

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 1 Ending March 2019.

Document Information

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Quarter 1 Ending March 2019

Prepared for: Holcim (Australia) Pty Ltd

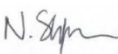

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan and in general accordance with relevant conditions outlined in the Development Consent (ref: SSD 6422); at five representative monitoring locations. This assessment has been undertaken during quarterly period ending March 2019, and forms part of the noise monitoring program for the quarry.

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015; and
- Australian Standard 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**.

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2 Noise Criteria

Schedule 3 of the Teven Quarry Development Consent (2015), outlines the applicable noise criteria for residential receivers surrounding the quarry site.

Table 1 reproduces relevant criteria for each of the receivers as outlined in the quarry's Development Consent.

Table 1 Noise Criteria		
Location ¹	Quarry Operations	
	Period: Day	Period: Evening
	7am – 6pm	6pm – 10pm
	dB LAeq(15min)	dB LAeq(15min)
R3, R4, R13, R15, R16, R17, R18, R20	38	35
All other receivers	37	35

Note 1: Receiver locations are shown in Figure 1.

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3 Methodology

3.1 Locality

The quarry is located in Teven, NSW approximately 7km west of Ballina, NSW. Receivers in the locality surrounding the quarry are primarily rural residential. The surroundings of the quarry include bushland and farming pastures. The monitoring locations with respect to the quarry are presented in the locality plan shown in **Figure 1**.

3.2 Noise Monitoring Locations

Five monitoring locations have been selected as part of the NMA in accordance with the NMP. The selected monitoring locations are presented in **Table 2** along with the noise sensitive receivers they represent.

Table 2 Monitoring Locations			
Location	Nearest Receiver	Easting, m	Northing, m
N1	R7	547017	6810098
N2	R3/R4	548877	6810290
N3	R2	548642	6810801
N4	R10	547729	6810226
N5	R15	547793	6808998

3.3 Assessment Methodology

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 and the NPI. The measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 6 March 2019. Acoustic instrumentation used carries current NATA calibration 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 ± 0.5 dBA.

As per the Noise Management Plan, two daytime measurements were conducted at each monitoring location. It is noted that the quarry was not operating during the evening period although two measurements were conducted at each monitoring location.

Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source.

Extraneous noise sources were excluded from the analysis to determine the $L_{Aeq}(15min)$ noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

FIGURE 1
LOCALITY PLAN
REF: MAC180611-06

0 150m



KEY



RECEIVER LOCATION



SITE LOCATION

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4 Results

4.1 Assessment Results - Location N1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location N1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _A max	L _A eq	L _A 90		
06/03/19	11:01 (Day)	63	42	33	WD: NE WS: 0.5m/s Rain: Nil	Insects 31-33
						Birds 43-60
						Wind in trees 36-46
						Aircraft 36-56
						Lawn mowing 46-63
						Quarry Inaudible
Teven Quarry L _A eq(15min) Contribution						<23
06/03/19	11:16 (Day)	63	46	37	WD: NE WS: 0.5m/s Rain: Nil	Wind in trees 32-44
						Insects 30-33
						Aircraft 34-42
						Birds 36-50
						Lawn mowing 46-63
						Quarry Inaudible
Teven Quarry L _A eq(15min) Contribution						<27
06/03/19	18:18 (Evening)	75	51	45	WD: N	Birds 40-51
					WS: 2m/s	Wind in trees 40-46
					Rain: Nil	Local traffic 45-75
Teven Quarry L _A eq(15min) Contribution						Quarry not operational
06/03/19	18:34 (Evening)	69	47	40	WD: N WS: 2m/s Rain: Nil	Wind in trees 36-46
						Local traffic 42-69
						Aircraft 38-52
						Birds 38-43
						Distant traffic 36-44
						Insects <40
Teven Quarry L _A eq(15min) Contribution						Quarry not operational

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.

4.2 Assessment Results - Location N2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location N2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _A max	L _A eq	L _A 90		
06/03/19	11:49 (Day)	88	65	38	WD: NE WS: 1.5m/s Rain: Nil	Traffic 33-84
						Wind in trees 33-37
						Birds 32-39
						Local residential noise 32-34
						Insects <30
						Aircraft 34-58
						Quarry Inaudible
Teven Quarry L _A eq(15min) Contribution						
<28						
06/03/19	12:04 (Day)	85	61	37	WD: NE WS: 0.5m/s Rain: Nil	Birds 38-42
						Insects <30
						Wind in trees 32-35
						Traffic 36-85
						Local residential noise 38-43
						Aircraft 41-51
						Quarry Inaudible
Teven Quarry L _A eq(15min) Contribution						
<27						
06/03/19	19:00 (Evening)	87	60	36	WD: N	Wind in trees 36-48
					WS: 2m/s	Traffic 36-87
					Rain: Nil	Birds 41-50
Teven Quarry L _A eq(15min) Contribution						
Quarry not operational						
06/03/19	19:16 (Evening)	84	57	37	WD: N	Wind in trees 36-44
					WS: 2m/s	Birds 36-62
					Rain: Nil	Traffic 36-84
						Insects <37
Teven Quarry L _A eq(15min) Contribution						
Quarry not operational						

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.

