3 September 2019

Ref: 171356/8533

Muswellbrook Coal Company Limited
PO Box 123
Muswellbrook NSW 2333

RE: PLANT NOISE TEST RESULTS – JULY/AUGUST 2019

This letter report presents the results of plant noise testing conducted for the Muswellbrook Coal Company (MCC) on 22 July and 21 August 2019 as required in Section 4.2 of the MCC Noise Management Plan (November 2017).

MONITORING PROCEDURES

Dynamic testing was conducted using a modified version of ISO 6395:2008[1] that utilises two microphones to capture the same data as the four ground level points in the standard. The layout of the machinery path of motion and measurement points in the Standard are shown in **Figure 1**. When applied to dump trucks in motion, the forward measurement path is from point A to point B and then from B to A so that the microphones positions record both the left and right side of the vehicle.

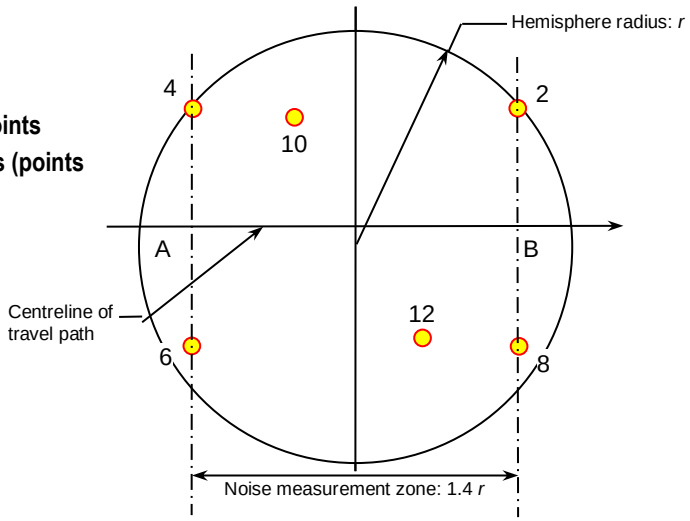

Figure 1. Measurement points for ISO 6395 dynamic tests (points 10 and 12 omitted).

Measurement points 2 and 4 (6 and 8) were combined into a single point and the measurement zone extended to approximately 2.8 *r* to allow for an approach distance of 1.4 *r* to represent the measurement at point 2 (4) and a departure distance of 1.4 *r* to represent the measurement at point 6 (8). For measurements of dozers 1437 and 1451 on 21 August the engine revs were held constant at 1850 rpm. NATA calibration certificates for the measurement equipment are attached to this report.

[1] Pennington, N. *Theoretical justification for modifying homologation standard ISO 6395:2008(E) to suit the working mine site*. Acoust. Aust. **45**, 77-84 (2017).

RESULTS

Calculated sound power levels (Lw, dB(A)) are presented in Table 1 below, with the test procedure (Stationary, dynamic or operational) noted along with the previously calculated sound power levels. All values are rounded to the nearest whole number with the method uncertainty error as defined in Annex N of ISO 6395.

TABLE 1
Sound Power Levels, Lw dB(A)
22 July and 21 August, 2019

Equipment	Action/Mode	Test condition	Lw (Prev)[1]	Lw, (2019)
Excavator no. 211	Dynamic (rotation)	Stationary (operation)	116 ± 1	115 ± 1
Water Cart 1115	Dynamic (forward)	Travel on incline	116 ± 1	118 ± 1
CAT haul truck 1231	Dynamic (forward)	Travel on incline	119 ± 1	118 ± 1
CAT haul truck 1232	Dynamic (forward)	Travel on incline	119 ± 1	117 ± 1
CAT haul truck 1233	Dynamic (forward)	Travel on incline	119 ± 1	116 ± 1
CAT haul truck 1234	Dynamic (forward)	Travel on incline	119 ± 1	118 ± 1
CAT haul truck 1235	Dynamic (forward)	Travel on incline	119 ± 1	116 ± 1
CAT haul truck 1236	Dynamic (forward)	Travel on incline	119 ± 1	117 ± 1
Dozer 1437 (22 Jul)	Dynamic fwd/rev[2]	Drive-by	119 ± 1	120 ± 1
Dozer 1437 (21 Aug)	Dynamic fwd/rev[2]	Drive-by	119 ± 1	120 ± 1
Dozer 1451 (22 Jul)	Dynamic fwd/rev[2]	Drive-by	120 ± 1	124 ± 1
Dozer 1451 (21 Aug)	Dynamic fwd/rev[2]	Drive-by	120 ± 1	125 ± 1

[1] Most recent measurement from previous years.

