 22:25	1.8	7.2	35	No	28	NA
N16	06/04/2016 23:53	1.8	4.8	35	No	NM	NA
N17	06/04/2016 23:08	1.8	1.6	35	Yes	NM	Nil
N18	07/04/2016 01:08	1.1	6.0	35	No	IA	NA

## Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – APRIL 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB 4,5	Exceedance <sup>6</sup>
N6	06/04/2016 22:00	0.0	6.6	45	No	35	NA
N13	07/04/2016 02:07	0.9	4.8	45	No	IA	NA
N14	07/04/2016 00:32	0.7	5.6	45	No	23	NA
N15	06/04/2016 22:25	1.8	7.2	45	No	36	NA
N16	06/04/2016 23:53	1.8	4.8	45	No	32	NA
N17	06/04/2016 23:08	1.8	1.6	45	Yes	NM	Nil
N18	07/04/2016 01:08	1.1	6.0	45	No	IA	NA

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – APRIL 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

# 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	06/04/2016 22:00	21	0.0	-	3
N13	07/04/2016 02:07	17	0.0	-	0
N14	07/04/2016 00:32	18	0.7	95	0
N15	06/04/2016 22:25	20	0.0	-	3
N16	06/04/2016 23:53	21	0.4	220	0
N17	06/04/2016 23:08	20	0.0	-	2
N18	07/04/2016 01:08	17	0.0	-	0

### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – APRIL 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
06/04/2016 22:00	0.0	-	7.4
06/04/2016 22:15	0.0	-	6.6
06/04/2016 22:30	0.0	-	6.8
06/04/2016 22:45	1.8	299	7.2
06/04/2016 23:00	2.6	256	0.6
06/04/2016 23:15	1.8	295	1.6
06/04/2016 23:30	1.9	318	4.4
06/04/2016 23:45	2.1	304	4.2
07/04/2016 00:00	1.8	299	4.8
07/04/2016 00:15	1.5	291	4.6
07/04/2016 00:30	1.2	299	5.0
07/04/2016 00:45	0.7	291	5.6
07/04/2016 01:00	1.0	280	4.2
07/04/2016 01:15	1.1	305	6.0
07/04/2016 01:30	1.6	275	4.2
07/04/2016 01:45	0.5	321	5.0
07/04/2016 02:00	0.9	257	4.8
07/04/2016 02:15	0.6	288	4.8

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm; and

3. Lapse rate sourced from the 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 6 April 2016



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

WCP was audible during the measurement as an exhaust and engine and fan continuum and regular dozer track noise, generating the site only  $L_{Aeq}$  of 26 dB. Exhaust noise generated the  $L_{A1,1minute}$  of 35 dB. Horns were also noted.

Birds generated the  $L_{Amax}$  and contributed to the  $L_{A1}$ . Insects and activities at WCP contributed to the  $L_{A1}$ , and generated the  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

Local resident voices were also noted at low levels.

## 5.1.2 N13, 7 April 2016



#### WCP was inaudible.

Cows generated the  $L_{Amax}$  and  $L_{Aeq'}$  and combined with aircraft to generate the  $L_{A1}$  and  $L_{A10}$ . Insects, a continuum from another mine and the noise floor of the sound level meter contribute to the  $L_{A90}$ .

Page 20

## 5.1.3 N14, 7 April 2016



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

A low level exhaust continuum from WCP was audible during the measurement, however the site only  $L_{Aeq}$  was not measurable. Exhaust noise generated the  $L_{A1,1minute}$  of 23 dB.

Insects contributed to the  $L_{Aeq'}$   $L_{A10}$  and  $L_{A90}$ . A local continuum contributed to the  $L_{Aeq'}$   $L_{A10}$  and  $L_{A90}$ . Ducks contributed to the  $L_{Aeq}$  and  $L_{A1}$  and generated the  $L_{Amax}$ . Bats contributed to the  $L_{A1}$ .

## 5.1.4 N15, 6 April 2016



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

A exhaust, engine and fan continuum from WCP was audible during the measurement, generating the site only  $L_{Aeq}$  of 28 dB. Exhaust noise generated the  $L_{A1,1minute}$  of 36 dB. Horn noise was also noted.

Dogs generated the  $L_{Amax'}$   $L_{A1}$  and  $L_{A10}$  and contributed to the  $L_{Aeq}$ . WCP and insects generated the  $L_{A90}$ .

Bats were also noted.

## 5.1.5 N16, 6 April 2016



A low-level exhaust continuum from WCP was audible during the measurement, however, the site only  $L_{Aeq}$  was not measurable. Impact noise generated the  $L_{A1,1minute}$  of 32 dB.

Insects and the continuum from WCP combined to generate the  $L_{Aeq'} L_{A1}$  and  $L_{A90}$ . Insects generated the  $L_{A10}$ . Bats generated the  $L_{Amax}$ .

## 5.1.6 N17, 6 April 2016



A low-level continuum from WCP was audible during the measurement, however, the resulting site only  $L_{Aeq}$  and  $L_{A1,1minute}$  were not measurable.

Bats generated the  $L_{Amax}$ . Insects generated the  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$  and contributed to the LA1.

Birds were also noted.

## 5.1.7 N18, 3 March 2016



WCP was inaudible during the measurement.

Cows generated the  $L_{Amax}$  and contributed to the  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Insects contributed to the  $L_{Aeq'}$ ,  $L_{A10}$  and  $L_{A90}$ . An aircraft was responsible for the  $L_{A1}$  and contributed to the  $L_{Aeq}$  and  $L_{A10}$ .

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 6/7 April 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

# 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the April 2016 monitoring period.

# 6.2 Low Frequency Assessment

During the April 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# APPENDIX

# A STATUTORY REQUIREMENTS

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 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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table 1: Land subject to acquisition upon request

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

# A.2 Environmental Protection Licence

#### 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	35	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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

## 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

## 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence	N6	Attended	777299.	6415716.9	Location based on the nearest non-mine
O'Toole Church		Noise	9		owned residence to the West of the Mine
Coonaroo	N13	Attended	763758.	6413471.9	Location based on the nearest non-mine
		Noise	9		owned residence to the West of the Mine
Tichular	N14	Attended	778791.	6408624.7	Location based on the nearest non-mine
		Noise	9		owned residence to the South of the Mine
Wollar Village	N15	Attended	777452.	6416158.9	Location based on the nearest non-mine
		Noise	0		owned residence to the South-East of the
					Mine
Araluen Rd	N16	Attended	778787.	6417418.7	Location based on the nearest non-mine
		Noise	4		owned residence to the East of the Mine
Mogo Rd	N17	Attended	780771.	6420641.0	Location based on the nearest non-mine
		Noise	0		owned residence to the North-East of the
					Mine
Barrigan	N18	Attended	780033.	6398618.1	DP&I Recommendation (MOD5) - Location
Valley <sup>2</sup>		Noise	3		approximately 20 km to the south of the Mine
WCPL Rail		Meteorolog	770630.	6418085.1	Location based on consideration of prevailing
Loop		y&	9		meteorological conditions
-		Inversion			_
Wollar		Real-Time	777608.	6415996.8	Location based on the nearest non-mine
Village		Noise -	9		owned residence to the South-East of the
		Fixed			Mine
Araluen Rd		Real-Time	778856.	6417401.3	Location based on the nearest non-mine
		Noise -	4		owned residence to the East of the Mine
		Fixed			

Table 4: Noise	Related	Monitoring	Locations
	Nuldrud	1 TOTILOTING	Locations

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4:

MGA94, Zone 55

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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

#### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

## Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

#### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- · Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

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

# **B** CALIBRATION CERTIFICATES

6	Acoustic Research Labs Pty Ltd Sound I	evel 7 Building 2 423 ennant Hills NSW A h: +61294840800 A.B www.acousticrese Level Meter	Pennant Hills Rd USTRALIA 2120 .N. 65 160 399 119 arch.com.au	
	IEC 61	672-3.2006		
	Calibratio	n Certificat	e	
	Calibration Number	C15250		
	Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive THORNTON NSW 232	22	
Equip	ment Tested/ Model Number : Instrument Serial Number : Microphone Serial Number : Pre-amplifier Serial Number :	Rion NA-28 00370304 480505 60313		
Pre-Test At	mospheric Conditions	Post-Test At	nospheric Conditions	
Ambient Ter Relative	nperature : 21.2°C Humidity : 52.5%	Ambien Rel	t Temperature : 21.6 ative Humidity : 51.1	°С %
Barometrie	Pressure : 99.94kPa	Baron	netric Pressure : 99.9	4kPa
Calibration Techr Calibration	ician : Dennis Kim Date : 29/05/2015	Secondary Chee Report Issue Dat	k: Sandra Minto e: 01/06/2015	
	Approved Signatory :	Blac	Ken	Williams
10: Self-generated non- 11: Acoustical tests of 1 12: Electrical tests of f 13: Frequency and tim The sound level meter su	e Pas a frequency weighting Pas requency weightings Pas e weightings at 1 kHz Pas bmitted for testing has successfully comple conditions under whis	14: Level linearity on     15: Level linearity in     16: Toneburst respon     17: Peak C sound lev     18: Overload Indicati eted the class 1 periodic tests of ch the tests were performed.	the reference level range cl. the level range control se el on IEC 61672-3-2006, for the env	Pass Pass Pass Pass Pass
As public evidence was performed in accordance IEC 61672-1:20	available, from an independent testing org with IEC 61672-2:2003, to demonstrate the test of the sound level meter submitted for test of t	panisation responsible for appro- hat the model of sound level met sting conforms to the class 1 req	ring the results of pattern evalu- er fully conformed to the requi uirements of IEC 61672-1:200	uation test irements in 2
Acoustic Tests	Least Uncertain	ties of Measurement - Environmental Conditions		
31.5 Hz to 8kHz	±0.120dB ±0.165dB	Temperature Relative Humidiry	±0.3°C +4.1%	
16kHz Electrical Tests	±0.245dB	Barometric Pressure	±0.1kPa	
31.5 Hz to 20 kHz	±0.121dB			
	All uncertainties are derived at the 95%	6 confidence level with a covera	ge factor of 2.	
~	This calibration certificate is to be read	in conjunction with the calibrat	on test report.	
NATA	Acoustic Research Labs Pty Ltd is NAT Accredited for compliance with ISO/IE	FA Accredited Laboratory Numl C 17025.	per 14172.	
NORLD RECOUNSED	The results of the tests, calibrations and Australian/National standards.	Vor measurements included in th	is document are traceable to	
			PAGE	1 OF 1

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
6	Researc	Penn Ph: +	ant Hills NSW A 51 2 9484 0800 A.B.	USTRALIA 212	o 9
	So	und Ca	librator	arcn.com.au	
	Calibr	IEC 6094	2-2004 Certificate		
	Calibration Nu	mber C1	5396		
	Client I	etails Glo 12/1 Tho	bal Acoustics Pty Ltd 6 Huntingdale Drive rnton NSW 2322		
Equip	nent Tested/ Model Nun Instrument Serial Nun	iber: Lan iber: 333	son Davis CAL150 3		
	A Ambient Tempera	tmospheric (	Conditions °C		
	Relative Hum Barometric Pres	dity: 30.1 sure: 99.5	% 1kPa		
Calibration Techn Calibration	ician : Dennis Kim Date : 06/08/2015		Secondary Chec Report Issue Date	k: Kate Alchin e: 07/08/2015	
Clause and Channel	Approved Signa	tory :	Clause and Chara	atavistia Tastad	Juan Aguero
5.2.2: Generated Sound	I Pressre Level	Pass	5.3.2: Frequency Gene 5.5: Total Distortion	erated	Pass
The sound calibrator has the sound pressur	been shown to conform to the cl e level(s) and frequency(ies) sta	ass 2 requiremented, for the envi	nts for periodic testing, des ronmental conditions under	cribed in Annex B of II which the tests were p	C 60942:2004 for erformed
Specific Tests Generated SPL	±0.09dB	Envi	ronmental Conditions Temperature	±0.3°C	
Short Term Fluct. Frequency Distortion	±0.02dB ±0.01% ±0.26%		Relative Humidity Barometric Pressure	±4,1% ±0,1kPa	
	All uncertainties are derived	at the 95% conj	idence level with a coverag	re factor of 2.	
~	This calibration certificate is	to be read in co	njunction with the calibration	on test report.	
NATA	Acoustic Research Labs Pty Accredited for compliance w	ttd is NATA A th ISO/IEC 170	ccredited Laboratory Numb 025.	er 14172.	
		and the second sec	and the second second second second	a document are traceab	le to

# Wilpinjong Coal

Environmental Noise Monitoring May 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

## Wilpinjong Coal

Environmental Noise Monitoring May 2016

Reference: 16150\_R01 Report date: 8 June 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

Ama inejour ski

Prepared:

Ronni Maciejowski Acoustics Technician

Kheekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 18/19 May 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the May 2016 monitoring.

### Low Frequency Assessment

During the May 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

## Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 18 May 2016	
5.1.2 N13, 19 May 2016	
5.1.3 N14, 18 May 2016	21
5.1.4 N15, 18 May 2016	

	5.1.5 N16, 19 May 2016	23
	5.1.6 N17, 18 May 2016	24
	5.1.7 N18, 18 May 2016	25
6 ST	IMMARY OF COMPLIANCE	26
6 SU	UMMARY OF COMPLIANCE	26
<b>6 SU</b> 6	1 Operational Noise Assessment	<b>26</b> 26
<b>6 SU</b> 6	MMARY OF COMPLIANCE	<b>26</b> 26 26

## **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	

## 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 seven locations during the night of 18/19 May 2016. Figure 1 shows the regular monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location					
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south					
N13	'Coonaroo' off Moolarben Road					
N14	'Tichular', intersection of Tichular and Barigan Roads					
N15	Track off Barigan Street near Wollar School, Wollar Village					
N16	Araluen Road, off Ulan-Wollar Road					
N17	Mogo Road, off Araluen Road					
N18	Barigan Road, Barigan Valley					

### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### **Figure 1: Attended Noise Monitoring Locations**

## 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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
ΙΑ	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location Day / LAeq,15minute		Evening L <sub>Aeq,</sub> 15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> LA1,1minute	
N6	St Laurence O'Toole Catholic Church	35	35	35/45	
N13	'Coonaroo'	36	36	36/45	
N14	'Tichular'	35	35	35/45	
N15	Wollar Village	35	35	35/45	
N16	Araluen Road	37	37	37/45	
N17	Mogo Road, off Araluen Road	35	35	35/45	
N18	Barigan Road, Barigan Valley	35	35	35/45	

### Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b)* temperature inversion conditions between 1.5<sup>°</sup>C and 3<sup>°</sup>C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

### 2.5 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 Wilpinjong Coal Project.

Table 2.2: WILPIN	JONG COAL PRO	JECT SPECIFIC	CRITERIA, dB
-------------------	---------------	---------------	--------------

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq,</sub> 15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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 of 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.

## 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

## 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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 Jesse Tribby.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

## 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 A.

#### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date		
Rion NA-28 sound level analyser	00701424	22/05/2017		
Pulsar 106 acoustic calibrator	74813	08/07/2017		

## 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	18/05/2016 23:04	40	34	25	21	23	20	18	38
N13	19/05/2016 01:13	41	29	25	20	22	18	16	29
N14	18/05/2016 22:36	35	26	24	22	23	21	20	39
N15	18/05/2016 23:27	36	29	25	22	23	21	19	45
N16	19/05/2016 00:31	39	30	28	26	26	24	20	50
N17	18/05/2016 23:58	43	31	28	26	26	23	21	50
N18	18/05/2016 22:03	50	45	34	19	33	17	15	47

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – MAY 2016<sup>1</sup>

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during May 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – MAY 2016

Conditions	Total for May 2016
Number of measurements	7
Number of measurements where met applied (in accordance with project approval)	5
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

## 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

#### Location Start Date and VTG WCP Exceedance <sup>6</sup> Wind Criterion Criterion Applies? <sup>2,3</sup> Time Speed °C per dB LAeq,15min m/s<sup>1,2</sup> 100m<sup>1,2</sup> dB 4,5 N6 18/05/2016 23:04 2.7 Nil 1.0 35 Yes <20 N13 19/05/2016 01:13 0.0 IA Nil 2.4 36 Yes N14 18/05/2016 22:36 3.0 1.2 35 Yes <20 Nil N15 18/05/2016 23:27 3.1 -0.2 35 No 20 NA N16 19/05/2016 00:31 1.5 37 25 Nil 0.4Yes N17 18/05/2016 23:58 1.8 -0.435 Yes 26 Nil N18 18/05/2016 22:03 3.2 1.2 35 No IA NA

### Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MAY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	18/05/2016 23:04	2.7	1.0	45	Yes	20	Nil
N13	19/05/2016 01:13	0.0	2.4	45	Yes	IA	Nil
N14	18/05/2016 22:36	3.0	1.2	45	Yes	23	Nil
N15	18/05/2016 23:27	3.1	-0.2	45	No	30	NA
N16	19/05/2016 00:31	1.5	0.4	45	Yes	31	Nil
N17	18/05/2016 23:58	1.8	-0.4	45	Yes	39	Nil
N18	18/05/2016 22:03	3.2	1.2	45	No	IA	NA

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – MAY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,</sub> 15min dB 4,5	Exceedance <sup>6</sup>
N6	18/05/2016 23:04	2.7	1.0	35	No	<20	NA
N13	19/05/2016 01:13	0.0	2.4	35	Yes	IA	Nil
N14	18/05/2016 22:36	3.0	1.2	35	No	<20	NA
N15	18/05/2016 23:27	3.1	-0.2	35	No	20	NA
N16	19/05/2016 00:31	1.5	0.4	35	Yes	25	Nil
N17	18/05/2016 23:58	1.8	-0.4	35	Yes	26	Nil
N18	18/05/2016 22:03	3.2	1.2	35	No	IA	NA

### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – MAY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB 4,5	Exceedance <sup>6</sup>
N6	18/05/2016 23:04	2.7	1.0	45	No	20	NA
N13	19/05/2016 01:13	0.0	2.4	45	Yes	IA	Nil
N14	18/05/2016 22:36	3.0	1.2	45	No	23	NA
N15	18/05/2016 23:27	3.1	-0.2	45	No	30	NA
N16	19/05/2016 00:31	1.5	0.4	45	Yes	31	Nil
N17	18/05/2016 23:58	1.8	-0.4	45	Yes	39	Nil
N18	18/05/2016 22:03	3.2	1.2	45	No	IA	NA

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – MAY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	18/05/2016 23:04	8	0.6	215	1
N13	19/05/2016 01:13	8	0.6	90	0
N14	18/05/2016 22:36	9	0.7	105	1
N15	18/05/2016 23:27	9	0.0	-	0
N16	19/05/2016 00:31	9	0.5	160	0
N17	18/05/2016 23:58	9	0.0	-	0
N18	18/05/2016 22:03	8	0.4	105	1

#### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – MAY 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
18/05/2016 22:00	3.2	282	1.2
18/05/2016 22:15	3.2	294	1.2
18/05/2016 22:30	3.3	290	0.8
18/05/2016 22:45	3.0	289	1.2
18/05/2016 23:00	3.2	284	1.4
18/05/2016 23:15	2.7	270	1.0
18/05/2016 23:30	2.9	277	0.0
18/05/2016 23:45	3.1	271	-0.2
19/05/2016 00:00	2.8	269	-0.4
19/05/2016 00:15	1.8	278	-0.4
19/05/2016 00:30	2.0	282	0.2
19/05/2016 00:45	1.5	272	0.4
19/05/2016 01:00	1.6	278	0.6
19/05/2016 01:15	1.3	266	1.6
19/05/2016 01:30	0.0.	-	2.4
19/05/2016 01:45	0.0	-	2.8
19/05/2016 02:00	1.3	278	2.0

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm; and

3. Lapse rate sourced from the 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 18 May 2016



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

A low-level continuum and engine noise from WCP generated a site only  $L_{Aeq}$  of less than 20 dB and  $L_{A1,1minute}$  of 20 dB.

WCP contributed to the total measured  $L_{\mbox{Aeq}}$  and  $L_{\mbox{A90}}.$ 

Dogs and kangaroos were primary contributors to the measured  $L_{A1}$  and  $L_{A10}$ .

Frogs also contributed to the measured LA90.

A bird was also noted.

### 5.1.2 N13, 19 May 2016



WCP was inaudible during the measurement.

Frogs were generally responsible for measured levels.

Cows, bats and a bird were also noted.

### 5.1.3 N14, 18 May 2016



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

A low-level exhaust continuum from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of less than 20 dB. Surges in engine noise generated the  $L_{A1,1minute}$  of 23 dB.

