

# Annual Noise Monitoring Assessment 2023

Dunmore Lakes Sand Project  
Dunmore, NSW  
July 2023



# Document Information

Annual Noise Monitoring Assessment 2023

Dunmore Lakes Sand Project

Dunmore, NSW

July 2023

Prepared for: Boral Resources (NSW) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

www.mulleracoustic.com

Document ID	Date	Prepared By	Signed	Reviewed By	Signed
MAC180747-10RP2	31 July 2023	Nicholas Shipman		Rod Linnett	

## DISCLAIMER

All documents produced by Muller Acoustic Consulting Pty Ltd (MAC) are prepared for a particular client's requirements and are based on a specific scope, circumstances and limitations derived between MAC and the client. Information and/or report(s) prepared by MAC may not be suitable for uses other than the original intended objective. No parties other than the client should use or reproduce any information and/or report(s) without obtaining permission from MAC. Any information and/or documents prepared by MAC is not to be reproduced, presented or reviewed except in full.

**CONTENTS**

1 INTRODUCTION.....5

2 NOISE CRITERIA .....7

3 METHODOLOGY .....9

    3.1 LOCALITY .....9

    3.2 ASSESSMENT METHODOLOGY ..... 10

4 RESULTS ..... 13

5 NOISE COMPLIANCE ASSESSMENT ..... 23

6 DISCUSSION ..... 25

    6.1 DISCUSSION OF RESULTS - LOCATION DN-6 ..... 25

    6.2 DISCUSSION OF RESULTS - LOCATION DN-7 ..... 25

    6.3 DISCUSSION OF RESULTS - LOCATION DN-8 ..... 25

    6.4 DISCUSSION OF RESULTS - LOCATION DN-9 ..... 25

    6.5 DISCUSSION OF RESULTS - LOCATION DN-10 ..... 26

    6.6 DISCUSSION OF RESULTS - LOCATION DN-11 ..... 26

    6.7 DISCUSSION OF RESULTS - LOCATION DN-12 ..... 26

    6.8 DISCUSSION OF RESULTS - LOCATION DN-13 ..... 26

7 CONCLUSION ..... 27

APPENDIX A - GLOSSARY OF TERMS

*This page has been intentionally left blank*

# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral Resources (NSW) Pty Ltd for Dunmore Lakes Sand Project (DLSP), at Dunmore, NSW.

The monitoring has been conducted in accordance with the Dunmore Lakes Sand Project Noise Management Plan V7 (NMP, 2021) and in general accordance with the Noise Policy for Industry (NPI). This assessment has been undertaken during July 2023 and forms the annual noise monitoring program to address conditions outlined in the Development Consent (DA 195-8-2004) with the commencement of Stage 5A.

This report summarises the operator-attended noise monitoring results measured at eight receivers in comparison to the relevant noise limits contained in the Development Consent and NMP.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA's), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Dunmore Lakes Sand Project Noise Management Plan V7 (NMP), 2021;
- Dunmore Lakes Sand Quarry Environmental Protection Licence No. 11147;
- Discussion Paper - Validation of Inversion Strength Estimation Method (EPA) 2014; and
- Standards Australia AS 1055:2018 - Acoustics - Description and measurement of environmental noise.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

*This page has been intentionally left blank*

## 2 Noise Criteria

The DLSP Noise Management Plan (NMP), outlines the applicable noise criteria for residential receivers surrounding the operation, and are presented in **Table 1**.

<b>Table 1 Consent Criteria</b>				
Receiver Location <sup>1</sup>	Day	Evening	Night	Morning Shoulder
	(7am - 6pm)	(6pm - 10pm)	(10pm - 12am)	(6am - 7am)
	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
Dunmore Village residences – 31 Shellharbour Road	49	44	41	47
R20	49	44	38	47
R3, R11, R12, R13, R14, R15, R16, R17, R18, 79 Fig Hill Lane	48	43	38	48
R19	47	43	38	46
R4, R5, R6, R7, R8, R9, R10	47	43	38	43
Renton (183 James Road, Dunmore)	46	43	37	46
All other residences	40	35	35	35

Note 1: Referenced from DLSP NMPv7 Table 7.

Maximum Noise Trigger Levels for residential receivers are presented in **Table 2**.

