NARRABRI MINE NOISE MONITORING

Quarter Ending September 2022
Summary Noise Report

Prepared for:

Narrabri Coal Operations Pty Ltd
10 Kurrajong Creek Road
Baan Baa NSW 2390

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Narrabri Coal Operations Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18063-R18-v1.0	12 October 2022	Adam Sirianni	Martin Davenport	Martin Davenport

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1 Introduction

Narrabri Coal Operations Pty Ltd has commissioned SLR Consulting Australia Pty Ltd (SLR) to conduct operational noise monitoring for the Narrabri Mine located near Narrabri, New South Wales (NSW) in accordance with the approved Noise Management Plan (NMP) dated June 2018, the Narrabri Mine Project Approval (PA) 08_0144 and the Environment Protection Licence 12789 (EPL 12789).

The objectives of the noise monitoring programme for this operating period were as follows:

- Conduct operator attended noise surveys at 8 locations (as listed in **Section 3.3**) surrounding the mine during the day, evening and night-time periods.
- Quantify all sources of noise within each of the attended noise surveys, including their measured and/or estimated contribution and maximum level of individual noise sources.
- Assess the noise emissions of Narrabri Mine and determine compliance with respect to the limits contained in Section 2 of the NMP and the relevant approvals.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2 PERFORMANCE ASSESSMENT AND DISCUSSION

The following provides a summary of the attended noise measurements undertaken at each monitoring location. Further details are provided for each location in **Section 5** of this report.

Table 1 Performance Assessment – Operations

EPL ID	Location	Date	Narrabri Mine Contribution dBA				Noise Criteria[1]	Measurement Periods	Standard Weather [3]			Compliant
			LAeq 15 min Day	LAeq 15 min Evening	LAeq 15 min Night	LA1 (1 min) Night			Day	Evening	Night	
N5	Oakleigh[2]	12/09/2022[4]	N/M	25	I/A	I/A	Day, Evening and Night – LAeq(15minute) 35 dBA Night LA1(1minute) – 45 dBA	Day - 1.5 hrs Evening - 0.5 hrs Night – 1hrs	Y	N	Y	Y
		13/09/2022[4]	I/A	27	N/M	N/M			Y	N	Y	Y
		14/09/2022[4]	37	34	32	40			Y	Y	Y	Y
N6	Newhaven	12/09/2022[4]	<25	32	N/M	N/M			Y	N	N	Y
		13/09/2022[4]	I/A	I/A	N/M	N/M			Y	Y	N	Y
		14/09/2022[4]	I/A	I/A	N/M	N/M			Y	Y	Y	Y
N8	Haylin View[2]	12/09/2022[4]	N/M	I/A	I/A	I/A			Y	N	Y	Y
		13/09/2022[4]	28	37	I/A	I/A			Y	Y	Y	Y
		14/09/2022[4]	37	N/M	35	40			Y	N	Y	Y
N9	High Range[2]	12/09/2022[4]	M/M	28	28	33			Y	N	N	Y
		13/09/2022[4]	I/A	I/A	25	27			Y	Y	N	Y
		14/09/2022[4]	I/A	I/A	I/A	I/A			Y	Y	Y	Y
-	Bow Hills[1]	13/09/2022	35	35	36	42		Day 15 min Evening 15 min Night 15 min	Y	Y	N	Y
-	Ardmona	14/09/2022	I/A	30	33	37			N	Y	Y	Y
-	Merriman[2]	14/09/2022	I/A	I/A	I/A	I/A			Y	Y	Y	Y
-	Matilda[2]	13/09/2022	N/M	I/A	I/A	I/A			Y	N	Y	Y

I/A = Inaudible, N/M = Not Measurable

Note 1: A private agreement between NCOPL and the residents of N1 Bow Hills of 50 dBA LAeq(15minute) is in place. This new level of 50 dBA LAeq(15minute) replaces the levels identified in Conditions 1-3, Schedule 4 of PA 08_0144 Mod 2 and the identical limits contained in condition L3 of Environment Protection Licence No 12789

Note 2: Property is owned by Narrabri Coal Operations. Noise limits contained in Conditions 1-3, Schedule 4 of PA 08_0144 Mod 2 and the identical limits contained in condition L3 of Environment Protection Licence No 12789 are not applicable.

Note 3: Noise levels presented are the highest measured noise level under standard weather conditions over the monitoring period.

Note 4: Evening and Night monitoring conducted on this date, Day monitoring conducted during the following day period.

3 Noise Criteria

3.1 Project Approval, EPL and NMP

Noise monitoring at the Narrabri Mine was conducted in accordance with EPL 12789, the PA requirements and the NMP. The site specific EPL and PA noise limits are summarised in Section 2 of the NMP and are reproduced in **Table 2**. These criteria do not apply where the mine has an agreement with the relevant owner/s of the residence to generate higher noise levels, or where the property is mine owned.

Table 2 Project Approval and EPL Noise Criteria

Location	Day	Emergency Day	Night	
	$L_{Aeq(15minute)}$	$L_{Aeq(15minute)}$	$L_{Aeq(15minute)}$	$L_{A1(1minute)}$
All Privately owned Residences	35	35	35	45

3.2 Non-compliances & Exemptions

In accordance with Section 11.1.3 of the NSW Industrial Noise Policy (INP) a development is deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence. This may occur for two reasons:

- The noise from the Narrabri Mine is excessive, in which case Narrabri Mine will be not complying with its consent or licence condition.
- The noise was increased by extreme, non-standard weather effects—in which case the Narrabri Mine is not considered to be in noncompliance with its consent or licence condition.

In this latter case, further monitoring at a later date is required to determine compliance under "normal" meteorological conditions.

