Invincible Colliery

Environmental Noise Monitoring

Quarter 1, 2017

Prepared for

Castlereagh Coal

Global Acoustics

Noise and Vibration Analysis and Solutions

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Invincible Colliery

Environmental Noise Monitoring Quarter 1, 2017

Reference: 17093_R01
Report date: 20 July 2017

Prepared for

Castlereagh Coal
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Cullen Bullen NSW 2790

Prepared by

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PO Box 3115
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Prepared:	Amanda Borserio Environmental Scientist (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

EXECUTIVE SUMMARY

Global Acoustics was engaged to conduct a noise survey around Invincible Colliery, an open cut coal mine north west of Lithgow.

Castlereagh Coal obtained a modification to the development consent in December 2008 (07-0127) for the continuation of open cut mining activities. Schedule 3, Conditions 1 to 7 of the consent details the noise requirements.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was generally 10 minutes. The exceptions were when mining was audible; the duration of these measurements was increased to 15 minutes.

Environmental noise monitoring described in this report was undertaken during the day period of 28 March 2017; there were 3 monitoring locations. Two other monitoring locations, "Hillview" and "Billabong", have been purchased by Castlereagh Coal prior to Quarter 4 2011 monitoring and are no longer included in the noise monitoring program.

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'. During this survey attended monitoring was undertaken once at each measurement location during the day period.

Invincible Colliery complied with the relevant consent $L_{Aeq,15minute}$ noise limits, where applicable, during Quarter 1, 2017 monitoring.

Global Acoustics Pty Ltd

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged to conduct a noise survey around Invincible Colliery (IC), an open cut coal mine north west of Lithgow.

Environmental noise monitoring described in this report was undertaken during the day period of 28 March 2017, there were 3 monitoring locations. Two other monitoring locations, "Hillview" and "Billabong", have been purchased by Castlereagh Coal prior to Quarter 4 2011 monitoring and are no longer included in the noise monitoring program.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was generally 10 minutes. The exceptions were when mining was audible; the duration of these measurements was increased to 15 minutes.

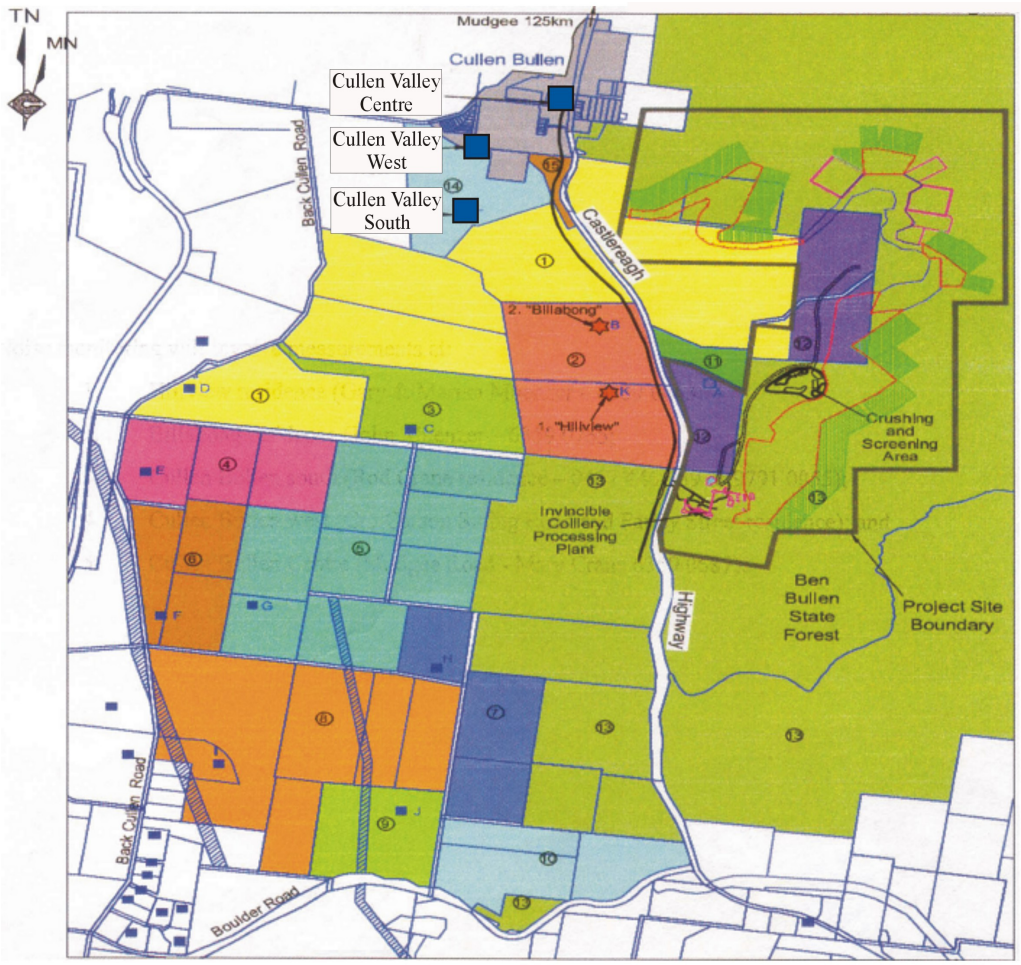
The purpose of the survey is to quantify and describe the acoustic environment around the site and compare results with specified limits.