4.3 Assessment Results - Location N3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location N3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _A max	L _A eq	L _A 90		
06/03/19	12:29 (Day)	72	50	33	WD: NE	Insects <28
					WS: 1m/s	Wind in grass 28-33
					Rain: Nil	Aircraft 31-40
						Holcim haul trucks 28-34
						Local residential noise 39-70
Teven Quarry L _A eq(15min) Contribution						31
06/03/19	12:46 (Day)	68	52	34	WD: N	Local residential noise 36-70
					WS: 1.5m/s	Wind in grass 36-39
					Rain: Nil	Insects <36
						Holcim tipping <31
					Teven Quarry L _A eq(15min) Contribution	
06/03/19	19:37 (Evening)	60	46	36	WD: N	Wind in trees 40-46
					WS: 1.5m/s	Insects <40
					Rain: Nil	Aircraft 42-58
						Traffic 46-48
					Teven Quarry L _A eq(15min) Contribution	
06/03/19	19:52 (Evening)	53	47	42	WD: N	Aircraft 38-54
					WS: 1m/s	Distant traffic 38-44
					Rain: Nil	Wind in grass 40-50
						Insects <42
					Teven Quarry L _A eq(15min) Contribution	

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.

4.4 Assessment Results - Location N4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location N4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _A max	L _A eq	L _A 90		
06/03/19	13:07 (Day)	77	53	35	WD: NE	Local traffic 38-76
					WS: 2m/s	Birds 34-38
					Rain: Nil	Wind in trees 36-40
						Holcim haul trucks <34
						Distant traffic <34
Teven Quarry L _A eq(15min) Contribution						<34
06/03/19	13:23 (Day)	81	57	37	WD: NE	Holcim reverse alarms <36
					WS: 1.5m/s	Holcim haul trucks <36
					Rain: Nil	Wind in trees 36-40
						Holcim FEL <36
						Traffic 36-81
Teven Quarry L _A eq(15min) Contribution						<36
06/03/19	20:14 (Evening)	53	47	45	WD: N	Insects 36-40
					WS: 0.5m/s	Distant traffic 40-42
					Rain: Nil	Aircraft 40-52
						Wind in trees 38-44
						Birds 46-50
Teven Quarry L _A eq(15min) Contribution						Quarry not operational
06/03/19	20:30 (Evening)	52	45	43	WD: N	Insects <33
					WS: 0.5m/s	Traffic 38-42
					Rain: Nil	Aircraft 42-50
Teven Quarry L _A eq(15min) Contribution						Quarry not operational

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.

4.5 Assessment Results - Location N5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at location N5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location N5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L _{Amax}	L _{Aeq}	L _{A90}		
06/03/19	13:43 (Day)	87	63	40	WD: NE	Traffic 36-78
					WS: 1.5m/s	Birds 36-50
					Rain: Nil	Industrial noise 36-40
						Quarry Inaudible
Teven Quarry L _{Aeq} (15min) Contribution						<30
06/03/19	13:58 (Day)	88	62	40	WD: NE	Birds 38-45
					WS: 1.5m/s	Traffic 38-88
					Rain: Nil	Industrial noise 37-42
						Aircraft 41-52
Teven Quarry L _{Aeq} (15min) Contribution						<30
06/03/19	20:50 (Evening)	74	46	32	WD: N	Traffic 30-74
					WS: 1m/s	Insects <30
					Rain: Nil	Aircraft 38-47
					Teven Quarry L _{Aeq} (15min) Contribution	
06/03/19	21:05 (Evening)	68	44	32	WD: N	Insects <30
					WS: 1m/s	Distant traffic 30-34
					Rain: Nil	Local traffic 34-65
					Teven Quarry L _{Aeq} (15min) Contribution	

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.

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5 Noise Compliance Assessment

The compliance assessment for each residential receiver (R2, R3/R4, R7, R10 and R15) are presented in **Table 8** and **Table 9** for day and evening assessment periods respectively.

Table 8 Daytime Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise	Quarry Noise Criteria	Compliant
		Contribution		
		dB LAeq(15min)	dB LAeq(15min)	
R2	N3	31	37	✓
R3/R4	N2	<28	38	✓
R7	N1	<27	37	✓
R10	N4	<36	37	✓
R15	N5	<30	38	✓

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.

Table 9 Evening Noise Compliance Assessment

Receiver No.	Monitoring Location	Quarry Noise	Quarry Noise Criteria	Compliant
		Contribution		
		dB LAeq(15min)	dB LAeq(15min)	
R2	N3	Quarry Not Operational	35	✓
R3/R4	N2	Quarry Not Operational	35	✓
R7	N1	Quarry Not Operational	35	✓
R10	N4	Quarry Not Operational	35	✓
R15	N5	Quarry Not Operational	35	✓

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.

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6 Discussion

6.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 6 March 2019, therefore satisfying the daytime noise limits. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non quarry noise sources observed during the measurements included insects, birds, wind in trees, aircraft pass-by, lawn mowing, local and distant traffic.