The INP states in Section 9.2 that *"it is not practicable to meet the noise limit under all inversion events; hence exceedances under extreme temperature inversions are not considered to be a non-compliance with consent or licence conditions."*

Non-standard weather effects include:

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

As stated in EPL 12789 *"Data recorded by the meteorological station identified as EPA Identification Point(s) W1 must be used to determine meteorological conditions and temperature inversion conditions (stability category) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E of the "New South Wales Industrial Noise Policy" dated January 2000 ISBN 0 7313 2715 2."*

Weather and Temperature inversion monitoring is undertaken continuously in accordance with EPL 12789 with monitoring locations displayed in **Figure 1**. Monitoring Location W1 records wind speed and direction at 10m above ground level. Temperature inversion monitoring is undertaken continuously by directly measuring temperature at two elevations 50m apart (10m & 60m from ground level) at monitoring location W2. All weather data reported in **Table 5** to **Table 20** have been recorded at these monitoring locations.

3.3 Attended Monitoring

Attended Noise monitoring is to be undertaken on a quarterly basis at residential areas. The attended monitoring will take place at the following locations:

EPL Monitoring Locations

- N5 Oakleigh – 16293 Kamilaroi Highway Baan Baa
- N6 Newhaven – 184 Greylands Road Turrawan
- N8 Haylin View – 791 Mayfield Road, Baan Baa
- N9 High Range – 92 Davis Road Turrawan

It is noted that the Narrabri Mine own the properties Oakleigh (N5), Haylin View (N8) an High Range (N9).

NMP Monitoring Locations

- N1 Bow Hills – 16652 Kamilaroi Highway Baan Baa
- N3 Ardmona – 16462 Kamilaroi Highway Baan Baa
- N7 Merriman – 16896 Kamilaroi Highway Baan Baa
- $N8_{(NMP)}$ Matilda – 773 Mayfield Road Baan Baa

It is noted that the Narrabri Mine owns the properties Merriman (N7) and Matilda ($N8_{(NMP)}$) and has a private agreement with the landholder of Bow Hills (N1) for increased noise limits.

The following details the requirements of the monitoring:

EPL Monitoring Requirements

- At each one of the monitoring locations N5, N6, N8 and N9;
- Occur quarterly in a reporting period;
- Occur during each day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum of:

  i) 1.5 hours during the day;

  ii) 30 minutes during the evening; and

  iii) 1 hour during the night.
- Occur for three consecutive operating days.

NMP Monitoring Requirements

- At each one of the monitoring locations N1, N3, N7 and N8$_{(NMP)}$
- Occur quarterly in a reporting period; and
- Occur during a day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum 15 minutes.

4 Operational Noise Monitoring Methodology

4.1 General Requirements

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2004 *Electroacoustics—Sound level meters – Specifications*, AS IEC 61672.2-2004, AS IEC 61672.3-2004 and carried current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. Calibration certificates for all instruments employed during the monitoring campaign are presented in **Appendix B.**

4.2 Methodology - Operator Attended Noise Monitoring

Operator attended noise measurements were conducted during the day, evening and night-time periods for a minimum of 1.5 hours during the day; 30 minutes during the evening and 1 hour during the night at the three EPL nominated noise monitoring locations and for 15 minutes during the day, evening and night at each of the NMP nominated noise monitoring location representing the most affected receiver locations, listed in **Table 3** and shown in **Figure 1**. During the operator attended noise measurements, the character and relative contribution of ambient noise sources and mine contributions were determined.

Table 3 Noise Monitoring Locations

Monitoring Location	Monitoring Requirements	Receiver Type	Address	Monitoring Location - MGA Zone 55	
				Easting (m)	Northing (m)
N5[1,2]	EPL	Residence	Oakleigh – 16293 Kamilaroi Highway Baan Baa	779526	6617751
N6[1,2]	EPL	Residence	Newhaven – 184 Greylands Road Turrawan	776564	6624643
N8[1]	EPL	Residence	Haylin View – 791 Mayfield Road Baan Baa	777428	6617316
N9[1]	EPL	Residence	High Range – 92 Davis Road Turrawan	775879	6625895
N1	NMP	Residence	Bow Hills – 16652 Kamilaroi Highway Baan Baa	780114	6620641
N3[2]	NMP	Residence	Ardmona – 16462 Kamilaroi Highway Baan Baa	780233	6618836
N7[2]	NMP	Residence	Merriman – 16896 Kamilaroi Highway Baan Baa	779290	6623143
$N8_{(NMP)}$[2]	NMP	Residence	Matilda – 773 Mayfield Road Baan Baa	777815	6617045

Note: 1. EPL monitoring locations
2. NMP monitoring locations

The objective of the operator attended noise monitoring was to measure the $L_{A1(1minute)}$ and the $L_{Aeq(15minute)}$ noise level contribution from the Narrabri Mine at the nearest potentially affected receptors in order to determine the noise contribution of operational activities associated with Narrabri Mine over each 15 minute measurement period. In addition, the operator quantifies and characterises the overall levels of ambient noise in the area (i.e. L_{Amax}, L_{A1}, L_{A10}, L_{A90}, and L_{Aeq}) over the 15 minute measurement interval.

Operator attended noise measurements were conducted using one-third octave integrating Brüel & Kjær Type 2270 sound level meters (s/n 3029485 and s/n 3027586). Attended noise measurements were undertaken by SLR staff Jason Rasquinha and Adam Sirianni.