<b>Table 2 Maximum Noise Trigger Levels</b>		
Receiver Location	Night <sup>1</sup>	Morning Shoulder <sup>1</sup>
	(10pm - 12am)	(6am - 7am)
	dB LAmax	dB LAmax
R1, R2, R3, R11, R12, R13, R14, R15, R16, R17 and R18	61	
R4, R5, R6, R7, R8, R9, R10	53	
R19	56	

Note 1: Referenced from DLSP NMPv7 Table 8.

Section L3 of the DLSP Environmental Protection Licence (EPL #11147), outlines the applicable noise limits for residential receivers surrounding the operation. The criteria outlined in the EPL is reproduced below in **Table 3** along with relevant noise conditions.

*L3.1 Noise from the premises must not exceed the following limits:*

<b>Table 3 EPL Noise Limits</b>					
Description	Address	Day	Evening	Night	Morning Shoulder
		(7am - 6pm)	(6pm - 10pm)	(10pm - 6am)	(6am - 7am)
		dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
Renton	James Road	46	43	37	46
Dunmore Village	31 Shellharbour Road	49	44	41	47
Stocker	Swamp Road	49	44	38	47

*Note: The night-time noise limit for Dunmore Village was determined on the basis of predicted noise levels that would be attained after a noise reduction of 8 dB(A) for the loader and/or loading area.*

*L3.2 For the purposes of condition L3.1:*

- *Shoulder is the period 6am to 7am Monday to Saturday;*
- *Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6 pm Sundays and Public holidays;*
- *Evening is defined as the period from 6pm to 10pm; and*
- *Night is defined as the period from 10pm to 6am.*

*L3.3 Noise from the premises is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary to determine compliance with the LAeq(15 minute) noise limit in this condition.*

*The modification factors presented in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.*

*L3.4 The noise emission limits identified in this condition apply under meteorological conditions of:*

- *wind speeds up to 3 m/s at 10metres above the ground level; or*
- *temperature inversions conditions of up to 6oC/100m and wind speeds up to 2m/s at 10 metres above ground level.*

### 3 Methodology

#### 3.1 Locality

DLSP is located at Dunmore near Shellharbour, NSW. Receivers in the locality surrounding DLSP are primarily rural and residential. Highway traffic is a dominant noise source for receivers as they are situated within 500m of the Princes Highway. The representative monitoring locations with respect to DLSP are presented in the locality plan in **Figure 1**. **Table 4** presents the noise criteria for each assessed receiver.

**Table 4 Attended Monitoring Locations and Consent Criteria**

ID <sup>2</sup>	Description <sup>3</sup>	Day <sup>1</sup>	Evening <sup>1</sup>	Night <sup>1</sup>	Morning Shoulder <sup>1</sup>
		dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
DN-6	Renton	46	43	37	46
DN-7	Dunmore Village	49	44	41	47
DN-8	Stocker (R20)	49	44	38	47
DN-9	R17	48	43	38	48
DN-10	R14	48	43	38	48
DN-11	R11	48	43	38	48
DN-12	R3	48	43	38	48
DN-13	R4	47	43	38	43

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

Note 2: Referenced from DLSP NMPv7 Figure 3 and Figure 4.

Note 3: Referenced from DLSP NMPv7 Table 7.

**Table 5** presents the attended monitoring locations and maximum noise trigger levels for each assessed receiver.

**Table 5 Attended Monitoring Locations and Maximum Noise Trigger Levels**

ID <sup>2</sup>	Description <sup>3</sup>	Night <sup>1</sup>	Morning Shoulder <sup>1</sup>
		(10pm - 12am)	(6am - 7am)
		dB LAmax	dB LAmax
DN-9, DN-10, DN-11 and DN-12	R1, R2, R3, R11, R12, R13, R14, R15, R16, R17 and R18		61
DN-13	R4, R5, R6, R7, R8, R9, R10		53
DN6, DN7 and DN-8	Renton, Dunmore Village and Stocker		N/A

Note 1: Referenced from DLSP NMPv7 Table 8.

Note 2: Referenced from DLSP NMPv7 Figure 1, Figure 2, Figure 3 and Figure 4.

Note 3: Referenced from DLSP NMPv7 Table 7.

## 3.2 Assessment Methodology

The attended noise measurements were conducted in general accordance with the procedures described in Standards Australia AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the DLSP NMP. Noise measurements of two 15-minutes in duration during the day period and one 15-minute duration during the remaining periods were conducted at eight locations (DN-6, DN-7, DN-8, DN-9, DN-10, DN-11, DN-12, DN-13) using Svantek Type 1, 971 noise analysers between Tuesday 11 July 2023 and Tuesday 18 July 2023 to satisfy the requirements of the NMP. All acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA.

