



Multiquip Aggregates Acoustic Report – August 2023 Assessment

CEAL Limited
5152 Oallen Ford Road
Bungonia NSW 2580

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1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (Pulse White Noise Acoustics) was engaged to undertake a noise compliance assessment of the Ardmore Park Quarry and Bungonia bypass road located in Bungonia, NSW. Ardmore Park Quarry and its associated EPL 13213 are currently owned by CEAL Limited, trading as Multiquip Quarries.

The quarry compliance assessment took place on the morning of Thursday 9th August 2023. The assessment measures sand extraction and processing, rock crushing and earthmoving activities being undertaken. As part of the assessment, attended noise monitoring was conducted in the vicinity of residential receivers surrounding the Ardmore Park Quarry.

Noise compliance of truck movements along the Bungonia bypass road was also investigated with attended monitoring. The noise impacts of the quarry facility and bypass road were assessed against the noise limits identified in the Environment Protection Licence.

Road traffic noise contributions from quarry trucks were measured at the closest residential dwelling to Jerrara Road. Additional two nominated receivers in the *Noise Monitoring Program – November 2021* on Oallen Ford Road have also been included during the attended monitoring process.

This report contains a status of compliance with the noise criteria during the attended measurements that were conducted. A glossary of the terminology utilised within this report has been provided in Appendix A.

1.1 Scope

Undertaken noise monitoring and reporting to satisfy the requirements as outline in Schedule 3 Environmental Performance of the Mod 3 of the Condition of consent:

NOISE

2. *The Proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence or on more than 25 per cent of any privately-owned land.*
3. *Noise generated by the project is to be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry. However, the Noise Impact Assessment Criteria are to apply during F-Class temperature inversions and 2 metres/second draining winds during the 5am – 7am morning shoulder, and 3 metres/second wind during the day.*
6. *(b) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the relevant noise limits in this approval*

This report summarises the August 2023 noise compliance monitoring results for the project site.

2 SITE IDENTIFICATION

This report considers two sites, the Ardmore Park Quarry in which extractive industries occur, and the Bungonia bypass road in which vehicles travelling to and from site can travel around the village of Bungonia.

The Ardmore Park Quarry is located on Lot 24 in DP 1001312, 5152 Oallen Ford Road, Bungonia. The quarry site location is shown in Figure 2-1. The location of the bypass road around the village of Bungonia is located approximately 4 km to the north of the quarry, as shown in Figure 2-2.

Figure 2-1 Ardmore Park Quarry Location



Figure 2-2 Bungonia Bypass Road Location



3 NEAREST SENSITIVE RECEIVERS

As outlined in Environment Protection Licence 13213, receivers are located around the Ardmore Park Quarry and the Bungonia bypass road. Details on the considered receptors around the quarry are contained in section 3.1, while the list of receivers around the bypass road is shown in section 3.2.

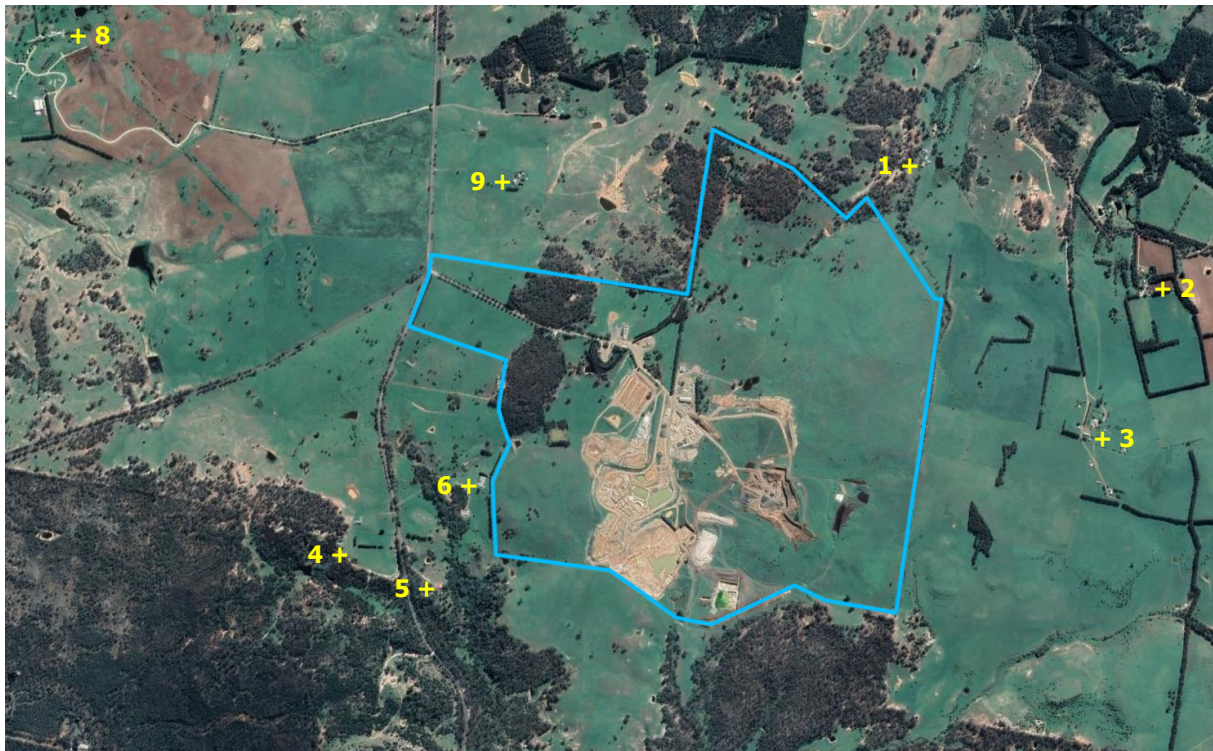
3.1 Nearest Receivers – Quarry Operations

The closest receivers to the quarry site are listed in Table 3-1, with their locations shown in Figure 3-1. These receptors are identified in section L3 of the Environment Protection Licence 13213.