Frogs were primarily responsible for measured levels. Activities at WCP and a local substation continuum also contributed to measured levels.

### 5.1.4 N15, 18 May 2016



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 a site only  $L_{Aeq}$  of 20 dB. A surge in engine noise generated the  $L_{A1,1minute}$  of 30 dB.

WCP was primarily responsible for measured levels. Birds and dogs also contributed to the measured  $L_{\rm A1}$  and  $L_{\rm Aeq}.$ 

### 5.1.5 N16, 19 May 2016



A continuum from WCP generated a site only  $L_{Aeq}$  of 25 dB. A surge in engine noise generated the  $L_{A1,1minute}$  of 31 dB.

WCP was primarily responsible for measured levels. Dogs also contributed to the measured LA1.

Kangaroos and sheep were also noted.

### 5.1.6 N17, 18 May 2016



An engine and exhaust continuum from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of 26 dB. Impact noise generated an  $L_{A1,1minute}$  of 39 dB.

WCP was responsible for generating all measured levels.

A train horn was also noted.

### 5.1.7 N18, 18 May 2016



WCP was inaudible during the measurement.

An aircraft generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs were primarily responsible for the  $L_{A90}$ .

Birds were also noted.

## 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 18/19 May 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the May 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the May 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table 1: Land subject to acquisition upon request

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day Evening		Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

 Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.
### A.2 Environmental Protection Licence

#### 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	35	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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

### 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

### 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4, Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence	N6	Attended	777299.	6415716.9	Location based on the nearest non-mine
O'Toole Church		Noise	9		owned residence to the West of the Mine
Coonaroo	N13	Attended	763758.	6413471.9	Location based on the nearest non-mine
		Noise	9		owned residence to the West of the Mine
Tichular	N14	Attended	778791.	6408624.7	Location based on the nearest non-mine
		Noise	9		owned residence to the South of the Mine
Wollar Village	N15	Attended	777452.	6416158.9	Location based on the nearest non-mine
		Noise	0		owned residence to the South-East of the
					Mine
Araluen Rd	N16	Attended	778787.	6417418.7	Location based on the nearest non-mine
		Noise	4		owned residence to the East of the Mine
Mogo Rd	N17	Attended	780771.	6420641.0	Location based on the nearest non-mine
		Noise	0		owned residence to the North-East of the
					Mine
Barrigan	N18	Attended	780033.	6398618.1	DP&I Recommendation (MOD5) - Location
Valley <sup>2</sup>		Noise	3		approximately 20 km to the south of the Mine
WCPL Rail		Meteorolog	770630.	6418085.1	Location based on consideration of prevailing
Loop		у&	9		meteorological conditions
		Inversion			
Wollar		Real-Time	777608.	6415996.8	Location based on the nearest non-mine
Village		Noise -	9		owned residence to the South-East of the
		Fixed			Mine
Araluen Rd		Real-Time	778856.	6417401.3	Location based on the nearest non-mine
		Noise -	4		owned residence to the East of the Mine
		Fixed			

Table 4: Noise	Related	Monitoring	Locations
	it citie co	1. IOI III OI III S	Locations

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4:

 MGA94, Zone 55
 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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

 The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

#### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

#### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

### Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

#### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- · Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	ACOUSTIC Research Labs Pty Ltd Soun	Level 7 Pennan Ph: +61 www. d Level C 61672-3	Building 2 423 F t Hills NSW AU 2 9484 0800 A.B. acousticresea Meter .2006	'ennant Hills Rd JSTRALIA 2120 N. 65 160 399 119 arch.com.au	
	Calibra	tion C	ertificate		
	Calibration Numb	per C152	226		
	Client Deta	ils Global 12/16 Thornt	Acoustics Pty Ltd Huntingdale Drive on NSW 2322		
Equipm P	ent Tested/ Model Numbe Instrument Serial Numbe Microphone Serial Numbe re-amplifier Serial Numbe	er: Rion N er: 007014 er: 01916 er: 01463	A-28 124		
Pre-Test Atn	nospheric Conditions		Post-Test Atm	ospheric Conditions	6°C
Relative H Barometric	Iumidity: 55.7% Pressure: 99.62kPa		Rela	tive Humidity : 53° etric Pressure : 99.	% .82kPa
Calibration Techni Calibration	cian : Dennis Kim Date : 22/05/2015		Secondary Check Report Issue Date	<ul> <li>Sandra Minto</li> <li>25/05/2015</li> </ul>	
	Approved Signator	y: das	D	Ke	en Willia
Clause and Characte	eristic Tested	Result	Clause and Charac	cteristic Tested	Res
<ul><li>10: Self-generated noise</li><li>11: Acoustical tests of a</li><li>12: Electrical tests of free</li><li>13: Frequency and time</li></ul>	frequency weighting quency weightings weightings at 1 kHz	Pass 1 Pass 1 Pass 1 Pass 1 1	4: Level linearity on t 5: Level linearity incl 6: Toneburst response 7: Peak C sound level 8: Overload Indication	he reference level range . the level range control e n	Pa. Pa. Pa. Pa. Pa.
The sound level meter sub	nitted for testing has successfully conditions under	completed the c er which the tes	lass 1 periodic tests of II ts were performed.	EC 61672-3:2006, for the e	environmer
As public evidence was a performed in accordance w IEC 61672-1:200	vailable, from an independent testi vith IEC 61672-2:2003, to demons 2, the sound level meter submitted	ing organisation trate that the me for testing con	responsible for approvi odel of sound level meter forms to the class 1 requi	ng the results of pattern eva r fully conformed to the rec irements of IEC 61672-1:20	aluation tes quirements 002.
Acoustic Tests	Least Uno	certainties of M Environ	easurement - nental Conditions		11.1.11
31.5 Hz to 8kHz	$\pm 0.120 dB$ $\pm 0.165 dB$	Ten	perature ative Humidity	$\pm 0.3^{\circ}C$ +4.1%	
12.5KHz 16kHz	$\pm 0.245 dB$	Bar	cometric Pressure	$\pm 0.1 kPa$	
Electrical Tests 31.5 Hz to 20 kHz	±0.121dB				
	All uncertainties are derived at th	he 95% confider	nce level with a coverage	e factor of 2.	
	This calibration certificate is to b	e read in conjur	action with the calibratio	n test report.	10000000000000000000000000000000000000
NATA	Acoustic Research Labs Pty Ltd i Accredited for compliance with I	is NATA Accre SO/IEC 17025.	dited Laboratory Numbe	er 14172.	
	The results of the tests, calibratio	ns and/or meas	rements included in this	s document are traceable to	

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 Page 38

6	Acou Resea Labs	stic Pen Pen Ph:- Ph:- Ny Ltd WW	el 7 Building 2 423 nant Hills NSW A 61 2 9484 0800 A.B w.acousticrese alibrator	Pennant Hills USTRALIA 21 .N. 65 160 399 1 arch.com.au	Rd 20 19 J
	Cali	IEC 609	42-2004 Certificat	9	
	Calibratio	n Number C	15325		
	Cli	ent Details Gl 12 Th	obal Acoustics Pty Ltd /16 Huntingdale Drive IORNTON NSW 232	22	
Equipr	nent Tested/ Model Instrument Serial	Number: Pu Number: 74	lsar Model 106 813		
		Atmospheric	· Conditions		
	Ambient Tem Relative l Barometric	perature : 21 Humidity : 44 Pressure : 10	.9°C % 0.6kPa		
Calibration Techn Calibration	ician : Dennis Kin Date : 08/07/201	n 5	Secondary Chee Report Issue Dat	ek: Sandra Mint e: 13/07/2015	0
Clause and Charac	Approved S	Result	Clause and Chara	acteristic Tested	Result
5.2.3: Short Term Fluct	tuation	Pass	5.5: Total Distortion		Pass
The sound calibrator has the sound pressur	been shown to conform to e level(s) and frequency(i	the class 2 requiremes) stated, for the en	ients for periodic testing, des vironmental conditions unde	scribed in Annex B of r which the tests were	IEC 60942:2004 for performed
The sound calibrator has the sound pressur	been shown to conform to e level(s) and frequency(i	o the class 2 requirem es) stated, for the en Least Uncertainties En	ients for periodic testing, de vironmental conditions unde of Measurement - vironmental Conditions	scribed in Annex B of r which the tests were	IEC 60942:2004 for performed
The sound calibrator has the sound pressure specific Tests <i>Generated SPL</i> <i>Short Term Fluct.</i> <i>Frequency</i> <i>Distortion</i>	been shown to conform to e level(s) and frequency(i $\pm 0.09 dB$ $\pm 0.02 dB$ $\pm 0.01\%$ $\pm 0.26\%$	the class 2 requiren es) stated, for the en Least Uncertainties En	of Measurement - vironmental conditions under of Measurement - vironmental Conditions Temperature Relative Humidity Barometric Pressure	scribed in Annex B of r which the tests were $\pm 0.3 ^{\circ}C$ $\pm 4.1\%$ $\pm 0.1 kPa$	IEC 60942:2004 for performed
The sound calibrator has the sound pressur Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	been shown to conform to e level(s) and frequency(i ±0.09dB ±0.02dB ±0.01% ±0.26% All uncertainties are d	the class 2 requiren es) stated, for the en Least Uncertainties En	ents for periodic testing, de vironmental conditions unde of Measurement - vironmental Conditions Temperature Relative Humidity Barometric Pressure nfidence level with a covera	scribed in Annex B of r which the tests were $\pm 0.3 ^{\circ}C$ $\pm 4.1\%$ $\pm 0.1kPa$ ge factor of 2.	IEC 60942:2004 for performed
The sound calibrator has the sound pressur	been shown to conform to e level(s) and frequency(i ±0.09dB ±0.02dB ±0.01% ±0.26% All uncertainties are d	the class 2 requirem es) stated, for the en Least Uncertainties En erived at the 95% co	ents for periodic testing, de vironmental conditions unde of Measurement - vironmental Conditions Temperature Relative Humidity Barometric Pressure nfidence level with a covera	scribed in Annex B of r which the tests were $\pm 0.3 ^{\circ}C$ $\pm 4.1\%$ $\pm 0.1 kPa$ ge factor of 2.	IEC 60942:2004 for performed
The sound calibrator has the sound pressur	been shown to conform to e level(s) and frequency(i ±0.09dB ±0.02dB ±0.01% ±0.26% All uncertainties are d This calibration certifi Acoustic Research Lal Accredited for compli	the class 2 requirem es) stated, for the en Least Uncertainties En erived at the 95% co cate is to be read in o os Pty Ltd is NATA ance with ISO/IEC 1	ents for periodic testing, de vironmental conditions unde of Measurement - vironmental Conditions <i>Temperature Relative Humidity Barometric Pressure</i> <i>nfidence level with a covera</i> <i>nfidence level with a covera</i> conjunction with the calibrat	scribed in Annex B of r which the tests were $\pm 0.3 ^{\circ}C$ $\pm 4.1\%$ $\pm 0.1kPa$ ge factor of 2.	IEC 60942:2004 for performed

# Wilpinjong Coal

Environmental Noise Monitoring June 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

# Wilpinjong Coal

Environmental Noise Monitoring June 2016

Reference: 16187\_R01 Report date: 30 June 2016

**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: Joel Curran Chemical Engineer (Acoustics)

QA Review: Jeremy Welbourne Civil Engineer (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 22/23 June 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the June 2016 monitoring.

#### Low Frequency Assessment

During the June 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	8
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 22 June 2016	
5.1.2 N13, 23 June 2016	20
5.1.3 N14, 23 June 2016	21
5.1.4 N15, 22 June 2016	22

	5.1.5 N16, 22 June 2016	23
	5.1.6 N17, 18 June 2016	24
	5.1.7 N18, 23 June 2016	25
6 SU	MMARY OF COMPLIANCE	26
<b>6 SU</b> 6	1 Operational Noise Assessment	<b>26</b> 26
<b>6 SU</b> 6	1 Operational Noise Assessment	26 26 26

# **Appendices**

A STATUTORY REQUIREMENTS	27
B CALIBRATION CERTIFICATES	37

# 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 seven locations during the night of 22/23 June 2016. Figure 1 shows the regular monitoring locations.

The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### **Figure 1: Attended Noise Monitoring Locations**

### 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
$L_{A}$	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
LA90	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
LAmin	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the project approval are reproduced in Appendix A.

### 2.2 Environment Protection Licence

The Environment Protection License (EPL) (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

### 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq</sub> ,15minute / L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT APPROVAL CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b)* temperature inversion conditions between 1.5<sup>°</sup>C and 3<sup>°</sup>C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

### 2.5 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 EPL associated with Wilpinjong Coal Project.

#### Table 2.2: WILPINJONG COAL EPL CRITERIA, dB

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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 of 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.

### 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with the EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the INP:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the INP:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a practice note is not yet available, low frequency noise results from WCP have been compared to both assessment methods presented above above, when considering applicability of low frequency modifying factor corrections.

# 3 METHODOLOGY

### 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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 Joel Curran.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

# 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 A.

### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	29/05/2017
Larson Davis 150 acoustic calibrator	3333	06/08/2017

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	22/06/2016 23:50	40	28	26	25	25	23	21	45
N13	23/06/2016 00:34	41	38	35	33	33	30	27	43
N14	23/06/2016 00:21	51	30	27	24	25	22	20	45
N15	22/06/2016 23:21	40	34	32	30	31	28	27	48
N16	22/06/2016 22:53	46	32	29	26	27	24	20	51
N17	22/06/2016 22:20	44	32	30	27	28	24	20	47
N18	23/06/2016 01:00	39	27	24	22	23	22	21	36

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – JUNE 2016<sup>1</sup>

Note:

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

### 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during June 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – JUNE 2016

Conditions	Total for June 2016
Number of measurements	7
Number of measurements where met applied (in accordance with project approval)	7
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency noise source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

### 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JUNE 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	22/06/2016 23:50	0.6	0.8	35	Yes	21	Nil
N13	23/06/2016 00:34	0.0	0.2	36	Yes	IA	Nil
N14	23/06/2016 00:21	0.0	0.2	35	Yes	22	Nil
N15	22/06/2016 23:21	0.0	1.0	35	Yes	28	Nil
N16	22/06/2016 22:53	0.7	1.2	37	Yes	27	Nil
N17	22/06/2016 22:20	0.0	0.0	35	Yes	28	Nil
N18	23/06/2016 01:00	0.9	0.4	35	Yes	NM	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	22/06/2016 23:50	0.6	0.8	45	Yes	26	Nil
N13	23/06/2016 00:34	0.0	0.2	45	Yes	IA	Nil
N14	23/06/2016 00:21	0.0	0.2	45	Yes	25	Nil
N15	22/06/2016 23:21	0.0	1.0	45	Yes	34	Nil
N16	22/06/2016 22:53	0.7	1.2	45	Yes	33	Nil
N17	22/06/2016 22:20	0.0	0.0	45	Yes	32	Nil
N18	23/06/2016 01:00	0.9	0.4	45	Yes	NM	Nil

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JUNE 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

### 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP <sup>L</sup> Aeq,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	22/06/2016 23:50	0.6	0.8	35	Yes	21	Nil
N13	23/06/2016 00:34	0.0	0.2	35	Yes	IA	Nil
N14	23/06/2016 00:21	0.0	0.2	35	Yes	22	Nil
N15	22/06/2016 23:21	0.0	1.0	35	Yes	28	Nil
N16	22/06/2016 22:53	0.7	1.2	35	Yes	27	Nil
N17	22/06/2016 22:20	0.0	0.0	35	Yes	28	Nil
N18	23/06/2016 01:00	0.9	0.4	35	Yes	NM	Nil

#### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JUNE 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	22/06/2016 23:50	0.6	0.8	45	Yes	26	Nil
N13	23/06/2016 00:34	0.0	0.2	45	Yes	IA	Nil
N14	23/06/2016 00:21	0.0	0.2	45	Yes	25	Nil
N15	22/06/2016 23:21	0.0	1.0	45	Yes	34	Nil
N16	22/06/2016 22:53	0.7	1.2	45	Yes	33	Nil
N17	22/06/2016 22:20	0.0	0.0	45	Yes	32	Nil
N18	23/06/2016 01:00	0.9	0.4	45	Yes	NM	Nil

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JUNE 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

### 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	22/06/2016 23:50	8	0.4	270	8
N13	23/06/2016 00:34	8	0.5	130	8
N14	23/06/2016 00:21	6	0.6	120	8
N15	22/06/2016 23:21	9	0.0	-	8
N16	22/06/2016 22:53	10	0.0	-	8
N17	22/06/2016 22:20	10	0.0	-	8
N18	23/06/2016 01:00	9	0.0	-	8

#### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JUNE 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
22/06/2016 22:00	0.9	349	0.8
22/06/2016 22:15	0.0	-	0.4
22/06/2016 22:30	0.0	-	0
22/06/2016 22:45	0.0	-	0.8
22/06/2016 23:00	0.0	-	1.2
22/06/2016 23:15	0.7	224	1.2
22/06/2016 23:30	0.0	-	1
22/06/2016 23:45	0.7	18	1.4
23/06/2016 00:00	0.6	51	0.8
23/06/2016 00:15	0.0	-	0.6
23/06/2016 00:30	0.0	-	0.2
23/06/2016 00:45	0.0	-	0.2
23/06/2016 01:00	0.7	345	0.2
23/06/2016 01:15	0.9	275	0.4
23/06/2016 01:30	0.0	-	0.4
23/06/2016 01:45	0.7	322	0.8
23/06/2016 02:00	0.0	-	1.4

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm; and

3. Lapse rate sourced from the 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 22 June 2016



A low-level exhaust and engine/fan continuum from WCP generated a site only  $L_{Aeq}$  of 21 dB. A surge in exhaust noise generated the  $L_{A1,1minute}$  of 26 dB.

WCP combined with insects and frogs to generate all measured levels.

### 5.1.2 N13, 23 June 2016



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

WCP was inaudible during the measurement.

Insects and frogs were responsible for measured levels. Continuum from another mine was just perceptible on occasion.

Breeze in foliage and an aircraft were also noted.

### 5.1.3 N14, 23 June 2016



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

A low-level exhaust continuum from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of 22 dB. Impact noise generated the  $L_{A1,1minute}$  of 25 dB.

WCP combined with insects and frogs to generate all measured levels.

### 5.1.4 N15, 22 June 2016



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

WCP was audible for an exhaust and engine/fan continuum during the measurement, generating a site only  $L_{Aeq}$  of 28 dB. A surge in exhaust noise generated the  $L_{A1,1minute}$  of 34 dB.

WCP combined with insects and frogs to generate all measured levels.
### 5.1.5 N16, 22 June 2016



WCP was audible for an exhaust and engine fan continuum, along with low level dozer track noise, generating a site only  $L_{Aeq}$  of 27 dB. A surge in exhaust noise generated the  $L_{A1,1minute}$  of 33 dB.

WCP was primarily responsible for measured levels. Insects and frogs were a minor contributor to measured  $L_{\mbox{\rm A90}}.$ 

Birds were also noted.

### 5.1.6 N17, 18 June 2016



WCP was audible for an exhaust and engine/fan continuum, generating a site only  $L_{Aeq}$  of 28 dB. A surge in engine noise generated an  $L_{A1,1minute}$  of 32 dB.

WCP was responsible for all measured levels.

Insects, frogs and birds were also noted.

### 5.1.7 N18, 23 June 2016



WCP was audible for a low level continuum; these levels were not measurable.

Insects and frogs generated all measured levels.

Ducks were also noted.

