



24 June 2021

Ref: 171356/29422

Muswellbrook Coal Company
PO Box 123
Muswellbrook NSW 2333

RE: JUNE 2021 NOISE MONITORING RESULTS – MUSWELLBROOK COAL MINE

This letter report presents the results of noise compliance monitoring, commencing at about 10.00 pm on Tuesday 15th of June, 2021, for the Muswellbrook Coal Company (MCC) mine at Muscle Creek Road, Muswellbrook. The monitoring was undertaken as per the requirements of D.A. 205/2002 and detailed in the Noise Management Plan (NMP) for the mine.

Attended Noise Monitoring Program

Noise monitoring was undertaken in accordance with the NMP as summarised below.

All attended monitoring and equipment maintenance and calibration is conducted in accordance with the Noise Policy for Industry (NPI) and AS1055 – Acoustics, Description and Measurement of Environmental Noise.

Attended noise monitoring is undertaken monthly by an independent noise consultant. Each attended noise survey will be conducted during night periods only. If it is identified during the noise monitoring that the mining noise from the operation is exceeding the criteria, MCC will be notified and the operations will be modified as required. Monitoring at the location(s) where the noise levels are elevated will be undertaken again with a minimum break of 75 minutes between monitoring.

The noise criteria for MCC apply under all meteorological conditions except for the following:

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

To determine compliance with the Leq (15 min) operational noise criteria the modification factors detailed in Section 4 of the NPI must be applied, as appropriate, to the measured noise levels.

Due to the distance of the mine from each residence, the monitoring of LA1 (1minute) at the facade is not considered necessary and will be conducted at/or near the property boundary.

The attended noise monitoring locations are detailed in **Table 1** and shown in **Figure 1**.

| Table 1 Noise Monitoring Locations | |
|---------------------------------------|-------------------|
| Location | Description |
| R13 | Sandy Creek Road |
| R15 | Queen St |
| R17 | Queen St |
| R25 | Sandy Creek Road |
| R32 | Muscle Creek Road |



Figure 1 – Noise Monitoring Locations

Noise criteria for all assessment locations shown in Figure 1 are detailed in **Appendix I** to this report.

Monitoring Equipment

Attended noise monitoring was conducted with a Brüel & Kjær Type 2250 Precision Sound Analyser. This instrument has Type 1 characteristics as defined in AS1259-1990 “Sound Level Meters” and has current NATA calibration. Field calibration is carried out at the start and end of each monitoring period. Calibration certificates are attached as **Appendix II** to this report.

A-weighted noise levels were measured over the 15 minute monitoring period with data acquired of 1 second statistical intervals and the meter set to “fast” response. Each 1 second measurement is accompanied by a third-octave band spectrum from 20 - 20k Hz which is required for analysing NPI ‘modifying factors’.



Time based field notes allow for determination of the relative contributions to the overall noise level of all significant noise sources.

Measurement Analysis

The MCC compliance noise criteria are based on a 15 minute Leq noise level. The 15 minute Leq noise level for each monitoring period is shown in the tables below. Where the noise from MCC was audible Bruel & Kjaer “Evaluator” analysis software was used to quantify the contribution of the mine and other significant noise sources to the overall level. Mine noise from MCC is shown in the table in bold type.

All noise levels shown are in dB(A) Leq (15 min) unless otherwise detailed.

MCC Operations

Operational details for MCC for the monitoring period on 15th of June, 2021 are shown in **Appendix III**.

Noise Compliance Assessment

The results of the noise measurements are shown in **Table 2**.

| Table 2 MCC Operational Noise Monitoring Results – 15 June 2021 | | | | | | | | | |
|--|-------------|---------------|-----------------------------------|---------------------------|-------------------------------------|--|--|---------------------------------|---|
| Location | Time | dB(A), Leq | MCC Contribution dB(A), Leq | Criterion dB(A) Leq | dB(A), L1 (1min) ¹ | Criterion dB(A), L1 (1min) ¹ | Stability Class/ Wind speed (m/s)/dir ^o | Compliant Met Conditions? | Identified Noise Sources ² |
| R13 Sandy Creek Rd. | 10:18 pm | 33 | <20 | 41 | 26 | 45 | D/1.0/332 | Yes | Traffic (33), MCC occasionally audible (<20) |
| R15 Queen St. | 10:40 pm | 42 | <20 | 37 | <25 | 45 | E/0.6/351 | Yes | Train (41), traffic (33), domestic a/c (26), MCC occasionally audible (<20) |
| R17 Queen St. | 10:58 pm | 34 | 30 | 35 | 37 | 45 | F/0.3/317 | Yes | Traffic (31), MCC (30) , insects (24) |
| R25 Sandy Creek Rd. | 10:00 pm | 34 | 32 | 42 | 38 | 45 | F/0.9/5 | Yes | MCC (32) , substation (29), traffic (23) |
| R32 Muscle Creek Rd. | 11:21 pm | 31 | 31 | 35 | 36 | 45 | E/0.9/338 | Yes | MCC (31) |

1. L1 (1 min) from MCC mine noise only
2. See text regarding MCC noise sources

The results in Table 2 show that, under the operational and meteorological conditions at the time, noise from MCC did not exceed the relevant noise criteria at any time or location during the monitoring period.

The data from the mine operated weather station showed that meteorological conditions were compliant with the conditions in the NMP for the entire noise monitoring survey.

Mine noise from Muswellbrook Coal was audible and measurable at monitoring locations R17, R25 and R32.

At each of locations R17 and R25 the mine noise was attributable to mine hum with occasional engine revs, dozer tracks and horns. At location R32 the mine noise was dominated by dozer tracks and engine noise.

At locations R13 and R15 the mine noise was occasionally audible and this was typically noise from dozer tracks.

Data from those times where MCC operations were audible were analysed using the “Evaluator” software. This analysis showed the noise did not contain any tonal or impulsive components as per definitions in the Noise Policy for Industry.

The methodology for analysing the low frequency noise modifying factor correction in the NPI is shown in extract below.

| | | | | |
|---------------------|--|---|------------------------|---|
| Low-frequency noise | Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10– 160 Hz | Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: <ul style="list-style-type: none"> where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2-dB(A) positive adjustment to measured/predicted A- weighted levels applies for the evening/night period where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A- weighted levels applies for the evening/night period and a 2- dB(A) positive adjustment applies for the daytime period. | 2 or 5 dB ² | A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations. |
|---------------------|--|---|------------------------|---|

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

| Hz/dB(Z) | One-third octave dB(Z) Leq (15 min) 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 | |



The correction applies to the mine noise component only. There are many sources of low frequency noise in the acoustic environment of each receiver area (including noise from road and rail traffic and from rail track works). In many cases the C minus A level is greater than 15dB due to these other noise sources. In most instances the screening criteria will be the one third octave analysis. Should the mine noise not comply with this then the C minus A analysis will be applied.

Tables 3, 4 and 5 show the low frequency noise analysis for the periods where the mine noise was able to be accurately isolated from the overall measurements during the monitoring at Locations R17, R25 and R32. At location R25 the noise from a nearby electrical substation was a constant contributor to the overall noise measurement. This noise was dominant in the 80 and 100Hz octave bands. This noise has been shown in bold in Table 4.

| Table 3 | | | | | | | | | | | | | |
|---|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| Low Frequency Noise Analysis – 15 June 2021 | | | | | | | | | | | | | |
| Frequency (Hz) | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
| R17 Queen St. | <36 | 36.8 | 46.2 | 43.4 | 46.0 | 40.6 | 42.9 | 43.2 | 39.6 | 39.3 | 39.3 | 35.4 | 33.2 |
| dB(Z) Criterion | 92 | 89 | 86 | 77 | 69 | 61 | 54 | 50 | 50 | 48 | 48 | 46 | 44 |
| Exceedance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Table 4 | | | | | | | | | | | | | |
|---|-----|------|------|------|------|------|------|------|------|-------------|-------------|------|------|
| Low Frequency Noise Analysis – 15 June 2021 | | | | | | | | | | | | | |
| Frequency (Hz) | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
| R25 Sandy Ck Rd | <31 | 31.3 | 39.8 | 42.9 | 35.9 | 40.4 | 42.4 | 40.6 | 38.5 | 40.7 | 45.8 | 40.9 | 36.0 |
| dB(Z) Criterion | 92 | 89 | 86 | 77 | 69 | 61 | 54 | 50 | 50 | 48 | 48 | 46 | 44 |
| Exceedance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Table 5 | | | | | | | | | | | | | |
|---|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| Low Frequency Noise Analysis – 15 June 2021 | | | | | | | | | | | | | |
| Frequency (Hz) | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
| R32 Muscle Ck Rd. | <37 | 37.4 | 38.7 | 43.4 | 41.7 | 39.7 | 44.7 | 45.3 | 40.8 | 38.8 | 36.9 | 37.7 | 35.4 |
| dB(Z) Criterion | 92 | 89 | 86 | 77 | 69 | 61 | 54 | 50 | 50 | 48 | 48 | 46 | 44 |
| Exceedance | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The results in Tables 3, 4 and 5 show that there is no requirement to apply a low frequency noise modifying factor correction to the measured noise levels at any of the monitoring locations.

In addition to the operational noise, the noise from MCC must not exceed **45 or 47 dB(A) L1 (1 min)** between the hours of 10 pm and 7 am (see Appendix I for details of noise criteria at various receiver locations). This is to minimise the potential for sleep disturbance as a result of individual loud noises from the mine. The compliance measurement locations are different for each of the operational and sleep disturbance noise. That is, the sleep disturbance criterion is typically applicable at 1m from the facade of a bedroom window.

To avoid undue disturbance to residents the L1 (1 min) noise level from the operational measurements are used to show general compliance with the sleep disturbance criterion. That is, as the distance

between the noise source and the operational noise monitoring location is significantly greater than the distance between the operational noise monitoring location and the sleep disturbance monitoring location (i.e. 1m from the facade of the house) there will be little variation in L1 (1 min) levels between the two monitoring locations.

It must be noted, however, that the sleep disturbance criterion is applicable at the outside of a bedroom window. As the internal layout of each residence is not known, to consider a worst case, the bedroom windows were assumed to be facing towards the mine.

As shown in Table 2, during the night time measurement circuit the L1 (1 min) noise from MCC did not exceed 45 dB(A) at any monitoring location.

At locations R17 and R25 the L1 (1 min) noise was attributable to impact noises. At the other locations the L1 (1 min) noise was attributable to dozer tracks.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 0412 023 455.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:



Ross Hodge
Acoustical Consultant

Review:



Neil Pennington
Acoustical Consultant

Appendix I

Noise criteria from Development Consent DA205/2002 (Locations as per Figure 1).

| Location | Day | Evening | Night | |
|--|------------------------------|------------------------------|------------------------------|----------------------------|
| | L _{Aeq} (15 minute) | L _{Aeq} (15 minute) | L _{Aeq} (15 minute) | L _{A1} (1 minute) |
| R1, R2, R3, R4, R17, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R37, R38, R39 | 35 | 35 | 35 | 45 |
| R5 | 36 | 36 | 36 | 45 |
| R7 | 38 | 38 | 38 | 45 |
| R11 | 39 | 39 | 39 | 45 |
| R12 | 39 | 39 | 39 | 45 |
| R13 | 41 | 41 | 41 | 45 |
| R14 | 38 | 38 | 38 | 45 |
| R15 | 37 | 37 | 37 | 45 |
| R16 | 36 | 36 | 36 | 45 |
| R17 | 35 | 35 | 35 | 45 |
| R18 | 45 | 38 | 37 | 47 |
| R20 | 45 | 38 | 37 | 47 |
| R21 | 37 | 37 | 37 | 45 |
| R22 | 39 | 39 | 39 | 45 |
| R23 | 39 | 39 | 39 | 45 |
| R24 | 40 | 40 | 40 | 45 |
| R25 | 42 | 42 | 42 | 45 |
| R36 | 38 | 38 | 38 | 45 |
| R40 | 42 | 42 | 42 | 45 |
| R41 | 42 | 42 | 42 | 45 |
| R42 | 40 | 40 | 40 | 45 |

Note: All levels are in dB(A)

Note: Following further consultation with the community it has been identified that R11 is a stable complex, not a residence, so the criteria listed in the table above do not apply.

