Boggabri Coal Mine

Environmental Noise Monitoring

February 2020

Prepared for

Boggabri Coal Operations Pty Ltd

Global Acoustics

Noise and Vibration Analysis and Solutions

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

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Boggabri Coal Operations Pty Ltd to conduct a monthly noise survey of operations at Boggabri Coal Mine (BCM), an open cut coal mine located near Boggabri, NSW. The purpose of the survey was to quantify and describe the existing acoustic environment around the mine and compare results with relevant limits.

Attended environmental noise monitoring described in this report was undertaken during the night period of 17/18 February 2020 at three monitoring locations around BCM.

1.2 Monitoring Locations

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

Table 1.1: BCM MONITORING LOCATIONS

Report Descriptor	Property Name and Location
N2	'Sylvania', Dripping Rock Road[1]
N3	'Picton', Dripping Rock Road
N4	'Barbers Lagoon', Boggabri-Manilla Road

Notes:

1. *Monitoring location moved approximately 300m south from May 2018 to avoid disturbing dogs (as requested by the resident).*

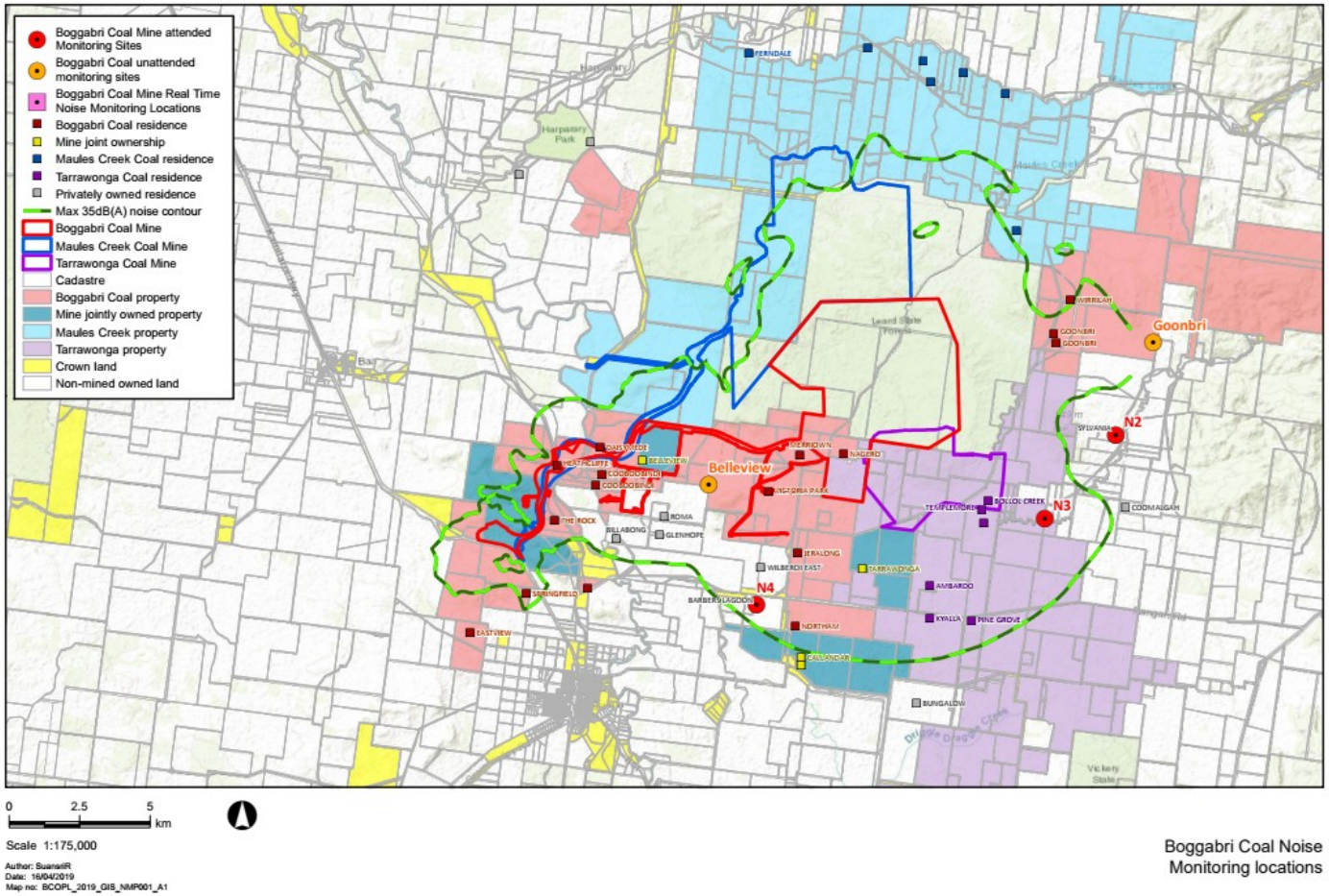

Figure 1: BCM Attended Noise Monitoring Locations (Source: BCM Noise Management Plan)

1.3 Terminology & Abbreviations

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

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Project Approval

The most current approval associated with activities at BCM is the 'Boggabri Coal Project, Project Approval 09_0182 (MOD 7, July 2019). Schedule 3 of the project approval details specific conditions related to noise generated by BCM. Relevant sections of the project approval are reproduced in Appendix A.