6.2 Discussion of Results - Location N2

Quarry emissions were inaudible during the two daytime measurements on Wednesday 6 March 2019, therefore satisfying the relevant daytime and evening noise limits. The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Extraneous sources measured include traffic, wind in trees, birds, local residential noise, insects and aircraft pass-by.

6.3 Discussion of Results - Location N3

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 6 March 2019. Holcim haul trucks and tipping were audible during the two daytime measurements with contributions measured at 31dBA, therefore satisfying the daytime criteria.

The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non-quarrying noise sources observed during the measurements included insects, wind in grass, aircraft pass-by, local residential noise and traffic.

6.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 6 March 2019. Holcim haul trucks, reverse alarms and front-end loader were audible during the two daytime measurements with contributions ranging between <34dBA and <36dBA, therefore satisfying the daytime criteria.

The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Non-quarrying sources observed during the measurements included local traffic, birds, wind in trees, distant traffic, insects and aircraft pass-by audible throughout the noise measurements.

6.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 6 March 2019, therefore satisfying the daytime criteria.

The quarry was not operational during the evening period which satisfied the relevant evening noise limits, however background measurements were completed as per the requirements of the EPL.

Local traffic was the dominant source audible throughout the survey at this location. Other non-quarrying sources including traffic, birds, industrial noise, insects and aircraft pass-by all audible during the March 2019 monitoring period.

7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at the Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for relevant surrounding residential receivers during Quarter 1, period ending March 2019.

Attended noise measurements were undertaken on Wednesday 6 March 2019 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry comply with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

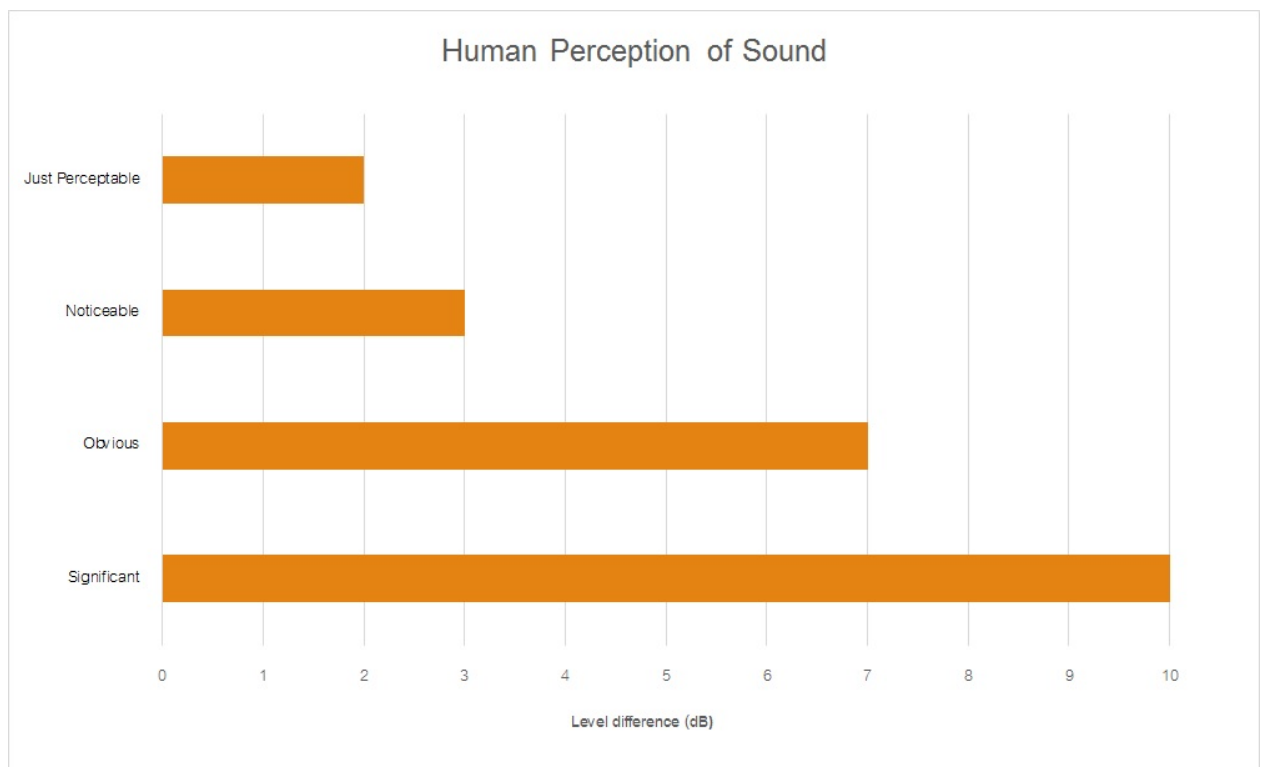
Table A1 provides a number of technical terms have been used in this report.

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 _{ax}	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)	<p>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 :</p> $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W₀ is the sound reference power at 10-12 watts.</p>

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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