

Annual Noise Monitoring Assessment

Roberts Rd Sand Quarry
Roberts Road
Maroota, NSW
December 2023

Prepared for: Hodgson Quarry and Plant
C/-VGT Environmental Compliance Solutions Pty Ltd
March 2024
MAC160257-03RP1V1



Document Information

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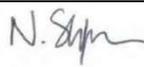
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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by VGT Environmental Compliance Solutions Pty Ltd (VGT), on behalf of Hodgson Quarry and Plant to complete a Noise Monitoring Assessment (NMA) for the Roberts Rd Sand Quarry (the quarry), Maroota, NSW.

The NMA involved quantifying the noise contribution of the quarry by conducting operator attended measurements to determine compliance with the Environmental Protection Licence (EPL #6535) noise limits. The monitoring has been conducted in general accordance with Conditions P1.2 and L3 of the EPL and Conditions 16, 48, 49 and 50 of the Consolidated Consent (Mod 4, DA 267-11-99) at seven receiver locations.

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), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- NSW Environment Protection Authority (EPA), Environment Protection Licence (EPL) #6535;
- NSW Department of Planning, Industry and Environment (DPIE), Consolidated Consent DA #267-11-99, Modification 4;
- Standards Australia AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters – Specifications; and
- Standards Australia AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures.

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

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2 Noise Criteria

2.1 Operational Noise Criteria

Table 1 incorporates the noise limits for assessed receivers referenced from Conditions P1.2 and L3.1 of the EPL and Condition 49 of the Consolidated Consent, that have been adopted for this NMA and are consistent with EPL monitoring locations.

Table 1 Noise Limits, dBA			
Receiver Identification	Day ³	Morning Shoulder ²	
	LAeq(15min)	LAeq(15min)	LA1(1min)
Point 1,3,4,5,6,7 (EPA 1,3,4,5,6,7) ¹ or All other receivers ²	43	40	50
Point 2 (EPA 2) ¹ or Receiver B ²	44	40	50

Note 1: Noise criteria adopted from EPL #6535.

Note 2: Noise criteria adopted from Consolidated Consent #DA 267-11-99, Modification 4.

Note 3: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

The subsequent conditions stated in Section L3 and P1.2 of the projects EPL (EPL #6535) and are reproduced below:

Condition L3.3

- a) *The noise limits set out in condition L3.1 apply under all meteorological conditions shown in the table below; and*
- b) *For those meteorology conditions not referred to in Condition L3.3(a), the noise limits that apply are the noise limits in Condition L3.1 plus 5dB.*

Assessment Period	Meteorology Conditions
Day	Stability Categories A, B, C, D and E with wind speeds up to and including 3m/s at 10m above ground level.

L3.4 For the purpose of condition L3.3:

- a) *The meteorological conditions are to be determined from meteorological data obtained from a meteorological weather station.*
- b) *Stability category shall be determined using the following method from fact Sheet D of the Noise Policy for Industry (NSW EPA, 2017):*
 - i. *Pasquill-Gifford stability classification scheme (section D1.3.1).*

L3.5 To assess compliance:

a) with LAeq (15 minute) noise limits in condition L3.1, the noise measurement equipment must be located:

- i. approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or where applicable,*
- ii. within 30 meters of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 meters from the property boundary closest to the premises; or, where applicable,*
- iii. in an area within 50 meters of the boundary of a National Park or a Nature Reserve,*
- iv. at any other location identified in condition L3.1.*

b) with LAeq (15 minute) noise limits in condition L3.1, the noise measurement equipment must be located:

- i. at the reasonably most affected point at a location where there is no residence at the location; or,*
- ii. at the reasonably most affected point within an area at a location prescribed by condition L3.5(a).*

L3.6 A non-compliance of conditions L3.1 will still occur where noise generated from the premises is measured in excess of the noise limit at a point other than the reasonably most affected point at the locations referred to in condition L3.5(a) or L3.5(b).

Notes to L3.5 and L3.6: *The reasonably most affected point is a point at a location or within an area at a location experiencing or expected to experience the highest sound pressure level from the premises.*

L3.7 For the purpose of determining the noise generated at the premises, the modifying factor correction in Table C1 in Fact Sheet C of the Noise Policy for Industry (NSW EPA, 2017) may be applied, if appropriate, to the noise measurements by the noise monitoring equipment.

L3.8 Noise measurement must not be undertaken where rain or wind speed at microphone level will affect the acquisition of valid measurements.