2.2 Environment Protection Licence

BCM holds Environment Protection Licence (EPL) No. 12407 issued by the Environment Protection Authority (EPA) most recently on 9 November 2018. Noise limits and meteorological exclusions are consistent between the EPL and project approval. However, the EPL does not specify cumulative noise criteria. Relevant sections of the EPL are reproduced in Appendix A.

2.3 Noise Management Plan

Noise monitoring requirements, including monitoring locations, are detailed in the BCM Noise Monitoring Plan (NMP). The most recent version of the NMP was Revision No. 13 approved in June 2019. Relevant sections of the NMP are reproduced in Appendix A.

2.4 Noise Criteria

2.4.1 Impact Assessment Criteria

Schedule 3 of the project approval outlines day, evening, and night period impact assessment criteria for the project, which are reproduced below.

Table 3: Noise impact assessment criteria dB(A) – maximum any stage of project life

Location Property/ID	Noise Impact Assessment Criteria			
	Day ($L_{Aeq\ (15\ min)}$)	Evening ($L_{Aeq\ (15\ min)}$)	Night ($L_{Aeq\ (15\ min)}$)	Night ($L_{A1\ (1\ min)}$)
All other privately-owned residences	35	35	35	45

Notes:

1. *Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy*
2. *Operational noise generated by the project includes noise generated from use of the private haul road and proposed rail spur.*

2.4.2 Cumulative Noise Criteria

Cumulative noise criteria detailed in the project approval are reproduced below.

Table 4: Cumulative noise criteria dB(A) $L_{Aeq\ (period)}$

Location	Day ($L_{Aeq\ (period)}$)	Evening ($L_{Aeq\ (period)}$)	Night ($L_{Aeq\ (period)}$)
All privately-owned land	40	40	40

Notes:

- *Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.*
- *Operational noise includes noise from the mining operations and use of private haul roads and rail spurs*

2.5 Meteorological Conditions

Further to this, Condition 14 of Schedule 3 provides more detail regarding meteorological exclusions:

> *"Where conditions in this approval refer to measurement of noise within the context of the NSW Industrial Noise Policy the inversion class to be applied to the project is Class G."*

As noise limits apply under the strongest inversion conditions (Stability Class G), no exemptions for inversion conditions are applicable for BCM. Based on the information above, noise limits have been assumed to apply under all meteorological conditions except during periods of rainfall or wind speeds greater than 3 m/s at 10 metres above ground level.

2.6 Modifying Factors

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

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

2.6.1 Tonality and Intermittent Noise

As defined in the NPfI:

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

2.6.2 Low-Frequency Noise

As defined in the NPfI:

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

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

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

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

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

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

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.
- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

3 METHODOLOGY

3.1 Overview

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

3.2 Attended Noise Monitoring

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

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

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

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

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

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

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

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

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

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

Often extraneous noise events (for example, road traffic pass-bys and dogs) interfere with the measurement of site noise levels in the frequency range of interest. Where required, the analyser is paused during these occurrences to aid in quantification of the site only $L_{Aeq,15minute}$ level.

3.3 Cumulative Noise

In order to assess cumulative noise impacts as required by the project approval, Global Acoustics assumed total mining noise levels from the attended survey will apply for the entire period being assessed. If there is no other mining noise audible during the monitoring period, there will be no cumulative noise impacts and no need for further assessment.

3.4 Modifying Factors

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

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

- meteorological conditions resulted in criteria being applicable;

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

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

- BCM was the only low-frequency noise source.

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

3.5 Monitoring Equipment

Table 3.1 lists the equipment 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	01070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	22/01/2021

4 RESULTS

4.1 Total Measured Noise Levels

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

Table 4.1: MEASURED NOISE LEVELS - FEBRUARY 2020[1]

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Ceq} dB
N2	17/02/2020 22:00	59	51	50	47	46	38	30	56
N3	17/02/2020 22:27	57	49	42	40	38	34	32	55
N4	17/02/2020 23:03	59	40	38	37	36	35	33	56

Notes:

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

4.2 Modifying Factors

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

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

None of the measurements satisfied the conditions outlined in Section 3.4 when assessing low-frequency noise. Therefore no further assessment of modifying factors was undertaken.