Figure 1 Attended Noise Monitoring Locations

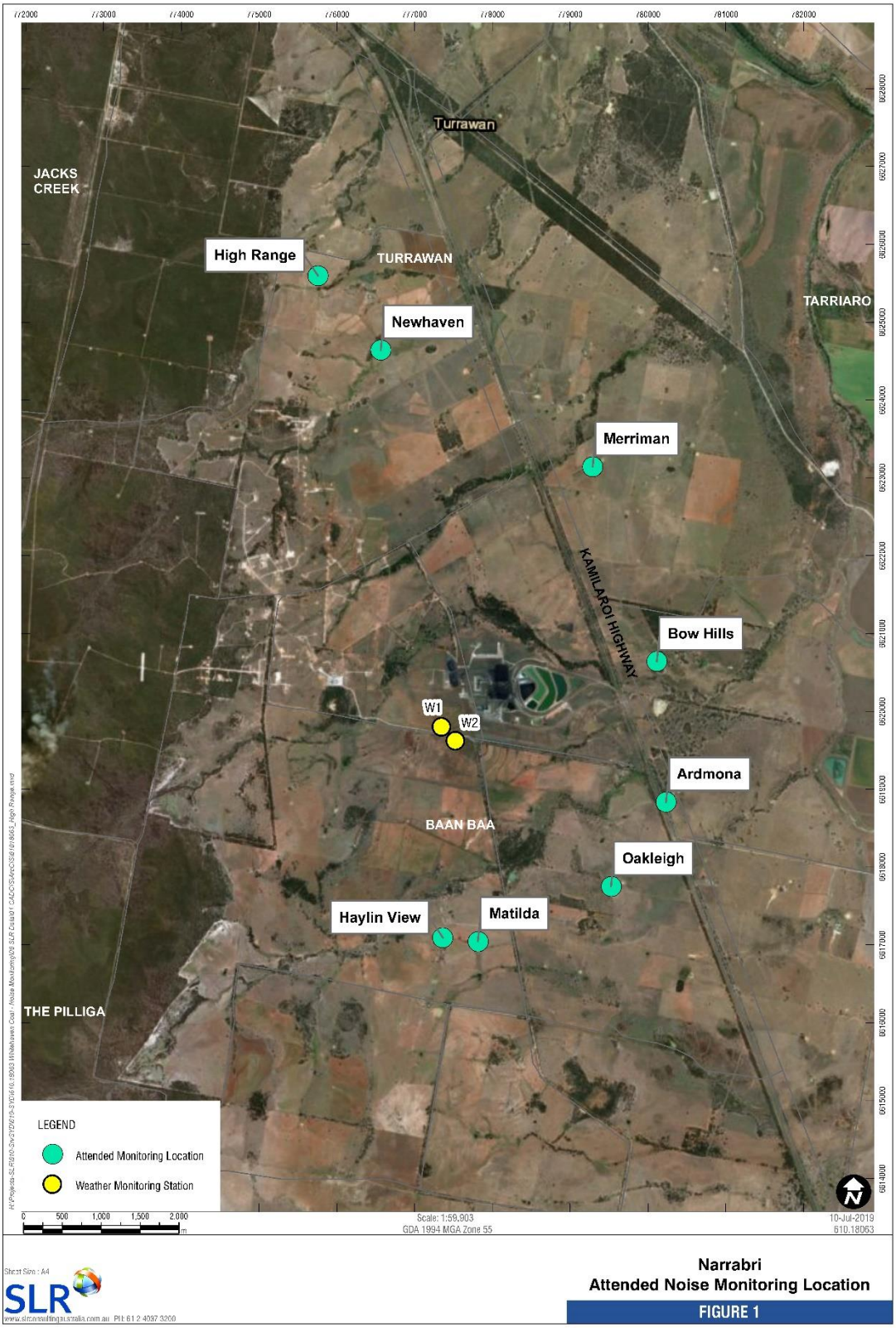


Table 4 presents a summary of which days of the week the quarterly monitoring was conducted, in accordance with condition M7.4 of EPL 12789 and Section 5 of the NMP.

Table 4 Days of the Week Quarterly EPL Monitoring was Conducted – Q3 2022

Period	Day of the Week (Excluding Weekends and Public Holidays)				
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
EPL Monitoring Locations					
Day	12 September 2022	13 September 2022	14 September 2022	15 September 2022	
Evening	12 September 2022	13 September 2022	14 September 2022	15 September 2022	
Night[1]	12 September 2022	13 September 2022	14 September 2022	15 September 2022	
NMP Monitoring Locations					
Day		13 September 2022	14 September 2022		
Evening		13 September 2022	14 September 2022		
Night[1]		13 September 2022	14 September 2022		

Note 1: Taken to mean the night-time period from 10:00 pm on the stated day to 7:00 am the following day.

5 Results and Discussion

5.1 Results of Operator Attended Monitoring

Results of the operator attended noise surveys at N5, N6, N9, N1, N3, N7 and $N8_{(NMP)}$ are provided **Table 5** to **Table 20**.

Ambient noise levels presented include all noise sources such as transport (roads, rail and aircraft), fauna (insects, frogs, birds and bats), the natural environment (wind in trees), domestic noises, other industrial operations as well as Narrabri Mine noise emissions.

Weather data during the monitoring period has been obtained from the weather station located on the Narrabri Mine site and observed conditions.

The tables also provide the following information:

- Date and start time, operator and equipment details.
- Monitoring location.
- Wind velocity (m/s) and temperature (°C) at weather station W1, as detailed in **Section 3.2**.
- Typical maximum (L_{Amax}) and contributed $L_{Aeq(15minute)}$ noise levels.

5.1.1 Operator Attended Noise Survey Results – EPL Monitoring Location N5

Results of the operator attended noise surveys at N5 are provided in **Table 5**, **Table 6** and **Table 7**. Monitoring location N5 represents residential receptors located to the southeast of the site in Oakleigh.