P1.2 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

<i>EPA identification no.</i>	<i>Type of monitoring point</i>	<i>Location description</i>
1	Noise monitoring	100 Old Telegraph Road, Maroota
2	Noise monitoring	35 Roberts Road, Maroota
3	Noise monitoring	4471 Northern Road, Maroota
4	Noise monitoring	11 Roberts Road, Maroota
5	Noise monitoring	4460 Old Northern Road, Maroota
6	Noise monitoring	59 Roberts Road, Maroota
7	Noise monitoring	45 Roberts Road, Maroota

Due to technical difficulties, data from the on-site meteorological station was unavailable. Therefore, data from the nearest Bureau of Meteorological (BoM) Station has been supplemented.

2.2 Traffic Noise Criteria

The subsequent conditions stated in Section 50 of the projects Consolidated Consent (DA# 267-11-99, Modification 4) and are reproduced below:

50. The Applicant shall ensure that all traffic noise from the development does not exceed (LAeq (1hr)) 55dB(A) between 7am and 10pm and 50dB(A) between 10pm and 7am at any affected residence under adverse weather conditions. Where ambient Leq levels already exceed these criteria, the Applicant shall ensure that traffic noise from the development does not result in an exceedance of more than 2dB(A).

Note: Adverse weather conditions means in the presence of winds up to 3 meters per second and/or temperature inversions of up to 4 degrees Centigrade per 100 meters.

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3 Methodology

3.1 Locality

Roberts Rd Sand Quarry is located at the Corner of Roberts Road and Old Northern Road, Maroota, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential and for consistency the naming conventions for each receiver have been retained from Condition P1.2 of the EPL. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1**.

3.2 Assessment Methodology

The attended noise survey was conducted by MAC staff in general accordance with the procedures described in Standards Australia AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. Measurements were carried out using Svantek Type 1, 971 noise analysers between Wednesday 13 December 2023 and Thursday 14 December 2023. The 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 $\pm 0.5\text{dBA}$.

Due to time constraints within the shoulder period, several Svantek Type 1, 971 noise analysers were installed simultaneously and an intermittent observation point representative of the locations monitored was used. The noise analysers have audio playback capabilities to confirm noise sources during the observation period.

Day and morning shoulder measurements were of 15-minutes duration. Where possible, throughout each survey the operator quantified the contribution of each significant noise source. Extraneous noise sources were excluded from the analysis to calculate the $L_{Aeq}(15\text{min})$ quarry noise contribution for comparison against the relevant EPL limit.

Prevailing meteorological conditions for the monitoring period were sourced from the Bureau of Meteorology (BoM) site located at Mangrove Mountain AWS, NSW Site #61375. Results obtained during non-prevailing meteorological conditions (ie F Class Stability in conjunction with a 2m/s drainage or G Class Stability) are considered not applicable against the EPL criteria.