## 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 22/23 June 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

### 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the June 2016 monitoring period.

### 6.2 Low Frequency Assessment

During the June 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

Table 1: Land subject to acquisition upon request

30 – Gaffney

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

### NOISE

#### Noise Criteria

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Nig	ght	
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub> L <sub>Aeq(15 minute)</sub>		L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

 Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

### A.2 Environmental Protection Licence

#### 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	35	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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

### 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

### 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence	N6	Attended	777299.	6415716.9	Location based on the nearest non-mine
O'Toole Church		Noise	9		owned residence to the West of the Mine
Coonaroo	N13	Attended	763758.	6413471.9	Location based on the nearest non-mine
		Noise	9		owned residence to the West of the Mine
Tichular	N14	Attended	778791.	6408624.7	Location based on the nearest non-mine
		Noise	9		owned residence to the South of the Mine
Wollar Village	N15	Attended	777452.	6416158.9	Location based on the nearest non-mine
		Noise	0		owned residence to the South-East of the
					Mine
Araluen Rd	N16	Attended	778787.	6417418.7	Location based on the nearest non-mine
		Noise	4		owned residence to the East of the Mine
Mogo Rd	N17	Attended	780771.	6420641.0	Location based on the nearest non-mine
		Noise	0		owned residence to the North-East of the
					Mine
Barrigan	N18	Attended	780033.	6398618.1	DP&I Recommendation (MOD5) - Location
Valley <sup>2</sup>		Noise	3		approximately 20 km to the south of the Mine
WCPL Rail		Meteorolog	770630.	6418085.1	Location based on consideration of prevailing
Loop		у&	9		meteorological conditions
		Inversion			
Wollar		Real-Time	777608.	6415996.8	Location based on the nearest non-mine
Village		Noise -	9		owned residence to the South-East of the
		Fixed			Mine
Araluen Rd		Real-Time	778856.	6417401.3	Location based on the nearest non-mine
		Noise -	4		owned residence to the East of the Mine
		Fixed			

Table 4: Noise	Related	Monitoring	Locations
	it citie co	1. IOI III OI III S	Locations

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4: 1. MGA94, Zone 55

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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

 The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

#### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

#### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

### Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

## APPENDIX

## **B** CALIBRATION CERTIFICATES

<text><text><text><text><text><text><text><text></text></text></text></text></text></text></text></text>	6	Research Labs Pty Ltd	Pennant Hills NSW AU Ph: +61 2 9484 0800 A.B.I www.acousticresea	JSTRALIA 2120 N. 65 160 399 119 Irch.com.au	
Calibration Certificate         Autor of Number         Client Details       Global Acoustics Pty Ltd 12/16 Huntingdale Drive THORNTON NSW 2322         Equipment Tested/ Model Number:       Roin NA-28 Microphone Serial Number:         Microphone Serial Number:       00370304 Microphone Serial Number:         Microphone Serial Number:       28050 Pre-amplifier Temperature:         Barometric Pressure:       29-08 Microphone Serial Number:         Barometric Pressure:       90-90-90         Calibration Technician:       Dennis Kim 2905/2015         Barometric Pressure:       90-90-90         Calibration Date:       29/05/2015         Approved Signatory:       Went Willia         Tures and Characteristic Tested       Result         Ads 5.3: 1/3 Octave relative attenuation       Pass       4.8.6.5.7: Anti-alias filters       Pass         Add 5.3: 1/3 Octave relative attenuation       Pass       4.8.6.5.7: Anti-alias filters       Pass         Add 5.3: 1/3 Octave relative attenuation       Pass       4.8.6.5.7: Anti-alias filters       Pass         Add 5.3: 1/3 Octave relative attenuation       Pass       4.8.6.5.7: Anti-alias filters       4.9.7C         Microphysic       0.0050       Measurement - Environmental Conditions       4.9.7C         Microphysi       0.0050       Measu		AS	4476:1997		
Calibration Number       C15250A         Client Details       Global Acoustics Pty Ltd 12/16 Huntingdale Drive THORNTON NSW 2322         Equipment Tested/ Model Number:       00370304         Microphone Serial Number:       00370304         Microphone Serial Number:       60313         Atmospheric Conditions       Ambient Temperature:         Relative Humidity:       55.1%         Barometric Pressure:       99.9kPa         Calibration Technician:       Dennis Kim         Calibration Technician:       Dennis Kim         Calibration Technician:       Dennis Kim         Calibration Technician:       Dennis Kim         Calibration Vacuum Proved Signatory:       Ken Willia         Tause and Characteristic Tested       Result         Clause and Characteristic Tested       Result         Clause and Characteristic Tested       Result         A & 5.3: 1/3 Octave relative attenuation       Pass         4.4 & 5.3: 1/3 Octave relative attenuation       Pass         4.6 & 5.9: Flat frequency response       Pass         4.10 & S.9: Glat Signatory:       Least Uncertainties of Measurement -         Iontic-10001;       #0.0804B       Barometric Pressure: #0.18Pa         100015-10014:       #0.0804B       Barometric Pressure: #0.18Pa		Calibrati	on Certificate		
Client Details Global Acoustics Pry Ltd 12/16 Huntingdale Drive THORNTON NSW 2322 Equipment Tested/ Model Number : Rion NA-28 Instrument Serial Number : 00370304 Microphone Serial Number : 480505 Pre-amplifier Serial Number : 60313 Atmospheric Conditions Ambient Temperature : 22°C Relative Huntidity : 55.1% Barometric Pressure : 99.9kPa Calibration Technician : Dennis Kim Calibration Date : 29/05/2015 Harrow 4.5.5: Lincar Operating range Pass 4.8 5.5: Lincar Operating range Pass 4.8 5.5: Lincar Operating range Pass 4.10 & 5.9: Flat frequency response Pass 5.1015 Distribution : 0.0528 Relative Humidity 4.1% Barometric Pressure 4.0.18/28 All uncertainties are derived at the 95% confidence level with a coverage factor of 2. All uncertainties are derived at the 95% confidence level with a coverage factor of 2. Acoustic Research Labs Phy Lid is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.		Calibration Number	C15250A		
Equipment Tested/ Model Number : Rion NA-28 Instrument Serial Number : 00370304 Microphone Serial Number : 60313         Atmospheric Conditions Ambient Temperature : 22°C Relative Humidity : 55.1% Barometric Pressure : 99.9kPa         Calibration Technician : Dennis Kim Calibration Date : 29/05/2015 Approved Signatory : Work Science and Characteristic Tested Result         Calibration Technician : Dennis Kim Calibration Date : 29/05/2015 Approved Signatory : Work Science and Characteristic Tested Result       Result         Clause and Characteristic Tested Result       Result         Adv & 5.3: 1/3 Octave relative attenuation Pass       4.8 & 5.7: Anticalias filters Pas         4.10 & 5.9: Flat frequency response         Pas         Least Uncertainties of Measurement - Environmental Conditions         Interview attenuation Pass       4.8 & 5.7: Anticalias filters Pas         10/3/2         Attent Uncertainties of Measurement - Environmental Conditions         Interview attenuation         10/3/2         <		Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive THORNTON NSW 2322		
Atmospheric Conditions         Ambient Temperature :       22°C         Relative Humidity :       55.1%         Barometric Pressure :       99.9kPa         Calibration Technician :       Dennis Kim       Secondary Check:       Sandra Minto         Calibration Date :       29/05/2015       Report Issue Date :       01/06/2015         Approved Signatory :       Ken Willia       Image and Characteristic Tested       Result       Clause and Characteristic Tested       Result         Clause and Characteristic Tested       Result       Clause and Characteristic Tested       Result       Clause and Characteristic Tested       Result         Clause and Characteristic Tested       Result       Clause and Characteristic Tested       Result         Least Uncertainties of Measurement -       Environmental Conditions       20.3°C         4.6 & 5.9: Flat frequency response       Pas         4.10 & 5.9: Flat frequency response       Pas         2.10011:       20.182dB       Relative Humidity       ±4.1%         Ionon-1.1011:       ±0.182dB       Relative Humidity       ±4.1%         Ionon-1.1021:       ±0.182dB       Relative Humidity       ±4.1%         Ionon-1.1021:       ±0.182dB       Relative Humidity       ±4.1%         Ionon-1.1021:<	Equip	ment Tested/ Model Number : Instrument Serial Number : Microphone Serial Number : Pre-amplifier Serial Number :	Rion NA-28 00370304 480505 60313		
Calibration Technician ::       Dennis Kim 29/05/2015       Secondary Check:       Sandra Minto Report Issue Date ::       01/06/2015         Approved Signatory ::       Image: Composition of the second of th		Atmospl Ambient Temperature : Relative Humidity : Barometric Pressure :	eric Conditions 22°C 55.1% 99.9kPa		
Hause and Characteristic Tested       Result       Clause and Characteristic Tested       Result         4 & 5.3: 1/1 Octave relative attenuation       Pass       4.6 & 5.5: Linear operating range       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.6 & 5.5: Linear operating range       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.6 & 5.5: Linear operating range       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 0 & 5.9: Flat frequency response       Pass       4.10 & 5.9: Flat frequency response       Pass         16Hz       ±0.182dB       Temperature       ±0.3°C       16Hz       10.05dB       Relative Humidity       ±4.1%         1000Hz-100Hz       ±0.05dB       Relative Humidity       ±4.1%       18Pa       1000Hz       100Hz       10.1kPa         1000Hz       ±0.66dB       Barometric Pressure       ±0.1kPa       10.1kPa       10.1kPa         210kHz       ±0.119dB       All uncertainties are derived at the 95% confidence level with a coverage factor of 2. <td>Calibration Techr Calibration</td> <td>ician : Dennis Kim Date : 29/05/2015 Approved Signatory :</td> <td>Secondary Check Report Issue Date</td> <td>: Sandra Minto : 01/06/2015 Ken</td> <td>Williams</td>	Calibration Techr Calibration	ician : Dennis Kim Date : 29/05/2015 Approved Signatory :	Secondary Check Report Issue Date	: Sandra Minto : 01/06/2015 Ken	Williams
4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 5.3: 1/3 Octave relative attenuation       Pass       4.8 & 5.7: Anti-alias filters       Pass         4 & 0.182       ± 0.182B       Temperature       ± 0.3 % C       100Hz-100Hz       ± 0.18Pa         1000Hz-100Hz       ± 0.105dB       Barometric Pressure       ± 0.1kPa       0.1kPa         1000Hz-10kHz       ± 0.104B       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	Clause and Charac	teristic Tested Re	sult Clause and Charact	teristic Tested	Result
Least Uncertainties of Measurement - Environmental Conditions         < 16Hz	4.4 & 5.3: 1/3 Octave	relative attenuation Pa	4.8 & 5.7: Anti-alias fil 4.10 & 5.9: Flat frequer	ters ney response	Pass Pass
lectrical Tests       Environmental Conditions         < 16Hz		Least Uncerta	inties of Measurement -		
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.	Electrical Tests < 16Hz 16Hz - 100Hz 100Hz-1000Hz 1000Hz-10kHz > 10kHz	±0.182dB ±0.105dB ±0.089dB ±0.166dB ±0.119dB	Environmental Conditions Temperature Relative Humidity Barometric Pressure	±0.3°C ±4.1% ±0.1kPa	*
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.		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.					
Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172. Accredited for compliance with ISO/IEC 17025.	~	This calibration certificate is to be rea	d in conjunction with the calibration	n test report.	
	NATA	Acoustic Research Labs Pty Ltd is N/ Accredited for compliance with ISO/I	TA Accredited Laboratory Numbe EC 17025.	r 14172.	
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.	NORLD RECOGNISED	The results of the tests, calibrations ar Australian/National standards.	id/or measurements included in this	document are traceable to	

6	Acoustic Research Labs Pty Ltd Sound IEC	Level 7 Building 2 423 Po Pennant Hills NSW AU Ph: +61 2 9484 0800 A.B.N www.acousticresea Calibrator 60942-2004	ennant Hills R STRALIA 2120 I. 65 160 399 11 rch.com.au	d o 9
	Calibratio	on Certificate		
	Calibration Number	C15396		
	Client Details	12/16 Huntingdale Drive Thornton NSW 2322		
Equipn	nent Tested/ Model Number : Instrument Serial Number :	Larson Davis CAL150 3333		
	Atmosph	neric Conditions		
	Ambient Temperature : Relative Humidity : Barometric Pressure :	23.1% 30.1% 99.51kPa		
Calibration Techni Calibration	ician : Dennis Kim Date : 06/08/2015	Secondary Check: Report Issue Date :	Kate Alchin 07/08/2015	
Clause and Charact	Approved Signatory :	sult Clause and Charact	eristic Tested	Juan Aguero Result
5.2.2: Generated Sound	Pressre Level Pe	255 5.3.2: Frequency General	ated	Pass
The sound calibrator has b the sound pressure Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	een shown to conform to the class 2 req level(s) and frequency(ies) stated, for the Least Uncerta ±0.09dB ±0.02dB ±0.01% ±0.26% All uncertainties are derived at the 95	uirement's for periodic testing, descri he environmental conditions under w inties of Measurement - Environmental Conditions Temperature Relative Humidity Barometric Pressure % confidence level with a coverage,	bed in Annex B of IE hich the tests were p $\pm 0.3^{\circ}C$ $\pm 4.1\%$ $\pm 0.1kPa$ factor of 2.	C 60942:2004 for erformed
~	This calibration certificate is to be rea Acoustic Research Labs Pty Ltd is NA Accredited for compliance with ISO/I	d in conjunction with the calibration ATA Accredited Laboratory Number EC 17025.	test report. 14172. document are traceab	le to

# Wilpinjong Coal

Environmental Noise Monitoring July 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

## Wilpinjong Coal

Environmental Noise Monitoring July 2016

Reference: 16230\_R01 Report date: 12 August 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

Amaciejouski

Prepared:

Ronni Maciejowski Acoustics Technician

Kheekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 14/15 July 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the July 2016 monitoring.

#### Low Frequency Assessment

During the July 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

## Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	8
3.2 Attended Noise Monitoring	9
4 RESULTS	10
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	10
4.3 Project Approval and Weather Conditions	
4.4 EPL and Weather Conditions	13
4.5 Atmospheric Conditions	15
5 DISCUSSION	
5.1 Noted Noise Sources	
5.1.1 N6, 14 July 2016	
5.1.2 N13, 15 July 2016	20
5.1.3 N14, 14 July 2016	21
5.1.4 N15, 14 July 2016	

	5.1.5 N16, 15 July 2016	23
	5.1.6 N17, 15 July 2016	24
	5.1.7 N18, 14 July 2016	25
6 SU	MMARY OF COMPLIANCE	26
<b>6 SU</b> 6	MMARY OF COMPLIANCE	<b>26</b> 26
<b>6 SU</b> 6 6	MMARY OF COMPLIANCE	<b>26</b> 26 26

## **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	37

## 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 seven locations during the night of 14/15 July 2016. Figure 1 shows the regular monitoring locations.

The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

### Table 1.1: ATTENDED NOISE MONITORING LOCATIONS



#### Figure 1: Attended Noise Monitoring Locations

### 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the project approval are reproduced in Appendix A.

### 2.2 Environment Protection Licence

The Environment Protection License (EPL) (No. 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

### 2.3 Noise Monitoring Program

The draft noise monitoring program (NMP) for WCP was prepared in March 2014 in response to the February 2014 modification to the project approval. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq,</sub> 15minute	Evening L <sub>Aeq,</sub> 15minute	Night L <sub>Aeq,15</sub> minute / L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT APPROVAL CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b)* temperature inversion conditions between 1.5<sup>°</sup>C and 3<sup>°</sup>C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

### 2.5 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 EPL associated with Wilpinjong Coal Project.

Table 2.2:	WILPINJONG	COAL EPL	CRITERIA, dB
------------	------------	----------	--------------

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq,15</sub> minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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 of 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<sup>°</sup>C per 100 metres.

### 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with the EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the INP:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the INP:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considering when applying low frequency modifying factor corrections.

## 3 METHODOLOGY

### 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

### 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 A.

### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	28/06/2018
Rion NA-28 sound level analyser	00701424	22/05/2017
Pulsar 106 acoustic calibrator	57413	23/12/2017
Pulsar 106 acoustic calibrator	74813	25/07/2018

## 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	14/07/2016 23:08	53	48	40	27	36	24	22	40
N13	15/07/2016 00:49	32	26	19	16	18	15	14	28
N14	14/07/2016 22:36	49	34	24	21	24	19	18	32
N15	14/07/2016 23:32	49	43	37	25	33	22	21	35
N16	15/07/2016 00:39	60	58	51	27	46	21	19	57
N17	15/07/2016 00:04	47	29	24	22	23	20	18	42
N18	14/07/2016 22:00	45	27	23	21	22	20	19	31

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – JULY 2016<sup>1</sup>

Note:

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

### 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during July 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – JULY 2016

Conditions	Total for July 2016
Number of measurements	7
Number of measurements where met applied (in accordance with project approval)	5
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency noise source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

### 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

#### Location Start Date and VTG WCP Exceedance <sup>6</sup> Wind Criterion Criterion Applies? <sup>2,3</sup> Time Speed °C per dB LAeq,15min m/s<sup>1,2</sup> 100m<sup>1,2</sup> dB 4,5 N6 14/07/2016 23:08 2.2 No IA NA 2.6 35 N13 15/07/2016 00:49 -0.2 IA Nil 1.7 36 Yes N14 14/07/2016 22:36 2.2 2.4 35 No IA NA N15 14/07/2016 23:32 1.7 1.6 35 Yes IA Nil N16 15/07/2016 00:39 0.2 37 <20 Nil 2.1 Yes N17 15/07/2016 00:04 1.9 0.8 35 Yes <25 Nil N18 14/07/2016 22:00 2.6 35 Yes IA Nil 1.4

### Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JULY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	14/07/2016 23:08	2.6	2.2	45	No	IA	NA
N13	15/07/2016 00:49	1.7	-0.2	45	Yes	IA	Nil
N14	14/07/2016 22:36	2.2	2.4	45	No	IA	NA
N15	14/07/2016 23:32	1.7	1.6	45	Yes	IA	Nil
N16	15/07/2016 00:39	2.1	0.2	45	Yes	<25	Nil
N17	15/07/2016 00:04	1.9	0.8	45	Yes	26	Nil
N18	14/07/2016 22:00	1.4	2.6	45	Yes	IA	Nil

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – JULY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

### 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP <sup>L</sup> Aeq,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	14/07/2016 23:08	2.6	2.2	35	No	IA	NA
N13	15/07/2016 00:49	1.7	-0.2	35	Yes	IA	Nil
N14	14/07/2016 22:36	2.2	2.4	35	No	IA	NA
N15	14/07/2016 23:32	1.7	1.6	35	Yes	IA	Nil
N16	15/07/2016 00:39	2.1	0.2	35	No	<20	NA
N17	15/07/2016 00:04	1.9	0.8	35	Yes	<25	Nil
N18	14/07/2016 22:00	1.4	2.6	35	Yes	IA	Nil

#### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – JULY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB 4,5	Exceedance <sup>6</sup>
N6	14/07/2016 23:08	2.6	2.2	45	No	IA	NA
N13	15/07/2016 00:49	1.7	-0.2	45	Yes	IA	Nil
N14	14/07/2016 22:36	2.2	2.4	45	No	IA	NA
N15	14/07/2016 23:32	1.7	1.6	45	Yes	IA	Nil
N16	15/07/2016 00:39	2.1	0.2	45	No	<25	NA
N17	15/07/2016 00:04	1.9	0.8	45	Yes	26	Nil
N18	14/07/2016 22:00	1.4	2.6	45	Yes	IA	Nil

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – JULY 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to and including 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and
## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	14/07/2016 23:08	1.2	-	-	0
N13	15/07/2016 00:49	0.9	-	-	0
N14	14/07/2016 22:36	0.7	0.7	170	0
N15	14/07/2016 23:32	0.3	-	-	0
N16	15/07/2016 00:39	1.2	0.6	330	0
N17	15/07/2016 00:04	2.4	-	-	0
N18	14/07/2016 22:00	0.6	0.4	320	0

#### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – JULY 2016

Notes:

1. Wind speed and direction measured at 1.8 metres; and

2. "-" in wind direction column indicates that conditions were calm.

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
14/07/16 22:00	0.5	240	2.6
14/07/16 22:15	1.4	295	2.6
14/07/16 22:30	2.1	283	2.6
14/07/16 22:45	2.2	252	2.4
14/07/16 23:00	1.5	251	2.4
14/07/16 23:15	2.6	307	2.2
14/07/16 23:30	2.6	298	2.2
14/07/16 23:45	1.7	261	1.6
15/07/16 00:00	1.9	273	1.0
15/07/16 00:15	1.9	275	0.8
15/07/16 00:30	1.8	282	0.6
15/07/16 00:45	2.1	252	0.2
15/07/16 01:00	1.7	246	-0.2
15/07/16 01:15	2.0	267	0.2
15/07/16 01:30	0.2	70	1.0
15/07/16 01:45	0.4	319	1.4

Notes:

3. Data supplied by WCP;

4. "-" in wind direction column indicates that conditions were calm; and

5. Lapse rate sourced from the 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 LAeq,15minute and LA1,1minute (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 9 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, 14 July 2016



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

WCP was inaudible during the measurement.

Dogs generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs were responsible for the measured  $L_{A90}$ .

Distant road traffic tyre noise was also noted.

## 5.1.2 N13, 15 July 2016



WCP was inaudible during the measurement.

A bird and possum generated the L<sub>A1</sub>.

Frogs were also noted.

## 5.1.3 N14, 14 July 2016



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

WCP was inaudible during the measurement.

Dogs generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . A nearby substation continuum and insects generated the measured  $L_{A90}$ .

Birds, insects and frogs were also noted.