Table 5 Operator Attended EPL Noise Survey Results – N5 – Oakleigh (Day 1)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 1 13/09/2022 08:34 1.7 – 2.8 m/s SE/ESE 13-17°C 3027586	35 dBA LAeq(15minute)	1	D	58	52	39	28	38	25	I/A	**Site Related Noise Events:** Dozer operations faintly audible **Other Noise Events:** Birds 40-63 Wind 30-36 Traffic 33-41 Aircraft 40-44
		2	D	63	45	38	28	36	25	N/M	
		3	D	50	45	39	29	36	24	I/A	
		4	D	54	42	37	29	34	26	I/A	
		5	D	61	48	37	27	37	24	I/A	
		6	D	53	47	40	30	37	25	I/A	
Evening 1 12/09/2022 19:39 3.3 – 3.7 m/s SSW 12-13°C 3027586	35 dBA LAeq(15minute)	1	E	44	41	39	36	38	33	25 LAeq	**Site Related Noise Events:** Dozer operations 25-31 **Other Noise Events:** Insects 38-44 Traffic 30-37
		2	E	45	40	39	36	37	34	25 LAeq	
Night 1 12/09/2022 23:14 0 – 1.7 m/s SE 9-10°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	E	57	53	42	30	40	23	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Insects 35-42 Traffic 38-46 Birds 55-57
		2	E	48	44	40	30	37	23	I/A	
		3	F	47	42	39	27	35	22	I/A	
		4	F	49	46	40	27	36	22	I/A	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 6 Operator Attended EPL Noise Survey Results – N5 – Oakleigh (Day 2)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 2 14/09/2022 09:30 1.2 - 3.1 m/s SE 14-19°C 3027586	35 dBA LAeq(15minute)	1	D	60	54	46	30	42	26	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 35-41 Birds 47-63 Train 40-45 Aircraft 36-39
		2	A	55	48	41	32	39	28	I/A	
		3	D	58	50	39	28	38	23	I/A	
		4	C	56	48	38	27	36	24	I/A	
		5	D	52	45	38	26	35	23	I/A	
		6	D	63	45	37	28	36	23	I/A	
Evening 2 13/09/2022 20:43 1.1 – 2.8 m/s SSW 9°C 3027586	35 dBA LAeq(15minute)	1	G	52	49	47	41	44	35	25 LAeq	**Site Related Noise Events:** Dozer operations 25-32 General surface activity 23-25 **Other Noise Events:** Insects 48-51 Traffic 45-59
		2	G	59	55	47	35	44	30	27 LAeq	
Night 2 13/09/2022 22:00 0.7 – 2.8 m/s NW 8-9°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	G	51	46	42	33	39	27	N/M	**Site Related Noise Events:** General surface activity faintly audible **Other Noise Events:** Traffic 42-56 Aircraft 40-45 Insects 30-39 Train 44-56
		2	F	50	46	42	30	39	24	I/A	
		3	F	56	52	45	27	41	23	I/A	
		4	F	56	51	43	26	40	23	I/A	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 7 Operator Attended EPL Noise Survey Results – N5 – Oakleigh (Day 3)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 3 15/09/2022 07:11 1.9 – 3.2 m/s SSE/SE 11-13°C 3027586	35 dBA LAeq(15minute)	1	E	69	57	47	38	46	34	32 LAeq	**Site Related Noise Events:** Dozer operations 35-45 General surface activity 28-34 **Other Noise Events:** Traffic 40-49 Birds 53-69 Train 38-46
		2	E	53	47	43	36	40	34	33 LAeq	
		3	D	62	50	43	37	41	35	37 LAeq	
		4	D	57	48	43	38	41	36	36 LAeq	
		5	D	57	46	41	36	39	33	35 LAeq	
		6	D	56	47	42	36	40	33	35 LAeq	
Evening 3 14/09/2022 20:38 0 – 1.1 m/s NNW 13-14°C 3027586	35 dBA LAeq(15minute)	1	F	54	51	48	43	46	38	30 LAeq	**Site Related Noise Events:** Dozer operations 29-43 General surface activity 25-28 **Other Noise Events:** Insects 46-50 Traffic 47-54 Horn 49
		2	F	52	50	48	42	46	37	34 LAeq	
Night 3 14/09/2022 22:00 0 – 0.9 m/s S 11°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	57	52	49	38	46	33	29 LAeq 32 LA1	**Site Related Noise Events:** Dozer operations 27-40 General surface activity 25-29 **Other Noise Events:** Traffic 40-55 Insects 50-54 Aircraft 48-58 Train 46-51
		2	F	55	52	49	39	45	33	31 LAeq 36 LA1	
		3	F	52	47	43	35	40	30	31 LAeq 40 LA1	
		4	F	54	51	46	34	42	30	32 LAeq 40 LA1	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

5.1.2 Operator Attended Noise Survey Results – EPL Monitoring Location N6

Results of the operator attended noise surveys at N6 are provided in **Table 8**, **Table 9** and **Table 10**. Monitoring location N6 represents residential receptors located to the northwest of the site in Newhaven.

Table 8 Operator Attended EPL Noise Survey Results – N6 – Newhaven (Day 1)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 1 13/09/2022 11:51 2.3 – 4.1 m/s ESE 18°C 3029485	35 dBA LAeq(15minute)	1	D	62	53	46	30	42	26	<25 LAeq	**Site Related Noise Events:** Evaporation fan 20-25 General surface activity 20-25 **Other Noise Events:** Birds 44-74 Wind 38-42 Aircraft 48-55
		2	D	63	56	47	32	44	27	<25 LAeq	
		3	D	68	53	45	33	42	29	I/A	
		4	D	65	53	44	30	41	25	I/A	
		5	D	74	54	46	30	45	24	I/A	
		6	D	64	53	46	31	43	27	I/A	
Evening 1 12/09/2022 20:38 2.9 – 3.0 m/s SSW 12°C 3029485	35 dBA LAeq(15minute)	1	F	70	51	43	40	44	38	31 LAeq	**Site Related Noise Events:** Dozer operations 30-35 **Other Noise Events:** Insects 40-47 Birds 58-70
		2	F	60	46	43	40	42	38	32 LAeq	
Night 1 13/09/2022 00:58 0 – 0.9 m/s NE 5-8°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	G	56	45	43	38	41	35	N/M	**Site Related Noise Events:** General surface activity faintly audible **Other Noise Events:** Traffic 40-42 Insects 40-43 Impact 56
		2	G	61	43	40	37	39	34	N/M	
		3	G	62	43	40	37	39	35	N/M	
		4	G	59	44	40	37	39	34	N/M	