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

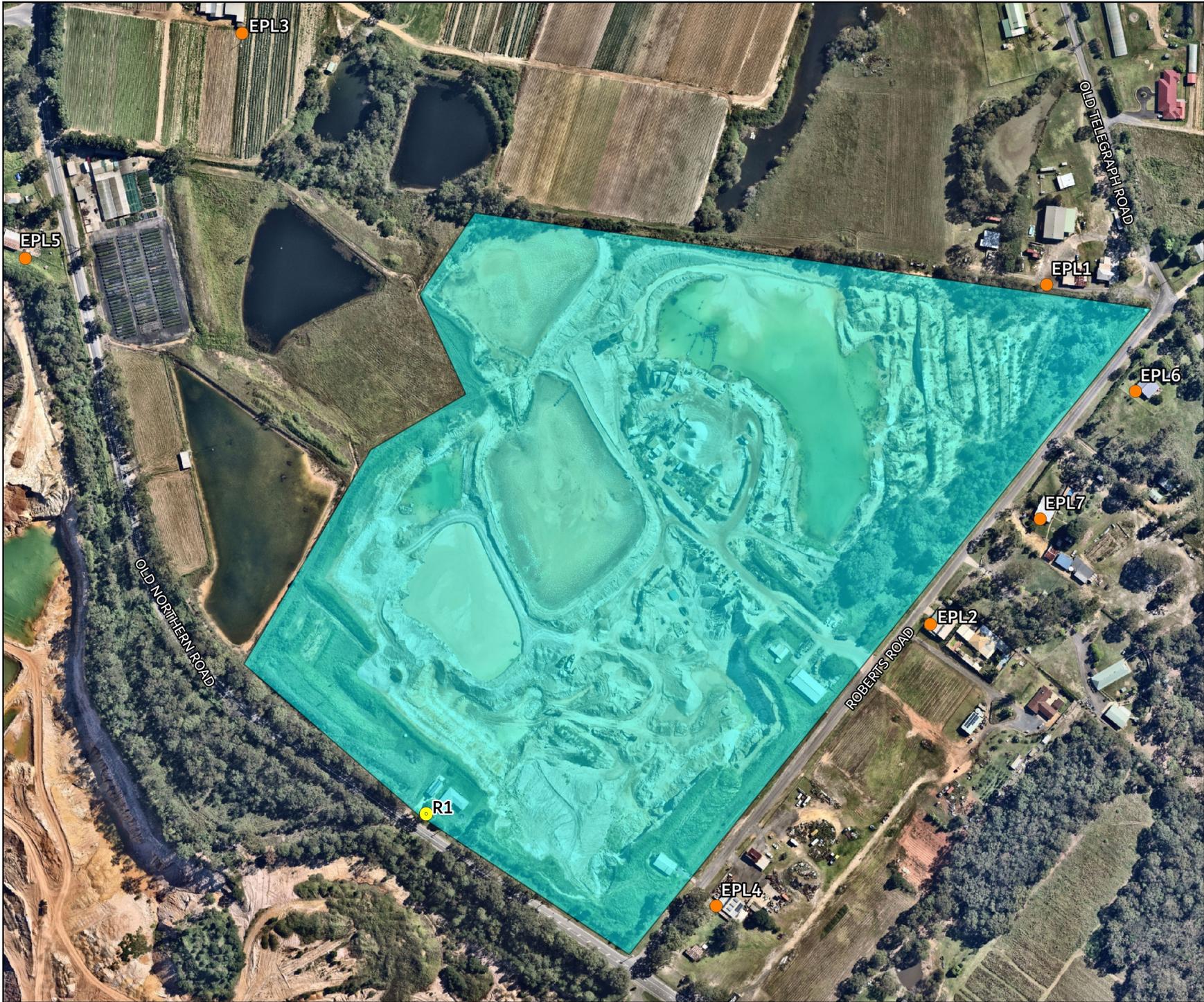


FIGURE 1
 LOCALITY PLAN
 MAC160257-03
 Roberts Road Quarry

KEY

- EPL Monitoring Locations
- Unattended Traffic Logger
- Quarry Boundary



4 Results

The monitoring and assessment results are presented in individual tables for each assessment location.

4.1 Meteorological Conditions

Weather data for the noise assessment was sourced from the BoM station, Mangrove Mountain, NSW, as well as operator measured conditions on site of EPL nominated receiver locations. The data was used to determine prevailing meteorological conditions at the time of the attended measurements, which are presented in **Table 2**.

Table 2 Prevailing Meteorological Conditions

Date & Time	Mangrove Mountain AWS, NSW Bureau of Meteorological Station Site #61375		Operator Measured Weather Monitoring Location (1.8m AGL)	
	Wind Direction	Wind (m/s)	Wind Direction	Wind (m/s)
	13/12/2023 06:04	NE	0.5	N
13/12/2023 06:20	ENE	0.5	N	0.1
13/12/2023 06:22	ENE	0.5	N	0.1
13/12/2023 06:40	N	0.0	N	0.1
13/12/2023 06:42	N	0.0	N	0.1
13/12/2023 07:12	ENE	0.5	N	0.2
13/12/2023 07:35	NNE	1.6	N	0.1
13/12/2023 07:55	NE	1.6	N	0.1
13/12/2023 08:14	NE	1.6	N	0.1
13/12/2023 08:32	NE	1.6	N	0.1
13/12/2023 08:51	N	1.1	N	0.1
13/12/2023 09:22	NE	1.9	N	0.1
14/12/2023 06:24	NW	0.5	N	0.1
14/12/2023 06:41	NW	0.5	N	0.1

4.2 Assessment Results – Location EPA 1

The results of the attended noise measurements at location EPA 3 for the December 2023 survey are summarised in **Table 3** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 3 Operator-Attended Noise Survey Results – EPA 1