To understand meteorological conditions during the evening and night periods, direct measurement of temperature profile was undertaken at Trevethan Reserve, Minnamurra at 2m above ground level and at 50m above ground level using a weather balloon between Tuesday 11 July 2023 to Thursday 13 July 2023.

The results of the temperature measurements were used to determine the temperature lapse rate in general accordance with the Validation of Inversion Strength Estimation Method (2014). These measurements, in combination with the on-site weather station provide a reference to validate the relevant meteorological conditions under which compliance is assessed.

Extraneous noise sources were excluded from the analysis to determine the dB LA<sub>eq(15min)</sub> DSLP noise contribution for comparison against the relevant criteria. In the event of quarry attributed noise being above criteria, prevailing meteorological conditions for the monitoring period are sourced from the onsite meteorological station and analysed in accordance with Fact Sheet A4 of the NPI to determine the stability category present at the time of each attended measurement.

Where the quarry is inaudible, the contribution is estimated to be at least 10dBA below the ambient noise level.



FIGURE 1  
LOCALITY PLAN

MAC180747

Dunmore Lakes Sand Project, Dunmore

**KEY**

- Receiver Locations
- Site Boundary



*This page has been intentionally left blank*

## 4 Results

A summary of the operator attended measurements at location DN-6 to DN-13 are presented **Table 6** to **Table 13** and provide the following information;

- Monitoring location.
- Date, time and assessment period.
- Observed Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 1.5m above the ground measured at the monitoring location.
- Measured Temperature (Temp) in °C at 2.0m and 60.0m above ground level at a representative location.
- Average Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 10m above ground level at the on-site weather station.
- Atmospheric stability class derived from the on-site weather station.
- Calculated temperature inversion strength.
- Ambient measured noise levels LAeq(15min) and LA90(15min) in dB re 20µPa.
- DLSP LAeq(15min) and LAmax noise level contribution.
- Noise Limit LAeq(15min) and LAmax.

Results of the attended noise survey identified that the DLSP was audible for short durations during the measurements, however extraneous sources such as distant traffic, insects, livestock and birds were audible during the survey period and dominated the acoustic environment. The attended noise measurements within the development consent conditions (ie lower than 6°C/100m) remained below the consent noise criteria during the assessment period.

**Table 6 DN-6 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria LAeq(15min)/ LAmax	Observed Meteorology							Description and SPL, dBA
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp °C	60m Temp °C	Delta Temp °C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
12/07/2023 Morning Shoulder	06:33	0.1m/s N 15°C	62	59	46/n/a	1.9	W	4.6	9.5	4.9	10.1	G	Traffic 55-67 DLSP inaudible
DLSP Contribution												<46dB LAeq(15min)	
18/07/2023 Day	11:04	1m/s E 18°C	60	57	46	1.5	E	n/a	n/a	n/a	n/a	n/a	Traffic 53-72 Birds 53-60 Aircraft 56-66 DLSP inaudible
DLSP Contribution												<46dB LAeq(15min)	
18/07/2023 Day	11:19	1m/s E 18°C	60	57	46	1.5	E	n/a	n/a	n/a	n/a	n/a	Traffic 53-68 Train 53-62 Aircraft 56-60 DLSP inaudible
DLSP Contribution												<46dB LAeq(15min)	
11/07/2023 Evening	18:01	0.2m/s N 12°C	61	58	43	2.4	W	n/a	n/a	n/a	n/a	n/a	Traffic 62-68 DLSP inaudible
DLSP Contribution												<43dB LAeq(15min)	
11/07/2023 Night	23:12	0.1m/s N 9°C	51	43	37/ n/a	1	WNW	10.7	8.9	-1.8	-0.8	E	Traffic 39-63 DLSP inaudible
DLSP Contribution												<33dB LAeq(15min)	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 7 DN-7 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria LAeq(15min)/ LAmax	Observed Meteorology							Description and SPL, dBA
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
12/07/2023	Morning 06:09	0.1m/s N 15°C	66	64	47/ n/a	0.4	ENE	4.8	8.0	3.2	6.6	G	Traffic 61-74
Train 60-69													
Shoulder													DLSP inaudible
DLSP Contribution													<47dB LAeq(15min)
18/07/2023	Day 11:43	1m/s ESE 18°C	56	50	49	1.9	E	n/a	n/a	n/a	n/a	n/a	Traffic 47-72
Birds 47-56													
DLSP Contribution													DLSP inaudible
DLSP Contribution													<40dB LAeq(15min)
18/07/2023	Day 11:58	1m/s ESE 18°C	57	52	49	1.7	NE	n/a	n/a	n/a	n/a	n/a	Traffic 48-74
Birds 50-59													
DLSP Contribution													Aircraft 51-62
DLSP Contribution													DLSP inaudible
DLSP Contribution													<42dB LAeq(15min)
11/07/2023	Evening 18:25	0.3m/s N 12°C	62	59	44	0.3	W	n/a	n/a	n/a	n/a	n/a	Traffic 56-71
DLSP inaudible													
DLSP Contribution													<44dB LAeq(15min)
11/07/2023	Night 22:48	0.1m/s N 10°C	57	50	41/ n/a	2.3	W	8.0	9.1	1.1	2.3	F	Traffic 44-63
Train 45-81													
DLSP Contribution													DLSP inaudible
DLSP Contribution													<40dB LAeq(15min)