Table 3-1 Nearest Potentially Affected Receivers – Quarry Operations Table

Receptor ID	Address	Lot and DP	Type of Receiver
1	"Reevesdale" 346 Inverary Road, Bungonia	Lot 1 in DP 1012650	Residential
2	"Inverary" 590 Inverary Road, Bungonia	Lot 2 in DP 1095479	Residential
3	"Inverary Park" 40 Broadhead Lane, Bungonia	Lot 2 in DP 84966	Residential
4	"Damar Lodge" 5025 Oallen Ford, Bungonia	Lot 5 in DP 865000	Residential
5	"The Osiers" 5028 Oallen Ford, Bungonia	Lot 2 in DP 852175	Residential
6	"Lochmoor Lodge" 5046 Oallen Ford, Bungonia	Lot 21 in DP 1001312	Residential
8	"Lumley Park" 5223 Oallen Ford Road, Bungonia	Lot 2 in DP 735523	Residential
9	The primary private residence at 5194 Oallen Ford, Bungonia	Lot 2 in DP 846549	Residential

Figure 3-1 Nearest Affected Operational Receivers – Quarry Operations Figure



3.2 Nearest Receivers – Bungonia Bypass Road

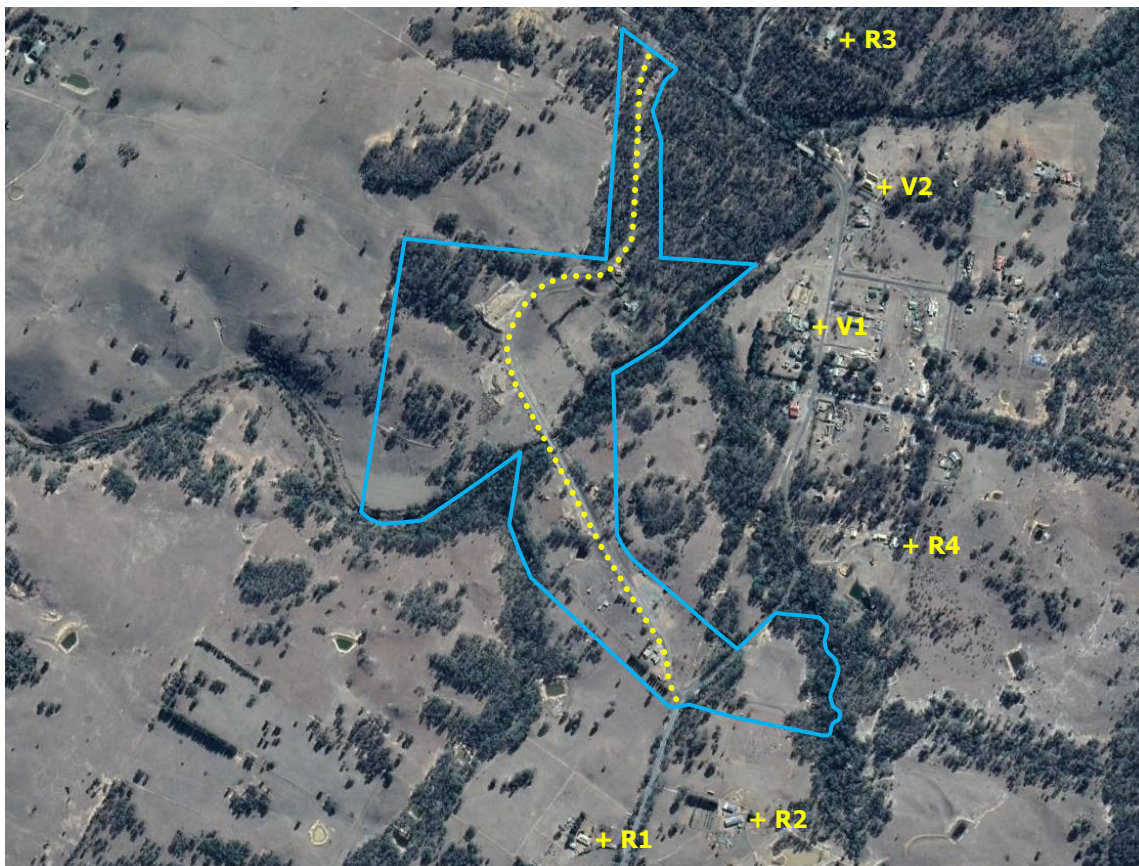
The nearest sensitive receptors to the Bungonia bypass road are listed in Table 3-2, with their positions shown in Figure 3-1. The receptors are identified as the potentially most impacted by the bypass road in the Environment Protection Licence 13213.