[2] Geometric average of results for first and second gears.

Section 4.2 of the site Noise Management Plan (NMP, November 2017) states: “MCC conducts a survey of significant noise sources to determine the noise levels from the equipment. This survey will be completed so that all significant noise generating equipment is surveyed over a 3 year period. The results of this monitoring will be compared to previous results and if there is an increase of more than 2dB an investigation into the changes will be conducted to identify if any further mitigation on the equipment is required. As part of this investigation the attended noise monitoring results and complaints history will be considered.”

All items in Table 1 satisfy this requirement with respect to the most recently conducted measurements apart from Dozer #1451 which was 4 dB louder on 22 July than the previous measurement. As a result, Dozers #1451 was remeasured on 21 August with Dozer #1437 also remeasured as a control. For the 21 August measurements, both dozers were held at 1850 rpm, which corresponds approximately to the manufacturer’s rated high idle (no load) rpm. The two results for Dozer #1437 were the same, with only a 1 dB difference for Dozer #1451.

Noise from tracked dozers is dominated by track slap as the teeth on primary drive sprockets engage and lift successive grouser plates. Plate linkages wear over time and the progressive looseness of plate connections produces more noise. It is recommended that the serviceability parameters of the tracks on Dozer #1451 be checked to ensure they are within manufacturer’s tolerances.

In summary, we advise that MCC mobile plant sound power levels do not exceed the previously measured levels by more than 2 dB, apart from dozer #1451 which was 4-5 dB greater than the sound power level for this item measured in previous years. This noise increase may be due to, but not limited to, natural track wear over time. Dozer #1451 should be re-measured upon completion of its next scheduled maintenance. The remaining two-third of plant on site will be measured over the next two years as required in the NMP.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please do not hesitate to contact the undersigned.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Author:

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Review:

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Acoustical Consultant

This document was prepared for the sole use of Muswellbrook Coal Limited and the regulatory agencies that are directly involved in this project, the only intended beneficiaries of our work. No other party should rely on the information contained herein without the prior written consent of Spectrum Acoustics Pty Limited and Muswellbrook Coal Limited.

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: CAU1800652 Page 1 of 10

CALIBRATION OF:

Sound Level Meter:	Bruel & Kjaer	2250	No: 2747794
Microphone:	Bruel & Kjaer	4189	No: 2733511
Preamplifier:	Bruel & Kjaer	ZC-0032	No: 15339
Supplied Calibrator:	N/A	N/A	No: N/A
Software version:	BZ7224 Version 4.6	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 7.2 - DB: 7.20) and test procedure 2250-4189.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
X	Calibration without 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 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: 25/06/2018

Sajeeb Tharayil
Calibration Technician

Certificate issued: 26/06/2018

Jan Rasmussen
Approved signatory

Brüel & Kjær

Australian Calibration Laboratory
Suite 2, 6-10 Talavera Road, North Ryde NSW 2113, Australia

NATA
WORLD RECOGNISED ACCREDITATION
Laboratory No. 1301

CERTIFICATE OF CALIBRATION

Certificate No: CAU1700839 Page 1 of 10

CALIBRATION OF:

Sound Level Meter:	Bruel & Kjaer	2250	No: 2653961
Microphone:	Bruel & Kjaer	4189	No: 3087490
Preamplifier:	Bruel & Kjaer	ZC-0032	No: 25104
Supplied Calibrator:	N/A	N/A	No: N/A
Software version:	BZ7222 Version 4.5.1	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 IEC61672-3:2006 class 1. Procedures from IEC 61672-3:2006 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 6.0 - DB: 6.00) and test procedure 2250-4189.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
	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: 04/09/2017

Sajeeb Tharayil
Calibration Technician

Certificate issued: 04/09//2017

Jan Rasmussen
Approved signatory