1.2 Attended Noise Monitoring Locations

There were three monitoring locations during this survey as detailed in Table 1.1 and shown on Figure 1.

Table 1.1: ATTENDED NOISE MONITORING LOCATIONS

Descriptor	Owner	Monitoring Location
Cullen Bullen Centre	M. Crane	Mudgee Road
Cullen Bullen West	NA	Off Carson Siding Road and Farley Street
Cullen Bullen South	R. Crane	Off Cullen Valley Haul Road



Invincible Colliery attended noise monitoring locations

Source: Invincible Colliery Open Cut Mine Extension – Noise Impact Assessment (ERM – April 2008).

Figure 1: Invincible Colliery 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_{A10}	The noise level which is exceeded for 10 percent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 percent 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_{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data
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 CONSENTS AND CRITERIA

2.1 Regulatory Approvals

This section discusses the relevant regulatory approvals relating to noise monitoring and assessment for the Invincible Colliery operation. The relevant conditions relating to noise from the development consent and Environmental Protection Licence (EPL) are reproduced in Appendix A.

2.1.1 Development Consent

Castlereagh Coal obtained development consent in December 2008 (07-0127) for the continuation of open cut mining activities. Schedule 3, Conditions 1 to 7 of the consent details the noise requirements.

2.1.2 EPA Licence

Invincible Colliery operates in accordance with EPL 1095. Noise requirements are detailed in L5 of the licence.

2.2 Project Specific Criteria

Noise impact assessment criteria are detailed in Table 2.1.

Table 2.1: INVINCIBLE COLLIERY NOISE IMPACT ASSESSMENT CRITERIA, dB

Residence / Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$
All Privately owned land	40	35	35

Notes:

1. *An agreement with respect to noise emissions has been negotiated between Invincible Colliery and the owner of "Billabong" and "Hillview". The owner of the two residences has confirmed that predicted noise levels are acceptable, despite the predicted noise levels being greater than the calculated noise criterion. These two residences are also subject to acquisition upon request. As such there is no noise criterion for these two residences and monitoring is no longer undertaken.*

The noise criteria in Table 2.1 apply under meteorological conditions of:

- wind speeds of 3 m/s at 10 metres above ground level; or
- up to 3ºC/100metre temperature inversion strength for all receivers, plus a 2m/s source-to-receiver component drainage flow wind at 10 metres above ground level for those receivers where applicable.

Land acquisition criteria are detailed in Table 2.2.

Table 2.2: INVINCIBLE COLLIERY LAND ACQUISITION CRITERIA, dB

Residence / Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$
All privately owned land	45	40

2.3 Modifying Factors

Noise monitoring and reporting is carried out generally in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP). 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.

2.3.1 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 and 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 from Invincible Colliery 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.

2.4 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 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 modifying factor trigger, a 5 dB penalty (modifying factor) is added to measured levels. This method is included to provide a comparison with the INP method.

Low Frequency Assessment Methods

Low frequency assessment methods are detailed in Table 2.3.