4.3 Attended Noise Monitoring

Table 4.2 and Table 4.3 detail noise levels from BCM in the absence of other noise sources. Noise criteria are applicable if weather conditions were within specified parameters during the measurement.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY BCM AGAINST NOISE IMPACT ASSESSMENT CRITERIA – FEBRUARY 2020

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies?[1]	BCM $L_{Aeq,15minute}$ dB[2]	Exceedance dB[3]
N2	17/02/2020 22:00	1.9	0.0	35	Yes	IA	Nil
N3	17/02/2020 22:27	2.1	0.0	35	Yes	IA	Nil
N4	17/02/2020 23:03	2.2	0.0	35	Yes	29	Nil

Notes:

1. *Noise emission limits do not apply during wind speeds greater than 3 metres per second (at a height of 10 metres) or rainfall. Criterion may or may not apply due to rounding of meteorological data values;*
2. *Site-only $L_{Aeq,15minute}$ attributed to BCM, including modifying factors if applicable; and*
3. *NA in exceedance column indicates atmospheric conditions outside those specified in project approval and EPL, therefore criterion does not apply.*

Table 4.3: $L_{A1,1minute}$ GENERATED BY BCM AGAINST NOISE IMPACT ASSESSMENT CRITERIA – FEBRUARY 2020

Location	Start Date and Time	Wind Speed m/s	Rainfall mm	Criterion dB	Criterion Applies?[1]	BCM $L_{A1,1minute}$ dB[2]	Exceedance dB[3]
N2	17/02/2020 22:00	1.9	0.0	45	Yes	IA	Nil
N3	17/02/2020 22:27	2.1	0.0	45	Yes	IA	Nil
N4	17/02/2020 23:03	2.2	0.0	45	Yes	35	Nil

Notes:

1. *Noise emission limits do not apply during wind speeds greater than 3 metres per second (at a height of 10 metres) or rainfall. Criterion may or may not apply due to rounding of meteorological data values;*
2. *Site-only $L_{A1,1minute}$ attributed to BCM; and*
3. *NA in exceedance column indicates atmospheric conditions outside those specified in project approval and EPL, therefore criterion does not apply.*

Table 4.4 compares measured L_{Aeq} levels for BCM and all other audible mining operations with cumulative noise criteria, as detailed in the project approval.

Table 4.4: MINING $L_{Aeq,period}$ NOISE LEVELS AGAINST BCM CUMULATIVE NOISE CRITERIA – FEBRUARY 2020

Location	Start Date and Time	Cumulative Noise Criterion $L_{Aeq,period}$ dB	Measured Mining Only $L_{Aeq,15minute}$ dB[1,2]	Exceedance
N2	17/02/2020 22:00	40	Nil	NA
N3	17/02/2020 22:27	40	Nil	NA
N4	17/02/2020 23:03	40	Nil	NA

Notes:

1. *These are results for BCM and all other mining noise. 15-minute measurements have been assumed to apply across the entire night period as worst case results and that criteria apply due to meteorological conditions; and*
2. *By definition, cumulative noise refers to two or more noise sources. If only one source of mining noise is audible, or if BCM is inaudible, then the measured cumulative noise is defined here as Nil.*

4.4 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – FEBRUARY 2020

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
N2	17/02/2020 22:00	23	2.1	340	8
N3	17/02/2020 22:27	21	0.8	340	7
N4	17/02/2020 23:03	23	0.6	210	6

Notes:

1. *"-" denotes calm conditions at 1.8 metres.*

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

5 SUMMARY

Global Acoustics was engaged by Boggabri Coal Operations Pty Ltd to conduct a monthly noise survey of operations at BCM. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken during the night period of 17/18 February 2020 at three monitoring locations..

Noise levels from BCM complied with relevant criteria at all monitoring locations during the February 2020 survey. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

A.1 PROJECT APPROVAL

NOISE AND VIBRATION

Construction Noise and Vibration Criteria

2. During the hours of:
   (a) 7:00 am to 6:00 pm Monday to Fridays, inclusive;
   (b) 8:00 am to 1:00 pm on Saturdays; and
   (c) at no time on Sundays or public holidays.

noise from activities associated with the construction and/or upgrade of the Boggabri Rail Spur Line, Kamilaroi Highway Access Roads, and Daisymede Laydown Compound shall meet the criteria in Table 1.

Table 1: Construction Noise impact assessment criteria – maximum any stage of project life

Location	Construction Noise Impact Assessment Criteria
Property/ID	Day dB(A) $L_{Aeq(15\ min)}$
27	50
23	45
All other privately-owned residences	40

Note: To interpret the locations referred to in Table 1, see the applicable figure in Appendix 4.