Note: N/M = Not Measurable, I/A = Inaudible

Table 9 Operator Attended EPL Noise Survey Results – N6 – Newhaven (Day 2)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 2 14/09/2022 10:29 0.9 – 1.7 m/s SSE/NW 18-20°C 3029485	35 dBA LAeq(15minute)	1	D	64	52	44	30	41	25	I/A	**Site Related Noise Events:** **Other Noise Events:** Birds 56-65 Traffic 30-36 Animals 36-40 Aircraft 35-38
		2	D	59	49	38	25	37	22	I/A	
		3	D	60	47	37	26	36	22	I/A	
		4	D	51	44	33	24	32	22	I/A	
		5	D	65	49	36	28	38	25	I/A	
		6	D	61	50	38	25	37	22	I/A	
Evening 2 13/09/2022 19:36 0.7 – 1.8 m/s SW 9-10°C 3029485	35 dBA LAeq(15minute)	1	F	54	50	46	40	43	37	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Insects 38-46 Traffic 48-51 Impact 54
		2	G	51	48	46	38	42	36	I/A	
Night 2 14/09/2022 00:21 2.7 – 3.6 m/s SE 7-8°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	47	45	41	36	39	33	N/M	**Site Related Noise Events:** Dozer operations faintly audible **Other Noise Events:** Insects 34-45 Traffic 46-47 Birds 44-49
		2	F	46	42	39	35	37	32	N/M	
		3	F	49	46	42	37	40	33	N/M	
		4	F	47	43	40	37	39	34	N/M	

Note: N/M = Not Measurable, I/A = Inaudible

Table 10 Operator Attended EPL Noise Survey Results – N6 – Newhaven (Day 3)

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 3 15/09/2022 07:12 1.9 – 3.2 m/s SE/SSE 11-13°C 3029485	35 dBA LAeq(15minute)	1	E	78	56	50	39	49	34	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Birds 75-78 Traffic 41-50 Train 48-53
		2	E	67	57	44	34	45	29	I/A	
		3	D	72	61	53	39	50	33	I/A	
		4	D	62	52	45	35	42	31	I/A	
		5	D	60	49	41	32	39	29	I/A	
		6	D	59	53	45	34	42	28	I/A	
Evening 3 14/09/2022 19:33 1.2 – 1.3 m/s NNW 14-15°C 3029485	35 dBA LAeq(15minute)	1	F	55	47	44	38	42	35	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 42-55 Insects 42-45 Impacts 47-48
		2	F	51	47	43	38	41	35	I/A	
Night 3 15/09/2022 00:25 1.8 – 3.5 m/s SE 12°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	52	42	39	35	37	33	I/A	**Site Related Noise Events:** General surface activity faintly audible **Other Noise Events:** Insects 33-41 Traffic 40-43 Dog 41-52 Train 41-52
		2	F	43	41	39	35	37	33	N/M	
		3	F	49	44	41	36	39	33	N/M	
		4	F	52	49	46	36	41	34	N/M	

Note: N/M = Not Measurable, I/A = Inaudible

5.1.3 Operator Attended Noise Survey Results – EPL Monitoring Location N8

Results of the operator attended noise surveys at N8 are provided in **Table 11**, **Table 12** and **Table 13**. Monitoring location N8 represents residential receptors located to the southeast of the site in Haylin View.