## 5.1.4 N15, 14 July 2016



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

WCP was inaudible during the measurement.

Dogs generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects generated the measured  $L_{A90}$ .

#### 5.1.5 N16, 15 July 2016



A low level continuum from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of less than 20 dB, and an  $L_{A1,1minute}$  of less than 25 dB.

A train was responsible for the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Insects and frogs generated the measured  $L_{A90}$ .

Dogs were also noted.

## 5.1.6 N17, 15 July 2016



A low-level continuum from WCP generated the site only  $L_{Aeq}$  of less than 25 dB. A surge in engine noise generated the  $L_{A1,1minute}$  of 26 dB.

Dogs were primarily responsible for the measured  $L_{A1}$ . The continuum from WCP contributed to the  $L_{A1}$  and was primarily responsible for the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

Insects were also noted.

## 5.1.7 N18, 14 July 2016



Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible during the measurement.

Frogs generated all measured levels.

A very low-level local continuum was also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 14/15 July 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the July 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the July 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table 1: Land subject to acquisition upon request

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Nig	ght	
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

 Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

## A.2 Environmental Protection Licence

#### 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	35	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:

The EPL (number 12425) for WCP was originally issued in February 2006 and has been the subject of subsequent variations, the most recent in October 2014.

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.
- R4.1 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 noise monitoring program for WCP dated March 2014 and the relevant sections are reproduced below.

## 6.0 NOISE MONITORING PROGRAM

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 3**. Unattended or real-time monitoring is primarily utilised as a proactive noise control system; providing noise alerts when predetermined noise levels are triggered.

## 6.1 Monitoring Locations

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 attended monitoring at seven locations (**Table 4, Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence	N6	Attended	777299.	6415716.9	Location based on the nearest non-mine
O'Toole Church		Noise	9		owned residence to the West of the Mine
Coonaroo	N13	Attended	763758.	6413471.9	Location based on the nearest non-mine
		Noise	9		owned residence to the West of the Mine
Tichular	N14	Attended	778791.	6408624.7	Location based on the nearest non-mine
		Noise	9		owned residence to the South of the Mine
Wollar Village	N15	Attended	777452.	6416158.9	Location based on the nearest non-mine
		Noise	0		owned residence to the South-East of the
					Mine
Araluen Rd	N16	Attended	778787.	6417418.7	Location based on the nearest non-mine
		Noise	4		owned residence to the East of the Mine
Mogo Rd	N17	Attended	780771.	6420641.0	Location based on the nearest non-mine
		Noise	0		owned residence to the North-East of the
					Mine
Barrigan	N18	Attended	780033.	6398618.1	DP&I Recommendation (MOD5) - Location
Valley <sup>2</sup>		Noise	3		approximately 20 km to the south of the Mine
WCPL Rail		Meteorolog	770630.	6418085.1	Location based on consideration of prevailing
Loop		у&	9		meteorological conditions
		Inversion			
Wollar		Real-Time	777608.	6415996.8	Location based on the nearest non-mine
Village		Noise -	9		owned residence to the South-East of the
		Fixed			Mine
Araluen Rd		Real-Time	778856.	6417401.3	Location based on the nearest non-mine
		Noise -	4		owned residence to the East of the Mine
		Fixed			

Table 4: Noise Related M	Ionitoring Locations
--------------------------	----------------------

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
Wandoona <sup>3</sup>		Real-Time	777684.	6414786.2	Location based on the nearest non-mine
		Noise -	4		owned residence to the South-East of the
		Mobile			Mine

Notes to Table 4:

MGA94, Zone 55

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&I and OEH of the results of this monitoring and advise if and when the monitoring at this location will be scaled back or discontinued.

The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 4** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&I and the EPA.

#### 6.3.3 Methodology

Attended noise monitoring will be undertaken one night per month by an independent acoustic consultant in accordance with the INP (EPA, 2000) and AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'. Routine 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 3**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- The noise consultant will immediately report both results to the WCPL Environmental and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&I and OEH within 24 hours.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

When determining the noise generated by the Mine, WCPL will monitor the modification factors in Section 4 of the INP (EPA, 2000).

#### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

#### 6.3.5 Evaluation of Compliance

Table 6 summarises the definition used by WCPL for the evaluation of compliance with statutory requirements. WCPL has developed a Compliance Review and Evaluation Process (Figure 5) that clearly illustrates when WCPL is deemed to have exceeded the Noise Criteria in Table 3.

Term	Definition
Exceedance	An exceedance is recorded when a second attended noise monitoring result, taken with 75 minutes of the first result and in accordance with the INP, exceeds the Noise Criteria in Table 3. The noise must be solely attributable to WCPL and meteorological conditions must be favourable (Figure 5). Reporting requirements for exceedances are detailed in Section 9.1.

## Table 6: Definition of an Exceedance

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 5.5°C/100 m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

#### 6.3.6 Response to Exceedance

Where any exceedance of the Noise Criteria and/or performance measures has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (refer Section 10.0),

to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

Calibration Number C16323 Client Details Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thorton NSW 2322 Equipment Tested/ Model Number : Rion NA-28 Instrument Serial Number : 08184 Pre-amplifier Serial Number : 52329	
Sound Level Meter IEC 61672-3.2006         Calibration Certificate         Calibration Certificate         Calibration Number         Client Details         Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thorton NSW 2322         Equipment Tested/ Model Number :         Nistrument Serial Number :       01070590         Microphone Serial Number :       08184         Pre-amplifier Serial Number :       52329	
Calibration Certificate Calibration Number C16323 Client Details Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thorton NSW 2322 Equipment Tested/ Model Number : Rion NA-28 Instrument Serial Number : 08184 Pre-amplifier Serial Number : 52329	2
Calibration Certificate         Calibration Number         Client Details         Global Acoustics Pty Ltd         12/16 Huntingdale Drive         Thorton NSW 2322         Equipment Tested/ Model Number :         Rion NA-28         Instrument Serial Number :       01070590         Microphone Serial Number :       08184         Pre-amplifier Serial Number :       52329	
Client Details       Global Acoustics Pty Ltd         12/16 Huntingdale Drive       Thorton NSW 2322         Equipment Tested/ Model Number :       Rion NA-28         Instrument Serial Number :       01070590         Microphone Serial Number :       08184         Pre-amplifier Serial Number :       52329	
Equipment Tested/ Model Number :       Rion NA-28         Instrument Serial Number :       01070590         Microphone Serial Number :       08184         Pre-amplifier Serial Number :       52329	
Equipment Tested/ Model Number : Rion NA-28 Instrument Serial Number : 01070590 Microphone Serial Number : 08184 Pre-amplifier Serial Number : 52329	
Pro-Test Atmospheric Conditions Post-Test Atmospheric Conditions	
Ambient Temperature :21.4°CAmbient Temperature :21.4°CRelative Humidity :37.5%Relative Humidity :37.5%Barometric Pressure :100.19kPaBarometric Pressure :100.23	c kPa
Calibration Technician : Calvin Secondary Check: Riley Cooper	14.00
Calibration Date : 28/06/2016 Report Jssue Date : 30/06/2016	
Approved Signatory : Ken W	Villiams
Clause and Characteristic Tested Result Clause and Characteristic Tested	Result
10: Self-generated noise       Pass       14: Level linearity on the reference level range         11: Acoustical tests of a frequency weighting       Pass       15: Level linearity incl. the level range control	Pass Pass
12: Electrical tests of frequency weightings Pass 16: Toneburst response 13: Frequency and time weightings at 1 kHz Pass 17: Peak C sound level	Pass 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 enviro conditions under which the tests were performed.	onmental
As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluate performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirer IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.	ion test ments in
Least Uncertainties of Measurement -	•
Acoustic tests Environmental Conditions 31.5 Hz to 8kHz ±0.12dB Temperature ±0.05°C	
12.3kHz     ±0.48db     Ketative trumatiy     ±0.40%       16kHz     ±0.31dB     Barometric Pressure     ±0.017kPa	
Electrical rests $31.5 Hz$ to 20 kHz $\pm 0.12 dB$	
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.	

Research	ennant Hills NSW AUS h: +61294840800 A.B.N.	TRALIA 2120
Labs Pty Ltd   V		65 160 399 119
Cd	www.acousticresear	ch.com.au
Sound IEC 6	<b>Calibrator</b> 0942-2004	
Calibratio	on Certificate	
<b>Calibration Number</b>	C15670	
Client Details	Global Acoustics 12/16 Huntingdale Drive Thornton NSW 2322	
nent Tested/ Model Number : Instrument Serial Number :	Pulsar 106 57413	
Atmosph	eric Conditions	
Ambient Temperature : Relative Humidity :	22°C 54.8%	
Barometric Pressure :	99.85kPa	
ician : Corey Stewart Date : 23/12/2015	Secondary Check: Report Issue Date :	Tim Williams 23/12/2015
Approved Signatory :	tel	Ken William
reristic Tested Res	ult Clause and Characte	eristic Tested Resul
tuation Pa	ss 5.5: Total Distortion	Pass
Nominal Frequency	Measured Level	Measured Frequency
neen shown to conform to the class 2 requ	irements for periodic testing describ	ed in Annex B of IEC 60942:2004 fo
e level(s) and frequency(ies) stated, for th Least Uncertain	e environmental conditions under wh nties of Measurement -	the tests were performed.
±0.09dB	Environmental Conditions Temperature	±0.3°C
$\pm 0.02 dB$ $\pm 0.01\%$	Relative Humidity Barometric Pressure	±4.1% ±0.1kPa
±0.51% All uncertainties are derived at the 95%	% confidence level with a coverage fc	actor of 2.
This calibration certificate is to be read	I in conjunction with the calibration t	est report.
Acoustic Research Labs Pty Ltd is NA Accredited for compliance with ISO/II	TA Accredited Laboratory Number 1 SC 17025.	14172.
The results of the tests, calibrations an	d/or measurements included in this d	ocument are traceable to
Australian/National standards.		Duer Lor L
	And the set of the set	Index output 2004         Calibration Number       Client Details       Global Acoustics         12/16 Huntingdale Drive       Thornton NSW 2322         Intent Tested/ Model Number :       Pulsar 106         Instrument Serial Number :       57413         Memory End to the period to the start of the

6	Acousti Researc Labs Pty L Sou	C Level Penn Ph: + td ww nd Lev	7 Building 2 423 ant Hills NSW A 51 2 9484 0800 A.B w.acousticrese rel Meter	Pennant Hills Rd USTRALIA 2120 N. 65 160 399 119 arch.com.au	
	Calibr	EC 61672	Contificat	0	
		ation	5226	e	
la de la com la copa de regionador de la	Client De	etails Glo 12/7 The	bal Acoustics Pty Ltc 6 Huntingdale Drive rnton NSW 2322		
Equip	nent Tested/ Model Num Instrument Serial Num Microphone Serial Num Pre-amplifier Serial Num	ber: Rio ber: 007 ber: 019 ber: 014	n NA-28 01424 16 63		
Pre-Test At Ambient Ter Relative Barometric	mospheric Conditions nperature : 20°C Humidity : 55.7% Pressure : 99.62kPa		Post-Test At Ambien Rel Baror	mospheric Condition t Temperature : ative Humidity : netric Pressure :	ons 21.6°C 53% 99.82kPa
Calibration Techr Calibration	ician : Dennis Kim Date : 22/05/2015	` m	Secondary Chee Report Issue Dat	<b>:k:</b> Sandra Minto <b>:e</b> : 25/05/2015	
Channel Channel	Approved Signat	ory : A	Clause and Char	ataristia Tastad	Ken Willia
10: Self-generated nois 11: Acoustical tests of 12: Electrical tests of f 13: Frequency and time	e a frequency weighting requency weightings e weightings at 1 kHz	Pass Pass Pass Pass	14: Level linearity or 15: Level linearity in 16: Toneburst respon 17: Peak C sound lev 18: Overload Indicati	the reference level ran cl. the level range cont se el on	nge Pas rol Pas Pas Pas
As public evidence was performed in accordance IEC 61672-1:20	bmitted for testing has successful conditions u available, from an independent to with IEC 61672-2:2003, to demo 002, the sound level meter submitt	ly completed t nder which the esting organisa onstrate that th ted for testing	the class 1 periodic tests of tests were performed. tion responsible for appro e model of sound level me conforms to the class 1 req	ving the results of pattern ter fully conformed to the uirements of IEC 61672-	evaluation tes requirements 1:2002.
	Least U	Uncertainties of	f Measurement -		
ACOUSTIC TESTS 31.5 Hz to 8kHz 12.5kHz 16kHz Electrical Tests	±0.120dB ±0.165dB ±0.245dB	Envi	Temperature Relative Humidity Barometric Pressure	±0.3°C ±4.1% ±0.1kPa	
31.5 Hz to 20 kHz	±0.121dB All uncertainties are derived a	t the 95% conj	fidence level with a covera	ge factor of 2.	
NATA	This calibration certificate is to Acoustic Research Labs Pty Li Accredited for compliance wit	o be read in co td is NATA A h ISO/IEC 170	njunction with the calibrat ceredited Laboratory Num 125.	ion test report. ber 14172.	
WORLD RECOGNISED	The results of the tests, calibra Australian/National standards.	tions and/or m	easurements included in th	is document are traceable	e to
					PAGE 1 OF 1

E	Research Labs	Pty Ltd WW Sound Ca IEC 609	17 Building 2 423 hant Hills NSW / 61294840800 A.E ww.acousticrese alibrator 42-2004	AUSTRALIA 212 3.N. 65 160 399 11 earch.com.au	.a .9
	Cal	ibration	Certificat	e	
	Calibrati	on Number C	16383		
	CI	ient Details Gl 12 TH	obal Acoustics Pty Lto 16 Huntingdale Drive IORNTON NSW 23.	d e 22	
Equip	oment Tested/ Mode Instrument Seria	el Number : Pu ll Number : 74	lsar 106 813		
		Atmospheric	Conditions		
	Ambient Ter Relative Barometric	nperature : 20 Humidity : 39 c Pressure : 99	9°C 8% 08kPa		
Calibration Tech Calibratio	nician : Dennis Ki n Date : 25/07/201	im 6	Secondary Che Report Issue Da	ck: Sandra Minto te: 25/07/2016	
	Approved	Signatory :	Rdl	~	Ken Williams
Clause and Chara 5.2.2: Generated Sour 5.2.3: Short Term Flu	cteristic Tested nd Pressure Level ctuation	Result Pass Pass	Clause and Char 5.3.2: Frequency Ger 5.5: Total Distortion	acteristic Tested nerated	Result Pass Pass
Measured Output	Nominal Level 94.0	Nominal Freq 1000.0	uency Measured 93.3	d Level Measur 8	red Frequency 1000.34
The sound calibrator has	s been shown to conform t	to the class 2 requirem	ents for periodic testing, de	escribed in Annex B of II	EC 60942:2004 for
Specific Tests	are reven(s) and requerely	Least Uncertainties	of Measurement -	er witten die tests were p	chonned
Generated SPL Short Term Fluct.	$\begin{array}{c} \pm 0.09 dB \\ \pm 0.02 dB \end{array}$		Temperature Relative Humidity	$\pm 0.05 ^{\circ}C$ $\pm 0.46\%$	
Frequency Distortion	$\pm 0.01\%$ $\pm 0.51\%$		Barometric Pressure	±0.017kPa	
	An incertaintes we		,	<b>A J J H H H H H H H H H H</b>	
			145 (1996) (1996) (1996)		
NATA	This calibration certif Acoustic Research La Accredited for compl	ficate is to be read in c abs Pty Ltd is NATA A iance with ISO/IEC 1	onjunction with the calibrat Accredited Laboratory Num 7025.	tion test report. iber 14172.	
WORLD RECOGNISED	The results of the test Australian/National st	s, calibrations and/or tandards.	neasurements included in th	his document are traceab	ble to
					PAGE 1 OF 1

# Wilpinjong Coal

Environmental Noise Monitoring August 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

# Wilpinjong Coal

Environmental Noise Monitoring August 2016

Reference: 16273\_R01 Report date: 25 August 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

#### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

Amaciejouski

Prepared:

Ronni Maciejowski Acoustics Technician

Kheckes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 4/5 August 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

#### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the August 2016 monitoring.

#### Low Frequency Assessment

During the August 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	10
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	10
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	13
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 4 August 2016	
5.1.2 N13, 5 August 2016	20
5.1.3 N14, 4 August 2016	21
5.1.4 N15, 4 August 2016	

	5.1.5 N16, 5 August 2016	23
	5.1.6 N17, 5 August 2016	24
	5.1.7 N18, 4 August 2016	25
6 SL	IMMARY OF COMPLIANCE	26
<b>6 SL</b> 6	J <b>MMARY OF COMPLIANCE</b>	<b>26</b> 26
<b>6 SL</b> 6	JMMARY OF COMPLIANCE .1 Operational Noise Assessment .2 Low Frequency Assessment	<b>26</b> 26 26

# **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	38

# 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 seven locations during the night of 4/5 August 2016. Figure 1 shows the regular monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location		
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south		
N13	'Coonaroo' off Moolarben Road		
N14	'Tichular', intersection of Tichular and Barigan Roads		
N15	Track off Barigan Street near Wollar School, Wollar Village		
N16	Araluen Road, off Ulan-Wollar Road		
N17	Mogo Road, off Araluen Road		
N18	Barigan Road, Barigan Valley		

#### Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS



#### Figure 1: WCP Attended Noise Monitoring Locations

## 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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
ΙΑ	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day <sup>L</sup> Aeq,15minute	Evening L <sub>Aeq,</sub> 15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> LA1,1minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB
Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a) wind speeds greater than 3 m/s at 10m above ground level;*
- *b)* temperature inversion conditions between 1.5<sup>°</sup>C and 3<sup>°</sup>C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

# 2.5 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 Wilpinjong Coal Project.

Table 2.2: WI	ILPINJONG	<b>COAL PROJECT</b>	<b>SPECIFIC</b>	CRITERIA,	dB
---------------	-----------	---------------------	-----------------	-----------	----

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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<sup>°</sup>*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<sup>°</sup>*C per* 100 *metres.*

# 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

# 2.6.2 Low Frequency Noise

### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

# 3 METHODOLOGY

# 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

# 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 A.

### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	29/05/2017
Larson Davis CAL150 acoustic calibrator	3333	06/08/2017

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	04/08/2016 23:16	45	35	30	26	28	25	23	37
N13	05/08/2016 01:30	47	38	37	34	34	30	28	47
N14	04/08/2016 22:47	42	33	25	22	24	21	20	34
N15	04/08/2016 23:38	39	31	26	23	24	22	20	39
N16	05/08/2016 00:43	51	39	37	26	31	18	16	52
N17	05/08/2016 00:10	34	26	18	15	17	15	14	21
N18	04/08/2016 22:10	44	34	29	27	27	25	24	35

### Table 4.1: MEASURED NOISE LEVELS' – AUGUST 2016'

Note:

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

# 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during August 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – AUGUST 2016

Conditions	Total for August 2016
Number of measurements	7
Number of measurements where met applied (in accordance with project approval)	4
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

# 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAeq.15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – AUGUST 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	04/08/2016 23:16	0	2.8	35	Yes	IA	Nil
N13	05/08/2016 01:30	0.6	2.6	36	Yes	27	Nil
N14	04/08/2016 22:47	1.1	3.4	35	No	IA	NA
N15	04/08/2016 23:38	0.0	2.8	35	Yes	IA	Nil
N16	05/08/2016 00:43	0.0	4.0	37	No	IA	NA
N17	05/08/2016 00:10	0.0	3.4	35	No	IA	NA
N18	04/08/2016 22:10	1.3	0.2	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	04/08/2016 23:16	0	2.8	45	Yes	IA	Nil
N13	05/08/2016 01:30	0.6	2.6	45	Yes	31	Nil
N14	04/08/2016 22:47	1.1	3.4	45	No	IA	NA
N15	04/08/2016 23:38	0.0	2.8	45	Yes	IA	Nil
N16	05/08/2016 00:43	0.0	4.0	45	No	IA	NA
N17	05/08/2016 00:10	0.0	3.4	45	No	IA	NA
N18	04/08/2016 22:10	1.3	0.2	45	Yes	IA	Nil

### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – AUGUST 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

# 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,</sub> 15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	04/08/2016 23:16	0	2.8	35	Yes	IA	Nil
N13	05/08/2016 01:30	0.6	2.6	35	Yes	27	Nil
N14	04/08/2016 22:47	1.1	3.4	35	No	IA	NA
N15	04/08/2016 23:38	0.0	2.8	36	Yes	IA	Nil
N16	05/08/2016 00:43	0.0	4.0	35	No	IA	NA
N17	05/08/2016 00:10	0.0	3.4	35	No	IA	NA
N18	04/08/2016 22:10	1.3	0.2	35	Yes	IA	Nil

### Table 4.5: LAeq, 15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – AUGUST 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	04/08/2016 23:16	0	2.8	45	Yes	IA	Nil
N13	05/08/2016 01:30	0.6	2.6	45	Yes	31	Nil
N14	04/08/2016 22:47	1.1	3.4	45	No	IA	NA
N15	04/08/2016 23:38	0.0	2.8	45	Yes	IA	Nil
N16	05/08/2016 00:43	0.0	4.0	45	No	IA	NA
N17	05/08/2016 00:10	0.0	3.4	45	No	IA	NA
N18	04/08/2016 22:10	1.3	0.2	45	Yes	IA	Nil

### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – AUGUST 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

# 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	04/08/2016 23:16	7	-	-	0
N13	05/08/2016 01:30	5	-	-	0
N14	04/08/2016 22:47	7	-	-	0
N15	04/08/2016 23:38	4	-	-	0
N16	05/08/2016 00:43	5	-	-	0
N17	05/08/2016 00:10	7	-	-	0
N18	04/08/2016 22:10	6	0.4	130	0

### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – AUGUST 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2,4</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
04/08/16 22:00	2.2	159	0.2
04/08/16 22:15	2.0	156	0.0
04/08/16 22:30	1.3	159	0.2
04/08/16 22:45	0.9	348	2.4
04/08/16 23:00	1.1	327	3.4
04/08/16 23:15	0.7	294	3.2
04/08/16 23:30	0.0	-	2.8
04/08/16 23:45	0.0	-	3.0
05/08/16 00:00	0.0	-	2.8
05/08/16 00:15	0.6	266	3.2
05/08/16 00:30	0.0	-	3.4
05/08/16 00:45	0.7	355	4.0
05/08/16 01:00	0.0	-	4.0
05/08/16 01:15	0.8	74	3.0
05/08/16 01:30	0.7	325	2.8
05/08/16 01:45	0.6	260	2.6
05/08/16 02:00	0.6	328	3.0

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm;

3. Lapse rate sourced from the WCP inversion tower; and

4. NA indicates data not available/recorded.

# 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 4 August 2016



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

WCP was inaudible during the measurement.