Vibration from activities associated with the construction and/or upgrade of Boggabri Rail Spur Line, Kamilaroi Highway Access Roads, and Daisymede Laydown Compound shall meet the limits set by:
(a) for structural damage, the vibration limits set out in the German Standard *DIN 4150-3: Structural Vibration - effects of vibration on structures*; and
(b) for human exposure, the acceptable vibration values set out in the *Environmental Noise Management Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006).

Should the Proponent propose to undertake any construction works associated with the Boggabri Rail Spur Line, Kamilaroi Highway Access Roads, and Daisymede Laydown Compound outside of hours specified above then the Proponent must develop an Out of Hours Work (OOHW) protocol consistent with the requirements of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009). The OOHW protocol must be developed to the satisfaction of the Secretary in consultation with the EPA and residents likely to be affected and demonstrate how the proposed scheduling would minimise impacts and how local residents' preferences would be accommodated.

Note: For areas where construction noise from the Boggabri Rail Spur Line, Kamilaroi Highway Access Roads, and Daisymede Laydown Compound is predicted to be at or below 35dB(A) and/ or below operational noise criteria at sensitive receptors, this is likely to provide sufficient justification for the need to operate outside of recommended standard hours as specified in the ICNG.

Operational Noise – Noise Affected Land

3. For privately-owned residences identified within the project's 35dB(A) noise impact contour (see Appendix 4A) the owner(s) can make a written request to the Proponent for one of the following:
   (a) mitigation (such as double glazing, insulation and air conditioning) at the residence in consultation with the owner(s). 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(s), the Proponent and owner(s) 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 Secretary for resolution; or
   (b) acquisition of the residence and land in accordance with the procedures in conditions 8-9 of Schedule 4.

   Upon receiving a written request from the owner(s), the Proponent must undertake whichever option has been requested by the owner(s).

   However, this condition does not apply if the Proponent has an agreement with the owner(s) of the relevant residence to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

   Notes:
   1. *For the purposes of this condition a privately-owned residence is defined as a residence not owned by a mining company that: is regularly occupied; or is an existing residence that is not regularly occupied but for which a valid development consent exists; or is a proposed residence for which a development application has been lodged with the relevant authority prior to the date of this approval.*
   2. *For the purposes of acquisition under this condition, parcels of land that are in close proximity and operated as a single agricultural enterprise should be considered as part of the land to be acquired. Where the Proponent and the owner(s) cannot agree on whether non-contiguous parcels of land should be included, either party may refer the matter to the Secretary for resolution. The Secretary's decision as to the lands to be included for acquisition under the procedures in conditions 8 and 9 of Schedule 4 shall be final.*

4. Where the owner(s) of a residence included in condition 3 of this schedule have opted for either an agreement to generate higher noise levels or mitigation under condition 3(a), and the owner(s) have reason to believe that the noise impacts at the residence are more than 3 dB(A) above the predicted noise levels for that residence (see Table 2), the owner(s) can request an independent noise impact assessment for the residence. The request shall be made in writing to the Secretary. If the Secretary considers that a noise impact assessment is warranted, then the Proponent shall commission the assessment.

   If the noise impact assessment determines that the noise generated by the project causes sustained exceedances, or is likely to cause sustained exceedances, of the predicted noise levels by more than 3 dB(A) the owner(s) may require the Proponent to acquire the residence and land in accordance with the procedures in conditions 8-9 of Schedule 4.

Table 2: Maximum Predicted Noise Levels

Location Property/ID	Day ($L_{Aeq\ (15\ min)}$)	Evening ($L_{Aeq\ (15\ min)}$)	Night ($L_{Aeq\ (15\ min)}$)	Night ($L_{A1\ (1\ min)}$)
54	35	42	42	45
52	35	41	41	45
67, 68	35	40	40	45
23	35	38	38	51
27, 48	36	38	38	48
86	35	38	38	45
43, 44	35	37	37	45
32, 33, 79, 90	35	36	36	45

Notes:

