Noise Monitoring Assessment

Wallerawang Quarry
September 2020

Prepared for: Walker Quarries Pty Ltd
September 2020
MAC160392RP8

Muller Acoustic Consulting

Document Information

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Walker Quarries Pty Ltd to complete a bi-annual Noise Monitoring Assessment (NMA) for Wallerawang Quarry ('the quarry').

The NMA involved quantifying the noise contribution of the quarry by direct attended measurements to compare quarry emissions against relevant criteria. Monitoring has been conducted at three representative receiver locations in accordance with the Walker Quarry Noise Management Plan (NMP) and the quarry's Environmental Protection License (ref: 13172). An additional measurement at a nearfield reference location was also conducted to verify the operation of quarry plant and to quantify the noise contribution from site.

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Environment Protection Licence EPL 13172 (EPL);
- Development Consent 344-1-2001 (Mod 3), February 2020;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- Muller Acoustic Consulting Pty Ltd, Noise and Vibration Impact Assessment, 2019; and
- Umwelt, Wallerawang Quarry Noise Management Plan (NMP), 2019.

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 Environmental Protection License Noise Limits

Table 1 reproduces the noise criteria for the quarry as per Condition L4.1 of EPL 13172.

Table 1 EPL Noise Limits, dBA

Location	Day	Evening	Night
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
All privately owned residences	43	43	39

Note: Day Period is 7am to 6pm, Evening Period is 6pm to 10pm, Night Period is 10pm to 7am.

It is noted that Condition L4.3 of EPL 13172 identifies conditions under which the noise criteria do not apply and include:

a) Wind speeds greater than 3m/s at 10m above ground level;

b) Temperature inversion conditions greater than 3 degrees Celsius / 100m; or

c) Under "non-significant weather conditions".

2.2 Development Consent Noise Limits

Schedule 3 of the site's Development Consent (DA344-11-2001) outlines applicable noise criteria for the operation of the quarry. Table 2 reproduces the criteria as outlined in the development consent.

Table 2 Development Consent Noise Limits, dBA

Location	Day	Evening	Night
	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$	$L_{Aeq(15min)}$
All privately owned residences	43	43	35

2.3 Variance in Noise Limits

It is noted that the night-time criteria presented in the Development Consent differs from that outlined in the EPL. This is due to the consent being updated to reflect the recent modification for site. Hence, the more conservative criteria outlined in the consent have been adopted for this assessment.

Notwithstanding, as the quarry is not operational during the night period, the variance between the EPL criteria and Development Consent criteria is inconsequential.

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3 Methodology

3.1 Locality

Wallerawang is located approximately 10km to the north west of Lithgow, NSW. Receivers in the locality surrounding the quarry are primarily rural/residential and for consistency the naming conventions for each receiver has been retained from the NMP. The monitoring locations with respect to the quarry are presented in **Table 3** and graphically in the locality plan shown in **Figure 1.**

Table 3 Receiver Locations

ID	Address	Distance to Quarry Boundary
RL1	Reference Location (adjacent to site office)	N/A
N1	139 Gemalong, Marrangaroo, NSW	1000m
N2	987 Great Western Highway, Marrangaroo, NSW	160m
N3	2 Cypress Close, Wallerawang, NSW	480m

3.2 Environmental Noise Assessment Methodology

The attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise", the EPL and NMP. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Tuesday 1 September 2020. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Two daytime measurements of 15-minutes in duration were completed at each monitoring location during standard onsite operations. 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 $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant EPL limits.

FIGURE 1

LOCALITY PLAN

REF: MAC160392

0 200m

KEY	
N1	RECEIVER / MONITORING LOCATION
RL1	REFERENCE LOCATION
	PROJECT SITE

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4 Results

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

4.1 Assessment Results – Reference Location (RL1)

Operational attended noise monitoring was completed at RL1 on Tuesday 1 September 2020. **Table 4** presents the monitored noise level contributions and meteorological conditions for each measurement.

Table 4 Operator-Attended Noise Survey Results – Reference Location 1 (RL1)

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit[1]	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
01/09/2020	10:30	74	58	55	N/A	WS: 1.6m/s WD: E Rain: Nil	Site Vehicles 50-74 Generator and Sand Plant 56-60 Reverse Alarm 54-57
Quarry Site $L_{Aeq(15min)}$ Contribution							58
01/09/2020	13:02	79	62	60	N/A	WS: 1.2m/s WD: E Rain: Nil	Generator and Sand Plant 59-61 Site Vehicles 55-60
Quarry Site $L_{Aeq(15min)}$ Contribution							62

Note 1: EPL not applicable for this onsite reference location.

4.2 Assessment Results – Location N1

Operational attended noise monitoring was completed at N1 on Tuesday 1 September 2020. **Table 5** presents the monitored noise level contributions and meteorological conditions for each measurement.