Table 3-2 Nearest Potentially Affected Receivers – Bungonia Bypass Table

Receptor ID	Address	Lot and DP	Type of Receiver
R1	5477 Oallen Ford Road, Bungonia	Lot 3 in DP 735523	Residential
R2	5492 Oallen Ford Road, Bungonia	Lot 1 in DP 264643	Residential
R3	1455 Jerrara Road, Bungonia	Lot 146 in DP 750022	Residential
R4	5544 Oallen Ford, Bungonia	Lot 112 in DP 750007	Residential
V1	28-30 King Street, Bungonia	Lot 8 in DP 758184	Residential
V2	1 Eliza Champion Street, Bungonia	Lot 1 in DP 758184	Residential
V3	5477 Oallen Ford Rd, Bungonia NSW 2580	Lot 3 in DP 735523	Residential
V4	989 Jerrara Rd, Marulan NSW 2579	Lot 1 in DP 1004957	Residential

Note: 1. Receptor V3 and V4 have been included for road traffic impact assessment based on the nominated receivers within the Noise Monitoring Program – November 2021.

Figure 3-2 Nearest Affected Road Traffic Receivers – Bungonia Bypass Figure



4 ACOUSTIC CRITERIA

The acoustic criteria for the quarry and bypass road are contained in Table 4-1 and Table 4-2 below. Note that our assessment covers the criteria detailed in both Modification 2 and Modification 3 of the Project Approval (Project Application 07_0155).

Table 4-1 Noise Assessment Criteria – Nearest Potentially Affected Receivers – Modification 2 of the Project Approval

Receptor ID	Address	Day	Evening	Night	Night
		L _{Aeq} (15 minutes)	L _{Aeq} (15 minutes)	L _{Aeq} (15 minutes)	L _{A1} (1 min)
Residence 1	"Reevesdale" 346 Inverary Road, Bungonia	35	35	35	45
Residence 2	"Inverary" 590 Inverary Road, Bungonia	35	35	35	45
Residence 3	"Inverary Park" 40 Broadhead Lane, Bungonia	35	35	35	45
Residence 4	"Damar Lodge" 5025 Oallen Ford Road, Bungonia	35	35	35	45
Residence 5	"The Osiers" 5028 Oallen Ford Road, Bungonia	35	35	35	45
Residence 6	"Lochmoor Lodge" 5046 Oallen Ford Road, Bungonia	36	35	35	45
Residence 8	"Lumley Park" 5223 Oallen Ford Road, Bungonia	35	35	35	45
Residence 9	The primary private residence at 5194 Oallen Ford, Bungonia	36	35	35	45
Residence R1	5477 Oallen Ford Road, Bungonia	35	35	35	45
Residence R2	5492 Oallen Ford Road, Bungonia	35	35	35	45
Residence R3	1455 Jerrara Road, Bungonia	36	35	35	45
Residence R4	5544 Oallen Ford Road, Bungonia	35	35	35	45
Residence V1	28-30 King Street, Bungonia	38	35	35	45
Residence V2	1 Eliza Champion Street, Bungonia	36	35	35	45

Table 4-2 Noise Assessment Criteria – Nearest Potentially Affected Receivers – Modification 3 of the Project Approval

Receptor ID	Address	Day	5am – 7am
		L _{Aeq} (15 minutes)	L _{Aeq} (15 minutes)
Residence 1	"Reevesdale" 346 Inverary Road, Bungonia	40	35
Residence 2	"Inverary" 590 Inverary Road, Bungonia	40	35
Residence 3	"Inverary Park" 40 Broadhead Lane, Bungonia	40	35
Residence 4	"Damar Lodge" 5025 Oallen Ford Road, Bungonia	40	35
Residence 5	"The Osiers" 5028 Oallen Ford Road, Bungonia	40	35
Residence 6	"Lochmoor Lodge" 5046 Oallen Ford Road, Bungonia	40	36
Residence 8	"Lumley Park" 5223 Oallen Ford Road, Bungonia	40	35
Residence 9	The primary private residence at 5194 Oallen Ford, Bungonia	40	36
Residence R1	5477 Oallen Ford Road, Bungonia	40	35
Residence R2	5492 Oallen Ford Road, Bungonia	40	35



Receptor ID	Address	Day	5am – 7am
		L _{Aeq} (15 minutes)	L _{Aeq} (15 minutes)
Residence R3	1455 Jerrara Road, Bungonia	40	35
Residence R4	5544 Oallen Ford Road, Bungonia	40	35
Residence V1	28-30 King Street, Bungonia	40	35
Residence V2	1 Eliza Champion Street, Bungonia	40	35
Residence V3	5477 Oallen Ford Rd, Bungonia NSW 2580	40	35
Residence V4	989 Jerrara Rd, Marulan NSW 2579	40	35

It is noted that from Table 4-1 and Table 4-2 above, criteria for residences 1-6 and 8-9 refer to noise from the quarry site. Criteria for residences R1-R4 and V1-V4 refer to noise from the Bungonia bypass and road. Given the Environment Protection Licence, the following noise limits are recommended for road traffic noise from selected public roads.