1. *To interpret the locations referred to in Table 2, see the applicable figure in Appendix 4.*
2. *The noise assessment must be undertaken by a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary and include either:*
   - *sufficient monitoring at the affected residence to allow for assessment of the impacts under a range of meteorological conditions (including adverse conditions) likely to be experiences at the residence; or*
   - *Sufficient monitoring to allow reliable prediction of the likely impacts under the range of meteorological conditions (including adverse conditions) likely to be experienced at the residence.*
3. *Monitoring should be conducted in accordance with the requirements of the NSW Industrial Noise Policy.*
4. *Where predictions of likely impacts is to be used, either in substitution for, or in conjunction with, direct measurement of noise impacts at the residence, it must be based on sufficient monitoring data to provide a reliable estimate of the impacts (including under adverse meteorological conditions) and be derived using standard noise modeling techniques accepted by the EPA.*
5. *The Proponent shall ensure that the requested noise impact assessment is submitted to the Secretary within 3 months of the Secretary's decision that the assessment was warranted. The Proponent shall also provide a copy of the assessment to the owner(s) of the residence at the same time it is submitted to the Secretary.*
6. *Note 2 to condition 3 of this Schedule applies to acquisition under this condition.*

5. At any stage of the project, except for the noise-affected land identified in condition 3 as being within the project's 35 dB(A) contour, the Proponent shall ensure that operational noise generated by the project does not exceed the criteria in Table 3 at any residence on privately-owned land.

Table 3: Noise impact assessment criteria dB(A) – maximum any stage of project life

Location Property/ID	Noise Impact Assessment Criteria			
	Day ($L_{Aeq\ (15\ min)}$)	Evening ($L_{Aeq\ (15\ min)}$)	Night ($L_{Aeq\ (15\ min)}$)	Night ($L_{A1\ (1\ min)}$)
All other privately-owned residences	35	35	35	45

Notes:

1. *Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy*
2. *Operational noise generated by the project includes noise generated from use of the private haul road and proposed rail spur.*

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

6. If the owner(s) of a privately-owned residence, which is not within the project's 35 dB(A) noise impact contour (see condition 3 and Appendix 4A), have reason to believe that operational noise from the project

is causing the criteria in Table 3 to be exceeded at the residence, the owner(s) can request an independent noise impact assessment for the residence. The request shall be made in writing to the Secretary. If the Secretary considers that a noise impact assessment is warranted, then the Proponent shall commission the assessment.

If the noise impact assessment determines that the noise generated by the project causes sustained exceedances, or is likely to cause sustained exceedances, of the criteria in Table 3, the owner(s) can make a written request to the Proponent for one of the following:

(a) mitigation (such as double glazing, insulation and air conditioning) at the residence in consultation with the owner(s). 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(s), the Proponent and owner(s) 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 Secretary for resolution; or

(b) acquisition of the residence and land in accordance with the procedures in conditions 8-9 of Schedule 4.

Upon receiving a written request from the owner(s), the Proponent must undertake whichever option has been requested by the owner(s).

However, this condition does not apply if the Proponent has an agreement with the owner(s) of the relevant residence to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

Notes:

1. *For the purposes of this condition a privately-owned residence is defined as a residence not owned by a mining company that: is regularly occupied; or is an existing residence that is not regularly occupied but for which a valid development consent exists; or is a proposed residence for which a development application has been lodged with the relevant authority prior to the date of this approval.*
2. *For the purposes of acquisition under this condition, parcels of land that are in close proximity and operated as a single agricultural enterprise should be considered as part of the land to be acquired. Where the Proponent and the owner(s) cannot agree on whether non-contiguous parcels of land should be included, either party may refer the matter to the Secretary for resolution. The Secretary's decision as to the lands to be included for acquisition under the procedures in conditions 8 and 9 of Schedule 4 shall be final.*
3. *Notes 2, 3, 4 and 5 of condition 4 apply to this condition.*

Cumulative Noise Criteria

7. Except for the noise affected land identified in condition 3 as being within the project's 35 dB(A) contour, the Proponent shall ensure that the operational noise generated by the project combined with the noise generated by other mines does not exceed the criteria in Table 4 at any residence on privately-owned land.

Table 4: Cumulative noise criteria dB(A) $L_{Aeq\ (period)}$

Location	Day ($L_{Aeq\ (period)}$)	Evening ($L_{Aeq\ (period)}$)	Night ($L_{Aeq\ (period)}$)
All privately-owned land	40	40	40

Notes:

- *Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.*
- *Operational noise includes noise from the mining operations and use of private haul roads and rail spurs*

Cumulative Noise Acquisition Criteria

8. If the owner(s) of a privately-owned residence, which is not within the project's 35 dB(A) noise impact contour (see condition 3 and Appendix 4A), reasonably believes that the noise limits in Table 4 are being exceeded at the residence and that the exceedance is caused by operational noise from the project and one or more other mines (including use of private haul roads or rail spurs), the owner(s) can request an independent noise impact assessment for the residence. The request shall be made in writing to the Secretary. If the Secretary considers that a noise impact assessment is warranted, then the Proponent shall commission the assessment.