Table 5 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
01/09/2020	11:24	63	48	39	43	WS: 1.4m/s WD: E Rain: Nil	Traffic 39-59 Farm Machinery 36-49 Wind 32-36 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<30
01/09/2020	12:36	62	50	42	43	WS: 1m/s WD: E Rain: Nil	Traffic 36-60 Birds 36-44 Dogs 49-62 Farm Machinery 30-36 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<32

Note 1: Quarry Site $L_{Aeq(15min)}$ calculated based on nearfield measurements.

4.3 Assessment Results – Location N2

Operational attended noise monitoring was completed at N2 on Tuesday 1 September 2020. **Table 6** presents the monitored noise level contributions and meteorological conditions for each measurement.

Table 6 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
01/09/2020	10:08	57	45	40	43	WS: 0.1m/s WD: E Rain: Nil	Birds 38-51 Traffic 36-57 Aircraft 40-44 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<30
01/09/2020	11:55	65	46	39	43	WS: 1.0m/s WD: E Rain: Nil	Traffic 37-53 Operator Noise Birds 36-42 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<30

Note 1: Quarry Site $L_{Aeq(15min)}$ calculated based on nearfield measurements.

4.4 Assessment Results – Location N3

Operational attended noise monitoring was completed at N3 on Tuesday 1 September 2020. **Table 7** presents the monitored noise level contributions and meteorological conditions for each measurement.

Table 7 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			EPL Limit	Meteorology	Comments
		L_{Amax}	L_{Aeq}	L_{A90}			
01/09/2020	10:49	65	48	36	43	WS: 0.5m/s WD: E Rain: Nil	Birds 36-41 Traffic 35-61 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<30
01/09/2020	12:16	61	45	35	43	WS: 1m/s WD: E Rain: Nil	Traffic 33-61 Operator Noise Residential Noise 34-38 Dogs 33-36 Quarry Inaudible
Quarry Site $L_{Aeq(15min)}$ Contribution							<30

Note 1: Quarry Site $L_{Aeq(15min)}$ calculated based on nearfield measurements.

5 Discussion

5.1 Discussion of Results – Reference Location (RL1)

Noise measurements conducted on Tuesday 1 September 2020 were conducted when Wallerawang Quarry was operating at normal production levels, which included use of crusher train, several mobile screens, excavator, road trucks, water cart, and mobile sand plant.

The noise contribution from the quarry at the reference location was 58dBA $LA_{eq(15min)}$ for the first round of monitoring and 62dBA $LA_{eq(15min)}$ for the second round of monitoring. This is 5dBA lower than the previous biannual survey conducted in March 2020. The reduction in noise emissions are primarily due to the crusher trains being located at a lower RL as the quarry pit progresses to a greater depth. The noise environment at the reference location was primarily dominated by the nearby sand plant and export road trucks using the weighbridge.

At the attended reference location, the sound power (Lw) for the acoustically significant items of plant was calculated to be 104dB $LA_{eq(15min)}$.

To verify the offsite noise levels, calculations were undertaken to estimate the attenuation from the site to each monitoring location. The attenuation calculations incorporated loss due to distance, and conservative topography (ie barrier attenuation) and air absorption losses. The results of the attenuation calculations identified received noise level and the results of the attended surveys are discussed for each monitoring location in **Section 5.2** to **Section 5.4**.

5.2 Discussion of Results – Location N1

Measurements conducted on Tuesday 1 September 2020, identified that Wallerawang Quarry noise were inaudible during both measurements, satisfying the relevant noise limits of 43dB $LA_{eq(15min)}$. Extraneous non-quarry related sources included highway traffic, birds and farm noise were significant contributors to the ambient noise environment.

The calculated attenuation between the quarry site and N1, taking into account distance loss, the surrounding topography and air absorption, was 75dB. Based on the site Lw established from the near field measurements, the resulting received quarry contribution at N1 is <30dBA. This level is significantly lower than the ambient dominant sources which generally masks site noise and confirms the quarry was audible as a background noise source at this location for both measurements conducted.

5.3 Discussion of Results – Location N2

Measurement results for N2 were dominated by highway traffic and bird noise for measurements on Tuesday 1 September 2020. Quarry emissions were inaudible during both measurements conducted at this location satisfying the relevant noise limit of 43dB $LA_{eq(15min)}$ on both occasions.

The attenuation between the quarry site and N2 taking into account distance between the locations, the loss due to surrounding topography (ie ground attenuation) and air absorption is 72dB. Based on the current site Lw established from the near field measurements, the resulting received quarry contribution at N2 is <32dBA. This estimated noise level is generally consistent with the measured noise contribution from the attended monitoring.