Table 4-3 Project Road Traffic Noise Criteria ¹

Receptor ID	L _{Aeq} (60 minutes)
Oallen Ford Road	55
Mountain Ash Road	55
Jerrara Road	55
Tarago Road	55
Windellama Road	55

Note: 1. Noise Monitoring Program for the Ardmore Park Quarry Via Bungonia, NSW by VMS, Dated November 2021

5 ATTENDED NOISE MONITORING

Noise compliance monitoring was carried out using attended noise measurements in the vicinity of the residential receptors surrounding the quarry, bypass road and Jerrara Road. Attended noise measurements were selected as the assessment method, as being present during the measurements enabled the most accurate way to quantify noise emissions from the subject site. In particular, it was aimed to quantify site noise and separate out background noise sources such as birds, aeroplanes and general road traffic noise.

Measurements were conducted on the morning of Thursday 9th August 2023. During the measurements, the quarry was fully operational including sand extraction and processing, rock crushing, earthmoving and truck movement activities. Wind conditions were monitored from the nearest Bureau of Meteorology (BOM) weather station, Goulburn Airport (AWS 070330). Wind speeds from the BOM weather station were converted to local wind speeds 1.5 m above ground level using the conversion factors listed in *Converting Bureau of Meteorology Wind Speed Data to Local Wind Speeds at 1.5 m Above Ground Level* by Gowen, Karantonis and Rofail, Proceedings of Acoustics 2004, 3-5 November 2004, Gold Coast Australia. The converted 1.5 m wind speeds were below 5 m/s throughout measurements from the Ardmore Park site. Details of the methodology and measured noise results have been detailed below.

5.1 Instrumentation

Instrumentation for all acoustic surveys comprised one Brüel & Kjær Type 2270 sound level meter (serial number 2679267) which is a Class 1 instrument. The calibration of the sound level meter was checked prior to and following the measurements. The instrument was calibrated prior and subsequent to measurements using Brüel & Kjær Type 4230 calibrator. Drift in calibration did not exceed ± 0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates and complies with AS IEC 61672.1 2019 "Electroacoustics – Sound Level Meters".

5.2 Meteorological conditions

The meteorological conditions during the attended monitoring are provided in below Table 5-1. There was no rain during the time of the monitoring.

Table 5-1 Meteorological conditions

Date	Time	Wind Speed m/s	Temperature (°C)	Humidity (%)	Cloud cover
9/8/2023	7:20	0	7	80	2/8
9/8/2023	8:00	< 1	8	85	2/8
9/8/2023	8:45	< 1	8	80	2/8
9/8/2023	9:15	< 1	10	70	2/8
9/8/2023	10:00	1	11	95	2/8

The meteorological conditions under which the noise limits apply are specified in Operational Noise Assessment criteria are summarised in Table 5-2.

Table 5-2 Meteorological conditions under which the Noise Limits apply

Parameter	Conditions
Rain	No rain or hail weather condition
Wind speed at microphone	≤ 5 m/s
Wind speed at 10 m	≤ 3 m/s
Temperature inversion and/or atmospheric stability	Stability category F and wind speed ≤ 2 m/s at 10 m height Stability category G (no wind specified)

Parameter	Conditions
Meteorological Data¹	Data extracted from the nearest Bureau of Meteorology (BoM) Weather Station.
<i>Note: 1. Due to the weather station does not provide sigma theta data, temperature inversion and atmospheric stability cannot be calculated in this assessment. Conservative approach has been considered which assumption made that temperature inversion and/or atmospheric stability conditions are present during all measurement periods.</i>	

5.3 Attended Noise Measurements – Quarry Site

Attended measurements from the Ardmore Park Quarry were taken in the vicinity of the potentially most impacted receivers, as shown in Figure 5-1. During the measurements, the site was operational with sand extraction and processing, rock crushing and earthmoving activities being undertaken. Earthmoving activities included road maintenance and the removal of overburden within the southern sand extraction area. The sand activities peak up to 3000 T/day.

Equipment that was operational on site during the attended measurements is listed below

- CDE M4500 Sand Wash Plant x 1
- Precision screen stacker x 1
- 40T Dump Trucks x 5
- 60T Excavator x 1
- 70T Excavator x 1
- D85 Bulldozer
- Komatsu WA480 Front End Loader x 2
- Sandvik mechanical screen x 2
- Tesab Jaw Crusher
- Kleeman Impact Crusher
- 15000L Water Truck
- Fuel Truck
- Kenworth 610 Trucks x 2
- 500 Kva Diesel Generator

5.3.1 Measurement Results

Table 5-3 presents the results of the conducted quarry site measurements. The table displays the LAeq, LA90, LA10 and LA1 levels from the conducted noise measurements. These descriptors refer to the noise levels of all noise sources including birds, road traffic and wind through trees as well as site noise.

Additionally, each noise measurement includes the “Estimated L_{Aeq} Site at monitoring point”. This descriptor refers to the equivalent L_{Aeq} continuous sound level of the quarry sources alone, excluding the background noise sources such as birds, road traffic and insects. As per section 7 of the Noise Policy for Industry, “a noise limit applies to the noise from a particular development/activity and not to general ambient noise”. The “Estimated L_{Aeq} Site at monitoring point” is therefore used to determine compliance with the site criteria. The site L_{Aeq} is calculated using the numerical results of the total measurements, and observations during the 15-minute periods, both when site noise is audible and site noise is not audible. The estimated L_{Aeq} level from the site must be equal to, or less than the total measured L_{Aeq} noise level. More details can be found in the acoustic glossary in Appendix A.