Table 2.3: LOW FREQUENCY ASSESSMENT METHODS AND MODIFYING FACTOR TRIGGERS

Method	Calculation Method	Night Period Modifying Factor Trigger	Day Period Modifying Factor Trigger
Broner, 2010	Site only L_{Ceq}	>60	>65
INP, total	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 Invincible Colliery 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 Attended Noise Monitoring

Attended monitoring was conducted at three sites 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.

Given the site is on care and maintenance, the duration of each day measurement was generally 10 minutes. The exceptions were when mining was audible; the duration of these measurements was increased to 15 minutes. During this survey attended monitoring was undertaken once at each measurement location during the day period. Meteorological data has been sourced from the Australian Bureau of Meteorology Bathurst weather station.

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

As indicated in section L5.2 of the EPL, modifying factors from Section 4 of the INP should be implemented where applicable. Tonality and low frequency from Invincible Colliery were assessed by analysis of the measured L_{Aeq} spectrum.

If the exact contribution of the source of interest cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise levels, for example, L_{A10}, L_{A50} or L_{A90}. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

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

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

- site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or
- it was not feasible or reasonable to employ INP methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

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

Table 3.1: ATTENDED NOISE MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	00701424	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.

Table 4.1: MEASURED NOISE LEVELS - QUARTER 1 2017

Location	Start Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	L_{Ceq} dB
Cullen Bullen South	28/03/2017 13:29	51	47	44	40	66
Cullen Bullen West	28/03/2017 13:12	51	45	44	38	62
Cullen Bullen Centre	28/03/2017 16:11	70	61	58	38	63

Notes:

1. *Levels in this table are not necessarily the result of activity at Invincible Colliery.*

Table 4.2 details L_{Aeq} noise levels for Invincible Colliery in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the mine's development consent.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY INVINCIBLE COLLIERY – QUARTER 1 2017

Location	Start Date and Time	Wind Speed m/s [2]	VTG °C/100m [3]	L_{Aeq} Criterion dB	Criterion Applies? [1]	IC L_{Aeq} dB [3,4]	Exceedance	Notes
Cullen Bullen South	28/03/2017 13:29	6.2	-2.0	40	No	IA	NA	IC was inaudible. Breeze in foliage, breeze on the microphone and insects generated measured levels.
Cullen Bullen West	28/03/2017 13:12	7.7	-2.0	40	No	IA	NA	IC was inaudible. Breeze and road traffic noise were primarily responsible for the measured L_{A1}, L_{A10} and L_{Aeq}. An aircraft contributed to the measured L_{A1}. Birds contributed to the measured L_{Aeq}. Breeze in foliage and insects generated the measured L_{A90}.
Cullen Bullen Centre	28/03/2017 16:11	5.7	-2.0	40	No	IA	NA	IC was inaudible. Road traffic noise generated the measured L_{A1}, L_{A10} and L_{Aeq}. Road traffic noise and insects generated the measured L_{A90}.

Notes:

1. *Noise emission limits apply the following meteorological conditions:*
   - *Wind speeds of up to 3 m/s at 10 meters above ground level; or*
   - *Up to 3°C/100m temperature inversion strength plus a 2m/s source-to-receiver component drainage flow wind at 10 meters above ground level;*
2. *Wind speed data sourced from the Australian Bureau of Meteorology Bathurst weather station;*
3. *Standard daytime vertical temperature gradient assumed;*
4. *These are results for Invincible Colliery (IC) in the absence of all other noise sources; and*
5. *Bold results in red are those greater than the relevant criterion (if applicable).*

4.2 Low Frequency Assessment

Table 4.3 provides statistics for attended noise monitoring undertaken around Invincible Colliery during the survey.

Table 4.3: ATTENDED MEASUREMENT STATISTICS FOR INVINCIBLE COLLIERY – QUARTER 1 2017

Conditions	Total for Quarter 1 2017
Number of measurements	3
Number of measurements where Invincible Colliery was measurable and criterion applied	0

None of the three measurements occurred during which Invincible Colliery was measurable (not "inaudible" or "not measurable") and where meteorological conditions resulted in criteria applying. Low frequency noise has not been assessed further in this report.