5.4 Discussion of Results – Location N3

Measurements conducted on Tuesday 1 September 2020 for N3 were dominated by local and highway traffic with quarry operations inaudible during both noise measurements at this location. Accordingly, quarry contributions remained below the relevant criteria of 43dB $LA_{eq(15min)}$ for both measurements conducted at the location. The current operational position of the crusher is shielded by the quarry walls and mounds which mitigates the noise contribution at this location.

The total attenuation due to distance, air absorption and surrounding topography for N3 was estimated to be 76dB. This resulted in an estimated site noise contribution of <30dBA which is consistent with the measured noise contribution from the attended monitoring.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment on behalf of Walker Quarries Pty Ltd. The assessment was completed to assess Wallerawang Quarry noise emissions against relevant criteria presented in EPL 13172 and DA 344-11-2001.

Attended measurements for Tuesday 1 September 2020 identified that noise emissions generated by Wallerawang Quarry satisfy relevant noise limits specified in the Noise Management Plan and Environmental Protection Licence at all assessed locations. In summary, quarry noise were inaudible during all offsite measurements, with monitoring locations dominated by extraneous sources that predominantly masked quarry operations.

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Appendix A – Glossary of Terms

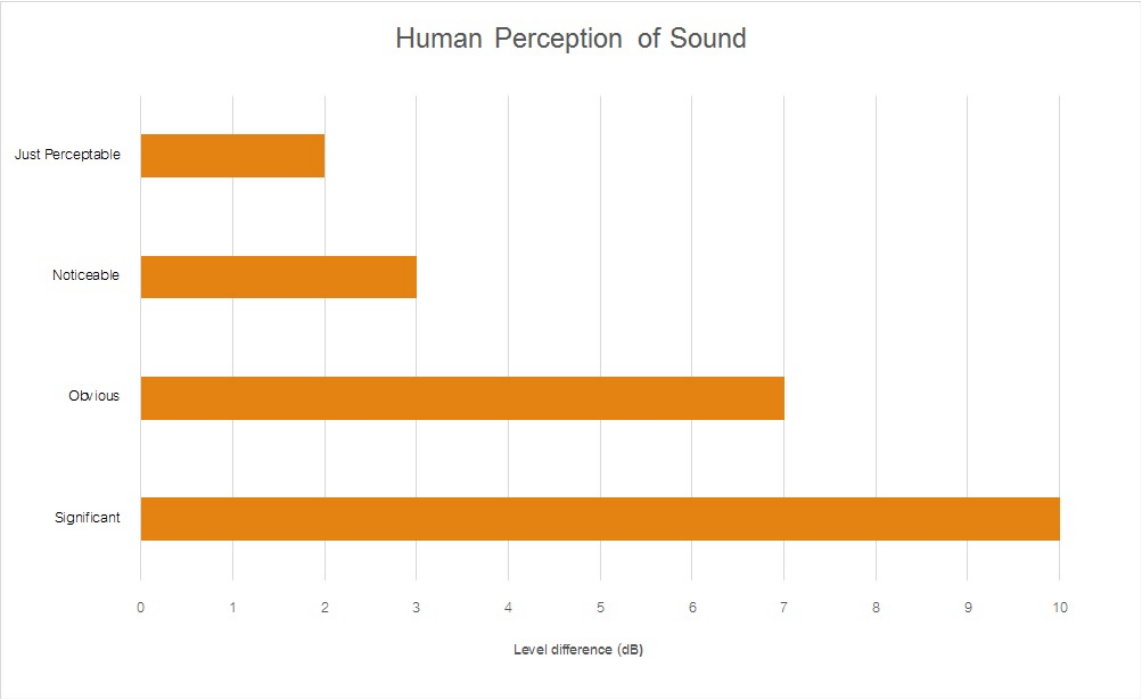
Several technical terms have been used in this report and are explained in **Table A1**.

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 L90 statistical noise levels.
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)	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.
LAmax	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 (SWL)	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.log10 (W/Wo) Where : W is the sound power in watts and Wo 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



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Appendix B – Correspondence Register

Table B1 Correspondence Register			
Date	Contact Between	Phone/Email	Comment
Friday 14 August 2020	J Van Der Merwe, R Heaton & A Irwin	Phone Call	Initial contact to schedule environmental compliance survey in September 2020.
Monday 17 August 2020	J Van Der Merwe, R Heaton & A Irwin	Email	Email confirming week to undertake noise survey
Monday 31 August 2020	J Van Der Merwe, N Shipman & R Heaton	Call	Call to confirm survey would be undertake the following day and to confirm COVID safety protocols.
Tuesday 1 September 2020	N Shipman & J Van Der Merwe	Onsite meeting	Meeting prior to survey to confirm operations for the day, survey completed.
Friday 4 September 2020	R Heaton & A Irwin	Phone Call	Call to confirm the survey was successfully completed and no noise exceedances were measured.

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