Table 11 Operator Attended EPL Noise Survey Results – N8 – Haylin View (Day 1)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 1 13/09/2022 08:31 1.7 – 2.8 m/s SE/ESE 13-17°C 3029485	35 dBA LAeq(15minute)	1	D	48	40	35	26	32	23	N/M	**Site Related Noise Events:** Dozer operations barely audible **Other Noise Events:** Birds 46-60 Aircraft 39-45 Animals 36-40 Horn 40
		2	D	60	45	37	25	35	22	N/M	
		3	D	60	43	35	27	33	23	N/M	
		4	D	60	47	39	27	37	24	I/A	
		5	D	59	42	35	28	34	24	I/A	
		6	D	52	45	39	28	36	25	I/A	
Evening 1 13/09/2022 20:44 0.9 – 1.6 m/s SSW 9-10°C 3029485	35 dBA LAeq(15minute)	1	G	61	38	34	29	34	26	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Impact 55-61 Traffic 34-38 Animals 40
		2	G	54	35	32	26	30	24	I/A	
Night 1 12/09/2022 22:14 1.1 – 1.7 m/s SE 10°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	78	56	50	39	49	34	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Insects 31-34 Traffic 30-32 Impact 47-69
		2	F	67	57	44	34	45	29	I/A	
		3	E	72	61	53	39	50	33	I/A	
		4	E	62	52	45	35	42	31	I/A	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 12 Operator Attended EPL Noise Survey Results – N8 – Haylin View (Day 2)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 2 14/09/2022 13:25 0.8 – 2.6 m/s NNW 20-21°C 3029485	35 dBA LAeq(15minute)	1	D	69	41	34	28	36	26	28 LAeq	**Site Related Noise Events:** Dozer operations 30-34 General surface activity 26-30 **Other Noise Events:** Birds 59-69 Animals 58 Tractor 42-49
		2	C	58	45	32	26	34	24	26 LAeq	
		3	C	58	46	42	26	37	24	26 LAeq	
		4	D	62	48	42	31	40	28	25 LAeq	
		5	C	52	42	40	25	35	23	25 LAeq	
		6	D	46	38	31	26	29	24	28 LAeq	
Evening 2 14/09/2022 20:39 0 – 1.1 m/s NNW 13-14°C 3029485	35 dBA LAeq(15minute)	1	F	52	43	38	33	36	31	35 LAeq	**Site Related Noise Events:** Dozer operations 39-53 General surface activity 31-35 **Other Noise Events:** Insects 35-40 Impacts 41-52
		2	F	53	47	40	33	38	30	37 LAeq	
Night 2 13/09/2022 22:36 0.7 – 2.7 m/s SE 11°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	47	40	37	27	34	24	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 34-38 Animals 47-63 Train 36-41 Insects 26-36
		2	F	61	38	34	24	33	21	I/A	
		3	F	63	35	28	23	30	21	I/A	
		4	F	43	29	27	23	25	21	I/A	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 13 Operator Attended EPL Noise Survey Results – N8 – Haylin View (Day 3)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 3 15/09/2022 09:16 1.0 – 7.0 m/s NNW 15-19°C 3029485	35 dBA LAeq(15minute)	1	D	56	46	43	38	41	36	37 LAeq	**Site Related Noise Events:** Dozer operations 44-46 General surface activity 35-38 **Other Noise Events:** Birds 50-56 Impact 46-47 Resident 55 Wind 52-61
		2	D	52	46	42	36	40	34	37 LAeq	
		3	D	55	48	40	32	38	30	32 LAeq	
		4	D	54	49	44	35	41	31	32 LAeq	
		5	D	61	56	51	40	47	37	I/A	
		6	D	62	56	52	44	49	37	I/A	
Evening 3 15/09/2022 18:01 3.8 – 5.1 m/s NW 14°C 3029485	35 dBA LAeq(15minute)	1	E	54	48	44	38	41	36	N/M	**Site Related Noise Events:** Dozer operations faintly audible **Other Noise Events:** Birds 48-54 Wind 45-49
		2	E	53	48	44	37	41	35	N/M	
Night 3 14/09/2022 22:44 0 – 1.0 m/s SW 11°C 3029485	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	46	38	36	33	35	29	33 LAeq 39 LA1	**Site Related Noise Events:** Dozer operations 35-42 General surface activity 30-36 **Other Noise Events:** Birds 41-46 Animals 40-43 Insects 31-35
		2	F	45	39	37	32	35	30	34 LAeq 41 LA1	
		3	F	42	40	38	33	36	31	35 LAeq 40 LA1	
		4	G	46	39	36	31	34	29	33 LAeq 42 LA1	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

5.1.4 Operator Attended Noise Survey Results – EPL Monitoring Location N9

Results of the operator attended noise surveys at N9 are provided in **Table 14**, **Table 15** and **Table 16**. Monitoring location N9 represents residential receptors located to the northwest of the site in High Range.

Table 14 Operator Attended EPL Noise Survey Results – N9 – High Range (Day 1)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 1 13/09/2022 11:58 2.3 – 4.1 m/s SE/ESE 18°C 3027586	35 dBA LAeq(15minute)	1	D	62	47	40	29	38	24	N/M	**Site Related Noise Events:** Exhaust vent fan faintly audible **Other Noise Events:** Birds 55-71 Traffic 35-44 Wind 38-44 Animals 54-58 Aircraft 50-57
		2	D	62	50	40	28	39	24	N/M	
		3	D	72	57	40	29	46	25	I/A	
		4	D	70	48	37	28	42	25	I/A	
		5	D	65	54	40	29	41	25	I/A	
		6	D	71	63	44	28	49	25	I/A	
Evening 1 12/09/2022 19:46 3.3 – 3.7 m/s SSW 12-13°C 3029485	35 dBA LAeq(15minute)	1	E	59	41	38	33	36	31	28 LAeq	**Site Related Noise Events:** Exhaust vent fan 25-30 **Other Noise Events:** Insects 35-40 Dog 49-59
		2	E	49	40	37	33	36	31	26 LAeq	
Night 1 13/09/2022 01:07 0 – 1.1 m/s NE 5-7°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	G	46	39	35	28	32	26	28 LAeq 30 LA1	**Site Related Noise Events:** Exhaust vent fan 23-27 Dozer operations 28-33 **Other Noise Events:** Traffic 39-49 Insects 32-39 Birds 50-53
		2	G	44	32	30	28	30	26	25 LAeq 28 LA1	
		3	G	53	34	32	29	32	27	28 LAeq 33 LA1	
		4	G	49	45	37	28	34	26	27 LAeq 29 LA1	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 15 Operator Attended EPL Noise Survey Results – N9 – High Range (Day 2)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 2 14/09/2022 07:07 3.0 – 4.3 m/s SE/SSE 8-12°C 3027586	35 dBA LAeq(15minute)	1	D	72	66	45	37	51	34	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 35-44 Birds 63-72 Animals 50-56 Train 35-48
		2	D	72	62	45	34	48	30	I/A	
		3	D	73	69	54	33	55	31	I/A	
		4	D	71	45	37	30	43	26	I/A	
		5	D	58	49	39	31	38	28	I/A	
		6	D	62	52	41	31	40	28	I/A	
Evening 2 13/09/2022 19:26 0.7 – 1.8 m/s SW 9-10°C 3027586	35 dBA LAeq(15minute)	1	F	49	44	41	32	38	29	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 44-49 Insects 30-35 Aircraft 40-47
		2	G	49	45	41	32	38	29	I/A	
Night 2 13/09/2022 23:52 2.4 – 3.6 m/s SE 7-8°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	F	52	40	35	29	33	27	25 LAeq 30 LA1	**Site Related Noise Events:** Exhaust vent fan 23-25 Dozer operations 25-30 **Other Noise Events:** Traffic 33-45 Animals 45-56 Insects 30-33
		2	F	56	37	32	29	31	26	25 LAeq 27 LA1	
		3	F	46	39	32	28	31	26	<25 LAeq 25 LA1	
		4	F	45	37	34	28	31	26	N/M	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