Where the noise impact assessment determines that the cumulative noise generated by the project combined with the noise from the other mine(s) causes, or is likely to cause, sustained exceedances of the criteria in Table 4, then the owner(s) can make a written request to the Proponent for one of the following:

(a) mitigation (such as double glazing, insulation and air conditioning) at the residence in consultation with the owner(s). 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(s), the Proponent and owner(s) 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 Secretary for resolution; or

(b) acquisition of the residence and land in accordance with the procedures in conditions 8-9 of Schedule 4.

Upon receiving a written request from the owner(s), the Proponent must undertake whichever option has been requested by the owner(s).

However, this condition does not apply if the Proponent has an agreement with the owner(s) of the relevant residence to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.

The Proponent may seek to recover an equitable share of the costs incurred from the other mines contributing to the cumulative impact. Unless otherwise agreed between the mines, the proportional contributions should be based on expert analysis of the monitoring results to assess relative contribution to the impact. In the event of a dispute between the mines the Proponent, or one of the contributing mines, may submit the matter to the Secretary for resolution. The Secretary's decision shall be final.

Notes:

1. *For the purposes of this condition a privately-owned residence is defined as a residence not owned by a mining company that: is regularly occupied; or is an existing residence that is not regularly occupied but for which a valid development consent exists; or is a proposed residence for which a development application has been lodged with the relevant authority prior to the date of this approval.*
2. *For the purposes of acquisition under this condition, parcels of land that are in close proximity and operated as a single agricultural enterprise should be considered as part of the land to be acquired. Where the Proponent and the owner(s) cannot agree on whether non-contiguous parcels of land should be included, either party may refer the matter to the Secretary for resolution. The Secretary's decision as to the lands to be included for acquisition under the procedures in conditions 8 and 9 of Schedule 4 shall be final.*
3. *Notes 2, 3, 4 and 5 of condition 4 apply to this condition.*
4. *The noise impact assessment shall include assessment of the relative contribution of the mines to the impact at the residence.*

Attenuation of Plant

9. The Proponent shall:
   (a) ensure that:
   - all new trucks, dozers, drills and excavators purchased for use on the site after the date of this approval are commissioned as noise suppressed (or attenuated) units;
   - ensure that all equipment and noise control measures deliver sound power levels that are equal to or better than the sound power levels identified in the EA and that correspond to best practice or the application of best available technology economically achievable;
   - where reasonable and feasible, improvements are made to existing noise suppression equipment as technologies become available; and

   (b) monitor and report on the implementation of these requirements annually on its website.

10. The Proponent shall:
   (a) conduct an annual testing program of the attenuated plant on site to ensure that the attenuation remains effective;
   (b) restore the effectiveness of any attenuation if it is found to be defective; and
   (c) report on the results of any testing and/or attenuation work within the Annual Review.

Boggabri Rail Spur Line and Bridge Design – Noise impacts

11. The Proponent shall:
   (a) ensure all relevant Boggabri Rail Spur Line and rail bridge designs are assessed by suitably qualified and experienced person/s in acoustic engineering for the purpose of providing reasonable and feasible recommendations to minimise noise, including low frequency noise. This acoustic review should consider the EA's relevant recommendations and additional noise attenuation such as acoustic barriers to minimise noise at sensitive receptors;
   (b) implement reasonable and feasible recommendations made in the acoustic review;
   (c) undertake commissioning trials of the operation of the Spur Line to optimise train speed to minimise noise impacts; and
   (d) following completion and commissioning of the Spur Line, undertake targeted noise monitoring to determine the accuracy of predicted acoustic impacts and effectiveness of any noise reduction measures, including monitoring during adverse inversion conditions,

   to the satisfaction of the Secretary.

Operating Conditions

12. The Proponent shall:
    (a) implement best management practice to minimise the operational, low frequency and road and rail traffic noise of the project;
    (b) operate a comprehensive noise management system on site 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) maintain the effectiveness of noise suppression equipment on plant at all times and ensure defective plant is not used operationally until fully repaired;
    (d) ensure that noise attenuated plant is deployed preferentially in locations relevant to sensitive receivers;
    (e) minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply;
    (f) ensure that the Boggabri Rail Spur Line is only accessed by locomotives that are approved to operate on the NSW rail network in accordance with the noise limits in ARTC's EPL (No. 3142);
    (g) use its best endeavours to ensure that rolling stock supplied by service providers on the Boggabri Rail Spur Line is designed and constructed to minimise noise;
    (h) ensure any new rail rolling stock manufactured specifically for the project is designed and constructed to minimise noise;
    (i) use its best endeavours to achieve the long term intrusive noise goals for the project in Table 5, where this is reasonable and feasible, and report on the progress towards achieving these goals in the annual review; and
    (j) co-ordinate the noise management on site with the noise management at other mines within the Leard Forest Mining Precinct to minimise the cumulative noise impacts of these mines.

    to the satisfaction of the Secretary.

    Notes:

- *The comprehensive review can be undertaken as part of independent environmental audits required under condition 10 of Schedule 5.*

Table 5: Long Term Intrusive Noise Goals – Existing Residences

Location	Day	Evening	Night	
	$L_{Aeq\ (15\ min)}$	$L_{Aeq\ (15\ min)}$	$L_{Aeq\ (15\ min)}$	$L_{A1\ (1\ min)}$
All residences on privately owned land	35	35	35	45

Notes:

- *To interpret the locations referred to Table 5, see the applicable figures in Appendix 4; and*
- *Noise generated by the project is to be measured in accordance with condition 14 of this schedule.*

Noise Management Plan

13. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with the EPA and the CCC, and submitted to the Secretary for approval within 6 months of the date of this approval;
    (b) describe the measures that would be implemented to ensure:
        - best management practice is being employed;
        - the noise impacts of the project are minimised during meteorological conditions when the noise limits in this approval do not apply; and
        - compliance with the relevant conditions of this approval;
    (c) describe the proposed noise management system in detail;
    (d) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities;
    (e) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from noise monitoring;
    (f) include a monitoring program that:
        - uses a combination of real time and supplementary attended monitoring to evaluate the performance of the project;
        - adequately supports the proactive and reactive noise management system on site;
        - uses predictive meteorological forecasting to incorporate proactive mitigation measures to manage noise impacts;
        - includes monitoring of inversion strength at an appropriate sampling rate to determine compliance with noise limits;
        - evaluates and reports on the effectiveness of the noise management system on site;

- provides for the annual validation of the noise model for the project; and

(g) includes a Leard Forest Mining Precinct Noise Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative noise impacts of all mines within the Precinct, that includes:

- systems and processes to ensure that all mines are managed to achieve their noise criteria;
- a shared environmental monitoring network and data sharing protocol; and
- procedures for identifying and apportioning the source/s and contribution/s to cumulative noise impacts for operating mines and other sources, using the noise and meteorological monitoring network and appropriate investigative tools.

Note: The Leard Forest Mining Precinct Noise Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination and commencement of other mining projects in the area.

Noise Measurement

14. Where conditions in this approval refer to measurement of noise within the context of the NSW Industrial Noise Policy the inversion class to be applied to the project is Class G.

However, the Proponent may undertake an investigation to determine whether a proposal for change in this classification could be considered for approval by the Secretary. Any such investigation must be conducted in consultation with the EPA and be conducted by a suitably qualified person whose appointment has been endorsed by the EPA and approved by the Secretary. The report and recommendation must be submitted to the EPA for endorsement prior to submission to the Secretary. If the Secretary is satisfied that the recommendation is reasonable, then the Secretary may amend the inversion class applying to the project under this approval.

A.2 ENVIRONMENT PROTECTION LICENCE

L3 Noise limits

L3.1 Noise generated at the premises must not exceed the noise limits in the table below.

Locality and Location	Day- LAeq(15 minute)	Evening- LAeq(15 minute)	Night- LAeq(15 minute)	Night- LA1(1 minute)
All privately owned residences	35 dB(A)	35 dB(A)	35 dB(A)	45 dB(A)

L3.2 The noise limits identified in the above table do not apply at privately owned residences that are:
a) identified as residences subject to acquisition or noise mitigation on request within the Project Approval Conditions (09_0182); or
b) subject to a private agreement, relating to the noise levels, between the licensee and the land owner.

L3.3 For the purpose of condition L3.2(a) above, those properties identified as residences subject to acquisition or noise mitigation on request within the Project Approval Conditions (PA 10_0138) are:

Property No.	Lot/ DP
54	Lot 121/ DP 754926
52	Lot 2/ DP 716002
67	Lot 2/ DP 754927
68	Lot 3/ DP 754927
23	Lot 1/ DP 754926
27	Lot 41/ DP 754926
48	Lot 22/ DP 618032
86	Lot 2/ DP 1131282
43	Lot 1/ DP 509312
44	Lot 11/ DP 775513
32	Lot 1/ DP 1099042
33	Lot 1/ DP 1092050
79	Lot 132/ DP 754926
90	Lot 143/ DP 754926

L3.4 For the purpose of the table above:

a) Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
b) Evening is defined as the period from 6pm to 10pm;
c) Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

L3.5 **Determining Compliance**

To determine compliance:
a) with the Leq(15 minute) noise limits in the Noise Limits table, 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 3m, 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 a Nature Reserve.
b) with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 metre of a dwelling façade.
c) with the noise limits in the Noise Limits table, 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 part (a) or part (b) of this condition.

L3.6 The noise limits set out in the Noise Limits table apply under all meteorological conditions except for the following:
a) Wind speeds greater than 3 metres/second at 10 metres above ground level.

For the purposes of this condition:
a) Data recorded by the meteorological station identified as EPA Identification Point(s) W1 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the sigma-theta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.

L3.7 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.

M8 Noise monitoring

M8.1 To assess compliance with the noise limits presented in the Noise Limits table, attended noise monitoring must be undertaken in accordance with the condition titled Determining Compliance, outlined above, and:
a) at noise monitoring locations N2, N3, N4, N6 and N7 as shown onthe map titled "Noise Management Strategy Boggabri Coal Pty Ltd" in the Boggabri Coal Operations Pty Ltd Noise Management Plan, Rev.9, dated January 2016, and approved by the DPE (DOC15/528364-31);
b) occur monthly in a reporting period; and
c) occur during each night period as defined in the NSW Industrial Noise Policy for a minimum of 15 minutes

A.3 NOISE MANAGEMENT PLAN

6.1 Attended monitoring

Attended noise monitoring was conducted on a quarterly basis from inception of the BCM to the end of 2015. Continued attended monitoring to assess ongoing compliance with individual and cumulative noise criteria at privately owned properties is now conducted at monthly intervals during night periods.

The attended monitoring locations outside the 35 dB(A) contour are listed in Table 6.2 and illustrated in Appendix A. Additional one-off or occasional monitoring may also be undertaken at other surrounding locations as required utilising either a mobile real-time monitor or by commissioning an independent acoustic consultant to undertake attended monitoring.

Table 6.2 BCM attended noise monitoring locations

Location No.	Landowner/Property name	Type
N2	Sylvania	Attended
N3	Picton	Attended
N4	Barbers Lagoon	Attended

Attended noise monitoring will be conducted as follows:

- All noise investigations will be carried out in accordance with NSW Industrial Noise Policy, 2000 (INP).
- Noise levels will be measured in one-third octave bands using an instrument with IEC Type 1 characteristics as defined in AS 1259-1990 “Sound Level Meters”. The instrument will have current calibration as per manufacturer’s instructions and field calibration will be confirmed before and after measurements with a sound level calibrator.

- The instrument will be set to A-weighting, "fast" response and measurements of $L_{Aeq(15\ minute)}$ will be taken at each location in Table 6.2.
- Attended surveys will occur at each location in Table 6.2 at a frequency specified in condition M8.1 of EPL 12407 as follows:
  - monthly,
  - During the night period as defined in the NSW Industrial Noise policy for a minimum of 15 minutes.
- Field notes will be taken during each measurement recording the time and duration of noise events, noise sources, instantaneous noise levels and frequency range of identified site noise sources.
- Extraneous noise sources will be filtered from the measured signal using appropriate methods such as, employing an appropriate low pass cut-off, pausing unwanted noise or similar methods and the $L_{Aeq(15\ minute)}$ and L_{Amax} (as an estimate of the LA1(1-minute) sleep disturbance descriptor) levels attributable to BCM activities will be identified and compared with the relevant criterion.
- Details regarding plant configuration, survey interval, weather conditions, extraneous noise sources, monitoring locations and times of measurement will be recorded for inclusion in the noise monitoring report.

The selection of monitoring locations has been undertaken in consultation with relevant agencies. Compliance against the noise criteria within the Project Approval will be assessed using the monitoring locations identified in Table 6.2 irrespective of land ownership or distance from dwellings.

APPENDIX

B CALIBRATION CERTIFICATES

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

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C18363

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	01070590
Microphone Serial Number :	08184
Pre-amplifier Serial Number :	52329

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.3°C	**Ambient Temperature :**	22.7°C
Relative Humidity :	41.7%	**Relative Humidity :**	39.2%
Barometric Pressure :	100.95kPa	**Barometric Pressure :**	100.89kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 25 Jun 2018
Secondary Check: Lewis Boorman
Report Issue Date : 25 Jun 2018

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

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

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.31dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

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

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

Accredited for compliance with ISO/IEC 17025 - calibration.

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

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Acoustic Research Labs Pty Ltd
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Sound Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C19029

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

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

Atmospheric Conditions
Ambient Temperature : 23.1°C
Relative Humidity : 58.2%
Barometric Pressure : 99.49kPa

Calibration Technician : Charlie Neil
Calibration Date : 22 Jan 2019
Secondary Check: Lewis Boorman
Report Issue Date : 24 Jan 2019

Approved Signatory : Ken Williams

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

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.3	1000.38

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

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.5%*	*Barometric Pressure*	*±0.013kPa*

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

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

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

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

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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