4.3 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.4. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions at microphone height during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres. Attended noise monitoring is not undertaken during rain or hail.

Table 4.4: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 1 2017 [1]

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction	Cloud Cover 1/8s
Cullen Bullen South	28/03/2017 13:29	29	2.3	270	4
Cullen Bullen West	28/03/2017 13:12	28	2.8	20	4
Cullen Bullen Centre	28/03/2017 16:11	31	1.3	340	3

Notes:

1. *Wind speed and direction measured at 1.8 metres.*

Data obtained from the Australian Bureau of Meteorology Bathurst weather station is used to determine compliance with criteria.

5 SUMMARY OF COMPLIANCE

Environmental noise monitoring described in this report was undertaken during the day period on 28 March 2017; there were 3 monitoring locations.

Given that the site is currently under care and maintenance, monitoring was not undertaken during the evening period as there are no activities occurring at this time. Although noise monitoring was carried out during the day period, given the site is on significantly reduced operations, there is unlikely to be any off-site noise. Therefore the monitoring program has been modified slightly to take this into account. The duration of each day measurement was generally 10 minutes. The exceptions were when mining was audible; the duration of these measurements was increased to 15 minutes.

Invincible complied with the consent $L_{Aeq,15minute}$ noise limits at all locations during Quarter 1, 2017 monitoring.

Global Acoustics Pty Ltd

APPENDIX

A STATUTORY REQUIREMENTS

NSW Department of Planning Project Approval 07-0127 applies to the Invincible Colliery operation. The noise section is reproduced below.

A.1 INVINCIBLE COLLIERY DEVELOPMENT CONSENT

Schedule 3 – Specific Environmental Conditions

NOISE

Acquisition Upon Request

1. Upon receiving a written request for acquisition from the owner of any land listed in Table 1, the proponent shall acquire the land in accordance with the procedures in conditions 6-8 of schedule 4.

Table 1: Land subject to acquisition upon request

Residence/Location
Billabong
Hillview

Impact Assessment Criteria

2. The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 2 at any residence on privately owned land, or on more than 25 percent of any privately owned land.

Table 2: Noise impact assessment criteria dB(A)

Residence/Location	Day L_{Aeq}(15 minute)	Evening L_{Aeq}(15 minute)	**Night** $L_{Aeq(15\ minute)}$
All privately owned land	40	35	35

However, if the Proponent has a written negotiated noise agreement with any landowner and a copy of this agreement has been forwarded to the Department and the DECC, then the Proponent may exceed the noise limits in Table 2 in accordance with the negotiated noise agreement.

Notes:

- To determine compliance with the $L_{Aeq(15minute)}$ noise limits, noise from the project is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
- These limits apply under meteorological conditions of:
    a. wind speeds of up to 3 m/s at 10 metres above ground level; or
    b. up to 3°C/100m temperature inversion strength for all receivers, plus a 2m/s source-to-receiver component drainage flow wind at 10 metres above ground level for those receivers where applicable.

Land Acquisition Criteria

3. If the noise generated by the project exceeds the criteria in Table 3 at any residence on privately owned land, or on more than 25 percent of any privately owned land, the Proponent shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 6-8 of schedule 4.

Table 3: Acquisition criteria dB(A)

Residence/Location	*Day* $L_{Aeq(15minute)}$	*Evening* $L_{Aeq(15minute)}$
All privately owned land	*45*	*40*

Additional Noise Mitigation Measures

4. Upon receiving a written request after 30 May 2009 from a landowner at any residence on privately owned land where subsequent noise monitoring shows the noise generated by the project is equal to, or greater than 3 dB(A) $L_{Aeq(15minute)}$ above the noise impact assessment criteria in Table 2 (unless a negotiated noise agreement is in place), the Proponent shall implement additional reasonable and feasible noise mitigation measures (such as double glazing, insulation and/or air conditioning) at the residence in consultation with the landowner.

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

5. The Proponent shall develop and implement a Pollution Reduction Program (PRP) to the satisfaction of the DECC. The Proponent shall include measures in the PRP to attenuate noise emissions from:

   - The rotary breaker at the Invincible coal preparation plant;
   - The jig washer at the Invincible coal preparation plant;
   - Reversing alarms on all mobile plant; and
   - The operation of the jig washer and/or front end loader at the Invincible coal preparation plant during evening hours.