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 8 DN-8 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria LAeq(15min)/ LAmax	Observed Meteorology							Description and SPL, dBA	
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>		
13/07/2022	Morning	06:30	0.1m/s N 11°C	62	56	47/ n/a	1.9	W	2.5	12.4	9.9	20.6	G	Traffic 54-79 Birds 50-69 DLSP impacts <50 (5 seconds)
DLSP Contribution													<30dB LAeq(15min)	
18/07/2022	Day	12:22	0.4m/s E 18°C	64	47	49	1.6	NW	n/a	n/a	n/a	n/a	n/a	Traffic 46-79 Birds 46-56 DLSP inaudible
DLSP Contribution													<37dB LAeq(15min)	
18/07/2022	Day	12:37	1.2m/s E 18°C	64	46	49	3.5	NW	n/a	n/a	n/a	n/a	n/a	Traffic 42-85 Birds 49-56 DLSP inaudible
DLSP Contribution													<36dB LAeq(15min)	
11/07/2022	Evening	20:56	0.1m/s N 12°C	60	50	44	1.2	W	7.5	13.2	5.7	11.8	G	Traffic 47-85 DLSP inaudible
DLSP Contribution													<40dB LAeq(15min)	
11/07/2022	Night	22:21	0.1m/s N 10°C	55	43	38/ n/a	1.1	W	6.6	9.1	2.5	5.3	G	Traffic 40-76 Aircraft 40-58 DLSP inaudible
DLSP Contribution													<33dB LAeq(15min)	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 9 DN-9 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria LAeq(15min)/ LAmix	Observed Meteorology							Description and SPL, dBA
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
13/07/2023	Morning 06:05	0.1m/s N 11°C	55	52	48//61	2.6	W	2.6	12.0	9.4	19.7	G	Traffic 48-61
Birds <45													
	Shoulder												DLSP inaudible
	DLSP Contribution												<42dB LAeq(15min) <42dB LAmix
18/07/2023	Day 12:55	2.5m/s E 19°C	47	44	48	2.7	W	n/a	n/a	n/a	n/a	n/a	Traffic 46-67
													Wind in vegetation 46-58
													DLSP inaudible
	DLSP Contribution												<34dB LAeq(15min)
18/07/2023	Day 13:10	1.2m/s SE 19°C	50	45	48	2.9	WNW	n/a	n/a	n/a	n/a	n/a	Traffic 43-70
													Birds 44-52
													DLSP inaudible
	DLSP Contribution												<35dB LAeq(15min)
11/07/2023	Evening 21:12	0.1m/s N 12°C	53	48	43	2.2	W	7.3	13.2	5.9	12.3	G	Traffic 44-60
													DLSP inaudible
													DLSP inaudible
	DLSP Contribution												<38dB LAeq(15min)
11/07/2023	Night 22:00	0.1m/s W 11°C	43	39	38/61	1.8	W	6.9	10.5	3.6	7.4	G	Traffic 35-52
													DLSP inaudible
													DLSP inaudible
	DLSP Contribution												<29dB LAeq(15min) <29dB LAmix

