1 November 2018

Ref: 171356/8121

Muswellbrook Coal Company
PO Box 123
Muswellbrook NSW 2333

RE: OCTOBER 2018 NOISE MONITORING RESULTS – MUSWELLBROOK COAL MINE

This letter report presents the results of noise compliance monitoring, commencing at 10.10pm on Thursday 23rd of October, 2018, 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 3 m/s at 10 m above ground level; or

ii. Stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m 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 (1 minute) at the facade is not considered necessary and will be conducted at the property boundary.
The attended noise monitoring locations are detailed in Table 1 and shown in Figure 1.

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13</td>
<td>Sandy Creek Road</td>
</tr>
<tr>
<td>R15</td>
<td>Queen St</td>
</tr>
<tr>
<td>R17</td>
<td>Queen St</td>
</tr>
<tr>
<td>R25</td>
<td>Sandy Creek Road</td>
</tr>
<tr>
<td>R32</td>
<td>Muscle Creek Road</td>
</tr>
</tbody>
</table>

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 AS1259-1982 “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.

Meteorological data used in this report were supplied by the mine from their automatic weather station.

**MCC Operations**

Operational details for MCC on 23rd October, 2018 are shown in Appendix III.

**Noise Compliance Assessment**

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>dB(A), Leq</th>
<th>MCC Contribution dB(A), Leq</th>
<th>Criterion dB(A), Leq</th>
<th>dB(A), L1 (1min)(^1)</th>
<th>Criterion dB(A), L1 (1min)(^1)</th>
<th>Stability Class/ Wind speed (m/s)/dir(^5)</th>
<th>Compliant Met Conditions?</th>
<th>Identified Noise Sources(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R13 Sandy Creek Rd.</td>
<td>11:10 pm</td>
<td>33</td>
<td>n/a</td>
<td>41</td>
<td>n/a</td>
<td>45</td>
<td>D/2.9/359</td>
<td>Yes</td>
<td>Traffic (32), insects (26), MCC inaudible</td>
</tr>
<tr>
<td>R15 Queen St.</td>
<td>10:28 pm</td>
<td>39</td>
<td>20</td>
<td>37</td>
<td>25</td>
<td>45</td>
<td>E/2.7/8</td>
<td>Yes</td>
<td>Traffic (38), birds &amp; insects (32), <strong>MCC (20)</strong></td>
</tr>
<tr>
<td>R17 Queen St.</td>
<td>10:10 pm</td>
<td>35</td>
<td>n/a</td>
<td>35</td>
<td>n/a</td>
<td>45</td>
<td>E/2.4/3</td>
<td>Yes</td>
<td>Traffic (34), insects (28), MCC inaudible</td>
</tr>
<tr>
<td>R25 Sandy Creek Rd.</td>
<td>10:50 pm</td>
<td>38</td>
<td>n/a</td>
<td>42</td>
<td>n/a</td>
<td>45</td>
<td>E/2.7/354</td>
<td>Yes</td>
<td>Sub station (36), traffic (33), insects (25), <strong>MCC inaudible</strong></td>
</tr>
<tr>
<td>R32 Muscle Creek Rd.</td>
<td>11:35 pm</td>
<td>45</td>
<td>21</td>
<td>35</td>
<td>24</td>
<td>45</td>
<td>D/2.8/354</td>
<td>Yes</td>
<td>Dog (45), traffic (23), insects (28), <strong>MCC (21)</strong></td>
</tr>
</tbody>
</table>

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 meteorological station showed that all of the monitoring was done under compliant meteorological conditions.

Mine noise was audible and measurable at monitoring locations R15 and R32. At each of these two locations the mine noise was faint mine hum with occasional engine revs from haul trucks and diggers.

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 NPI.

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

<table>
<thead>
<tr>
<th>Low-frequency noise</th>
<th>Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz</th>
<th>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:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• 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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 or 5 dB²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Hz/dB(Z)</th>
<th>One-third octave dB(Z) Leq (15 min) threshold level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (Hz)</td>
<td>10</td>
</tr>
<tr>
<td>dB(Z)</td>
<td>92</td>
</tr>
</tbody>
</table>

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 noises 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.
The mine noise at Locations R15 and R32 was relatively faint and not consistent enough to get a viable measurement for low frequency analysis. As the measured noise was significantly below the relevant criteria at these locations the low frequency noise analysis was not considered warranted.

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 façade 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 façade 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.