Dogs and road traffic tyre noise were primary contributors to the measured LA1.

Frogs generated the measured  $L_{Aeq}$ ,  $L_{A10}$  and  $L_{A90}$ .

Road traffic engine noise and cows were also noted.

# 5.1.2 N13, 5 August 2016



A continuum, consisting of mostly rear dump truck noise, from WCP was audible during the measurement, generating a site only  $L_{Aeq}$  of 27 dB, and an  $L_{A1,1minute}$  of 31 dB.

Frogs were primarily responsible for all measured levels.

Breeze in foliage was also noted.

# 5.1.3 N14, 4 August 2016



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

WCP was inaudible during the measurement.

Frogs were responsible for the  $L_{A90}$  and contributed to the total measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ .

A continuum from a nearby substation and an aircraft also contributed to the LA1.

Low-level noise from birds splashing in a dam, dogs and cows were also noted.

# 5.1.4 N15, 4 August 2016



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

WCP was inaudible during the measurement.

Frogs and insects were primarily responsible for measured levels. Dogs contributed to the measured LA1.

Sheep were also noted.

# 5.1.5 N16, 5 August 2016



WCP was inaudible during the measurement.

A train generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ .

Frogs and insects generated the measured LA90.

A train horn was also noted.

# 5.1.6 N17, 5 August 2016



WCP was inaudible during the measurement.

A bird, frogs and low-level traffic noise were noted. The floor of the sound level meter contributed to measured levels.

# 5.1.7 N18, 4 August 2016



WCP was inaudible during the measurement.

Frogs primarily generated measured levels. A distant aircraft also contributed to the LA1.

Distant running water was also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 4/5 August 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

# 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the August 2016 monitoring period.

# 6.2 Low Frequency Assessment

During the August 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table 1: Land subject to acquisition upon request

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### Noise Criteria

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Nig	ght
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	45
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

 Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

# 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 July 2016.

### 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 3ºC/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 facade, 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 May 2016 are reproduced below.

# 6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time 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

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 attended monitoring at up to seven locations (**Table 5**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

#### Table 5: Noise Related Monitoring Locations

Wollar Village	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona <sup>3</sup>	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55

 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.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

### 6.3 Attended Noise Monitoring

### 6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

### 6.3.2 Summary

Attended noise will be undertaken in accordance with Table 6.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

### 6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine 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 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

# 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

## 6.3.5 Evaluation of Compliance

**Tables 7** and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

### Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in <b>Table 4</b> . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).

Non-	A non-compliance is deemed to have occurred when a second attended noise
compliance	monitoring result, taken within 75 minutes of an exceedance and in accordance with the
compliance	INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The
	noise must be solely attributable to WCPL and meteorological conditions must be
	favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section
	6.3.7.

# 6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

# 6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (Section 10), to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	Acoustic Research Labs Pty Ltd W Sound Lo IEC 616	rel 7 Building 2 423 Per nant Hills NSW AUS +61 2 9484 0800 A.B.N. ww.acousticresear evel Meter 72-3.2006	nnant Hills Rd TRALIA 2120 65 160 399 119 ch.com.au	
	Calibration	<b>Certificate</b>		
	Client Details G	Hobal Acoustics Pty Ltd 2/16 Huntingdale Drive HORNTON NSW 2322		
Equipn	nent Tested/ Model Number : R Instrument Serial Number : 00 Microphone Serial Number : 4 Pre-amplifier Serial Number : 60	ion NA-28 0370304 80505 0313		
Pre-Test At Ambient Ten Relative Barometric	mospheric Conditions perature : 21.2°C Humidity : 52.5% Pressure : 99.94kPa	Post-Test Atmos Ambient To Relativ Barometr	pheric Conditions emperature : 21.6° e Humidity : 51.1% ic Pressure : 99.94	C 6 kPa
Calibration Techn Calibration	ician : Dennis Kim Date : 29/05/2015	Secondary Check: Report Issue Date :	Sandra Minto 01/06/2015	
Clause and Charact	Approved Signatory :	Clause and Characte	ristic Tested	Posult
<ul> <li>10: Self-generated nois</li> <li>11: Acoustical tests of a</li> <li>12: Electrical tests of fr</li> <li>13: Frequency and time</li> <li>The sound level meter sul</li> <li>As public evidence was</li> <li>performed in accordance</li> <li>IEC 61672-1:20</li> </ul>	e Pass a frequency weighting Pass equency weightings Pass weightings at 1 kHz Pass omitted for testing has successfully complete conditions under which available, from an independent testing orgar with IEC 61672-2:2003, to demonstrate that 02, the sound level meter submitted for testin	14: Level linearity on the 15: Level linearity incl. th 16: Toneburst response 17: Peak C sound level 18: Overload Indication d the class 1 periodic tests of IEC the tests were performed. instation responsible for approving the model of sound level meter fung conforms to the class 1 requirer	reference level range te level range control 61672-3:2006, for the envir the results of pattern evalua lly conformed to the requir nents of IEC 61672-1:2002	Pass Pass Pass Pass Pass ronmental
Acoustic Tests 31.5 H= to 8kHz 12.5kHz 16kHz Electrical Tests 31.5 Hz to 20 kHz	Least Uncertaintie ±0.120dB ±0.165dB ±0.245dB ±0.121dB All uncertainties are derived at the 95% c	s of Measurement - ivironmental Conditions Temperature Relative Humidity Barometric Pressure onfidence level with a coverage fa	±0.3°C ±4.1% ±0.1kPa ctor of 2.	
NATA	This calibration certificate is to be read in Acoustic Research Labs Pty Ltd is NATA	conjunction with the calibration to Accredited Laboratory Number 1	est report. 4172.	
WORLD RECOGNISED	The results of the tests, calibrations and/or Australian/National standards.	r measurements included in this do	cument are traceable to	1 OF 1

Q	Acoustic Research Labs Pty Ltd Sound Calibrator
	IEC 60942-2004
	Calibration Number C15396
ni oce Chai 19. – Alle 11. – Chai	Client Details Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipr	nent Tested/ Model Number : Larson Davis CAL150 Instrument Serial Number : 3333
	Atmospheric Conditions
	Relative Humidity : 30.1% Barometric Pressure : 99.51kPa
Calibration Techn	ician : Dennis Kim Secondary Check: Kate Alchin Data : 06/08/2015 Papert Issue Data : 07/08/2015
Cambration	Approved Signatory : Juan Aguero
Clause and Charact	teristic Tested Result Clause and Characteristic Tested Result
The sound calibrator has h	been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for e level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.
the sound pressure	
Specific Tests	Least Uncertainties of Measurement - Environmental Conditions
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       Least Construction       ±0.1kPa
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       All uncertainties are derived at the 95% confidence level with a coverage factor of 2.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       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.
Specific Tests Generated SPL Short Term Fluct. Frequency Distortion	Least Uncertainties of Measurement -         Environmental Conditions         ±0.09dB       Temperature       ±0.3°C         ±0.02dB       Relative Humidity       ±4.1%         ±0.01%       Barometric Pressure       ±0.1kPa         ±0.26%       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.
# Wilpinjong Coal

Environmental Noise Monitoring September 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

# Wilpinjong Coal

Environmental Noise Monitoring September 2016

Reference: 16322\_R01 Report date: 27 October 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

Prepared by Global Acoustics Pty Ltd

PO Box 3115 Thornton NSW 2322

Brasmus

Prepared:

Jonathan Erasmus Acoustics Technician

Kheekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 7/8 September 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the September 2016 monitoring.

### Low Frequency Assessment

During the September 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 7 September 2016	
5.1.2 N13, 8 September 2016	20
5.1.3 N14, 7 September 2016	21
5.1.4 N15, 7 September 2016	

	5.1.5 N16, 7 September 2016	23
	5.1.6 N17, 7 September 2016	24
	5.1.7 N18, 8 September 2016	25
6 SL	JMMARY OF COMPLIANCE	26
<b>6 SU</b> 6	J <b>MMARY OF COMPLIANCE</b>	<b>26</b> 26
<b>6 SU</b> 6	JMMARY OF COMPLIANCE .1 Operational Noise Assessment .2 Low Frequency Assessment	<b>26</b> 26 26

# **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	38

# 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 seven locations during the night of 7/8 September 2016. Figure 1 shows the regular monitoring locations.

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

### 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location						
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south						
N13	'Coonaroo' off Moolarben Road						
N14	'Tichular', intersection of Tichular and Barigan Roads						
N15	Track off Barigan Street near Wollar School, Wollar Village						
N16	Araluen Road, off Ulan-Wollar Road						
N17	Mogo Road, off Araluen Road						
N18	Barigan Road, Barigan Valley						

#### Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS



#### Figure 1: WCP Attended Noise Monitoring Locations

## 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition					
LA	The A-weighted root mean squared (RMS) noise level at any instant					
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event					
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time					
LA10	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					
LA90	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event					
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day <sup>L</sup> Aeq,15minute	Evening L <sub>Aeq,</sub> 15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b) temperature inversion conditions between* 1.5<sup>°</sup>C *and* 3<sup>°</sup>C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

### 2.5 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 Wilpinjong Coal Project.

Table 2.2: W	VILPINJONG	COAL PROJECT	SPECIFIC CRIT	ERIA, dB
--------------	------------	--------------	---------------	----------

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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<sup>°</sup>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<sup>°</sup>*C per* 100 *metres.*

## 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

# 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

# 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 A.

#### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	0107590	06/11/2017
Pulsar 106 acoustic calibrator	57413	23/12/2017

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	07/09/2016 23:18	52	38	34	32	32	30	28	41
N13	08/09/2016 01:27	46	40	39	37	37	35	32	49
N14	07/09/2016 23:45	44	36	33	30	31	29	27	39
N15	07/09/2016 22:58	60	55	50	36	46	32	30	61
N16	07/09/2016 22:32	46	37	32	30	31	28	26	36
N17	07/09/2016 22:00	42	34	29	27	28	27	25	36
N18	08/09/2016 00:23	52	37	31	30	31	29	28	37

#### Table 4.1: MEASURED NOISE LEVELS<sup>1</sup> – SEPTEMBER 2016<sup>1</sup>

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during September 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – SEPTEMBER 2016

Conditions	Total for September 2016
Number of measurements	7
Number of measurements where meteorological conditions applied (in accordance with project approval)	0
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

# 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAea.15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	07/09/2016 23:18	0.8	6.8	35	No	IA	NA
N13	08/09/2016 01:27	0.5	8.2	36	No	29	NA
N14	07/09/2016 23:45	0.0	7.4	35	No	IA	NA
N15	07/09/2016 22:58	0.0	6.6	35	No	IA	NA
N16	07/09/2016 22:32	0.0	5.8	37	No	IA	NA
N17	07/09/2016 22:00	0.0	6.8	35	No	IA	NA
N18	08/09/2016 00:23	0.0	7.4	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	07/09/2016 23:18	0.8	6.8	45	No	IA	NA
N13	08/09/2016 01:27	0.5	8.2	45	No	33	NA
N14	07/09/2016 23:45	0.0	7.4	45	No	IA	NA
N15	07/09/2016 22:58	0.0	6.6	45	No	IA	NA
N16	07/09/2016 22:32	0.0	5.8	45	No	IA	NA
N17	07/09/2016 22:00	0.0	6.8	45	No	IA	NA
N18	08/09/2016 00:23	0.0	7.4	45	No	IA	NA

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	07/09/2016 23:18	0.8	6.8	35	No	IA	NA
N13	08/09/2016 01:27	0.5	8.2	35	No	29	NA
N14	07/09/2016 23:45	0.0	7.4	35	No	IA	NA
N15	07/09/2016 22:58	0.0	6.6	36	No	IA	NA
N16	07/09/2016 22:32	0.0	5.8	35	No	IA	NA
N17	07/09/2016 22:00	0.0	6.8	35	No	IA	NA
N18	08/09/2016 00:23	0.0	7.4	35	No	IA	NA

### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – SEPTEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	07/09/2016 23:18	0.8	6.8	45	No	IA	NA
N13	08/09/2016 01:27	0.5	8.2	45	No	33	NA
N14	07/09/2016 23:45	0.0	7.4	45	No	IA	NA
N15	07/09/2016 22:58	0.0	6.6	45	No	IA	NA
N16	07/09/2016 22:32	0.0	5.8	45	No	IA	NA
N17	07/09/2016 22:00	0.0	6.8	45	No	IA	NA
N18	08/09/2016 00:23	0.0	7.4	45	No	IA	NA

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	07/09/2016 23:18	11	0.9	210	0
N13	08/09/2016 01:27	14	0.4	230	0
N14	07/09/2016 23:45	13	0.0	-	2
N15	07/09/2016 22:58	12	0.0	-	0
N16	07/09/2016 22:32	13	0.6	130	0
N17	07/09/2016 22:00	13	0.0	-	0
N18	08/09/2016 00:23	13	0.4	160	7

#### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – SEPTEMBER 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2,4</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
07/09/2016 22:00	1.0	334	6.0
07/09/2016 22:15	0.0	-	6.8
07/09/2016 22:30	0.0	-	6.2
07/09/2016 22:45	0.0	-	5.8
07/09/2016 23:00	0.0	-	4.8
07/09/2016 23:15	0.0	-	6.6
07/09/2016 23:30	0.8	351	6.8
07/09/2016 23:45	0.0	-	6.0
08/09/2016 00:00	0.0	-	7.4
08/09/2016 00:15	0.0	-	7.8
08/09/2016 00:30	0.0	-	7.4
08/09/2016 00:45	0.0	-	7.4
08/09/2016 01:00	0.0	-	7.4
08/09/2016 01:15	0.0	-	7.6
08/09/2016 01:30	0.0	-	8.2
08/09/2016 01:45	0.5	9	8.2
08/09/2016 02:00	0.0	-	7.4

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm;

3. Lapse rate sourced from the WCP inversion tower; and

4. NA indicates data not available/recorded.

# 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 7 September 2016



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

WCP was inaudible during the measurement.

Frogs and insects generated measured levels.

Livestock and a train were also noted.

5.1.2



A continuum from WCP was audible throughout the measurement generating the site only  $L_{Aeq}$  of 29 dB and  $L_{A1,1minute}$  of 33 dB. Horn noise was also noted.

Frogs primarily generated measured levels. The continuum from WCP was a minor contributor to the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .



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

WCP was inaudible during the measurement.

Birds, frogs and insects generated the measured  $L_{A1}$ . Frogs and insects generated the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

A local continuum was also noted at low levels.

### 5.1.4 N15, 7 September 2016



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

WCP was inaudible during the measurement.

A train generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs generated the measured  $L_{A90}$ .

Livestock was also noted.

### 5.1.5 N16, 7 September 2016



WCP was inaudible during the measurement.

Frogs generated measured levels.

Road traffic tyre noise and an aircraft were also noted.



WCP was inaudible during the measurement.

Frogs and a train generated the measured  $L_{A1}.\,$  Frogs generated the measured  $L_{A10},\,L_{Aeq}$  and  $L_{A90}.\,$ 



Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible during the measurement.

A bird and frogs generated the measured  $L_{A1}$ . Frogs primarily generated the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ . The bird was a minor contributor to the measured  $L_{Aeq}$ .

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 7/8 September 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the September 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the September 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table	1:	Land	sub	ject	to	acq	uisition	upon	req	uest		

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day Evening		Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

# 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 July 2016.

#### 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 3ºC/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 May 2016 are reproduced below.

## 6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time 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

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 attended monitoring at up to seven locations (**Table 5**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

Wollar Village	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona <sup>3</sup>	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55

 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.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

### 6.3 Attended Noise Monitoring

### 6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

## 6.3.2 Summary

Attended noise will be undertaken in accordance with Table 6.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

## 6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine 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 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

## 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

## 6.3.5 Evaluation of Compliance

**Tables 7** and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

#### Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in <b>Table 4</b> . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).

Non-	A non-compliance is deemed to have occurred when a second attended noise
compliance	monitoring result, taken within 75 minutes of an exceedance and in accordance with the
compliance	INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The
	noise must be solely attributable to WCPL and meteorological conditions must be
	favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section
	6.3.7.

## 6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

## 6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (Section 10), to the satisfaction of the Director-General.

# APPENDIX

## **B** CALIBRATION CERTIFICATES

	Personal Per	nnant Hills NSW A	USTRALIA 2120	
Q	Research Phi	+61 2 9484 0800 A.B	.N. 65 160 399 119	
	Sound La	evel Meter	archicomiao	
	IEC 616	72-3.2006		
	Calibration Number (	C15583	e	
	Client Details ( 1 7	Global Acoustics Pty Ltd 2/16 Huntingdale Drive Thornton NSW 2322		
Equipr	nent Tested/ Model Number : F Instrument Serial Number : 0 Microphone Serial Number : 0	tion NA-28 1070590 0533		
Pre-Test At	Pre-amplifier Serial Number : 7	0607 Post-Test Ati	mospheric Conditions	-
Ambient Ten Relative	nperature : 20.6°C Humidity : 56.3%	Ambien Rel	t Temperature : 21.2° ative Humidity : 62.49	°C %
Barometric	Pressure : 98.64kPa	Baron	netric Pressure : 98.50	6kPa
Calibration Techn Calibration	ician : Corey Stewart Date : 06/11/2015	Secondary Chec Report Issue Dat	ek: Kate Alchin e: 10/11/2015 Ken	Williams
Clause and Charact	teristic Tested Resul	t Clause and Chara	acteristic Tested	Result
<ul><li>10: Self-generated nois</li><li>11: Acoustical tests of a</li><li>12: Electrical tests of fi</li><li>13: Frequency and time</li></ul>	Pass       a frequency weighting     Pass       requency weightings     Pass       e weightings at 1 kHz     Pass	<ul> <li>14: Level linearity on</li> <li>15: Level linearity ind</li> <li>16: Toneburst respondent</li> <li>17: Peak C sound level</li> <li>18: Overload Indicati</li> </ul>	the reference level range cl. the level range control se el on	Pass Pass Pass Pass Pass
The sound level meter su	bmitted for testing has successfully complete	ed the class 1 periodic tests of	IEC 61672-3:2006, for the env	ironmental
As public evidence was performed in accordance IEC 61672-1:20	available, from an independent testing orga with IEC 61672-2:2003, to demonstrate tha 02, the sound level meter submitted for testi	nisation responsible for approv t the model of sound level met ng conforms to the class 1 req	ving the results of pattern evalu ter fully conformed to the requi uirements of IEC 61672-1:2002	ation test rements in 2.
Acoustic Tests	Least Uncertaintie E	es of Measurement - nvironmental Conditions		
31.5 Hz to 8kHz 12.5kHz	±0.120dB ±0.165dB	Temperature Relative Humidity	$\pm 0.3$ °C $\pm 4.1\%$ $\pm 0.1kPz$	
16kHz Electrical Tests 31.5 Hz to 20 kHz	±0.245dB ±0.121dB	Barometric Pressure	±0.1KPa	
	All uncertainties are derived at the 95% of	confidence level with a covera	ge factor of 2.	
	This calibration certificate is to be read ir	conjunction with the calibrati	ion test report.	
NATA	Acoustic Research Labs Pty Ltd is NATA Accredited for compliance with ISO/IEC	Accredited Laboratory Numl 17025.	ber 14172.	
		r measurements included in th	is document are traceable to	



# Wilpinjong Coal

Environmental Noise Monitoring October 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

## Wilpinjong Coal

Environmental Noise Monitoring October 2016

Reference: 16366\_R01 Report date: 14 November 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

## Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

hear bui

Prepared: Ryan Bruniges Scientist (Acoustics)

Kheekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 11/12 October 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the October 2016 monitoring.

### Low Frequency Assessment

During the October 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

## Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	15
5 DISCUSSION	
5.1 Noted Noise Sources	
5.1.1 N6, 11 October 2016	
5.1.2 N13, 12 October 2016	20
5.1.3 N14, 11 October 2016	21
5.1.4 N15, 11 October 2016	

	5.1.5 N16, 12 October 2016	23
	5.1.6 N17, 12 October 2016	24
	5.1.7 N18, 11 October 2016	25
6 SI	JMMARY OF COMPLIANCE	26
6 SU	J <b>MMARY OF COMPLIANCE</b>	<b>26</b> 26
<b>6 SU</b> 6	J <b>MMARY OF COMPLIANCE</b> 5.1 Operational Noise Assessment 5.2 Low Frequency Assessment	<b>26</b> 26 26

## **Appendices**

Α	STATUTORY REQUIREMENTS	27
B	CALIBRATION CERTIFICATES	38

## 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 seven locations during the night of 11/12 October 2016. Figure 1 shows the regular monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south
N13	'Coonaroo' off Moolarben Road
N14	'Tichular', intersection of Tichular and Barigan Roads
N15	Track off Barigan Street near Wollar School, Wollar Village
N16	Araluen Road, off Ulan-Wollar Road
N17	Mogo Road, off Araluen Road
N18	Barigan Road, Barigan Valley

#### Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS



#### Figure 1: WCP Attended Noise Monitoring Locations

## 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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
ΙΑ	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

## 2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day <sup>L</sup> Aeq,15minute	Evening L <sub>Aeq,</sub> 15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

## Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b)* temperature inversion conditions between 1.5<sup>°</sup>C and 3<sup>°</sup>C/100m and wind speeds greater than 2 m/s at 10m above ground level; or
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

## 2.5 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

#### 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<sup>°</sup>*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<sup>°</sup>*C per* 100 *metres.*

## 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

#### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

### 2.6.2 Low Frequency Noise

#### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

#### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

#### Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

#### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

## 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

## 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 A.

#### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date		
Rion NA-28 sound level analyser	0701424	22/05/2017		
Pulsar 106 acoustic calibrator	74813	25/07/2018		

## 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	11/10/2016 23:10	46	33	31	28	28	25	23	40
N13	12/10/2016 01:28	44	36	26	21	25	18	15	31
N14	11/10/2016 22:40	61	54	30	22	38	19	17	47
N15	11/10/2016 23:32	50	38	34	30	31	27	24	47
N16	12/10/2016 00:37	45	38	24	20	25	18	17	37
N17	12/10/2016 00:05	49	31	23	20	22	18	16	37
N18	11/10/2016 22:03	52	35	30	25	27	23	21	34

#### Table 4.1: MEASURED NOISE LEVELS – OCTOBER 2016<sup>1</sup>

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during October 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – OCTOBER 2016

Conditions	Total for October 2016
Number of measurements	7
Number of measurements where meteorological conditions applied (in accordance with project approval)	6
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

## 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAea,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – OCTOBER 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	11/10/2016 23:10	1.9	0.8	35	Yes	<25	Nil
N13	12/10/2016 01:28	0.7	3.2	36	No	IA	NA
N14	11/10/2016 22:40	2.0	0.4	35	Yes	IA	Nil
N15	11/10/2016 23:32	1.3	0.0	35	Yes	<25	Nil
N16	12/10/2016 00:37	0.6	1.2	37	Yes	<25	Nil
N17	12/10/2016 00:05	0.6	0.4	35	Yes	<20	Nil
N18	11/10/2016 22:03	2.0	-1.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	11/10/2016 23:10	1.9	0.8	45	Yes	28	Nil
N13	12/10/2016 01:28	0.7	3.2	45	No	IA	NA
N14	11/10/2016 22:40	2.0	0.4	45	Yes	IA	Nil
N15	11/10/2016 23:32	1.3	0.0	45	Yes	31	Nil
N16	12/10/2016 00:37	0.6	1.2	45	Yes	<25	Nil
N17	12/10/2016 00:05	0.6	0.4	45	Yes	29	Nil
N18	11/10/2016 22:03	2.0	-1.0	45	Yes	IA	Nil

#### Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – OCTOBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,</sub> 15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	11/10/2016 23:10	1.9	0.8	35	Yes	<25	Nil
N13	12/10/2016 01:28	0.7	3.2	35	No	IA	NA
N14	11/10/2016 22:40	2.0	0.4	35	Yes	IA	Nil
N15	11/10/2016 23:32	1.3	0.0	36	Yes	<25	Nil
N16	12/10/2016 00:37	0.6	1.2	35	Yes	<25	Nil
N17	12/10/2016 00:05	0.6	0.4	35	Yes	<20	Nil
N18	11/10/2016 22:03	2.0	-1.0	35	Yes	IA	Nil

### Table 4.5: LAeq, 15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – OCTOBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB 4,5	Exceedance <sup>6</sup>
N6	11/10/2016 23:10	1.9	0.8	45	Yes	28	Nil
N13	12/10/2016 01:28	0.7	3.2	45	No	IA	NA
N14	11/10/2016 22:40	2.0	0.4	45	Yes	IA	Nil
N15	11/10/2016 23:32	1.3	0.0	45	Yes	31	Nil
N16	12/10/2016 00:37	0.6	1.2	45	Yes	<25	Nil
N17	12/10/2016 00:05	0.6	0.4	45	Yes	29	Nil
N18	11/10/2016 22:03	2.0	-1.0	45	Yes	IA	Nil

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – OCTOBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	11/10/2016 23:10	10	0.8	260	6
N13	12/10/2016 01:28	7	0.4	230	0
N14	11/10/2016 22:40	13	0.9	220	5
N15	11/10/2016 23:32	10	0.8	170	5
N16	12/10/2016 00:37	10	0.0	-	1
N17	12/10/2016 00:05	11	0.0	-	4
N18	11/10/2016 22:03	12	0.0	-	6

#### Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – OCTOBER 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2,4</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
11/10/2016 22:00	2.0	248	-1.0
11/10/2016 22:00	2.0	248	-1.0
11/10/2016 22:15	2.0	246	-1.0
11/10/2016 22:30	1.9	245	0.0
11/10/2016 22:45	1.7	230	0.6
11/10/2016 23:00	2.0	236	0.4
11/10/2016 23:15	2.4	237	1.0
11/10/2016 23:30	1.9	224	0.8
11/10/2016 23:45	1.3	201	0.0
12/10/2016 00:00	1.4	197	0.2
12/10/2016 00:15	0.6	192	0.4
12/10/2016 00:30	0.5	0	0.8
12/10/2016 00:45	0.6	191	1.0
12/10/2016 01:00	0.6	339	1.2
12/10/2016 01:15	1.1	357	2.4
12/10/2016 01:30	0.8	342	3.8
12/10/2016 01:45	0.7	273	3.2
12/10/2016 02:00	0.7	282	2.6

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm;

3. Lapse rate sourced from the WCP inversion tower; and

4. NA indicates data not available/recorded.

## 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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)



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

A low-level continuum from WCP was audible during the measurement and generated the site only  $L_{Aeq}$  of less than 25 dB.

Frogs and insects combined with the continuum from WCP to generate the measured  $L_{A90}$ . Breeze in foliage and breeze on the microphone was primarily responsible for the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ .

Dogs were also noted.

## 5.1.2 N13, 12 October 2016



WCP was inaudible.

Birds were responsible for the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects were responsible for the measured  $L_{A90}$ .

Cows were also noted.

### 5.1.3 N14, 11 October 2016



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

WCP was inaudible during the measurement.

Birds generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects were responsible for the measured  $L_{A90}$ .

A nearby substation continuum, cows and breeze on the microphone were also noted.

N15, 11 October 2016

5.1.4



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

A low-level continuum from WCP was audible throughout the measurement and generated the site only  $L_{Aeq}$  of less than 25 dB. An engine and exhaust surge was audible on one occasion and generated the site only  $L_{A1,1minute}$  of 31 dB.

Breeze on the microphone and breeze in foliage were responsible for all measured noise levels.

Birds and insects were also noted.
### 5.1.5 N16, 12 October 2016



A low-level continuum from WCP was audible during the measurement and generated the site only  $L_{Aeq}$  of less than 20 and  $L_{A1,1minute}$  of less than 25 dB.

Birds were responsible for the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . The continuum from WCP and insects combined to generate the measured  $L_{A90}$ .

A nearby generator and dogs were also noted.



A low-level continuum from WCP was audible during the measurement and generated the site only  $L_{Aeq}$  of less than 20. An impact noise was audible on one occasion and generated the site only  $L_{A1,1minute}$  29 dB.

Animals in foliage were responsible for the measured  $L_{A1}$ . Frogs, insects and the continuum from WCP combined to generate the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .



Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible during the measurement.

Birds were responsible for the measured  $L_{A1}$ . Insects generated the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

Cows were also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 11/12 October 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

# 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the October 2016 monitoring period.

# 6.2 Low Frequency Assessment

During the October 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table	1:	Land	sub	ject	to	acq	uisition	upon	rec	quest		

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

# 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 July 2016.

### 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 3ºC/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

ABN 94 094 985 734

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 May 2016 are reproduced below.

# 6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time 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

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 attended monitoring at up to seven locations (**Table 5**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

#### Table 5: Noise Related Monitoring Locations

Wollar Village	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona <sup>3</sup>	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55

 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.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

### 6.3 Attended Noise Monitoring

### 6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

### 6.3.2 Summary

Attended noise will be undertaken in accordance with Table 6.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

### 6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine 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 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

## 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

### 6.3.5 Evaluation of Compliance

**Tables 7** and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

### Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in <b>Table 4</b> . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).

Non-	A non-compliance is deemed to have occurred when a second attended noise
compliance	monitoring result, taken within 75 minutes of an exceedance and in accordance with the
compliance	INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The
	noise must be solely attributable to WCPL and meteorological conditions must be
	favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section
	6.3.7.

## 6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

## 6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (Section 10), to the satisfaction
  of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	Acous Resear Labs re	tic rch y Ltd	el 7 Building 2 423 nant Hills NSW +61 2 9484 0800 A.I vw.acousticrese	3 Pennant Hills Rd AUSTRALIA 2120 B.N. 65 160 399 119 earch.com.au	
	C	octave B	and Filter		
	Calik	oration	Certificat	te	
	Calibration	Number C	15226A		
	Clien	t Details G 12 Tl	obal Acoustics Pty Lt /16 Huntingdale Drive ornton NSW 2322	d e	
Equipr	nent Tested/ Model N Instrument Serial N Microphone Serial N Pre-amplifier Serial N	umber: Ri umber: 00 umber: 01 umber: 01	on NA-28 701424 916 463		
	Ambient Tempo Relative Hu Barometric P	Atmospherie erature : 22 midity : 52 ressure : 99	c Conditions .2°C .1% .85kPa		
Calibration Techn Calibration	ician : Adrian Walk Date : 22/05/2015 Approved Sig	er natory : a	Secondary Che Report Issue Da	eck: Sandra Minto ate : 25/05/2015	Ken Willia
Clause and Charact	eristic Tested	Result	Clause and Char	acteristic Tested	Resu
4.4 & 5.3: 1/1 Octave r 4.4 & 5.3: 1/3 Octave r	elative attenuation elative attenuation	Pass Pass	4.6 & 5.5: Linear ope 4.8 & 5.7: Anti-alias 4.10 & 5.9: Flat frequ	erating range filters uency response	Pas. Pas. Pas.
	L	east Uncertainties	of Measurement -		
Electrical Tests < 16Hz 16Hz – 100Hz 100Hz-1000Hz 1000Hz-10kHz > 10kHz	±0.182dB ±0.105dB ±0.089dB ±0.166dB ±0.119dB	En	vironmental Conditions Temperature Relative Humidity Barometric Pressure	±0.3°C ±4.1% ±0.1kPa	
	All uncertainties are deri	ved at the 95% co	nfidence level with a cover	age factor of 2.	
NATA	This calibration certificat Acoustic Research Labs I Accredited for complianc	e is to be read in Pty Ltd is NATA e with ISO/IEC 1	conjunction with the calibra Accredited Laboratory Num 7025.	tion test report. nber 14172.	
WORLD RECOGNISED	The results of the tests, ca Australian/National stand	librations and/or ards.	measurements included in t	this document are traceable	to



# Wilpinjong Coal

Environmental Noise Monitoring November 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

# Wilpinjong Coal

Environmental Noise Monitoring November 2016

Reference: 16416\_R01 Report date: 22 November 2016

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

## Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

exalles

Prepared: Jonathan Erasmus Acoustic Technician

Ellectes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 2/3 November 2016. The survey purpose was to quantify and describe the acoustic environment around the site and compare results with specified limits.

### **Operational Noise Assessment**

WCP complied with relevant noise limits at all monitoring locations during the November 2016 monitoring.

### Low Frequency Assessment

During the November 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	3
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	8
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	11
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	17
5.1.1 N6, 2 November 2016	
5.1.2 N13, 3 November 2016	20
5.1.3 N14, 2 November 2016	21
5.1.4 N15, 2 November 2016	22

	5.1.5 N16, 2 November 2016	23
	5.1.6 N17, 2 November 2016	24
	5.1.7 N18, 3 November 2016	25
6 SL	IMMARY OF COMPLIANCE	26
<b>6 SL</b> 6	MMARY OF COMPLIANCE	<b>26</b> 26
<b>6 SL</b> 6	MMARY OF COMPLIANCE	<b>26</b> 26 26

# **Appendices**

Α	STATUTORY REQUIREMENTS	27
В	CALIBRATION CERTIFICATES	38

# 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 seven locations during the night of 2/3 November 2016. Figure 1 shows the monitoring locations.

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

## 1.2 Monitoring Locations

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

NMP Descriptor	Monitoring Location					
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south					
N13	'Coonaroo' off Moolarben Road					
N14	'Tichular', intersection of Tichular and Barigan Roads					
N15	Track off Barigan Street near Wollar School, Wollar Village					
N16	Araluen Road, off Ulan-Wollar Road					
N17	Mogo Road, off Araluen Road					
N18	Barigan Road, Barigan Valley					

### Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS



### Figure 1: WCP Attended Noise Monitoring Locations

# 1.3 Terminology & Abbreviations

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

### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
LA	The A-weighted root mean squared (RMS) noise level at any instant
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time
L <sub>A10</sub>	The noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels
L <sub>A50</sub>	The noise level which is exceeded for 50 per cent of the time
L <sub>A90</sub>	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

# 2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. 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 Wilpinjong Coal Project.

NMP Descriptor / Resident Number	Monitoring Location	Day <sup>L</sup> Aeq,15minute	Evening L <sub>Aeq,</sub> 15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

## Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- *a)* wind speeds greater than 3 m/s at 10m above ground level;
- *b) temperature inversion conditions between* 1.5<sup>°</sup>C *and* 3<sup>°</sup>C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>*C*/00*m*.

## 2.5 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 Wilpinjong Coal Project.

Table 2.2: W	VILPINJONG	COAL PROJECT	SPECIFIC CRIT	ERIA, dB
--------------	------------	--------------	---------------	----------

NMP Descriptor / Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening <sup>L</sup> Aeq,15minute	Night <sup>L</sup> Aeq,15minute <sup>/</sup> <sup>L</sup> A1,1minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### 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<sup>°</sup>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<sup>°</sup>C per 100 metres.

## 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

## 2.6.2 Low Frequency Noise

### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

### **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

### Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aec}$	l >=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

# 3 METHODOLOGY

# 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than L<sub>Aeq</sub> 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

# 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 A.

### Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date		
Rion NA-28 sound level analyser	01070590	06/11/2017		
Pulsar 106 acoustic calibrator	57413	23/12/2017		

# 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	02/11/2016 23:20	46	41	34	23	30	21	19	34
N13	03/11/2016 01:26	49	38	34	32	33	30	27	51
N14	02/11/2016 23:48	52	35	28	23	26	20	18	42
N15	02/11/2016 23:00	46	39	34	23	29	21	19	47
N16	02/11/2016 22:31	51	45	39	26	34	25	23	49
N17	02/11/2016 22:00	42	31	29	24	25	21	20	38
N18	03/11/2016 00:26	62	54	37	27	41	26	25	44

### Table 4.1: MEASURED NOISE LEVELS – NOVEMBER 2016<sup>1</sup>

Note:

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

# 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during November 2016.

### Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – NOVEMBER 2016

Conditions	Total for November 2016
Number of measurements	7
Number of measurements where meteorological conditions applied (in accordance with project approval)	0
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

# 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

### Table 4.3: LAea.15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,15</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/11/2016 23:20	1.0	8.1	35	No	IA	NA
N13	03/11/2016 01:26	0.0	4.0	36	No	IA	NA
N14	02/11/2016 23:48	0.7	6.9	35	No	IA	NA
N15	02/11/2016 23:00	0.8	8.3	35	No	IA	NA
N16	02/11/2016 22:31	0.6	4.1	37	No	25	NA
N17	02/11/2016 22:00	1.4	5.0	35	No	IA	NA
N18	03/11/2016 00:26	0.0	7.2	35	No	IA	NA

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded 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 or criterion not specified.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP L <sub>A1,1</sub> min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/11/2016 23:20	1.0	8.1	45	No	IA	NA
N13	03/11/2016 01:26	0.0	4.0	45	No	IA	NA
N14	02/11/2016 23:48	0.7	6.9	45	No	IA	NA
N15	02/11/2016 23:00	0.8	8.3	45	No	IA	NA
N16	02/11/2016 22:31	0.6	4.1	45	No	35	NA
N17	02/11/2016 22:00	1.4	5.0	45	No	IA	NA
N18	03/11/2016 00:26	0.0	7.2	45	No	IA	NA

### Table 4.4: LA11minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded 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 or criterion not specified.

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times (in fact, mostly inaudible) no analysis of modifying factors, for mining this is only low-frequency content, was required.

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq,</sub> 15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	02/11/2016 23:20	1.0	8.1	35	No	IA	NA
N13	03/11/2016 01:26	0.0	4.0	35	No	IA	NA
N14	02/11/2016 23:48	0.7	6.9	35	No	IA	NA
N15	02/11/2016 23:00	0.8	8.3	36	No	IA	NA
N16	02/11/2016 22:31	0.6	4.1	35	No	25	NA
N17	02/11/2016 22:00	1.4	5.0	35	No	IA	NA
N18	03/11/2016 00:26	0.0	7.2	35	No	IA	NA

### Table 4.5: LAeq,15minute GENERATED BY WCP AGAINST EPL ASSESSMENT CRITERIA – NOVEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded 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 or criterion not specified.
| Location | Start Date and<br>Time | Wind<br>Speed<br>m/s <sup>1,2</sup> | VTG<br>°C per<br>100m <sup>1,2</sup> | Criterion<br>dB | Criterion<br>Applies? <sup>2,3</sup> | WCP<br>LA1,1min<br>dB 4,5 | Exceedance <sup>6</sup> |
|----------|------------------------|-------------------------------------|--------------------------------------|-----------------|--------------------------------------|---------------------------|-------------------------|
| N6       | 02/11/2016 23:20       | 1.0                                 | 8.1                                  | 45              | No                                   | IA                        | NA                      |
| N13      | 03/11/2016 01:26       | 0.0                                 | 4.0                                  | 45              | No                                   | IA                        | NA                      |
| N14      | 02/11/2016 23:48       | 0.7                                 | 6.9                                  | 45              | No                                   | IA                        | NA                      |
| N15      | 02/11/2016 23:00       | 0.8                                 | 8.3                                  | 45              | No                                   | IA                        | NA                      |
| N16      | 02/11/2016 22:31       | 0.6                                 | 4.1                                  | 45              | No                                   | 35                        | NA                      |
| N17      | 02/11/2016 22:00       | 1.4                                 | 5.0                                  | 45              | No                                   | IA                        | NA                      |
| N18      | 03/11/2016 00:26       | 0.0                                 | 7.2                                  | 45              | No                                   | IA                        | NA                      |

#### Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – NOVEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded 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 or criterion not specified.