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	09:22	74	52	39	43	WD: N WS: 0.1m/s Rain: Nil	Birds 37-56
	(Day)						Insects <37
							Traffic 37-74
							Quarry mobile plant 37-39
		Quarry L _{Aeq} (15min) Contribution					38
13/12/2023	06:42	78	50	34	40/50	WD: N WS: 0.1m/s Rain: Nil	Birds 31-64
	(Morning						Insects <30
	Shoulder)						Traffic 30-78
							Quarry mobile plant 31-35
		Quarry L _{Aeq} (15min) Contribution					33
		Quarry L _{A1} (1min) Contribution					35

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.3 Assessment Results – Location EPA 2

The results of the attended noise measurements at location EPA 2 for the December 2023 survey are summarised in **Table 4** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 4 Operator-Attended Noise Survey Results – EPA 2							
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	08:14 (Day)	88	62	38	44	WD: N WS: 0.1m/s Rain: Nil	Traffic 35-88
							Birds 35-58
							Local residential noise 35-54
							Quarry inaudible
Quarry L _{Aeq} (15min) Contribution							<28
13/12/2023	06:20 (Morning Shoulder)	78	53	46	40/50	WD: N WS: 0.1m/s Rain: Nil	Traffic 40-78
							Birds 44-56
							Insects <40
							Pedestrian 40-45
Quarry L _{Aeq} (15min) Contribution							<36
Quarry L _{A1} (1min) Contribution							<36

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.4 Assessment Results – Location EPA 3

The results of the attended noise measurements at location EPA 3 for the December 2023 survey are summarised in **Table 5** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 5 Operator-Attended Noise Survey Results – EPA 3							
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	07:12 (Day)	66	52	42	43	WD: N WS: 0.2m/s Rain: Nil	Traffic 35-66
							Birds 35-58
							Agriculture 38-63
							Quarry inaudible
Quarry L _{Aeq} (15min) Contribution							<32
14/12/2023	06:24 (Morning Shoulder)	66	52	45	40/50	WD: N WS: 0.1m/s Rain: Nil	Traffic 41-66
							Agriculture 41-43
							Birds 46-54
							Insects 41-45
Quarry L _{Aeq} (15min) Contribution							<35
Quarry L _{A1} (1min) Contribution							<35

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.5 Assessment Results – Location EPA 4

The results of the attended noise measurements at location EPA 4 for the December 2023 survey are summarised in **Table 6** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 6 Operator-Attended Noise Survey Results – EPA 4								
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA	
		L _{Amax}	L _{Aeq}	L _{A90}				
13/12/2023	07:55	75	54	38	43	WD: N WS: 0.1m/s Rain: Nil	Insects <35	
	(Day)						Birds 35-56	
							Traffic 35-75	
							Quarry inaudible	
		Quarry L _{Aeq} (15min) Contribution						<30
13/12/2023	06:04	84	62	36	40/50	WD: N WS: 0.1m/s Rain: Nil	Traffic 33-84	
	(Morning						Birds 33-49	
	Shoulder)						Insects <33	
							Pedestrian 36-45	
							Quarry inaudible	
		Quarry L _{Aeq} (15min) Contribution						<30
		Quarry L _{A1} (1min) Contribution						<40

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.6 Assessment Results – Location EPA 5

The results of the attended noise measurements at location EPA 5 for the December 2023 survey are summarised in **Table 7** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 7 Operator-Attended Noise Survey Results – EPA 5

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	07:35 (Day)	92	69	41	43	WD: N WS: 0.1m/s Rain: Nil	Traffic 35-92
							Birds 35-56
							Rooster 35-50
							Quarry inaudible
Quarry L _{Aeq} (15min) Contribution							<31
14/12/2023	06:41 (Morning Shoulder)	88	69	45	40/50	WD: N WS: 0.1m/s Rain: Nil	Traffic 40-88
							Birds 40-52
							Rooster 40-46
							Insects 40-43
Quarry L _{Aeq} (15min) Contribution							<35
Quarry L _{A1} (1min) Contribution							<35

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.7 Assessment Results – Location EPA 6

The results of the attended noise measurements at location EPA 6 for the December 2023 survey are summarised in **Table 8** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 8 Operator-Attended Noise Survey Results – EPA 6

Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	08:51 (Day)	80	53	39	43	WD: N WS: 0.1m/s Rain: Nil	Dog bark 40-44
							Insects 35-42
							Traffic 35-80
							Birds 38-56
							Quarry mobile plant <35
Quarry L _{Aeq} (15min) Contribution							<35
13/12/2023	06:40 (Morning Shoulder)	80	53	33	40/50	WD: N WS: 0.1m/s Rain: Nil	Traffic 30-80
							Birds 36-52
							Insects <30
							Quarry inaudible
							Quarry L _{Aeq} (15min) Contribution
Quarry L _{A1} (1min) Contribution							<40

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.8 Assessment Results – Location EPA 7

The results of the attended noise measurements at location EPA 7 for the December 2023 survey are summarised in **Table 9** with the relevant EPL limits, the calculated quarry noise contribution and prevailing meteorological conditions at the time of each measurement.