The measured L1 (1 min) noise, at both locations where mine noise was audible, was attributable to engine revs which were heard briefly.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

**SPECTRUM ACOUSTICS PTY LIMITED**

Author: Ross Hodge

Review: Neil Pennington

Acoustical Consultant

Acoustical Consultant
Appendix I

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Day $L_{Aeq(15\ minute)}$</th>
<th>Evening $L_{Aeq(15\ minute)}$</th>
<th>Night $L_{Aeq(15\ minute)}$</th>
<th>$L_{A1\ (1\ minute)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1, R2, R3, R4, R17, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R37, R38, R39</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>R5</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>45</td>
</tr>
<tr>
<td>R7</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>45</td>
</tr>
<tr>
<td>R11</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>R12</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>R13</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>45</td>
</tr>
<tr>
<td>R14</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>45</td>
</tr>
<tr>
<td>R15</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>45</td>
</tr>
<tr>
<td>R16</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>45</td>
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<td>R17</td>
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<td>R18</td>
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<td>R20</td>
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<td>R21</td>
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<td>45</td>
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<td>R22</td>
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<td>R23</td>
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<td>R24</td>
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<td>R25</td>
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<td>R36</td>
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<td>R40</td>
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<tr>
<td>R41</td>
<td>42</td>
<td>42</td>
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<td>45</td>
</tr>
<tr>
<td>R42</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>45</td>
</tr>
</tbody>
</table>

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

![Certificate Image]

**Appendix II**

**Calibration Certificates**

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**Brüel & Kjaer**

Australasian Calibration Laboratory

12/13 Valorous Road, Wentworth NSW 2323, Australia

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**CERTIFICATE OF CALIBRATION**

Certificate No: CAU1700839  Page 1 of 10

**CALIBRATION OF:**

- Sound Level Meter: Brüel & Kjaer 2250
- Microphone: Brüel & Kjaer 4189
- Amplifier: Brüel & Kjaer ZC-0632
- Supplied Calibrator: N/A
- Software version: IE7222 Version 4.5.1
- Instruction manual: IEB712-22

**CUSTOMER:**

Spectrum Acoustics Pty Ltd
30 Veronia Street
Cardiff NSW 2285

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**CALIBRATION CONDITIONS:**

Preconditioning: 4 hours at 33 °C

Environment conditions: see actual calibration Environmental Conditions

**SPECIFICATIONS:**

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-2:2006 class 1. Procedures from IEC 61672-2:2006 were used to perform the periodic test.

**PROCEDURE:**

The measurements have been performed with the assistance of Brüel & Kjaer Sound Level Meter Calibration System D&K 3530 with application software type 7763 (version 6.0 - DB-6.0.1) and test procedure 3525-4189.

**RESULTS:**

<table>
<thead>
<tr>
<th>Initial calibration</th>
<th>Calibration prior to repair/adjustment</th>
<th>Calibration without repair/adjustment</th>
<th>X Calibration after repair/adjustment</th>
</tr>
</thead>
</table>

The quoted expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor 1 – 2 providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with EA-402 norms originating from the standards, calibration method, effect of environmental conditions and any short-term contribution from the device under calibration.

**Date of Calibration:** 04/09/2017

**Certificate issued:** 04/08/2017

Sajeeb Thanyi
Calibration technician

Jan Rasmussen
Approved signature

*Reproduction of this complete certificate is denied. Part of the certificate may only be reproduced after written permission.*
**CERTIFICATE OF CALIBRATION**

**No.: CAU1708213**

**CALIBRATION OF:**

<table>
<thead>
<tr>
<th>Calibrator:</th>
<th>Bruel &amp; Kjaer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Acoustic Calibrator</td>
</tr>
<tr>
<td>Identification:</td>
<td>N/A</td>
</tr>
<tr>
<td>IRC Class:</td>
<td>1</td>
</tr>
</tbody>
</table>

**CUSTOMER:**

Spectrum Acoustics Pty Ltd
39 Veronica Street
Coffs Harbour NSW 2430

**CALIBRATION CONDITIONS:**

- **Environmental conditions:**
  - Air temperature: 23.4 °C
  - Air pressure: 101.4 kPa
  - Relative humidity: 38.2% RH
  - Temperature stabilization: 4 hours at 23 °C

**SPECIFICATIONS:**

The acoustic calibrator has been calibrated in accordance with the requirements as specified in IEC61672.

**PROCEDURE:**

The measurements have been performed with the assistance of Bruel & Kjaer acoustic calibrator calibration application software Type 7254 using calibration procedure 4231. Complete.

**RESULTS:**

- Initial Calibration
- Recalibration without repair/adjustment
- Calibration before repair/adjustment
- 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 estimation has been carried out in accordance with IEC 61260. The estimated uncertainty includes the contributions from the calibration and the manufacturer's specification.

**Date of Calibration:** 11/05/2017

**Certificate issued:** 11/05/2017

[Signature]

ApprovedAuthority

Reproduction of this certificate is allowed. This certificate may not be reproduced other than for training purposes.
Appendix III

Operational Details – 23 October 2018 (10.00 pm to midnight)

For that period mining was carried out as follows:

- 211, 1 x D10 dozer and 4 x Hitachi 3500 in S22 hauling waste to the Pit 2 RL158 dump
- 212, 1 x D10 dozer, 4 x Hitachi 3500 in S21 hauling waste to the Pit 2 RL158 dump
- One D10 dozer on the RL 158 dump in Pit 2
- 209 on maintenance
- No crushing
- Wash plant running with one CAT 777.
- 1 x 777 watercarts, 1 x graders in Pit 1 and Pit 2
- Drill on breakdown