Appendix II

Calibration Certificates

Brüel & Kjær

Australian Calibration Laboratory
Suite 2, 6-10 Talavera Road, North Ryde NSW 2113, Australia
Accredited for compliance with ISO/IEC 17025 - Calibration. Laboratory No. 1301

NATA
WORLD RECOGNISED
ACCREDITATION

CERTIFICATE OF CALIBRATION

Certificate No: CAU1901071

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CALIBRATION OF:

| | | | |
|----------------------|----------------------|-------------------|-------------|
| Sound Level Meter: | Brüel & Kjær | 2250 | No: 2747794 |
| Microphone: | Brüel & Kjær | 4189 | No: 2733511 |
| Preamplifier: | Brüel & Kjær | ZC-0032 | No: 15339 |
| Supplied Calibrator: | Brüel & Kjær | None | No: N/A |
| Software version: | BZ7224 Version 4.6.0 | Pattern Approval: | PTB |
| Instruction manual: | BE1712-22 | Identification: | N/A |

CUSTOMER:

Spectrum Acoustics Pty Ltd
30 Veronica Street
Cardiff NSW 2285

CALIBRATION CONDITIONS:

Preconditioning: 4 hours at 23 °C
Environment conditions: *see actual values in Environmental conditions sections*

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 8.0 - DB: 8.00) and test procedure 2250-4189.

RESULTS:

| | | | |
|---|---------------------------------------|---|--|
| | Initial calibration | | Calibration prior to repair/adjustment |
| X | Calibration without repair/adjustment | X | Calibration after repair/adjustment |

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration: 05/11/2019

Sajeéb Tharayil
Calibration Technician

Certificate Issued: 05/11/2019

Craig Patrick
Approved signatory

Reproduction of the complete certificate is allowed. Part of the certificate may only be reproduced after written permission.



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 www.acousticresearch.com.au

Sound Calibrator
 IEC 60942-2017
Calibration Certificate

Calibration Number C21052

Client Details Spectrum Acoustics
 30 Veronica Street
 Cardiff NSW 2285

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 75503

Atmospheric Conditions
Ambient Temperature : 23.8°C
Relative Humidity : 48.3%
Barometric Pressure : 100.16kPa

Calibration Technician : Jeff Yu **Secondary Check:** Max Moore
Calibration Date : 04 Feb 2021 **Report Issue Date :** 5 Feb 2021

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 |
|---------------|-------------------|----------------|--------------------|
| 94 | 1000 | 94.00 | 1000.30 |

The sound calibrator has been shown to conform to the class 1 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 - Environmental Conditions | | | |
|---|---------|--------------------------|-----------|
| Specific Tests | | Environmental Conditions | |
| Generated SPL | ±0.14dB | Temperature | ±0.2°C |
| Frequency | ±0.09% | Relative Humidity | ±2.4% |
| Distortion | ±0.09% | Barometric Pressure | ±0.015kPa |

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

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA 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 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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.



Appendix III

Operational Details – 15 June 2021 (10.00 pm to 12.00 am)

For that period mining was carried out as follows;

- 209, - 1 x D10 dozer, 4 x Hitachi 3500 trucks in S24 hauling waste to the RL205 dump in Pit 1
- 1 x D10 dozer on RL 205 dump in Pit 1.
- 1 x D10 dozer on SP 4
- Crushing and wash plant running with 1 x CAT 777
- 1 x grader
- 1 x watercart
- No drilling