Table 16 Operator Attended EPL Noise Survey Results – N9 – High Range (Day 3)

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 3 15/09/2022 09:14 1.0 – 7.0 m/s N/NW 15-19°C 3027586	35 dBA LAeq(15minute)	1	D	71	53	46	38	44	33	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 37-44 Birds 60-78 Animals 45-56 Aircraft 44-47 Wind 47-59
		2	D	65	57	50	38	47	34	I/A	
		3	D	65	59	54	41	50	38	I/A	
		4	D	63	57	52	43	49	38	I/A	
		5	D	78	57	51	41	49	37	I/A	
		6	D	60	55	51	39	47	36	I/A	
Evening 3 14/09/2022 19:25 1.3 – 2.1 m/s NNW 14-15°C 3027586	35 dBA LAeq(15minute)	1	F	47	44	42	35	39	31	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Insects 33-38 Traffic 40-49 Train 40-43
		2	F	49	46	40	33	38	31	I/A	
Night 3 14/09/2022 23:47 1.3 – 2.6 m/s SE 11-12°C 3027586	35 dBA LAeq(15minute) 45 dBA LA1(1minute)	1	G	43	40	37	31	34	28	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 39-48 Insects 30-35 Animals 40-45
		2	G	48	45	39	29	35	26	I/A	
		3	G	44	41	36	29	33	27	I/A	
		4	F	43	38	33	29	32	27	I/A	

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable.

5.1.5 Operator Attended Noise Survey Results – NMP Monitoring Location N1

Results of the operator attended noise surveys at N1 are provided in **Table 17.** Monitoring location N1 represents residential receptors located to the east of the site in Bow Hills.

Table 17 Operator Attended NMP Noise Survey Results – N1 – Bow Hills

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 13/09/2022 10:23 3.0 m/s ESE 17°C 3027586	35 dBA LAeq(15minute)	1	D	63	49	42	34	41	30	35 LAeq	**Site Related Noise Events:** Evaporation fans 33-38 Dozer operations 35-41 **Other Noise Events:** Traffic 45-50 Birds 48-51 Aircraft 47-53 Resident 63
Evening 13/09/2022 20:12 1.7 m/s SW 9°C 3027586	35 dBA LAeq(15minute)	1	F	60	57	54	48	51	44	35 LAeq	**Site Related Noise Events:** Dozer operations 35-40 **Other Noise Events:** Traffic 51-60 Insects 50-54
Night 13/09/2022 23:21 2.6 m/s SSE 8°C 3027586	35 dBA LAeq(15minute)	1	F	56	54	52	47	50	44	36 LAeq 42 LA1	**Site Related Noise Events:** Dozer operations 35-42 General surface activity 35-38 **Other Noise Events:** Insects 50-55 Traffic 48-56

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: A private agreement between NCOPL and the residents of N1 Bow Hills of 50 dBA LAeq(15minute) is in place. This new level of 50 dBA LAeq(15minute) replaces the levels identified in Conditions 1-3, Schedule 4 of PA 08_0144 Mod 2 and the identical limits contained in condition L3 of Environment Protection Licence No 1278

5.1.6 Operator Attended Noise Survey Results – NMP Monitoring Location N3

Results of the operator attended noise surveys at N3 are provided in **Table 18.** Monitoring location N3 represents residential receptors located to the southeast of the site in Ardmona.

Table 18 Operator Attended NMP Noise Survey Results – N3 – Ardmona

Period Date/Start Time Weather SLM Details	Criteria	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 14/09/2022 09:01 3.2 m/s SE 13°C 3027586	35 dBA LAeq(15minute)	1	D	92	86	77	40	73	32	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 80-92 Birds 66-71
Evening 14/09/2022 20:09 1.5 m/s NNW 14°C 3027586	35 dBA LAeq(15minute)	1	F	90	79	67	43	67	39	30 LAeq	**Site Related Noise Events:** Dozer operations 30-37 **Other Noise Events:** Insects 35-40 Train 60-71 Traffic 85-90
Night 14/09/2022 23:18 1.0 m/s SW 11°C 3027586	35 dBA LAeq(15minute)	1	F	93	78	60	34	67	32	33 LAeq 37 LA1	**Site Related Noise Events:** Dozer operations 33-37 General surface activity 28-30 **Other Noise Events:** Traffic 40-43 Insects 34-37

Note: N/M = Not Measurable, I/A = Inaudible

5.1.7 Operator Attended Noise Survey Results – NMP Monitoring Location N7

Results of the operator attended noise surveys at N7 are provided in **Table 19.** Monitoring location N7 represents residential receptors located to the northeast of the site in Merriman.

Table 19 Operator Attended NMP Noise Survey Results – N7 – Merriman

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 14/09/2022 12:29 1.9 m/s NNW 20°C 3029485	35 dBA LAeq(15minute)	1	D	55	42	37	30	35	27	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 35-39 Birds 50-55 Insects 33-37
Evening 14/09/2022 21:35 0.0 m/s Calm 13°C 3029485	35 dBA LAeq(15minute)	1	F	69	63	54	41	51	35	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 49-50 Insects 46-51 Dog 56-69
Night 14/09/2022 22:00 0.9 m/s S 11°C 3029485	35 dBA LAeq(15minute)	1	F	56	47	42	37	40	33	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 40-46 Insects 38-41 Aircraft 46-56

Note: N/M = Not Measurable, I/A = Inaudible

Note: Due to roadworks restricting access to the property, monitoring was undertaken at the property boundary.