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 10 DN-10 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria		Observed Meteorology						Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m	60m	Delta	Lapse Rate	Stability	
								Temp°C	Temp°C	Temp°C	°C/100m <sup>2</sup>	Class <sup>1</sup>	
13/07/2023 Morning Shoulder	06:32	0.1m/s W 4°C	60	58	48/61	1.9	W	2.4	12.6	8.2	21.2	G	Traffic 54-68 Birds 54-58 DLSP inaudible
DLSP Contribution												<48dB LAeq(15min) <48dB LAmx	
18/07/2023 Day	13:29	2.5m/s N 20°C	49	41	48	2.6	NW	n/a	n/a	n/a	n/a	n/a	Traffic 39-82 Wind in vegetation 39-63 DLSP inaudible
DLSP Contribution												<31dB LAeq(15min)	
18/07/2023 Day	13:44	2m/s N 20°C	49	41	48	3.1	W	n/a	n/a	n/a	n/a	n/a	Traffic 39-70 Birds 48-72 DLSP inaudible
DLSP Contribution												<31dB LAeq(15min)	
11/07/2023 Evening	21:28	0.1m/s N 11°C	51	42	43	1.1	W	7.0	11.8	4.8	10.1	G	Traffic 42-62 DLSP inaudible
DLSP Contribution												<32dB LAeq(15min)	
11/07/2023 Night	22:02	0.1m/s N 10°C	51	43	38/61	1.8	W	6.8	10.4	3.6	7.5	G	Traffic 38-74 DLSP inaudible
DLSP Contribution												<33dB LAeq(15min) <33dB LAmx	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 11 DN-11 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria		Observed Meteorology						Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
12/07/2023 Morning Shoulder	06:39	0.2m/s W 8°C	57	54	48/61	2	W	4.6	9.8	5.2	10.9	G	Traffic 51-76 Birds 51-70 DLSP inaudible
DLSP Contribution												<44dB LAeq(15min) <44dB LAmax	
18/07/2023 Day	14:02	0.2m/s N 20°C	51	47	48	3.5	WSW	n/a	n/a	n/a	n/a	n/a	Traffic 44-66 Aircraft 46-52 DLSP inaudible
DLSP Contribution												<37dB LAeq(15min)	
18/07/2023 Day	14:17	0.2m/s N 20°C	52	48	48	2	WNW	n/a	n/a	n/a	n/a	n/a	Traffic 49-71 Birds 40-50 DLSP inaudible
DLSP Contribution												<38dB LAeq(15min)	
11/07/2023 Evening	21:45	0.1m/s N 10°C	52	44	43	2.4	W	7.0	10.9	3.9	8.3	G	Traffic 39-72 DLSP inaudible
DLSP Contribution												<34dB LAeq(15min)	
11/07/2023 Night	22:20	0.1m/s N 10°C	50	44	38/61	1.1	W	6.6	9.2	2.6	5.5	G	Traffic 39-62 DLSP inaudible
DLSP Contribution												<34dB LAeq(15min) <34dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 12 DN-12 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria		Observed Meteorology						Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp °C	60m Temp °C	Delta Temp °C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
12/07/2023 Morning Shoulder	06:18	0.2m/s SW 8°C	58	52	48/61	1.1	WNW	4.7	7.8	3.1	6.4	G	Traffic 49-83 Birds 49-66 DLSP inaudible
DLSP Contribution												<42dB LAeq(15min) <42dB LAmax	
18/07/2023 Day	14:40	0.1m/s E 20°C	71	55	48	1.5	NW	n/a	n/a	n/a	n/a	n/a	Traffic 48-87 Birds 48-54 DLSP inaudible
DLSP Contribution												<45dB LAeq(15min)	
18/07/2023 Day	14:55	0.1m/s NE 20°C	71	53	48	1.6	WNW	n/a	n/a	n/a	n/a	n/a	Traffic 47-82 Train 52-62 DLSP inaudible
DLSP Contribution												<43dB LAeq(15min)	
11/07/2023 Evening	20:36	0.1m/s N 12°C	64	44	43	1.3	W	7.8	12.8	5.0	10.4	G	Traffic 41-81 DLSP inaudible
DLSP Contribution												<34dB LAeq(15min)	
11/07/2023 Night	22:41	0.3m/s N 8°C	61	41	38/61	1.8	W	7.7	9.0	1.3	2.7	F	Traffic 41-76 DLSP inaudible
DLSP Contribution												<31dB LAeq(15min) <31dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 13 DN-13 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Criteria LAeq(15min)/ LAmax	Observed Meteorology						Description and SPL, dBA	
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp °C	60m Temp °C	Delta Temp °C	Lapse Rate °C/100m <sup>2</sup>		Stability Class <sup>1</sup>
12/07/2023 Morning Shoulder	06:00	0.2m/s SW 8°C	58	52	43/53	0.4	SW	4.9	6.5	1.6	5.7	G	Traffic 49-70 Train 49-62 DLSP inaudible
DLSP Contribution												<42dB LAeq(15min) <42dB LAmax	
18/07/2023 Day	15:13	1m/s N 20°C	57	51	47	2.3	W	n/a	n/a	n/a	n/a	n/a	Traffic 48-72 Birds 46-59 DLSP inaudible
DLSP Contribution												<41dB LAeq(15min)	
18/07/2023 Day	15:28	1.6m/s N 20°C	58	53	47	2.6	W	n/a	n/a	n/a	n/a	n/a	Traffic 48-73 Pedestrians 47-56 DLSP inaudible
DLSP Contribution												<43dB LAeq(15min)	
11/07/2023 Evening	20:16	0.1m/s N 12°C	54	47	43	1.6	W	8.3	13.1	4.8	10.0	G	Traffic 45-72 DLSP inaudible
DLSP Contribution												<37dB LAeq(15min)	
11/07/2023 Night	22:59	0.1m/s N 8°C	55	43	38/53	2.2	W	8.2	8.8	0.6	1.2	F	Traffic 39-73 DLSP inaudible
DLSP Contribution												<33dB LAeq(15min) <33dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