Monitoring

6. The Proponent shall prepare and implement a noise monitoring program for the project to the satisfaction of the Director-General. The program must:

   - Be prepared in consultation with the DECC;
   - Be submitted to the Director-General for approval prior to 30 May 2009;
   - Include attended noise monitoring measures; and
   - Set out and explain how the Proponent would respond to any exceedance of the noise impact assessment criteria in Tables 2 and 3.

Continuous Improvement

7. The Proponent shall:

   - implement all reasonable and feasible best practice noise mitigation measures;
   - continue to investigate ways to reduce the noise generated by the project; and
   - report on these investigations and the implementation and effectiveness of these measures in the AEMR, to the satisfaction of the Director-General.

A.2 INVINCIBLE EPL1095

L5 Noise limits

L5.1 Noise from the premises must not exceed:

a) 40 dB(A) LAeq(15 minute) during the day (7 am to 6 pm); and
b) 35 dB(A) LAeq(15 minute) at all other times except as expressly provided by this licence;

at any residence on privately owned land.

Where LAeq means the equivalent continuous noise level – the level of noise equivalent to the energy-average of noise levels occurring over a measurement period.

Note: The licensee may exceed the limits set in L5.1 only if the licensee has a written negotiated noise agreement with the landowner of the premises in question and has provided a copy of this agreement to the EPA.

L5.2 To determine compliance with condition(s) L5.1 noise must be measured at, or computed for, the most affected point or within the residential boundary, or at the most affected point within 30 m of a dwelling (rural situations) where the dwelling is more than 30 m from the boundary. A modifying factor correction must be applied for tonal, impulsive or intermittent noise in accordance with the "Environmental Noise Management - NSW Industrial Noise Policy (January 2000)".

L5.3 The noise emission limits identified in this licence apply under all meteorological conditions except:
a) during rain and wind speeds (at 10m height) greater than 3m/s; and
b) under "non-significant weather conditions".

Note: Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

APPENDIX

B CALIBRATION CERTIFICATES

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

Sound Level Meter
IEC 61672-3.2006
Calibration Certificate

Calibration Number C15226

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

Equipment Tested/ Model Number : Rion NA-28
Instrument Serial Number : 00701424
Microphone Serial Number : 01916
Pre-amplifier Serial Number : 01463

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	20°C	**Ambient Temperature :**	21.6°C
Relative Humidity :	55.7%	**Relative Humidity :**	53%
Barometric Pressure :	99.62kPa	**Barometric Pressure :**	99.82kPa

Calibration Technician : Dennis Kim
Calibration Date : 22/05/2015
Secondary Check: Sandra Minto
Report Issue Date : 25/05/2015

Approved Signatory : Ken Williams

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

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.120dB*	*Temperature*	*±0.3°C*
12.5kHz	*±0.165dB*	*Relative Humidity*	*±4.1%*
16kHz	*±0.245dB*	*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.

NATA
WORLD RECOGNISED ACCREDITATION

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

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

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

PAGE 1 OF 1

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Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C16383

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive THORNTON NSW 2322
Equipment Tested/ Model Number :	Pulsar 106
Instrument Serial Number :	74813

Atmospheric Conditions

Ambient Temperature :	20.9°C
Relative Humidity :	39.8%
Barometric Pressure :	99.08kPa

Calibration Technician :	Dennis Kim	**Secondary Check:**	Sandra Minto
Calibration Date :	25/07/2016	**Report Issue Date :**	25/07/2016

Approved Signatory : Ken Williams

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

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	93.8	1000.34

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

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.09dB*	*Temperature*	*±0.05°C*
Short Term Fluct.	*±0.02dB*	*Relative Humidity*	*±0.46%*
Frequency	*±0.01%*	*Barometric Pressure*	*±0.017kPa*
Distortion	*±0.51%*		

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

NATA
WORLD RECOGNISED ACCREDITATION

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

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Accredited for compliance with ISO/IEC 17025.

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PAGE 1 OF 1