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	02/11/2016 23:20	14	0.4	180	0
N13	03/11/2016 01:26	16	1.8	200	0
N14	02/11/2016 23:48	11	1.3	140	0
N15	02/11/2016 23:00	12	0.8	120	0
N16	02/11/2016 22:31	14	0.7	180	0
N17	02/11/2016 22:00	16	0.0	-	0
N18	03/11/2016 00:26	6	0.0	-	0

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – NOVEMBER 2016

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 DATA<sup>1</sup>

End Date and Time	Wind Speed m/s	Wind Direction Degrees <sup>2,4</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
02/11/2016 22:00	1.8	198	1.2
02/11/2016 22:15	1.4	3	5.0
02/11/2016 22:30	0.7	14	4.8
02/11/2016 22:45	0.6	257	4.1
02/11/2016 23:00	0.0	-	6.4
02/11/2016 23:15	0.8	353	8.3
02/11/2016 23:30	1.0	2	8.1
02/11/2016 23:45	1.6	357	7.1
03/11/2016 00:00	0.7	295	6.9
03/11/2016 00:15	0.0	-	5.7
03/11/2016 00:30	0.7	335	6.4
03/11/2016 00:45	0.0	-	7.2
03/11/2016 01:00	0.9	56	4.5
03/11/2016 01:15	0.5	289	3.8
03/11/2016 01:30	1.3	232	2.1
03/11/2016 01:45	0.0	-	4.0
03/11/2016 02:00	0.5	289	5.0

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm;

3. Lapse rate sourced from the WCP inversion tower; and

4. NA indicates data not available/recorded.

# 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  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  (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 9 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, 2 November 2016



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

WCP was inaudible.

Dogs generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects were primarily responsible for the measured  $L_{A90}$ .

Breeze in foliage and a train were also noted.



WCP was inaudible.

Frogs generated most measured levels.

Breeze in foliage and breeze on the microphone were also noted.

### 5.1.3 N14, 2 November 2016



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

WCP was inaudible.

Birds generated the measured  $L_{A1}$  and  $L_{Aeq}$ . Frogs and insects primarily generated the measured  $L_{A10}$  and  $L_{A90}$ .

An aircraft was also noted.

### 5.1.4 N15, 2 November 2016



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

WCP was inaudible.

A train generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . Frogs and the noise floor of the sound level meter generated the measured  $L_{A90}$ .

Breeze in foliage was also noted.

### 5.1.5 N16, 2 November 2016



A low-level continuum from WCP was audible during the measurement and generated the site only L<sub>Aeq</sub> of 25 dB. Track noise generated the site only L<sub>A1,1minute</sub> of 35 dB.

A train generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . The continuum from WCP and frogs generated the measured  $L_{A90}$ .

### 5.1.6 N17, 2 November 2016



WCP was inaudible.

Insects generated measured levels.

Birds and an aircraft were also noted.

### 5.1.7 N18, 3 November 2016



#### WCP was inaudible.

Livestock generated the measured  $L_{A1}$ ,  $L_{A10}$  and  $L_{Aeq}$ . A local continuum generated the measured  $L_{A90}$ .

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 2/3 November 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the November 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the November 2016 survey, WCP did not trigger modifying factor penalties for low frequency noise. None of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment of low frequency noise was undertaken.

**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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

1	Table	1:1	Land	sub	ject	to i	acq	uisition	upon	rec	quest		

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Night		
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>	
135	38	38	38	45	
129 and 137	37	37	37	45	
69	36	36	36	45	
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-	
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-	

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

## 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 July 2016.

#### 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.

#### L5.5 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.

#### R4 Other reporting conditions

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of 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

1 5 0

of the limits contained in Condition L5.1.

# A.3 Noise Monitoring Program

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

# 6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time 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

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 attended monitoring at up to seven locations (**Table 5**, **Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

#### Table 5: Noise Related Monitoring Locations

Wollar Village	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona <sup>3</sup>	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55

 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.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

#### 6.3 Attended Noise Monitoring

#### 6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

#### 6.3.2 Summary

Attended noise will be undertaken in accordance with Table 6.

Table 6: Attended Noise Monitoring Summary

Element	Description
Locations	As per Table 5, Figure 3 and Figure 4
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.
Frequency	12 times per year and on one night per month

#### 6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine 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 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

### 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

### 6.3.5 Evaluation of Compliance

**Tables 7** and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

#### Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in <b>Table 4</b> . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).

Non-	A non-compliance is deemed to have occurred when a second attended noise
compliance	monitoring result, taken within 75 minutes of an exceedance and in accordance with the
o compilation	INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The
	noise must be solely attributable to WCPL and meteorological conditions must be
	favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section
	6.3.7.

### 6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

### 6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (Section 10), to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

6	Acoustic	evel 7 Building 2 423 Pennant Hills Rd Pennant Hills NSW AUSTRALIA 2120
6	Research	h: +61 2 9484 0800 A.B.N. 65 160 399 119
No.	Labs Pty Ltd	www.acousticresearch.com.au
	Sound	Level Meter
	Calibratic	n Cartificata
	Calibration Number	C15583
		Child Acception Dep Ltd
	Client Details	12/16 Huntingdale Drive Thornton NSW 2322
Equipn	nent Tested/ Model Number :	Rion NA-28
	Instrument Serial Number : Microphone Serial Number :	00533
Р	re-amplifier Serial Number :	70607
Pre-Test At	mospheric Conditions	Post-Test Atmospheric Conditions
Relative l	Humidity: 56.3%	Relative Humidity : 62.4%
Barometric	Pressure : 98.64kPa	Barometric Pressure : 98.56kPa
Calibration Techn Calibration	ician : Corey Stewart Date : 06/11/2015	Secondary Check: Kate Alchin Report Issue Date : 10/11/2015
	Approved Signatory :	Ren winnan
10: Self-generated noise	e Pc	<i>tiss</i> 14: Level linearity on the reference level range <i>Pass</i>
<ol> <li>Acoustical tests of a</li> <li>Electrical tests of fm</li> <li>Frequency and time</li> </ol>	a frequency weighting Pa equency weightings Pa weightings at 1 kHz Pa	sss     15: Level linearity incl. the level range control     Pass       sss     16: Toneburst response     Pass       sss     17: Peak C sound level     Pass       18: Overload Indication     Pass
The sound level meter sub	omitted for testing has successfully comp conditions under wh	leted the class 1 periodic tests of IEC 61672-3:2006, for the environmenta ich the tests were performed.
As public evidence was performed in accordance IEC 61672-1:20	available, from an independent testing or with IEC 61672-2:2003, to demonstrate 02, the sound level meter submitted for t	rganisation responsible for approving the results of pattern evaluation test that the model of sound level meter fully conformed to the requirements in esting conforms to the class 1 requirements of IEC 61672-1:2002.
Acoustic Tests	Least Uncertai	nties of Measurement -
31.5 Hz to 8kHz	$\pm 0.120 dB$	Temperature $\pm 0.3 ^{\circ}C$ Relative Humidity $\pm 4.1\%$
12.5KHz 16kHz	$\pm 0.245 dB$	Barometric Pressure ±0.1kPa
31.5 Hz to 20 kHz	±0.121dB	
	All uncertainties are derived at the 95	% confidence level with a coverage factor of 2.
	This calibration certificate is to be read	d in conjunction with the calibration test report.
NATA	Acoustic Research Labs Pty Ltd is NA Accredited for compliance with ISO/I	TA Accredited Laboratory Number 14172. EC 17025.
WORLD RECOGNISED	The results of the tests, calibrations an Australian/National standards.	d/or measurements included in this document are traceable to PAGE 1 OF 1



# Wilpinjong Coal

Environmental Noise Monitoring December 2016

Prepared for Wilpinjong Coal Pty Ltd



Noise and Vibration Analysis and Solutions

# Wilpinjong Coal

Environmental Noise Monitoring December 2016

Reference: 16432\_R01 Report date: 24 January 2017

**Prepared for** 

Wilpinjong Coal Pty Ltd Locked Bag 2005 Mudgee NSW 2850

### Prepared by

Global Acoustics Pty Ltd PO Box 3115 Thornton NSW 2322

n/c

Prepared: Amanda Borserio Environmental Scientist (Acoustics)

Khleekes

QA Review: Katie Weekes Environmental Scientist (Acoustics)

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.

A modification (MOD5) to the WCP consent was approved in November 2014. 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) 'Industrial Noise Policy' (INP) 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 seven locations during the night of 19/20 December 2016. 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 December 2016 monitoring.

#### Low Frequency Assessment

During the December 2016 survey, none of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# Table of Contents

1 INTRODUCTION	1
1.1 Background	1
1.2 Monitoring Locations	1
1.3 Terminology & Abbreviations	
2 STATUTORY REQUIREMENTS AND CRITERIA	4
2.1 Project Approval	4
2.2 Environment Protection Licence	4
2.3 Noise Monitoring Program	4
2.4 Project Approval Criteria and Weather Conditions	4
2.5 EPL Criteria and Weather Conditions	5
2.6 INP Modifying Factors	6
2.6.1 Tonality, Intermittent and Impulsive Noise	6
2.6.2 Low Frequency Noise	6
3 METHODOLOGY	
3.1 Assessment Method	
3.2 Attended Noise Monitoring	9
4 RESULTS	
4.1 Attended Noise Monitoring	
4.2 Low Frequency Assessment	
4.3 Project Approval and Weather Conditions	
4.4 EPL and Weather Conditions	
4.5 Atmospheric Conditions	
5 DISCUSSION	17
5.1 Noted Noise Sources	
5.1.1 N6, 19 December 2016	
5.1.2 N13, 20 December 2016	20
5.1.3 N14, 19 December 2016	21
5.1.4 N15, 19 December 2016	

5.1.5 N16, 20 December 2016	23
5.1.6 N17, 20 December 2016	24
	25
5.1.7 N18, 19 December 2016	25
5.1.7 N18, 19 December 2016	25 <b>26</b>
<ul> <li>5.1.7 N18, 19 December 2016</li> <li>6 SUMMARY OF COMPLIANCE</li> <li>6.1 Operational Noise Assessment</li> </ul>	25 <b>26</b> 26

# **Appendices**

A STATUTORY REQUIREMENTS	27
B CALIBRATION CERTIFICATES	38

# 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 seven locations during the night of 19/20 December 2016. 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 seven monitoring locations during this survey as listed in Table 1.1 and shown on Figure 1. These monitoring locations are detailed in the Noise Monitoring Program (NMP).

NMP Descriptor	Monitoring Location		
N6	St Laurence O'Toole Catholic Church, representative of Wollar Village south		
N13	'Coonaroo' off Moolarben Road		
N14	'Tichular', intersection of Tichular and Barigan Roads		
N15	Track off Barigan Street near Wollar School, Wollar Village		
N16	Araluen Road, off Ulan-Wollar Road		
N17	Mogo Road, off Araluen Road		
N18	Barigan Road, Barigan Valley		

#### Table 1.1: WCP ATTENDED NOISE MONITORING LOCATIONS



#### **Figure 1: WCP Attended Noise Monitoring Locations**

# 1.3 Terminology & Abbreviations

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

#### Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition		
$L_{A}$	The A-weighted root mean squared (RMS) noise level at any instant		
L <sub>Amax</sub>	The maximum A-weighted noise level over a time period or for an event		
L <sub>A1</sub>	The noise level which is exceeded for 1 per cent of the time		
L <sub>A10</sub>	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		
LA90	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 <sub>Amin</sub>	The minimum A-weighted noise level over a time period or for an event		
L <sub>Aeq</sub>	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

WCP was given approval on 1 February 2006. The most recent modification to the project was approved in November 2014. The relevant noise conditions from the 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 July 2016. Section L5 of the licence outlines noise limits and is reproduced in Appendix A.

# 2.3 Noise Monitoring Program

The noise monitoring program (NMP) for WCP was most recently updated in May 2016. 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 Wilpinjong Coal Project.

NMP Descriptor/ Resident Number	Monitoring Location	Day L <sub>Aeq,</sub> 15minute	Evening L <sub>Aeq</sub> ,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church	35	35	35/45
N13	'Coonaroo'	36	36	36/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	35	35	35/45
N16	Araluen Road	37	37	37/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.1: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB
Appendix 10, Condition 1 of the project approval states:

The noise criteria in Table 2 of the conditions are to apply under all meteorological conditions except the following:

- a) wind speeds greater than 3 m/s at 10m above ground level;
- *b) temperature inversion conditions between* 1.5°C *and* 3°C/100*m and wind speeds greater than* 2 *m/s at* 10*m above ground level; or*
- *c) temperature inversion conditions greater than* 3<sup>°</sup>C/00*m*.

## 2.5 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 Wilpinjong Coal Project.

NMP Descriptor/ Resident Number	Monitoring Location	Day L <sub>Aeq</sub> ,15minute	Evening LAeq,15minute	Night L <sub>Aeq,</sub> 15minute/ L <sub>A1,1</sub> minute
N6	St Laurence O'Toole Catholic Church, Wollar Village	35	35	35/45
N13	'Coonaroo'	35	35	35/45
N14	'Tichular'	35	35	35/45
N15	Wollar Village	36	35	35/45
N16	Araluen Road	35	35	35/45
N17	Mogo Road, off Araluen Road	35	35	35/45
N18	Barigan Road, Barigan Valley	35	35	35/45

### Table 2.2: WILPINJONG COAL PROJECT SPECIFIC CRITERIA, dB

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<sup>°</sup>*C per* 100 *metres.*

## 2.6 INP Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with EPA 'Industrial Noise Policy' (INP). As detailed in Appendix 10, Condition 5 of the project approval:

Unless the Director-General agrees otherwise, 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: (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modification factors apart from adjustment for duration.

and Condition L5.7 of the EPL:

For the purposes 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.

Chapter 4 of the INP deals specifically with modifying factors that may apply to industrial noise. The most common modifying factors are addressed in detail below.

### 2.6.1 Tonality, Intermittent and Impulsive Noise

As defined in the Industrial Noise Policy:

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

Impulsive noise has high peaks of short duration or a sequence of such peaks.

Intermittent noise is characterised by the level suddenly dropping to the background noise levels several times during a measurement, with a noticeable change in noise level of at least 5 dB. Intermittent noise applies to night-time only.

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 or impulsive noise as defined in the INP.

## 2.6.2 Low Frequency Noise

### **INP** Method

As defined in the Industrial Noise Policy:

Low frequency noise contains major components within the low frequency range (20 Hz to 250 Hz) of the frequency spectrum.

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 As detailed in Chapter 4 of the INP, low frequency noise should be assessed by measuring the site only C-weighted and site only A-weighted level over the same time period. The correction/penalty of 5 dB is to be applied *if the difference between the two levels is 15 dB or more*.

## **Broner Method**

Low frequency noise can also be assessed against criteria specified in the paper 'A Simple Method for Low Frequency Noise Emission Assessment' (Broner JLFNV Vol29-1 pp1-14 2010). If the site only C – weighted noise level at a receptor exceeds the relevant trigger, a 5 dB penalty (modifying factor) is added to the measured level.

### Low Frequency Assessment Method

Low frequency assessment methods are detailed in Table 2.3.

### Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFICATION FACTORS

Method	Assessment/Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L <sub>Ceq</sub>	>60	>65
INP	Site only $L_{Ceq}$ minus site only $L_{Aeq}$	>=15	>=15

The EPA is currently undertaking a review of the assessment of low frequency noise. While a Draft Industrial Noise Guideline (ING) was released in September 2015, low frequency noise results from WCP have been compared to the assessment methods and modifying factor triggers presented above. The applicability of these triggers have been considered when applying low frequency modifying factor corrections.

# 3 METHODOLOGY

## 3.1 Assessment Method

Attended monitoring was conducted in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS 1055 '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.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. NM indicates that some site noise was audible, but indeterminate due to one of the following reasons:

- site noise levels were insignificant and unlikely, in many cases, to be even noticed; or
- site noise levels were masked by another relatively loud noise source, but were estimated to be less than LAeq 30 dB, which is insignificant in terms of any applicable criterion.

If site noise were NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods as per the Industrial Noise Policy (e.g. measure closer and back calculate) to determine a value for reporting. All sites noted NM in this report are due to insignificant absolute values.

A measurement of  $L_{A1,1minute}$  corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level emitted from a Wilpinjong Coal Project (WCP) noise source 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  $L_{A1,1minute}$  measurement should be undertaken at one (1) metre from the dwelling façade and the  $L_{Aeq}$  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.

As indicated in L5.7 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Low frequency noise from WCP was assessed by analysis of the measured  $L_{Aeq}$  spectrum.

## 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 A.

## Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00370304	16/11/2018
Larson Davis 150 acoustic calibrator	3333	30/09/2018

## 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.

Location	Start Date and Time	L <sub>Amax</sub> dB	L <sub>A1</sub> dB	L <sub>A10</sub> dB	L <sub>A50</sub> dB	L <sub>Aeq</sub> dB	L <sub>A90</sub> dB	L <sub>Amin</sub> dB	L <sub>Ceq</sub> dB
N6	19/12/2016 23:23	51	44	39	35	36	31	28	39
N13	20/12/2016 01:25	51	35	32	31	31	29	28	53
N14	19/12/2016 22:56	52	50	48	46	46	43	35	50
N15	19/12/2016 23:42	46	42	40	36	37	32	27	41
N16	20/12/2016 00:44	47	41	36	31	33	28	25	44
N17	20/12/2016 00:14	42	39	38	36	36	35	33	46
N18	19/12/2016 22:25	54	41	39	34	36	31	28	38

### Table 4.1: MEASURED NOISE LEVELS – DECEMBER 2016<sup>1</sup>

Note:

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

## 4.2 Low Frequency Assessment

Table 4.2 provides statistics for attended noise monitoring undertaken around WCP during December 2016.

## Table 4.2: ATTENDED MEASUREMENT STATISTICS FOR WCP – DECEMBER 2016

Conditions	Total for December 2016
Number of measurements	7
Number of measurements where meteorological conditions applied (in accordance with project approval)	7
Number of measurements where WCP was the only low-frequency source and levels were within 5 dB of the criterion and criterion applied	0

None of the seven measurements occurred during which WCP was the only low frequency source, was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion, and where meteorological conditions resulted in criteria applying (in accordance with the EPL and project approval). No further assessment was required.

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

## 4.3 Project Approval and Weather Conditions

Table 4.3 and Table 4.4 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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 approval. If applicable, modifying factors are considered in Section 4.2.

## Table 4.3: LAeq,15minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – DECEMBER 2016

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	19/12/2016 23:23	1.3	-0.4	35	Yes	<20	Nil
N13	20/12/2016 01:25	1.0	-0.2	36	Yes	<25	Nil
N14	19/12/2016 22:56	2.0	-0.8	35	Yes	<25	Nil
N15	19/12/2016 23:42	1.4	-0.4	35	Yes	<20	Nil
N16	20/12/2016 00:44	1.4	-0.4	37	Yes	<20	Nil
N17	20/12/2016 00:14	1.4	-0.4	35	Yes	<20	Nil
N18	19/12/2016 22:25	2.8	-1.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies?	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	19/12/2016 23:23	1.3	-0.4	45	Yes	<20	Nil
N13	20/12/2016 01:25	1.0	-0.2	45	Yes	30	Nil
N14	19/12/2016 22:56	2.0	-0.8	45	Yes	28	Nil
N15	19/12/2016 23:42	1.4	-0.4	45	Yes	<20	Nil
N16	20/12/2016 00:44	1.4	-0.4	45	Yes	25	Nil
N17	20/12/2016 00:14	1.4	-0.4	45	Yes	<20	Nil
N18	19/12/2016 22:25	2.8	-1.0	45	Yes	IA	Nil

## Table 4.4: LA1.1minute GENERATED BY WCP AGAINST PROJECT APPROVAL IMPACT ASSESSMENT CRITERIA – DECEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second at a height of 10 metres, temperature inversion conditions between 1.5°C and 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 4.4 EPL and Weather Conditions

Table 4.5 and Table 4.6 detail  $L_{Aeq,15minute}$  and  $L_{A1,1minute}$  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. As WCP levels were more than 5 dB below relevant criteria at all times no analysis of modifying factors (for mining this is only low-frequency content) was required.

Table 4.5: LAeq,15minute	GENERATED BY WCF	AGAINST EPL A	SSESSMENT CRI	TERIA – DECEMBER 2016
--------------------------	------------------	---------------	---------------	-----------------------

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP L <sub>Aeq</sub> ,15min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	19/12/2016 23:23	1.3	-0.4	35	Yes	<20	Nil
N13	20/12/2016 01:25	1.0	-0.2	35	Yes	<25	Nil
N14	19/12/2016 22:56	2.0	-0.8	35	Yes	<25	Nil
N15	19/12/2016 23:42	1.4	-0.4	36	Yes	<20	Nil
N16	20/12/2016 00:44	1.4	-0.4	35	Yes	<20	Nil
N17	20/12/2016 00:14	1.4	-0.4	35	Yes	<20	Nil
N18	19/12/2016 22:25	2.8	-1.0	35	Yes	IA	Nil

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

Location	Start Date and Time	Wind Speed m/s <sup>1,2</sup>	VTG °C per 100m <sup>1,2</sup>	Criterion dB	Criterion Applies? <sup>2,3</sup>	WCP LA1,1min dB <sup>4,5</sup>	Exceedance <sup>6</sup>
N6	19/12/2016 23:23	1.3	-0.4	45	Yes	<20	Nil
N13	20/12/2016 01:25	1.0	-0.2	45	Yes	30	Nil
N14	19/12/2016 22:56	2.0	-0.8	45	Yes	28	Nil
N15	19/12/2016 23:42	1.4	-0.4	45	Yes	<20	Nil
N16	20/12/2016 00:44	1.4	-0.4	45	Yes	25	Nil
N17	20/12/2016 00:14	1.4	-0.4	45	Yes	<20	Nil
N18	19/12/2016 22:25	2.8	-1.0	45	Yes	IA	Nil

## Table 4.6: LA1.1minute GENERATED BY WCP AGAINST EPL IMPACT ASSESSMENT CRITERIA – DECEMBER 2016

Notes:

1. Wind speed is sourced from WCP weather station, Vertical Temperature Gradient (VTG) is sourced from the WCP inversion tower;

2. Criterion may or may not apply due to rounding of meteorological data values;

3. Noise emission limits apply for winds up to and including 3 metres per second (at a height of 10 metres), temperature inversion conditions of up to 3°C/100m with winds up to and including 2 m/s, or temperature inversion conditions up to and including 3°C/100m;

4. These are results for WCP in the absence of all other noise sources;

5. Bolded results in red are those greater than the relevant criterion (if applicable); and

## 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.

Location	Start Date And Time	Temperature ° C	Wind Speed m/s	Wind Direction °MN	Cloud Cover eighths
N6	19/12/2016 23:23	20	0.0	-	0
N13	20/12/2016 01:25	17	0.3	160	0
N14	19/12/2016 22:56	21	0.0	-	0
N15	19/12/2016 23:42	21	0.0	-	0
N16	20/12/2016 00:44	18	0.0	-	0
N17	20/12/2016 00:14	20	0.0	-	0
N18	19/12/2016 22:25	22	0.0	-	0

Table 4.7: MEASURED ATMOSPHERIC CONDITIONS – DECEMBER 2016

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.

End Date	End Time	Wind Speed m/s	Wind Direction Degrees <sup>2,4</sup>	Lapse Rate Degrees / 100 metres <sup>3</sup>
19/12/2016	22:00	3.0	84	-1.0
19/12/2016	22:15	3.6	80	-1.2
19/12/2016	22:30	3.4	79	-1.2
19/12/2016	22:45	2.8	79	-1.0
19/12/2016	23:00	2.3	83	-1.0
19/12/2016	23:15	2.0	72	-0.8
19/12/2016	23:30	1.8	57	-0.8
19/12/2016	23:45	1.3	49	-0.4
20/12/2016	00:00	1.4	78	-0.4
20/12/2016	00:15	1.4	103	-0.8
20/12/2016	00:30	1.4	107	-0.4
20/12/2016	00:45	1.6	113	-0.4
20/12/2016	01:00	1.4	104	-0.4
20/12/2016	01:15	1.1	89	-0.4
20/12/2016	01:30	1.0	88	-0.4
20/12/2016	01:45	1.0	89	-0.2
20/12/2016	02:00	1.2	97	0.2

#### Table 4.8: WCP METEOROLOGICAL STATION DATA<sup>1</sup>

Notes:

1. Data supplied by WCP;

2. "-" in wind direction column indicates that conditions were calm;

3. Lapse rate sourced from the WCP inversion tower; and

4. NA indicates data not available/recorded.

# 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 LAeq,15minute and LA1,1minute (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 9 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 December 2016



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

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

Dogs primarily generated the measured  $L_{A1}$  and contributed to the measured  $L_{A10}$  and  $L_{Aeq}$ . Frogs and insects primarily generated the measured  $L_{A10}$ ,  $L_{Aeq}$  and  $L_{A90}$ .

Bats, livestock, owls, birds and a possum were also noted.

## 5.1.2 N13, 20 December 2016



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

An engine continuum from WCP was audible during the measurement. Impact and track noise were also noted. These sources generated the site only  $L_{Aeq}$  of less than 25 dB. Track noise generated the site only  $L_{A1,1minute}$  of 30 dB.

Frogs and insects generated measured levels.

Birds, breeze in foliage, cows and a continuum from another mine were also noted.



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

An engine continuum from WCP was audible during the measurement. Rear dump truck noise was also noted. These sources generated the site only  $L_{Aeq}$  of less than 25 dB. Rear dump trucks generated the site only  $L_{A1,1minute}$  of 28 dB.

Frogs and insects generated measured levels.

Ducks were also noted.

## 5.1.4 N15, 19 December 2016



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

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

Frogs and insects generated measured levels.

Dogs, bats, owls and cows were also noted.

## 5.1.5 N16, 20 December 2016



### Figure 7: Environmental Noise Levels - N16, Araluen Road, off Ulan-Wollar Road

Low level engine continuum and rear dump truck noise were audible from WCP during the measurement, generating the site only L<sub>Aeq</sub> of less than 20 dB and the site only L<sub>A1,1minute</sub> of 25 dB.

Frogs and insects generated measured levels.

Birds, cows and possums were also noted.

## 5.1.6 N17, 20 December 2016



### Figure 8: Environmental Noise Levels - N17, Mogo Road, off Araluen Road

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

Insects generated measured levels.

Birds, other wildlife, an aircraft, a train and a train horn were also noted.

## 5.1.7 N18, 19 December 2016



### Figure 9: Environmental Noise Levels, N18 - Barigan Road, Barigan Valley

WCP was inaudible.

Frogs and insects generated measured levels.

Owls, bats, birds and livestock were also noted.

# 6 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the night period of 19/20 December 2016. Attended noise monitoring was conducted at seven sites. The duration of all measurements was 15 minutes.

## 6.1 Operational Noise Assessment

Wilpinjong Coal Project (WCP) complied with noise limits at the monitoring locations during the December 2016 monitoring period.

## 6.2 Low Frequency Assessment

During the December 2016 survey, none of the measurements occurred during which WCP was measurable (not "inaudible", "not measurable" or less than a maximum cut-off value of 30 dB), was within 5 dB of the relevant criterion and where meteorological conditions resulted in criteria applying (in accordance with the project approval and EPL). No further assessment of low frequency noise was undertaken.

**Global Acoustics Pty Ltd** 

# APPENDIX

# A STATUTORY REQUIREMENTS

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 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 Project Approval

#### SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

#### ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the owner of the land listed in Table 1, the Proponent shall acquire the land in accordance with the procedures in conditions 5 – 6 of schedule 4.

30 – Gaffney

Table	1:	Land	sub	ject	to	acq	uisition	upon	request	

Note: To interpret the locations referred to in Table 1, see the applicable figures in Appendix 7.

#### NOISE

#### **Noise Criteria**

 Except for the land referred to in Table 1, the Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land or at the other specified locations.

	Day	Evening	Night	
Location	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>Aeq(15 minute)</sub>	L <sub>A1(1 minute)</sub>
135	38	38	38	45
129 and 137	37	37	37	45
69	36	36	36	45
Wollar Village – Residential	36	35	35	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 900 – St Laurence O'Toole Catholic Church		40 (internal) When in use		-
Goulburn River National Park/Munghorn Gap Nature Reserve		50 When in use		-

Table 2: Noise Impact assessment criteria dB(A)

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 11 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the criteria in Table 2 do not apply if the Proponent has an agreement with the relevant owner/s to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

- To interpret the locations referred to in Table 2, see the applicable figures in Appendix 7; and
- For the Goulburn River National Park/Munghorn Nature Reserve noise levels are to be assessed at the most
  affected point at the boundary of the Goulburn River National Park/Munghorn Nature Reserve.

#### Mitigation Upon Request

3. Upon receiving a written request from the owner of any residence on the land listed in either Table 1 or Table 3, the Proponent shall implement additional noise mitigation measures (such as double-glazing, insulation and/or air conditioning) at the residence in consultation with the landowner. These measures must be reasonable and feasible, and directed towards reducing the noise impacts of the project on the residence.

If within 3 months of receiving this request from the owner, the Proponent and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

Table 3: Land subject to additional noise mitigation upon request

Receiver ID	
69, 129, 135 and 137	

Note: To interpret the land referred to in Table 3, see the applicable figures in Appendix 7.

#### **Operating Conditions**

- 4. The Proponent shall:
  - (a) implement best management practice to minimise the operational, road, and rail noise of the project;
  - (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 approval;
  - (c) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply (see Appendix 11);
  - (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 project is complying with the relevant conditions of this approval, and publish these monitoring results on its website,
  - to the satisfaction of the Director-General.

#### Noise Management Plan

- The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Director-General. This plan must:
  - be prepared in consultation with the EPA, and submitted to the Director-General for approval by the end of May 2014;
  - (b) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - (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 approval; 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 approval 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.

#### APPENDIX 8 STATEMENT OF COMMITMENTS

#### **Operational Noise**

WCPL will continue to implement real-time noise monitoring and associated controls, such that noise from the Wilpinjong Coal Mine will comply with relevant Project Approval noise criteria (including a commitment to modify the operations as required to achieve continued compliance with project specific noise levels in the Village of Wollar under relevant meteorological conditions, as described in the Project Approval, EPL 12425 and the amended Noise Management Plan).

#### APPENDIX 10 NOISE COMPLIANCE ASSESSMENT

#### **Applicable Meteorological Conditions**

- 1. The noise criteria in Table 2 of the conditions 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) temperature inversion conditions between 1.5 °C and 3°C/100m and wind speeds greater than 2 m/s at 10 m above ground level; or
  - (c) temperature inversion conditions greater than 3°C/100m

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall 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 Director-General directs otherwise.
- 5. Unless the Director-General agrees otherwise, 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.

## 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 July 2016.

### 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 3ºC/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.

The relevant sections of the noise monitoring program for WCP dated May 2016 are reproduced below.

## 6 Noise Monitoring Program

WCPL utilise a combination of attended and unattended noise monitoring to assess the performance of the Mine against the Noise Criteria. Attended noise monitoring will be used for determining compliance against the Noise Criteria in **Table 4**. Unattended or real-time 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

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 attended monitoring at up to seven locations (**Table 5, Figure 3** and **Figure 4**). Real-time 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.

Location	Site	Туре	Easting <sup>1</sup>	Northing <sup>1</sup>	Justification
St Laurence O'Toole Church	N6	Attended Noise	777299.9	6415716.9	Location based on the nearest community structure to the East of the Mine
Coonaroo	N13	Attended Noise	763758.9	6413471.9	Location based on the nearest community structure to the West of the Mine
Tichular	N14	Attended Noise	778791.9	6408624.7	Location based on the nearest community structure to the South of the Mine
Wollar Village	N15	Attended Noise	777452.0	6416158.9	Location based on the nearest community structure to the South-East of the Mine
Araluen Rd	N16	Attended Noise	778787.4	6417418.7	Location based on the nearest community structure to the East of the Mine
Mogo Rd	N17	Attended Noise	780771.0	6420641.0	Location based on the nearest community structure to the North-East of the Mine
Barrigan Valley <sup>2</sup>	N18	Attended Noise	780033.3	6398618.1	DP&E Recommendation (MOD5) – Location approximately 20 km to the south of the Mine
WCPL Rail Loop		Meteorology & Inversion	770630.9	6418085.1	Location based on consideration of prevailing meteorological conditions

#### Table 5: Noise Related Monitoring Locations

Wollar Village	Real-Time Noise - Fixed	777608.9	6415996.8	Location based on the nearest non-mine owned residence to the South-East of the Mine
Araluen Rd	Real-Time Noise - Fixed	778856.4	6417401.3	Location based on the nearest non-mine owned residence to the East of the Mine
Wandoona <sup>3</sup>	Real-Time Noise - Mobile	777684.4	6414786.2	Location based on the nearest non-mine owned residence to the South-East of the Mine

Notes:

1. MGA94, Zone 55

- 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.
- The real-time noise monitor at Wandoona may be relocated in response to a complaint or identified noise issue at another location.

Should circumstances change, WCPL may amend the noise monitoring locations shown in **Table 5** with consideration to the above criteria. WCPL will update this Management Plan, in consultation with DP&E and the EPA.

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

## 6.3 Attended Noise Monitoring

### 6.3.1 Purpose

Attended noise monitoring will be used to evaluate compliance against the Noise Criteria detailed in **Table 4**.

## 6.3.2 Summary

Attended noise will be undertaken in accordance with Table 6.

Table 6: Attended Noise Monitoring Summary

Element	Description				
Locations	As per Table 5, Figure 3 and Figure 4				
Period	Night-time period (10 pm-7 am) being the most sensitive time period for noise.				
Frequency	12 times per year and on one night per month				

## 6.3.3 Methodology

Attended noise monitoring will be undertaken as outlined in **Table 6** by an independent acoustic consultant in accordance with the INP (EPA, 2000) and *AS 1055.1-1997 'Acoustics – Description and measurement of environmental noise – General procedures'*. Routine 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 4**, then the result will be recorded and the regular monitoring program resumed.

If the second measurement does exceed the applicable Noise Criteria ('confirmed exceedance') then:

- a) The noise consultant will immediately report both results to the WCPL Environment and Community Manager or delegate immediately; and
- b) WCPL will report both results to DP&E and EPA immediately, upon confirming the exceedance.

WCPL will:

- a) Take immediate action in accordance with the NMS;
- b) Arrange for additional 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.

## 6.3.4 Data Collection

Data and observations are collected in 15 minute periods and the Leq dBA results recorded. The Leq dBC noise levels will also be recorded to assess low frequency noise. All acoustic instrumentation will comply with AS 1259.2-1990 'Acoustics – Sound level meters – Integrating – Averaging'. Comprehensive field notes will be taken to indicate both mine related and non-mine related noise sources and when they occurred. Notes about maximum mine noise levels (source and times) will also be taken. All percentiles (LAmax, LA1, LA10, LA50, LA90, LAmin, LAeq) are measured in A weighting.

Where practicable, the LA<sub>1</sub> measurement will be undertaken at 1 m from the dwelling façade and the LA<sub>eq</sub> measurement within 30 m of the dwelling. Where impracticable, measurements will be undertaken at a suitable and representative location as close to the dwelling as practicable.

## 6.3.5 Evaluation of Compliance

**Tables 7** and **8** summarises the definition used by WCPL in this NMP for the evaluation of compliance with the Project Approval. The reporting requirements and actions that WCPL will take in the event of an exceedance or non-compliance are detailed in **Figure 5** and **Section 6.3.7**.

### Table 7: Definition of an Exceedance

Term	Definition
Exceedance	An exceedance is deemed to have occurred when an attended noise monitoring result, taken in accordance with the INP and Project Approval, exceeds the Noise Criteria in <b>Table 4</b> . The noise must be solely attributable to WCPL and meteorological conditions must be favourable (6.3.6).

Non-	A non-compliance is deemed to have occurred when a second attended noise
compliance	monitoring result, taken within 75 minutes of an exceedance and in accordance with the
compliance	INP and Project Approval, exceeds the Noise Criteria in Table 4 for a second time. The
	noise must be solely attributable to WCPL and meteorological conditions must be
	favourable (6.3.6). Reporting requirements for a non-compliance are detailed in Section
	6.3.7.

## 6.3.6 Favourable Meteorological Conditions

Favourable meteorological conditions means:

- No rain or hail;
- Average wind speed at microphone height less than 5 m/s;
- Wind speeds not greater than 3 m/s at 10 m above ground level; and
- Temperature inversion conditions less than 3°C/100m.

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

It should be noted that when assessing wind conditions to determine the potential for noise level alteration by the refraction of sound-waves through the atmosphere, meteorological measurements should be undertaken at a height of 10 m above the ground level, in accordance with Section 5 of the INP (EPA, 2000). Local meteorological conditions, including near-surface winds are measured at the SentineX unit using the inbuilt meteorological station (2 m); however, in accordance with the INP (EPA, 2000), the 2 m data cannot be used to determine impacts from sound-wave refraction. The 2 m meteorological data is used to assess local meteorological conditions that may increase ambient noise levels including surface winds and rainfall.

## 6.3.7 Response to Non-Compliance or Exceedance

Where any non-compliance of the Noise Criteria has occurred, WCPL will, at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the non-compliance ceases and does not recur;
- Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action (Section 9.1);
- Implement remediation measures as directed by the Director-General; and
- Review and, if necessary, revise this Management Plan (Section 10), to the satisfaction of the Director-General.

# APPENDIX

# **B** CALIBRATION CERTIFICATES

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

Q	Research Labs Pty Ltd Sound	Pennant Hills NSW AUSTRALIA 2120 Ph: +61 2 9484 0800 A.B.N. 65 160 399 119 www.acousticresearch.com.au Level Meter
	Calibrati	61672-3.2006 ion Certificate
	Calibration Number	C16643
	Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equip	ment Tested/ Model Number : Instrument Serial Number : Microphone Serial Number : Pre-amplifier Serial Number :	Rion NA-28 00370304 10421 60313
Pre-Test At Ambient Ter Relative Barometric	mospheric Conditions nperature : 22.2°C Humidity : 46.6% Pressure : 99.95kPa	Post-Test Atmospheric Conditions Ambient Temperature : 22.4°C Relative Humidity : 44.5% Barometric Pressure : 99.95kPa
Calibration Techr Calibration	ician : Vicky Jaiswal Date : 16/11/2016	Secondary Check: Sandra Minto Report issue Date : 17/11/2016
Clause and Charac 10: Self-generated nois 11: Acoustical tests of f 12: Electrical tests of f 13: Frequency and time The sound level meter su	teristic Tested     R       ie     //       a frequency weighting     //       requency weightings     //       e weightings at 1 kHz     //       bmitted for testing has successfully com-	Clause and Characteristic Tested         Result           Pass         14: Level linearity on the reference level range         Pass           Pass         15: Level linearity incl. the level range control         Pass           Pass         16: Toneburst response         Pass           Pass         17: Peak C sound level         Pass           18: Overload Indication         Pass           npleted the class 1 periodic tests of IEC 61672-3 2006 for the environmental
As public evidence was performed in accordance IEC 61672-1:20	conditions under w available, from an independent testing with IEC 61672-2:2003, to demonstrat 02, the sound level meter submitted for	which the tests were performed. organisation responsible for approving the results of pattern evaluation test e that the model of sound level meter fully conformed to the requirements in testing conforms to the class 1 requirements of IEC 61672-1:2002.
Acoustic Tests 31.5 Hz to 8kHz 12.5kHz 16kHz Electrical Tests 31.5 Hz to 20 kHz	Least Uncert. ±0.12dB ±0.18dB ±0.31dB ±0.12dB	ainties of Measurement - Environmental Conditions <i>Temperature</i> ±0.05°C <i>Relative Humidity</i> ±0.46% <i>Barometric Pressure</i> ±0.017kPa
	All uncertainties are derived at the 9	5% confidence level with a coverage factor of 2.
~	This calibration certificate is to be re Acoustic Research Labs Pty Ltd is N	ad in conjunction with the calibration test report.
ΝΑΤΑ	Accredited for compliance with ISO/ The results of the tests, calibrations a Australian/national standards.	nec 17025.
WORLD RECOGNISED ACCREDITATION	NATA is a signatory to the ILAC Mu equivalence of testing, medical testin	utual Recognition Arrangement for the mutual recognition of the g, calibration and inspection reports.



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