*This page has been intentionally left blank*

## 5 Noise Compliance Summary

The compliance summary for each monitoring location (DN-6, DN-7, DN-8, DN-9, DN10, DN11, DN12, DN-13) is presented in **Table 14** for the day and evening periods.

Table 14 Noise Compliance Assessment Summary								
Location	Estimated Noise Contribution dB LAeq(15min)			Criteria dB LAeq(15min)		Compliant		
	Day (Round 1)	Day (Round 2)	Evening	Day	Evening	Day (Round 1)	Day (Round 2)	Evening
	DN-6	<46	<46	<43	46	43	✓	✓
DN-7	<40	<42	<44	49	44	✓	✓	✓
DN-8	<37	<36	<40	49	44	✓	✓	✓
DN-9	<34	<35	<38	48	43	✓	✓	✓
DN-10	<31	<31	<32	48	43	✓	✓	✓
DN-11	<37	<38	<34	48	43	✓	✓	✓
DN-12	<45	<43	<34	48	43	✓	✓	✓
DN-13	<41	<43	<37	47	43	✓	✓	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

The compliance summary for each monitoring location (DN-6, DN-7, DN-8, DN-9, DN10, DN11, DN12, DN-13) is presented in **Table 15** for the night assessment period.

Table 15 Noise Compliance Assessment Summary												
Location	Estimated Noise Contribution				Criteria				Compliant			
	Night		Morning Shoulder		Night		Morning Shoulder		Night		Morning Shoulder	
	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax
DN-6	<33	n/a	<46	n/a	37	n/a	46	n/a	✓	n/a	✓	n/a
DN-7	<40	n/a	<47	n/a	41	n/a	47	n/a	✓	n/a	✓	n/a
DN-8	<33	n/a	<30	n/a	38	n/a	47	n/a	✓	n/a	✓	n/a
DN-9	<29	<29	<42	<42	38	61	48	61	✓	✓	✓	✓
DN-10	<33	<33	<48	<48	38	61	48	61	✓	✓	✓	✓
DN-11	<34	<34	<44	<44	38	61	48	61	✓	✓	✓	✓
DN-12	<31	<31	<42	<42	38	61	48	61	✓	✓	✓	✓
DN-13	<33	<33	<42	<42	38	53	43	53	✓	✓	✓	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

## 6 Discussion

### 6.1 Discussion of Results - Location DN-6

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise was inaudible during all measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds, aircraft and passing trains.

### 6.2 Discussion of Results - Location DN-7

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the west. DLSP noise was inaudible during the measurement periods and the noise contributions were calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, passing trains, birds and aircraft.

### 6.3 Discussion of Results - Location DN-8

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise impacts were audible on one occasion during the morning shoulder measurement period with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and aircraft.