Table 9 Operator-Attended Noise Survey Results – EPA 7							
Date	Time (hrs) ¹	Descriptor (dBA re 20 µPa)			Limit	Meteorology ²	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}			
13/12/2023	08:32 (Day)	78	54	38	43	WD: N WS: 0.1m/s Rain: Nil	Insects 36-42
							Birds 35-56
							Traffic 36-78
							Rooster 36-57
							Quarry inaudible
Quarry L _{Aeq} (15min) Contribution							<30
13/12/2023	06:22 (Morning Shoulder)	64	46	41	40/50	WD: N WS: 0.1m/s Rain: Nil	Pedestrian 43-54
							Traffic 34-64
							Birds 34-59
							Rooster 40-56
							Quarry impacts 41-46 (2 seconds)
Quarry L _{Aeq} (15min) Contribution							<31
Quarry L _{A1} (1min) Contribution							46

Note 1: Day - the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays, EPL #6535.

Note 2: Meteorological data obtained from direct measurement by the operator and by BoM Mangrove Mountain AWS, NSW Site #61375.

4.9 Unattended Road Traffic Noise Results – Location R1

To assess road traffic noise levels associated with quarry related heavy vehicle, an unattended noise monitor was located on the boundary of 4405 Old Northern Road, Maroota, NSW.

The results of the road traffic noise measurements on Wednesday 13 December 2023 are summarised in **Table 10**.

As per condition 50 of the quarries Consolidated Consent (#DA 267-11-99, Modification 4), results of the road traffic noise measurements identify that noise levels were influenced by extraneous noise sources such as birds and local road traffic not associated with the quarry. The noise contribution of the quarry related traffic at this location remained below relevant criteria.

Road traffic noise calculations were undertaken to quantify project related road traffic noise contributions at the measurement position using Traffic Noise Model (TNM) by the United States Department of Transport, Federal Highway Administrations Low Volume Calculator Tool at an offset distance of 25m from the road, which is representative of R1. Results of the road traffic noise calculations identify that quarry related heavy vehicles satisfy the relevant road noise criteria, hence would comply at all privately-owned receivers further than 25m from Old Northern Road.

Table 10 Road Noise Survey Results

Operational Period	Number of Quarry Trucks (passbys) ¹	Overall Calculated dB LAeq (dBA re 20 µPa)	Overall Measured dB LAeq (dBA re 20 µPa)	Compliance Limit dB LAeq (period)
Assessment Period – Day (7am to 8am), dB LAeq(1hr)				
7:00am to 8:00am	17	54	70	55
Assessment Period – Morning Shoulder (6am to 7am), dB LAeq(1hr)				
6:00am to 7:00am	6	49	70	50

Note 1: Vehicle flows provided by site, it is assumed that during the morning shoulder period, a maximum of 6 trucks will be loaded within that hour, the remaining 17 trucks are assumed to be loaded during the day period.

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5 Discussion

5.1 Discussion of Results – Location EPA 1

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were audible on both occasions during the morning shoulder and day periods at location EPA 1. The estimated quarry contributions satisfied the relevant EPL noise limits. Extraneous sources such as birds, insects and traffic were audible during the measurement period.

5.2 Discussion of Results – Location EPA 2

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were inaudible during all assessment periods at location EPA 2, therefore the estimated quarry contribution satisfied the relevant EPL noise limits. Extraneous sources such as birds, traffic, local residential noise, insects and pedestrians were audible during the measurement period.

5.3 Discussion of Results – Location EPA 3

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were inaudible during all assessment periods at location EPA 3, therefore the estimated quarry contribution satisfied the EPL noise limits. Extraneous sources such as traffic, birds, agricultural noise and insects were audible during the measurement period.

5.4 Discussion of Results – Location EPA 4

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were inaudible during all assessment periods at location EPA 4, therefore the estimated quarry contribution satisfied the relevant EPL noise limits. Extraneous sources such as insects, birds, traffic, and pedestrians were audible during the measurement period.