5.3.2 Measurement Locations

The first measurements were conducted at the residential receptor at 5025 Oallen Ford Road (receiver 4). The second measurements were conducted at the residential receptor at 5046 Oallen Ford Road (receiver 6). The third receiver assessed was located at 5194 Oallen Ford Road (receiver 9). The fourth measurement location was located at the boundary of the receiver 9 close to the project site. Finally, the fifth receiver assessed was located at 40 Broadhead Lane (receiver 3). For the noise measurement locations, the attended measurements are made at either the receiver in question, or closer to the site activities, providing a conservative assessment as shown in Figure 5-1.

Figure 5-1 Attended Measurement Locations

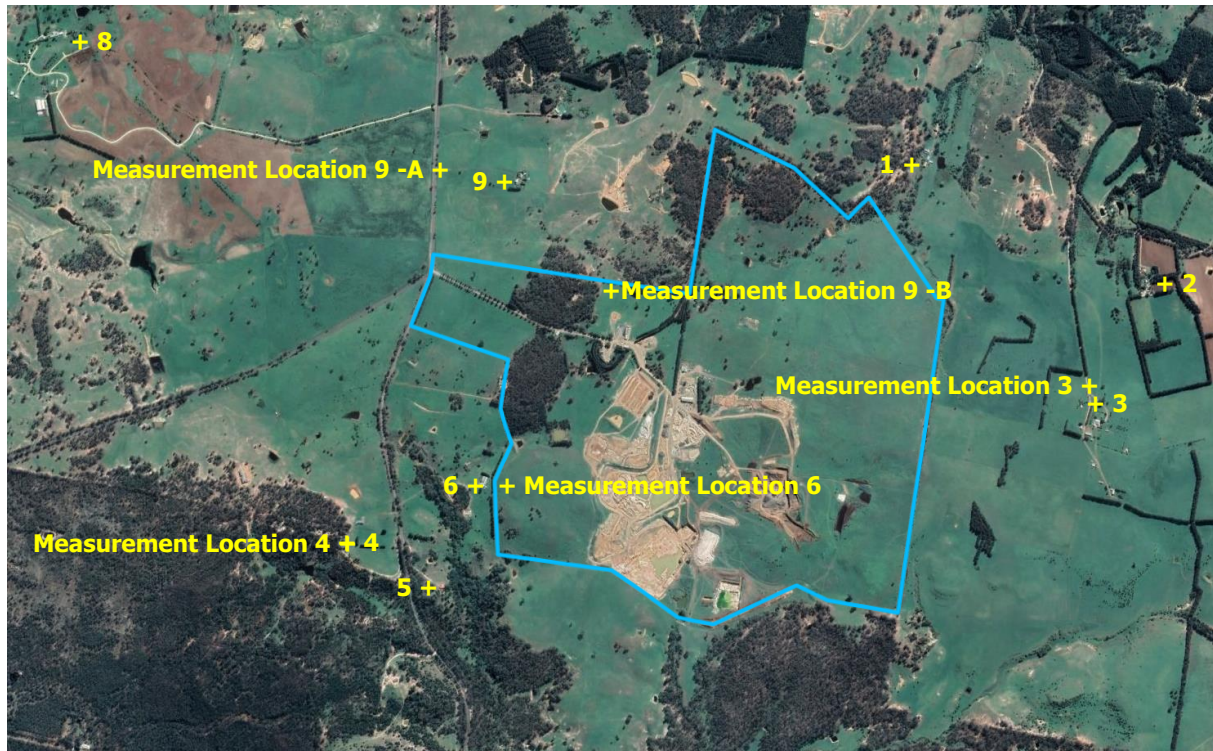




Table 5-3 Operational Attended Noise Measurements, dB(A)

Location	Data & Time	L _{Aeq,15mins} dB(A)	L ₉₀ dB(A)	Criteria ¹ dB(A)	Comments	Comply?
Measurement Location 4	9/8/2023 7:15am to 7:30am	40	30	40	Background noise was dominated by, birds tweeting, insects, and occasional road traffic noise from Oallen Ford Road. Quarry operational noise just audible between 30dB(A) to 33 dB(A); Estimated Site noise contribution at monitoring point ≤ 30 dB(A) L _{Aeq,15mins} .	YES
Measurement Location 6	9/8/2023 8:00am to 8:15am	40	35	40	Background noise was provided by wind through distant trees and birds tweeting. Occasional road traffic noise from Oallen Ford Road is audible. Project site noise is not audible at this monitoring location.	YES
Measurement Location 9 - A	9/8/2023 8:45am to 9:00am	57	40	40	Background noise was dominated by road traffic from both light and heavy vehicles on Oallen Ford Road. Ambient noise level controlled by light wind through trees. Project site noise is not audible at this monitoring location.	YES
Measurement Location 9 - B	9/8/2023 9:15am to 9:30am	54	44	40	Background noise was dominated by the heavy vehicle movement and operating equipment on site at this measurement location. Based on the distance attenuation, the contributed noise level at the receiver location to be estimated less than 30 dB(A) L _{Aeq,15mins} .	YES
Measurement Location 3	9/8/2023 10:00am to 10:15am	46	44	40	Background noise was provided by wind rustling through leaves, birds tweeting and animal noise. Project site noise is not audible at this monitoring location.	YES

Note: 1. The criteria outlined in the condition of consent stated that the 40dB(A) L_{Aeq (15min)} is applied to the “noise generated by the project” only. The measured noise level in this table includes the ambient noise sources.