### 6.4 Discussion of Results - Location DN-9

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 160m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and wind in vegetation.

## 6.5 Discussion of Results - Location DN-10

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 140m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and wind in vegetation.

## 6.6 Discussion of Results - Location DN-11

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 150m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and aircraft.

## 6.7 Discussion of Results - Location DN-12

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 470m to the west. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and passing trains.

## 6.8 Discussion of Results - Location DN-13

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from Riverside Drive, approximately 10m to the west. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, pedestrians, birds and passing trains.

## 7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral Resources (NSW) Pty Ltd for Dunmore Lakes Sand Project (DLSP), Dunmore, NSW.

Attended noise monitoring was undertaken between Tuesday 11 July 2023 and Tuesday 18 July 2023 at eight representative monitoring locations. The assessment has identified that noise emissions generated by DLSP were audible on one occasion during the assessment period. DSLP contributed noise emissions were below the relevant criteria at all locations during all measurement periods therefore satisfying the relevant consent conditions.

*This page has been intentionally left blank*

# Appendix A - Glossary of Terms

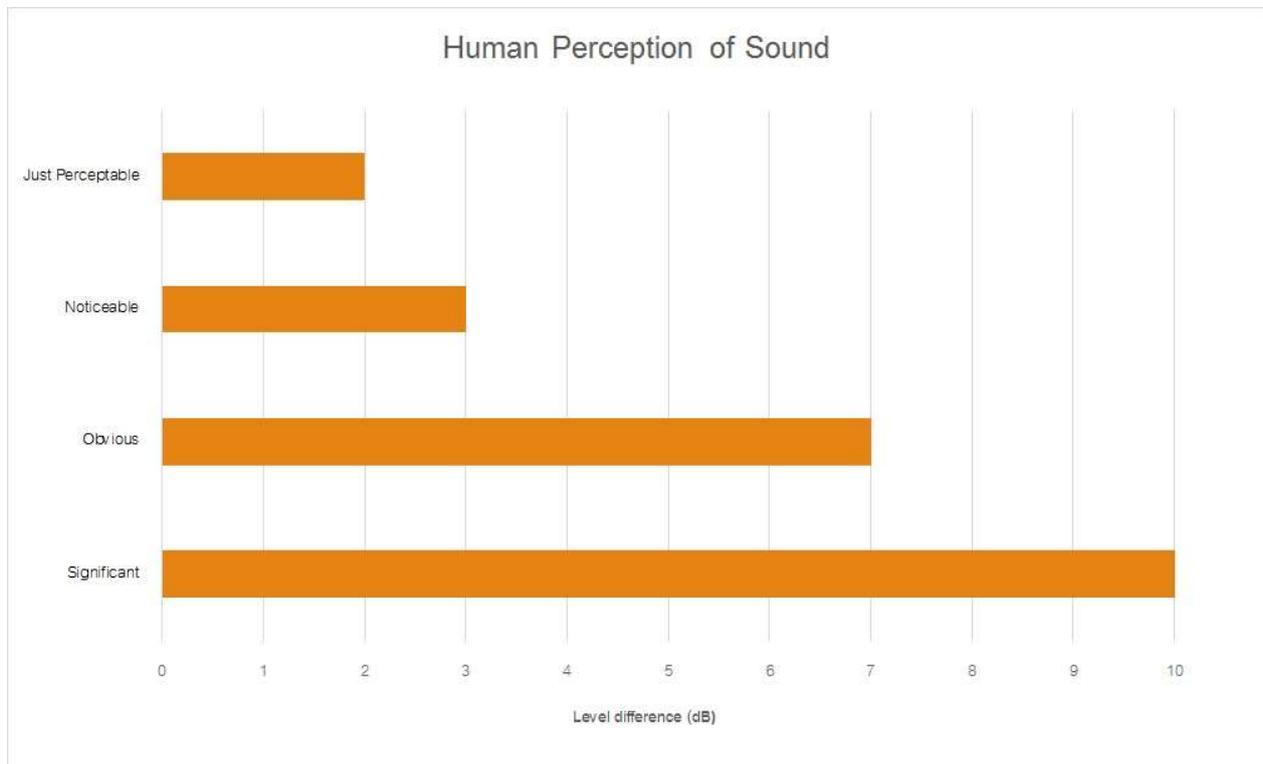
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm <sub>ax</sub>	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ Where : W is the sound power in watts and W <sub>0</sub> is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

Ph: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