Note 1: Mine owned receiver – criteria not applicable

5.1.8 Operator Attended Noise Survey Results – NMP Monitoring Location N8$_{(NMP)}$

Results of the operator attended noise surveys at N8$_{(NMP)}$ are provided in **Table 20**. Monitoring location N8$_{(NMP)}$ represents residential receptors located to the south of the site in Matilda.

Table 20 Operator Attended NMP Noise Survey Results – N8 – Matilda

Period Date/Start Time Weather SLM Details	Criteria[1]	Measurement Number	Stability Category	Primary Noise Descriptor						Narrabri Mine Contribution, (dB)	Description
				LAmax (dB)	LA1 (dB)	LA10 (dB)	LA90 (dB)	LAeq (dB)	LAmin (dB)		
Day 13/09/2022 10:53 2.7 m/s SE 17°C 3027586	35 dBA LAeq(15minute)	1	D	69	53	43	31	42	25	N/M	**Site Related Noise Events:** General surface operations faintly audible **Other Noise Events:** Animals 69 Birds 50-59 Wind 40-45
Evening 13/09/2022 21:31 1.0 m/s S 9°C 3029485	35 dBA LAeq(15minute)	1	G	45	33	30	26	28	24	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Insects 25-30 Traffic 30-34 Impact 42-45
Night 13/09/2022 22:03 0.8 m/s SSE 8°C 3029485	35 dBA LAeq(15minute)	1	F	43	37	32	27	30	24	I/A	**Site Related Noise Events:** Inaudible **Other Noise Events:** Traffic 35-39 Insects 26-29 Impact 40-43

Note: N/M = Not Measurable, I/A = Inaudible

Note 1: Mine owned receiver – criteria not applicable

6 Conclusion

SLR was engaged by Narrabri Coal Operations Pty Ltd to conduct attended noise monitoring for the Narrabri Mine in accordance with the Narrabri Mines' Noise Management Plan, Environment Protection Licence and Project Approval.

Operator attended noise monitoring was conducted at eight locations in order to determine the noise performance of the Narrabri Mine, with compliance achieved at all privately owned receiver locations.

APPENDIX A

Acoustic Terminology

Sound Level or Noise Level

The terms "sound" and "noise" are almost interchangeable, except that in common usage "noise" is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 "A" Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as "linear", and the units are expressed as dB(lin) or dB.

3 Sound Power Level

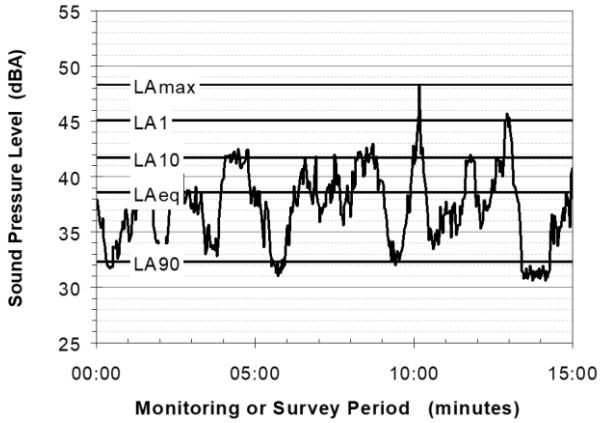
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceed for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the "repeatable minimum" LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or "average" levels representative of the other descriptors (LAeq, LA10, etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than "broad band" noise. 7. Impulsiveness

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

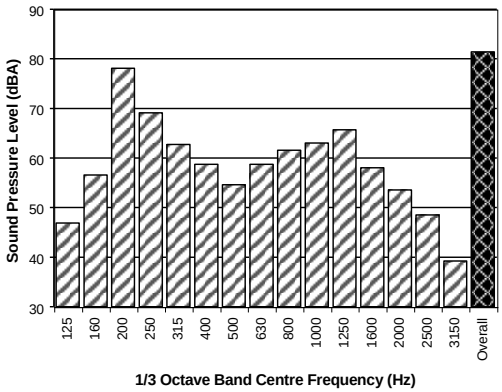
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



APPENDIX B

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM31777

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B&K		
Type No:	2270	**Serial No:**	3029485
Mic. Type:	4189	**Serial No:**	3260622
Pre-Amp. Type:	ZC0032	**Serial No:**	30123
Filter Type:	1/3 Octave	**Test No:**	F031778

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	15/02/2022
Temperature	25	°C ±1° C	**Date of Calibration :**	16/02/2022
Relative Humidity	55	% ±5%	**Date of Issue :**	16/02/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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WORLD RECOGNISED ACCREDITATION
Accredited Lab No. 9262
Acoustic and Vibration Measurements

Acu-Vib Electronics
CALIBRATIONS SALES RENTALS REPAIRS

Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	N/A
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM30969

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	B&K		
Type No:	2270	**Serial No:**	3027586
Mic. Type:	4189	**Serial No:**	3232163
Pre-Amp. Type:	ZC0032	**Serial No:**	29527
Filter Type:	1/3 Octave	**Test No:**	F030970

Owner: SLR Consulting Australia Pty Ltd
120 High Street
North Sydney, NSW 2060

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	988	hPa ±1 hPa	**Date of Receipt :**	28/10/2021
Temperature	26	°C ±1° C	**Date of Calibration :**	29/10/2021
Relative Humidity	41	% ±5%	**Date of Issue :**	01/11/2021

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: ... **AUTHORISED SIGNATURE:** .....
Jack Kidd

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This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:-2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:-2013 because evidence was not publically available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:-2013 and because the periodic tests of IEC 61672-3:-2013 cover only a limited subset of the specifications in IEC 61672-1:-2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

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