5.3.3 Comments on Quarry Measurements

Table 5-4 presents a summary of the estimated site contributions at the four noise measurement points. It is shown in Table 5-4 that throughout all measurement periods, compliance with the project criteria (both Modification 2 and Modification 3 of the Project Approval) was achieved.

Table 5-4 Summary – Operator Attended Noise Measurements

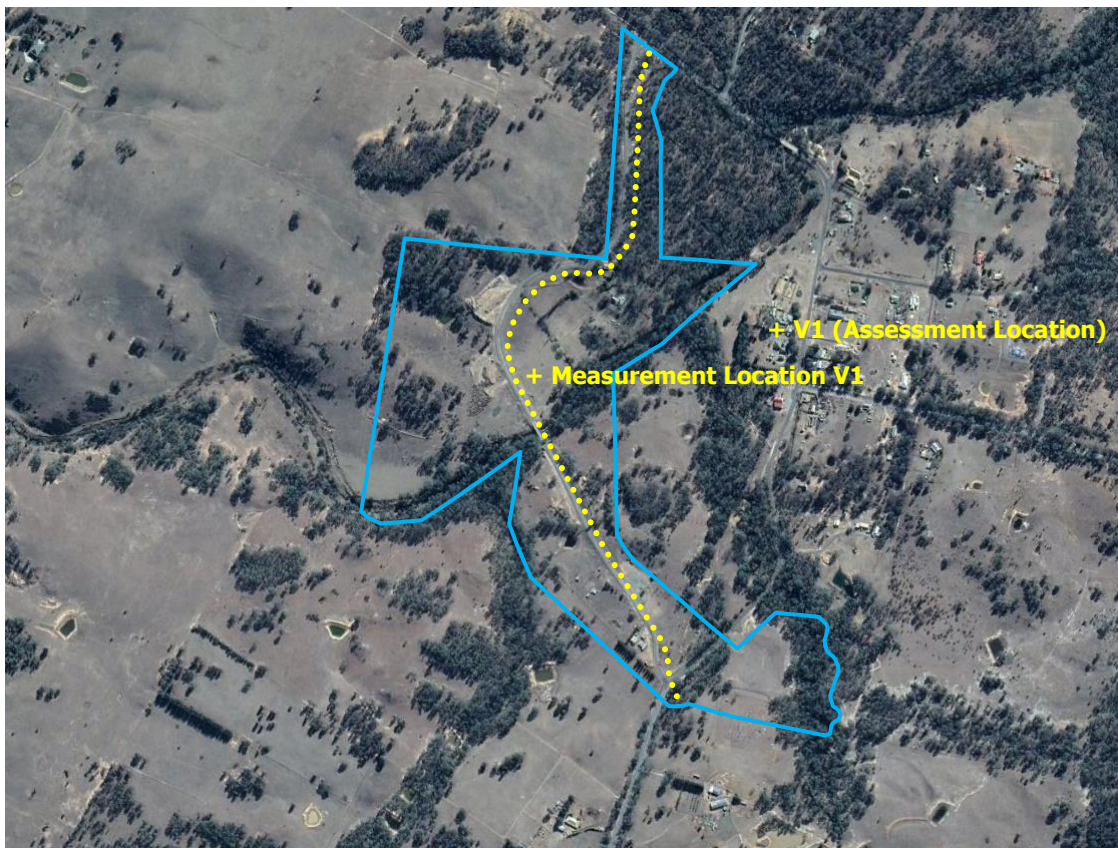
Date	Time	Measurement Location	Mod 2 Criteria / Mod 3 Criteria	Estimated L _{Aeq} Site	Complies
9/8/2023	7:20	4	35 / 40 dB(A)	≤ 40 dB(A)	Yes
9/8/2023	8:00	6	36 / 40 dB(A)	< 30 dB(A)	Yes
9/8/2023	8:45	9	36 / 40 dB(A)	< 30 dB(A)	Yes
9/8/2023	9:15	9	36 / 40 dB(A)	< 30 dB(A)	Yes
9/8/2023	10:00	3	36 / 40 dB(A)	< 30 dB(A)	Yes

5.4 Attended Measurements – Bypass Road

Two attended measurements of road traffic noise were taken in the vicinity of the Bungonia bypass road. The measurements were taken by the bypass route itself (Measurement Location V1). Measurements at this location allow a contribution from passing trucks to be easily quantified. Noise levels are then back calculated to the assessment point, the closest residential receptor to the Bungonia bypass road, 28-30 King Street (Receiver V1).

Measurements at Location V1 are presented in Table 5-5. The location of the measurement point and assessment location are shown in Figure 5-2.