5.5 Discussion of Results – Location EPA 5

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were inaudible during all assessment periods at location EPA 5, therefore the estimated quarry contribution satisfied the relevant EPL noise limits. Extraneous sources such as traffic, birds, roosters, and insects were audible during the measurement period.

5.6 Discussion of Results – Location EPA 6

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were audible during the day period at location EPA 6. The estimated quarry contribution satisfied the relevant EPL noise limits during the measurement period. Extraneous sources such as dogs barking, insects, traffic, and birds were audible during the measurement period.

5.7 Discussion of Results – Location EPA 7

Monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that noise emissions were audible during the morning shoulder period at location EPA 7. The estimated quarry contribution satisfied the relevant EPL noise limits during the measurement period. Extraneous sources such as insects, birds, traffic, roosters, and pedestrians were audible during the measurement period.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) for VGT Environmental Compliance Solutions Pty Ltd (VGT), on behalf of Hodgson Quarry and Plant. Monitoring was conducted in accordance with Conditions P1.2 and L3 of the Environmental Protection Licence (EPL #6535) and Conditions 16, 48, 49 and 50 of the Consolidated Consent (Mod 4, DA#267- 11- 99). The assessment was completed determine compliance with the EPL and Consent noise limits.

Attended monitoring conducted between Wednesday 13 December 2023 and Thursday 14 December 2023 identified that Roberts Rd Sand Quarry noise emissions were audible on several occasions, although satisfying the relevant EPL noise limits. A review of monitoring data and operator attended observations determined that Roberts Rd Sand Quarry contributions are below the EPL and Consent limits for all assessment periods.

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Appendix A – Glossary of Terms

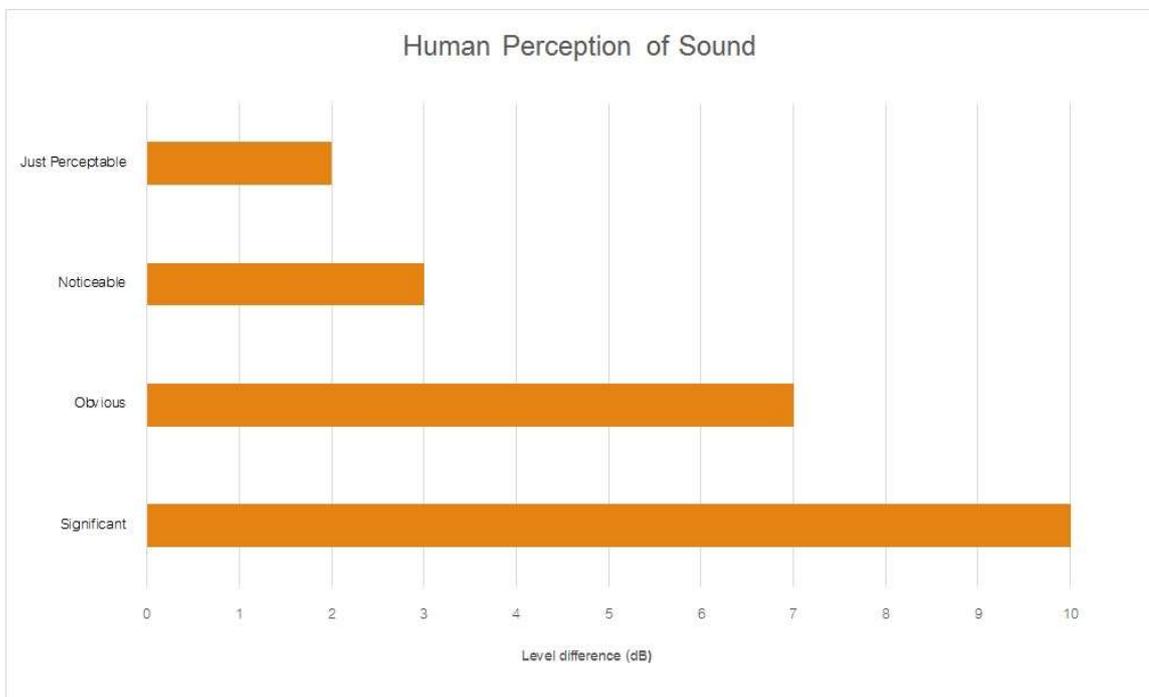
A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Acoustical 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 L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all 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 sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
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 Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmx	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by $10 \cdot \log_{10} (W/W_0)$. Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

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 Pressure 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



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