Figure 5-2 Bypass Road Measurement and Assessment Locations



The first measurement period consisted of two truck passbys, including both northbound and southbound travelling trucks. The second measurement period consisted of two truck passbys, including both north and southbound.

The measurement point was 5 m from the southbound lane and 5 m from the northbound lane. The assessment point is located 460 m from the roadway. The estimated L_{Aeq} noise contributions from Multiquip traffic using the bypass road at 28-30 King Street was found to comply with the project criteria at the closest receptor.

Table 5-5 Summary Road Traffic Attended Measurements – 28-30 King Street

Date	Time	No of truck passbys	Site noise L_{Aeq} at measurement point	Traffic noise criteria ¹	Estimated L_{Aeq} assessment point
9/8/2023	10:30-10:45	2	59 dB (A)	55	< 25 dB(A)
9/8/2023	10:45-11:00	2	60 dB (A)	55	< 25 dB(A)

Note: 1. Traffic noise contribution by quarry-related truck transporting are to be comply within Table 4 section 3.4 of the Noise Monitoring Program – November 2021.

5.5 Road Traffic Noise Assessment

Road Traffic noise assessment have been conducted to assess the noise impact from the site heavy vehicles to nearby receivers. The monitoring locations have been selected based the project monitoring requirements. An example of the attended measurement is shown in Figure 5-3.

Figure 5-3 Example of road traffic noise assessment location



5.5.1 328 Jerrara Road, Marulan

Two attended measurements took place outside 328 Jerrara Road, Marulan to measure road traffic noise from trucks driving to and from the quarry. The first measurement period consisted of one truck passbys, travelling northbound. The second measurement period consisted of two trucks passbys. The noise monitoring were undertaken at the residential boundary and adjacent to Jerrara Road. The measured noise levels were then back calculated to the residential façade, the closest residential receptor to Jerrara Road, 328 Jerrara Road. The location of the measurement point and assessment location are shown in Figure 5-4.

Figure 5-4 328 Jerrara Road Measurement and Assessment Locations



It is shown in Table 5-6 that the L_{Aeq} noise contribution from Multiquip vehicles at the measurement point was 65 to 66 dB(A). When back calculated to 1 m from the façade of the 328 Jerrara Road property, the estimated site contribution is 46-49 dB(A). The monitoring location is 5 m from the centre of Jerrara Road while the front façade of the property is 41 m from the centre of Jerrara Road. The estimated L_{Aeq} noise contributions from Multiquip trucks using Jerrara Road was found to comply with the project criteria at the closest receptor.

Table 5-6 Summary Road Traffic Attended Measurements on 328 Jerrara Road

Date	Time	No of truck passbys	Site noise L_{Aeq} at measurement point	Traffic noise criteria ¹	Estimated L_{Aeq} assessment point
9/8/2023	11:15-11:30	1	65 dB (A)	55	46
9/8/2023	11:30-11:45	2	66 dB (A)	55	49

Date	Time	No of truck passbys	Site noise L_{Aeq} at measurement point	Traffic noise criteria ¹	Estimated L_{Aeq} assessment point
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Note: 1. Traffic noise contribution by quarry-related truck transporting are to be comply within Table 4 section 3.4 of the Noise Monitoring Program – November 2021.

5.5.2 989 Jerrara Rd, Bungonia

One attended measurement took place outside 989 Jerrara Rd, Bungonia to measure road traffic noise from trucks driving to and from the quarry. The measurement period consisted of one site truck passby, travelling northbound. The noise monitoring was undertaken at the residential boundary and adjacent to Jerrara Road. The measured noise levels were then back calculated to the residential façade, the closest residential receptor to 989 Jerrara Road, Bungonia. The location of the measurement point and assessment location are shown in Table 5-6.

Figure 5-5 989 Jerrara Rd, Bungonia NSW 2580 - V2



Table 5-7 Summary Road Traffic Attended Measurements - 989 Jerrara Rd, Bungonia

Date	Time	No of truck passbys	Site noise L_{Aeq} at measurement point	Traffic noise criteria ¹	Estimated L_{Aeq} at assessment point
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9/8/2023	11:45-12:00	1	65 dB (A)	60	47
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Note: 1. Traffic noise contribution by quarry-related truck transporting are to be comply within Table 4 section 3.4 of the Noise Monitoring Program – November 2021.

It is shown in Table 5-8 that the L_{Aeq} noise contribution from Multiquip vehicles at the measurement point was 65dB(A). When back calculated to 1 m from the façade of the 989 Jerrara Rd, Bungonia property, the estimated site contribution is approximately 47 dB(A). The monitoring location is 4 m from the centre of the Oallen Ford Road while the front façade of the property is 72 m from the centre of Oallen Ford Road. The estimated L_{Aeq} noise contributions from Multiquip trucks using Oallen Ford Road was found to comply with the project traffic criteria at the this receiver.

5.5.3 Road Traffic Noise Assessment – Oallen Ford Road

One attended measurement took place outside 5447 Oallen Ford Road, Bungonia to measure road traffic noise from trucks driving to and from the quarry. The measurement period consisted of one site truck passby, travelling northbound. The noise monitoring was undertaken at the residential boundary and adjacent to Oallen Ford Road. The measured noise levels were then back calculated to the residential façade, the closest residential receptor to 5447 Oallen Ford Road. The location of the measurement point and assessment location are shown in Figure 5-6.

Figure 5-6 5477 Oallen Ford Road , Bungonia



It is shown in Table 5-8 that the L_{Aeq} noise contribution from Multiquip vehicles at the measurement point was 66dB(A). When back calculated to 1 m from the façade of the 5477 Oallen Ford Road, Bungonia property, the estimated site contribution is approximately 41 dB(A). The monitoring location is 5 m from the centre of the Oallen Ford Road while the front façade of the property is 75 m from the centre of Oallen Ford Road. The estimated L_{Aeq} noise contributions from Multiquip trucks using Oallen Ford Road was found to comply with the project traffic criteria at the this receiver.

Table 5-8 Summary Road Traffic Attended Measurements - 5477 Oallen Ford Road , Bungonia

Date	Time	No of truck passbys	Site noise L_{Aeq} at measurement point	Traffic noise criteria ¹	Estimated L_{Aeq} assessment point
9/8/2023	11:00-11:15	1	66 dB (A)	60	41

Note: 1. Traffic noise contribution by quarry-related truck transporting are to be comply within Table 4 section 3.4 of the Noise Monitoring Program – November 2021.



6 CONCLUSIONS

Pulse White Noise Acoustics conducted a noise compliance assessment of the Ardmore Park Quarry and the Bungonia bypass road located in Bungonia, NSW. This document details the noise limits, conducted attended measurements and determined outcomes of the August 2023 assessment.

Noise compliance of the quarry was investigated, with attended measurements conducted in the vicinity of residential properties surrounding the Ardmore Park Quarry. Noise measurements took place during sand extraction and processing, rock crushing and earthmoving activities. It was shown that compliance with the project criteria was achieved at the neighbouring receivers during all conducted measurements.

Road traffic measurements were conducted to assess noise from the Bungonia bypass road at 28-30 King Street. Noise from the bypass road was found to comply with the project criteria during all measurements at the considered receptor. Furthermore, the impact of road traffic noise from heavy vehicle on Oallen Ford Road and Jerrara Road has also been assessed and found to comply with the project assessment criteria.

APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

<i>Sound power level</i>	The total sound emitted by a source																						
<i>Sound pressure level</i>	The amount of sound at a specified point																						
<i>Decibel [dB]</i>	The measurement unit of sound																						
<i>A Weighted decibels [dB(A)]</i>	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
<i>Decibel scale</i>	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table><tr><td>0 dB(A)</td><td>Threshold of human hearing</td></tr><tr><td>30 dB(A)</td><td>A quiet country park</td></tr><tr><td>40 dB(A)</td><td>Whisper in a library</td></tr><tr><td>50 dB(A)</td><td>Open office space</td></tr><tr><td>70 dB(A)</td><td>Inside a car on a freeway</td></tr><tr><td>80 dB(A)</td><td>Outboard motor</td></tr><tr><td>90 dB(A)</td><td>Heavy truck pass-by</td></tr><tr><td>100 dB(A)</td><td>Jackhammer/Subway train</td></tr><tr><td>110 dB(A)</td><td>Rock Concert</td></tr><tr><td>115 dB(A)</td><td>Limit of sound permitted in industry</td></tr><tr><td>120 dB(A)</td><td>747 take off at 250 metres</td></tr></table>	0 dB(A)	Threshold of human hearing	30 dB(A)	A quiet country park	40 dB(A)	Whisper in a library	50 dB(A)	Open office space	70 dB(A)	Inside a car on a freeway	80 dB(A)	Outboard motor	90 dB(A)	Heavy truck pass-by	100 dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115 dB(A)	Limit of sound permitted in industry	120 dB(A)	747 take off at 250 metres
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100 dB(A)	Jackhammer/Subway train																						
110 dB(A)	Rock Concert																						
115 dB(A)	Limit of sound permitted in industry																						
120 dB(A)	747 take off at 250 metres																						
<i>Frequency [f]</i>	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
<i>Ambient sound</i>	The all-encompassing sound at a point composed of sound from all sources near and far.																						
<i>Equivalent continuous sound level [L_{eq}]</i>	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.																						
<i>Reverberation</i>	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)																						
<i>Air-borne sound</i>	The sound emitted directly from a source into the surrounding air, such as speech, television or music																						
<i>Impact sound</i>	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.																						
<i>Air-borne sound isolation</i>	The reduction of airborne sound between two rooms.																						
<i>Sound Reduction Index [R] (Sound Transmission Loss)</i>	The ratio the sound incident on a partition to the sound transmitted by the partition.																						
<i>Weighted sound reduction index [R_w]</i>	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.																						
<i>Level difference [D]</i>	The difference in sound pressure level between two rooms.																						



<i>Normalised level difference</i> [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
<i>Standardised level difference</i> [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
<i>Weighted standardised level difference</i> [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
<i>Impact sound isolation</i>	The resistance of a floor or wall to transmit impact sound.
<i>Impact sound pressure level</i> [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
<i>Normalised impact sound pressure level</i> [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
<i>Weighted normalised impact sound pressure level</i> [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
<i>Weighted standardised impact sound pressure level</i> [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
<i>Energy Equivalent Sound Pressure Level</i> [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
<i>Percentile Sound Pressure Level</i> [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols"