Noise Monitoring Assessment

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

Prepared for: Holcim (Australia) Pty Ltd
March 2019
MAC180611-06RP3

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 1 Ending March 2019

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

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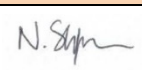
MAC180611-06RP3	Final	18 March 2019	Nicholas Shipman		Rod Linnett	

CONTENTS

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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 $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 ±0.5dBA.

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 $LA_{eq(15min)}$ 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

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

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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_{Amax}	L_{Aeq}	L_{A90}		
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 $L_{Aeq(15min)}$ 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 $L_{Aeq(15min)}$ Contribution						<27
06/03/19	18:18 (Evening)	75	51	45	WD: N WS: 2m/s Rain: Nil	Birds 40-51 Wind in trees 40-46 Local traffic 45-75
Teven Quarry $L_{Aeq(15min)}$ 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 $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
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 $L_{Aeq(15min)}$ 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 $L_{Aeq(15min)}$ Contribution						<27
06/03/19	19:00 (Evening)	87	60	36	WD: N WS: 2m/s Rain: Nil	Wind in trees 36-48 Traffic 36-87 Birds 41-50
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
06/03/19	19:16 (Evening)	84	57	37	WD: N WS: 2m/s Rain: Nil	Wind in trees 36-44 Birds 36-62 Traffic 36-84 Insects <37
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
06/03/19	12:29 (Day)	72	50	33	WD: NE WS: 1m/s Rain: Nil	Insects <28 Wind in grass 28-33 Aircraft 31-40 Holcim haul trucks 28-34 Local residential noise 39-70
		Teven Quarry $L_{Aeq(15min)}$ Contribution				31
06/03/19	12:46 (Day)	68	52	34	WD: N WS: 1.5m/s Rain: Nil	Local residential noise 36-70 Wind in grass 36-39 Insects <36 Holcim tipping <31
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<31
06/03/19	19:37 (Evening)	60	46	36	WD: N WS: 1.5m/s Rain: Nil	Wind in trees 40-46 Insects <40 Aircraft 42-58 Traffic 46-48
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry not operational
06/03/19	19:52 (Evening)	53	47	42	WD: N WS: 1m/s Rain: Nil	Aircraft 38-54 Distant traffic 38-44 Wind in grass 40-50 Insects <42
		Teven Quarry $L_{Aeq(15min)}$ 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.

4.4 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_{Amax}	L_{Aeq}	L_{A90}		
06/03/19	13:07 (Day)	77	53	35	WD: NE WS: 2m/s Rain: Nil	Local traffic 38-76 Birds 34-38 Wind in trees 36-40 Holcim haul trucks <34 Distant traffic <34
Teven Quarry $L_{Aeq(15min)}$ Contribution						<34
06/03/19	13:23 (Day)	81	57	37	WD: NE WS: 1.5m/s Rain: Nil	Holcim reverse alarms <36 Holcim haul trucks <36 Wind in trees 36-40 Holcim FEL <36 Traffic 36-81 Aircraft 38-52
Teven Quarry $L_{Aeq(15min)}$ Contribution						<36
06/03/19	20:14 (Evening)	53	47	45	WD: N WS: 0.5m/s Rain: Nil	Insects 36-40 Distant traffic 40-42 Aircraft 40-52 Wind in trees 38-44 Birds 46-50
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
06/03/19	20:30 (Evening)	52	45	43	WD: N WS: 0.5m/s Rain: Nil	Insects <33 Traffic 38-42 Aircraft 42-50
Teven Quarry $L_{Aeq(15min)}$ 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 WS: 1.5m/s Rain: Nil	Traffic 36-78 Birds 36-50 Industrial noise 36-40 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
06/03/19	13:58 (Day)	88	62	40	WD: NE WS: 1.5m/s Rain: Nil	Birds 38-45 Traffic 38-88 Industrial noise 37-42 Aircraft 41-52 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
06/03/19	20:50 (Evening)	74	46	32	WD: N WS: 1m/s Rain: Nil	Traffic 30-74 Insects <30 Aircraft 38-47
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
06/03/19	21:05 (Evening)	68	44	32	WD: N WS: 1m/s Rain: Nil	Insects <30 Distant traffic 30-34 Local traffic 34-65
Teven Quarry $L_{Aeq(15min)}$ 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.

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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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
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.

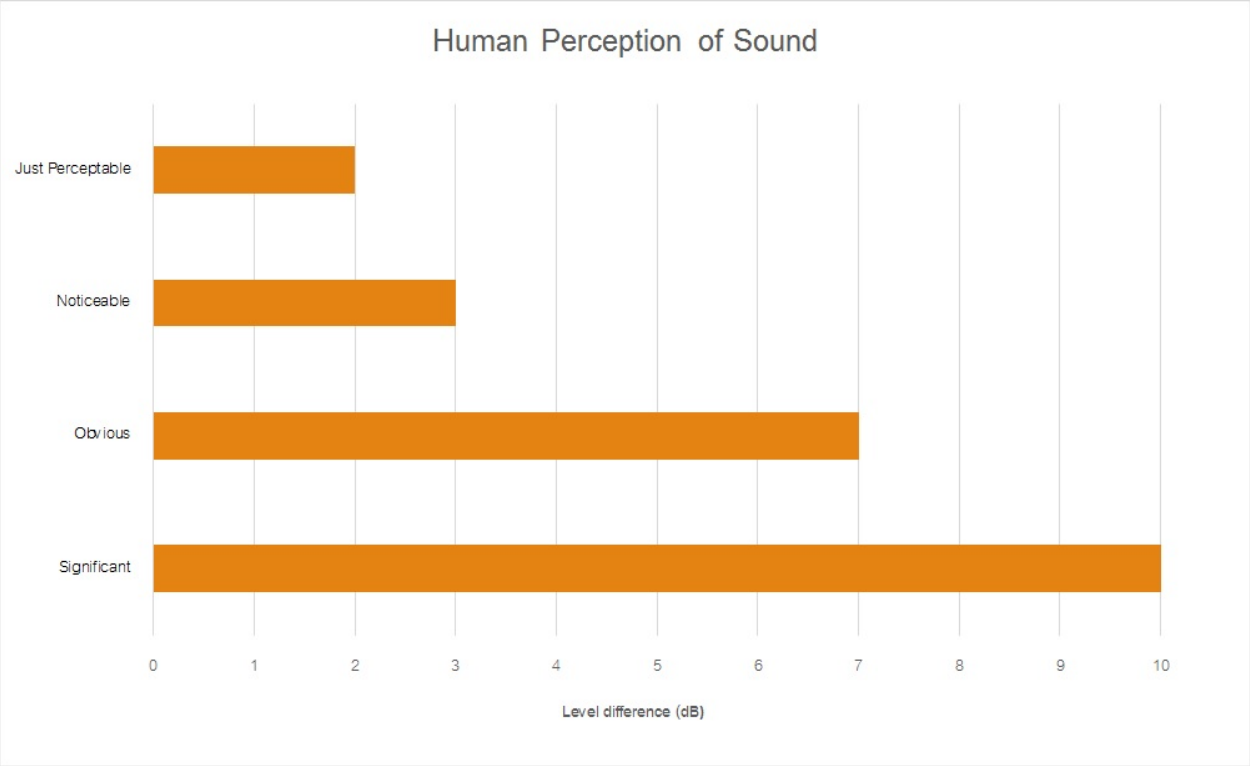
Table A1 Glossary of Terms

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.
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 (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.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



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 2 Ending June 2019.

Prepared for: Holcim (Australia) Pty Ltd
July 2019
MAC180611-06RP4

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 2 Ending June 2019

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

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MAC180611-06RP4	Final	9 July 2019	Robin Heaton		Rod Linnett	

CONTENTS

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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 June 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;
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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 $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 (MGA56)

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 Monday 17 June 2019 and Tuesday 18 June 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 ±0.5dBA.

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 $LA_{eq(15min)}$ 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

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

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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_{Amax}	L_{Aeq}	L_{A90}		
18/06/2019	08:15 (Day)	84	60	46	WD: NW WS: 2.4m/s Rain: Nil	Wind in Trees 48-54 Passing Traffic 60-84 Birds 50-67 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<36
18/06/2019	08:30 (Day)	69	50	46	WD: NW WS: 2.2m/s Rain: Nil	Wind in Trees 48-54 Birds 50-62 Passing Traffic 50-69 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<36
17/06/2019	21:20 (Evening)	60	41	39	WD: NW WS: 1.2m/s Rain: Nil	Wind in trees 39-60 Distant Traffic 30-40
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
17/06/2019	21:35 (Evening)	56	39	38	WD: NW WS: 1.4m/s Rain: Nil	Wind in trees 38-40 Distant traffic 35-36 Insects 30-38
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
18/06/2019	10:15 (Day)	89	69	40	WD: NW WS: 0.3m/s Rain: Nil	Birds 40-52 Passing Traffic 40-89 Quarry Operations 35-38
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
18/06/2019	10:30 (Day)	91	69	39	WD: NW WS: 0.2m/s Rain: Nil	Passing Traffic 58-91 Birds 40-57 Quarry Operations 34-37
Teven Quarry $L_{Aeq(15min)}$ Contribution						35
17/06/2019	19:34 (Evening)	88	64	47	WD: N WS: 0.4m/s Rain: Nil	Frogs 50-55 Traffic 45-88 Aircraft 55-60
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
17/06/2019	19:49 (Evening)	60	49	39	WD: N WS: 0.1m/s Rain: Nil	Frogs 50-55 Traffic 40-60 Aircraft 46-51
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
18/06/2019	10:54 (Day)	60	36	30	WD: NW WS: 0.2m/s Rain: Nil	Wind in Crops 33-40 Birds 42-45 Quarry Operations 30-36
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
18/06/2019	11:10 (Day)	58	37	30	WD: NW WS: 0.2m/s Rain: Nil	Quarry Operations 30-35 Winds in Crops 35-37 Aircraft 35-38
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
17/06/2019	19:00 (Evening)	71	51	35	WD: N WS: 0.0m/s Rain: Nil	Traffic 34-37 Insects 34-38 Dog Bark 40-50 Aircraft 40-71
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
17/06/2019	19:15 (Evening)	57	38	35	WD: N WS: 0.1m/s Rain: Nil	Traffic 30-37 Insects 32-35 Birds 37-45 Aircraft 40-57
Teven Quarry $L_{Aeq(15min)}$ 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.

4.4 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_{Amax}	L_{Aeq}	L_{A90}		
18/06/2019	09:38 (Day)	86	63	46	WD: NW WS: 0.1m/s Rain: Nil	Quarry Fixed Plant 38-46 Passing Traffic 50-86
Teven Quarry $L_{Aeq(15min)}$ Contribution						41
18/06/2019	09:53 (Day)	79	61	46	WD: NW WS: 0.1m/s Rain: Nil	Passing Traffic 44-79 Quarry Fixed Plant 38-47
Teven Quarry $L_{Aeq(15min)}$ Contribution						41
17/06/2019	20:06 (Evening)	68	38	31	WD: N WS: 0.1m/s Rain: Nil	Insects 30-34 Aircraft 40-52 Birds 40-68 Distant Traffic 30-35
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
17/06/2019	20:22 (Evening)	58	37	31	WD: N WS: 0.2m/s Rain: Nil	Insects 30-34 Traffic 29-42 Birds 45-58 Aircraft 40-42
Teven Quarry $L_{Aeq(15min)}$ 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}		
18/06/2019	08:57 (Day)	88	64	44	WD: NW WS: 1.5m/s Rain: Nil	Passing Traffic 50-86 Tractor in Field 35-46 Birds 45-56 Quarry Operations 30-40
Teven Quarry $L_{Aeq(15min)}$ Contribution						35
18/06/2019	09:17 (Day)	86	59	43	WD: NW WS: 1.3m/s Rain: Nil	Wind in Trees 40-44 Tractor in Field 37-46 Aircraft 50-68 Birds 50-74 Passing Traffic 70-86 Quarry Operations 31-38
Teven Quarry $L_{Aeq(15min)}$ Contribution						35
17/06/2019	20:39 (Evening)	87	59	35	WD: N WS: 0.4m/s Rain: Nil	Frogs 30-40 Traffic 35-42 Passing Traffic 80-87
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
17/06/2019	20:55 (Evening)	80	52	36	WD: N WS: 0.3m/s Rain: Nil	Passing Traffic 35-80 Wind in Trees 30-34 Insects 30-33 Birds 32-43
Teven Quarry $L_{Aeq(15min)}$ 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.

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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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
R2	N3	33	37	✓
R3/R4	N2	36	38	✓
R7	N1	<36	37	✓
R10	N4	41	37	X
R15	N5	35	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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
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 Tuesday 18 June 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, local and distant traffic.

6.2 Discussion of Results - Location N2

Quarry emissions were audible during the two daytime measurements on Tuesday 18 June 2019 however satisfied the relevant daytime and evening noise limits. Audible noise sources included processing plant and truck movements.

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 Tuesday 18 June 2019. Processing plant and truck movements were audible during the two daytime measurements with a measured contribution of 33dBA, 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 crops, 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 Tuesday 18 June 2019. Processing plant, in particular screens, were audible during the two daytime measurements with contributions ranging between 38dBA and 47dBA. The overall contribution was quantified as 41dBA at the dwelling at 108 Stokers Lane for both the first and second daytime measurements which is above the applicable daytime criteria of 37dBA.

Following discussion with quarry management, it is noted that changes were recently made to the processing plant and that the plant was being run at half load during the survey. This will allow the screen to shake excessively and material to rattle more on the screens.

It is recommended that the screens be checked for faults and to operate at full load to reduce noise emissions.

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 and distant traffic, birds, wind in trees, insects and aircraft pass-bys.

6.5 Discussion of Results - Location N5

Quarry noise emissions were audible during the two daytime measurements conducted on Tuesday 18 June 2019, however satisfied the daytime criteria of 38dBA with a quarry contribution of 35dBA.

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 June 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 2, period ending June 2019.

Attended noise measurements were undertaken on Monday 17 June 2019 and Tuesday 18 June 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, with the exception of R3/R4 during the daytime period which had a noise contribution of 41dBA for both the daytime measurements at the location.

Next quarterly assessment will validate any exceedance from the processing plant at R3/R4.

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Appendix A - Glossary of Terms

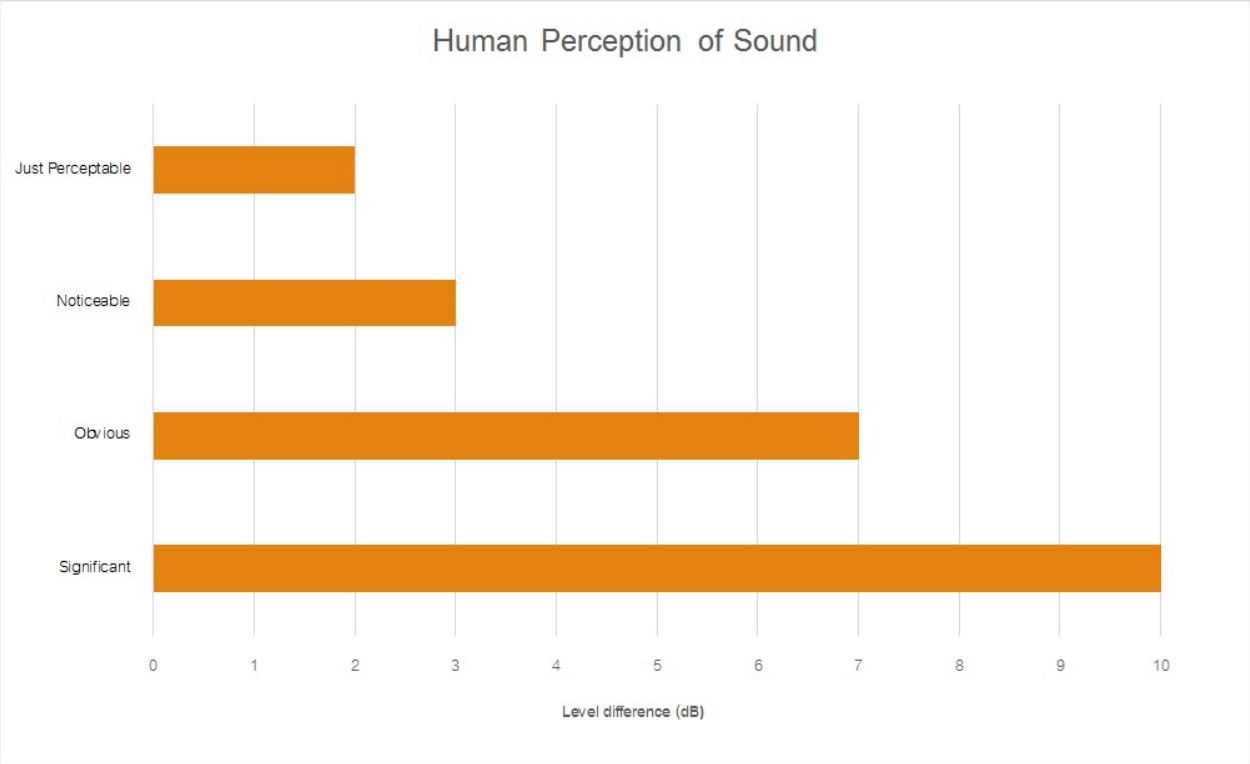
Table A1 provides a number of technical terms have been used in this report.

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.
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 (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.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



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 3 Ending September 2019.

Prepared for: Holcim (Australia) Pty Ltd
August 2019
MAC180611-06RP5

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 3 Ending September 2019

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-06RP5	Final	27 August 2019	Rod Linnett		Oliver Muller	

CONTENTS

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 September 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 $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 (MGA56)

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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Tuesday 20 August 2019 and Wednesday 21 August 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 ±0.5dBA.

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, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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 $LA_{eq(15min)}$ 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

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

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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_{Amax}	L_{Aeq}	L_{A90}		
21/08/2019	11:30 (Day)	63	38	30	WD: W WS: 1m/s Rain: Nil	Aircraft 45-58 Birds 37-55 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
21/08/2019	11:45 (Day)	76	42	31	WD: W WS: 1m/s Rain: Nil	Birds 40-55 Operator 55-68 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<32
20/08/2019	18:00 (Evening)	63	35	26	Calm Rain: Nil	Birds 40-45 Resident's car 38-45
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
21/08/2019	18:15 (Evening)	58	33	26	Calm Rain: Nil	Birds 40-50
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
21/08/2019	09:30 (Day)	88	64	37	WD: SW WS: 1.5m/s Rain: Nil	Birds 38-47 Passing Traffic 40-85 Quarry Operations 37-39
	Teven Quarry $L_{Aeq(15min)}$ Contribution					37
21/08/2019	09:45 (Day)	86	65	38	WD: SW WS: 1.5m/s Rain: Nil	Birds 38-47 Passing Traffic 40-85 Quarry Operations 36-38
	Teven Quarry $L_{Aeq(15min)}$ Contribution					37
21/08/2019	19:55 (Evening)	82	55	28	Calm Rain: Nil	Frogs 34-44 Passing Traffic 45-80
	Teven Quarry $L_{Aeq(15min)}$ Contribution					Quarry not operational
21/08/2019	20:11 (Evening)	86	62	28	Calm Rain: Nil	Frogs 34-44 Passing Traffic 45-85
	Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
20/08/2019	16:23 (Day)	57	37	32	Calm Rain: Nil	Birds 42-45 Quarry Operations 32-36
	Teven Quarry $L_{Aeq(15min)}$ Contribution					33
20/08/2019	16:38 (Day)	75	54	28	Calm Rain: Nil	Quarry Operations 33-38 Aircraft 43-73
	Teven Quarry $L_{Aeq(15min)}$ Contribution					33
20/08/2019	20:32 (Evening)	54	31	26	Calm Rain: Nil	Distant Traffic 30-32 Aircraft 33-40
	Teven Quarry $L_{Aeq(15min)}$ Contribution					Quarry not operational
20/08/2019	20:48 (Evening)	49	29	26	Calm Rain: Nil	Insects/Frogs 26-30
	Teven Quarry $L_{Aeq(15min)}$ 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.

4.4 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_{Amax}	L_{Aeq}	L_{A90}		
21/08/2019	10:05 (Day)	74	56	40	WD: W WS: 1m/s Rain: Nil	Quarry Fixed Plant 38-43 Passing Traffic 50-76 Truck parked (5min) 55-58 Birds 40-49
Teven Quarry $L_{Aeq(15min)}$ Contribution						37
21/08/2019	10:21 (Day)	70	52	39	WD: W WS: 1m/s Rain: Nil	Quarry Fixed Plant 38-43 Passing Traffic 50-70 Birds 40-51
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
20/08/2019	18:41 (Evening)	71	41	30	Calm Rain: Nil	Insects 28-30 Distant Traffic 28-30
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
20/08/2019	18:57 (Evening)	76	41	29	Calm Rain: Nil	Insects 27-29 Distant Traffic 28-30
Teven Quarry $L_{Aeq(15min)}$ 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}		
21/08/2019	10:41 (Day)	78	56	38	WD: W WS: 1.5m/s Rain: Nil	Passing Traffic 50-75 Tractor in Field 35-46 Resident 43-50 Wind in Trees 40-44 Quarry Operations 34-36
		Teven Quarry $L_{Aeq(15min)}$ Contribution				35
21/08/2019	10:57 (Day)	77	54	40	WD: W WS: 2.5m/s Rain: Nil	Passing Traffic 50-75 Tractor in Field 35-46 Wind in Trees 40-44 Quarry Operations 34-38
		Teven Quarry $L_{Aeq(15min)}$ Contribution				36
20/08/2019	19:20 (Evening)	68	44	26	Calm Rain: Nil	Passing Traffic 40-68 Operator 40-50
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry not operational
20/08/2019	19:36 (Evening)	44	30	26	Calm Rain: Nil	Frogs/Insects 26-30
		Teven Quarry $L_{Aeq(15min)}$ 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.

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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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
R2	N3	33	37	✓
R3/R4	N2	37	38	✓
R7	N1	<32	37	✓
R10	N4	37	37	✓
R15	N5	36	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 Contribution	Quarry Noise Criteria	Compliant
		dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	
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 21 August 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 and aircraft.

6.2 Discussion of Results - Location N2

Quarry emissions were audible during the two daytime measurements on Wednesday 21 August 2019 however satisfied the relevant daytime and evening noise limits. Audible noise sources included processing plant and road traffic.

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, birds and frogs.

6.3 Discussion of Results - Location N3

Quarry noise emissions were audible during the two daytime measurements conducted on Tuesday 20 August 2019. The Processing plant and pit activities were audible during the two daytime measurements with a measured contribution of 33dBA, 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, aircraft and distant traffic.

6.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 21 August 2019. The Processing plant and truck loading activities were audible during the two daytime measurements with a measured contribution of 37dBA, therefore satisfying the daytime criteria.

The exceedance noted from the previous survey was not observed during this round of measurements. The previous survey (quarter ending June 2019) had noted that the dominant noise was screen noise which was audible but not dominant during the survey. Therefore, the ameliorative measures implemented have successfully reduced noise emissions to a compliant level.

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 and local and distant traffic, birds and frogs/insects.

6.5 Discussion of Results - Location N5

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 21 August 2019, however satisfied the daytime criteria of 38dBA with a quarry contribution of 36dBA.

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 and insects were audible during the September 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 2, period ending September 2019.

Attended noise measurements were undertaken on Tuesday 20 August 2019 and Wednesday 21 August 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.

The exceedance noted from the previous survey was not observed during this quarterly survey, demonstrating that ameliorative measures have been successful in reducing noise emissions from the quarry achieveing compliance.

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Appendix A - Glossary of Terms

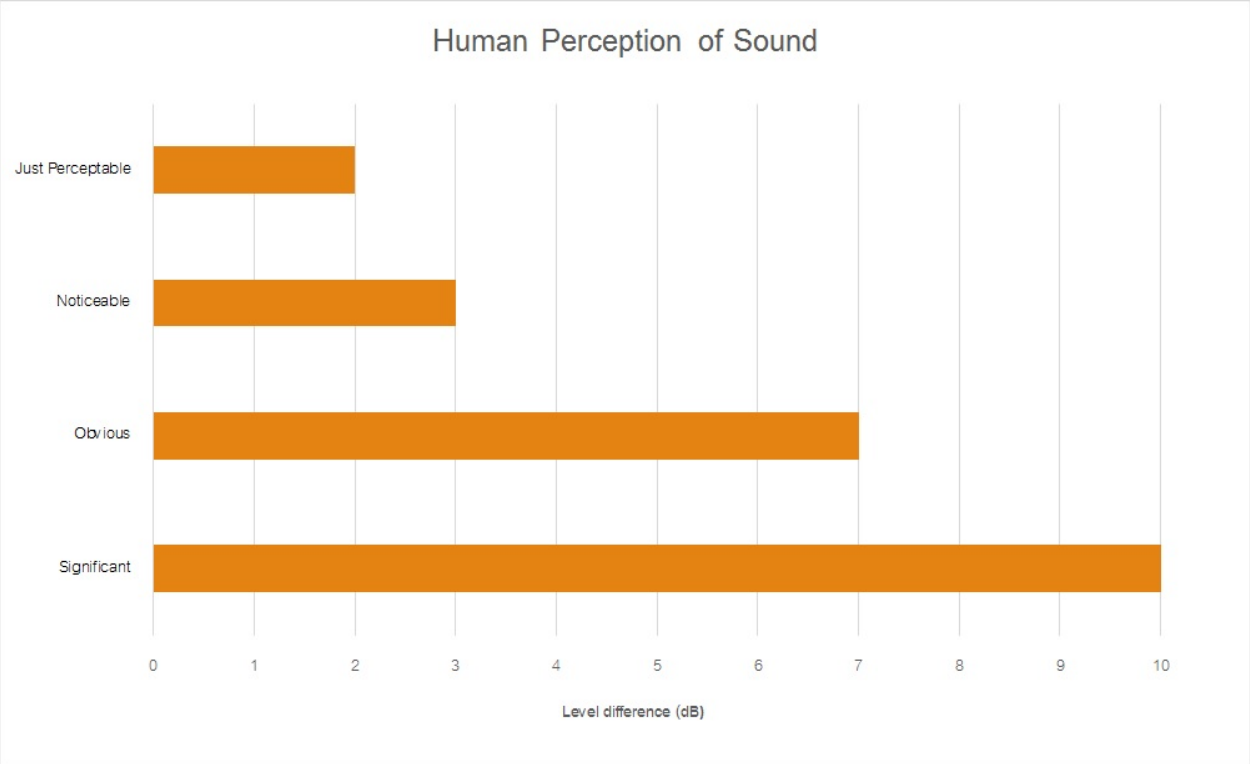
Table A1 provides a number of technical terms have been used in this report.

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.
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 (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.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



Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
Muller Acoustic Consulting

Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 4 Ending December 2019.

Prepared for: Holcim (Australia) Pty Ltd
December 2019
MAC180611-06RP6

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 4 Ending December 2019

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 262, Newcastle NSW 2300
ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

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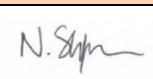
MAC180611-06RP6	Final	11 December 2019	Nicholas Shipman		Oliver Muller	

CONTENTS

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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 December 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 $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
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 (MGA56)

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. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 27 November 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 ±0.5dBA.

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, however two measurements were conducted at each monitoring location as per the requirements of the EPL.

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 $LA_{eq(15min)}$ 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

N1 RECEIVER LOCATION

SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

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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_{Amax}	L_{Aeq}	L_{A90}		
27/11/2019	10:43 (Day)	65	54	44	WD: ESE WS: 2.5m/s Rain: Nil	Wind 42-65 Construction works <42 Birds <42 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	10:58 (Day)	76	59	49	WD: ESE WS: 2.5m/s Rain: Nil	Wind 46-60 Traffic 52-76 Construction works <42 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	18:15 (Evening)	69	48	37	WD: SE WS: 2m/s Rain: Nil	Wind 36-46 Traffic 36-69 Birds 36-42 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
27/11/2019	18:30 (Evening)	81	54	35	WD: SE WS: 2m/s Rain: Nil	Insects <34 Traffic 38-81 Wind 34-42 Local residential noise 36-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
27/11/2019	11:28 (Day)	85	64	45	WD: E WS: 2m/s Rain: Nil	Traffic 46-84 Birds 42-50 Wind 42-51 Aircraft 44-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	11:43 (Day)	83	60	43	WD: E WS: 2m/s Rain: Nil	Traffic 44-82 Birds 38-46 Wind 38-46 Local residential noise 46-51 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	19:03 (Evening)	81	56	33	WD: SE WS: 1m/s Rain: Nil	Insects <35 Birds 36-50 Traffic 35-81 Wind 34-38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
27/11/2019	19:18 (Evening)	83	57	35	WD: SE WS: 1m/s Rain: Nil	Birds 46-52 Insects <34 Traffic 36-83 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ 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_{Amax}	L_{Aeq}	L_{A90}		
27/11/2019	12:09 (Day)	66	50	43	WD: E WS: 2.5m/s Rain: Nil	Wind 38-58 Traffic <36 Aircraft 38-48 Birds 36-66 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	12:24 (Day)	71	50	42	WD: E WS: 2.5m/s Rain: Nil	Birds 44-46 Wind 44-61 Aircraft 42-48 Insects <42 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	19:40 (Evening)	51	46	41	WD: S WS: 0.5m/s Rain: Nil	Dog bark 38-41 Traffic 36-40 Insects 36-45 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
27/11/2019	19:55 (Evening)	65	47	42	WD: S WS: 1m/s Rain: Nil	Traffic 43-46 Insects 43-45 Birds 43-55 Aircraft 38-61 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ 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.

4.4 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_{Amax}	L_{Aeq}	L_{A90}		
27/11/2019	12:51 (Day)	93	67	46	WD: ESE WS: 2.5m/s Rain: Nil	Wind 42-52 Quarry 42-44 (5-10sec) Birds <50 Traffic 48-92 Insects <46 Aircraft 46-54
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
27/11/2019	13:06 (Day)	87	62	48	WD: E WS: 2.5m/s Rain: Nil	Traffic 39-84 Quarry 42-44 (5-10sec) Wind 38-54 Birds 38-44 Insects <38
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
27/11/2019	20:18 (Evening)	53	47	45	WD: S WS: 1m/s Rain: Nil	Insects 44-46 Traffic 45-53 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
27/11/2019	20:33 (Evening)	50	44	43	WD: S WS: 1m/s Rain: Nil	Insects 44-45 Traffic <43 Aircraft 38-50 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ 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}		
27/11/2019	13:32 (Day)	87	63	43	WD: SE WS: 2.5m/s Rain: Nil	Traffic 42-84 Wind 36-46 Birds 36-54 Aircraft 42-57 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	13:47 (Day)	81	58	41	WD: SE WS: 2.5m/s Rain: Nil	Traffic 42-81 Wind 38-48 Birds 36-44 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
27/11/2019	20:56 (Evening)	83	55	38	WD: SE WS: 0.5m/s Rain: Nil	Traffic 37-83 Insects 36-38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
27/11/2019	21:11 (Evening)	84	58	37	WD: S WS: 0.5m/s Rain: Nil	Traffic 38-83 Insects <38 Local residential noise 38-46 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ 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.

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5 Discussion

5.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 27 November 2019. Quarry noise contributions were estimated to satisfy 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 wind in trees, construction works, birds, traffic and local residential noise.

5.2 Discussion of Results - Location N2

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 27 November 2019. Quarry noise contributions were estimated to satisfy 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 traffic, birds, wind in trees, aircraft, local residential noise and insects.

5.3 Discussion of Results - Location N3

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 27 November 2019. Quarry noise contributions were estimated to satisfy 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 wind in trees, traffic, aircraft, birds, dog bark and insects.

5.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 27 November 2019. The processing plant and truck loading activities were audible during the two daytime measurements with a measured contribution of 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 wind in trees, birds, traffic, insects and aircraft.

5.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 27 November 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.

Non quarry noise sources observed during the measurements included traffic, wind in trees, birds, aircraft, insects and local residential noise.

6 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 4, period ending December 2019.

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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.
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RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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Typical conversation	60
Ambient suburban environment	40
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Bedroom (night with windows closed)	20
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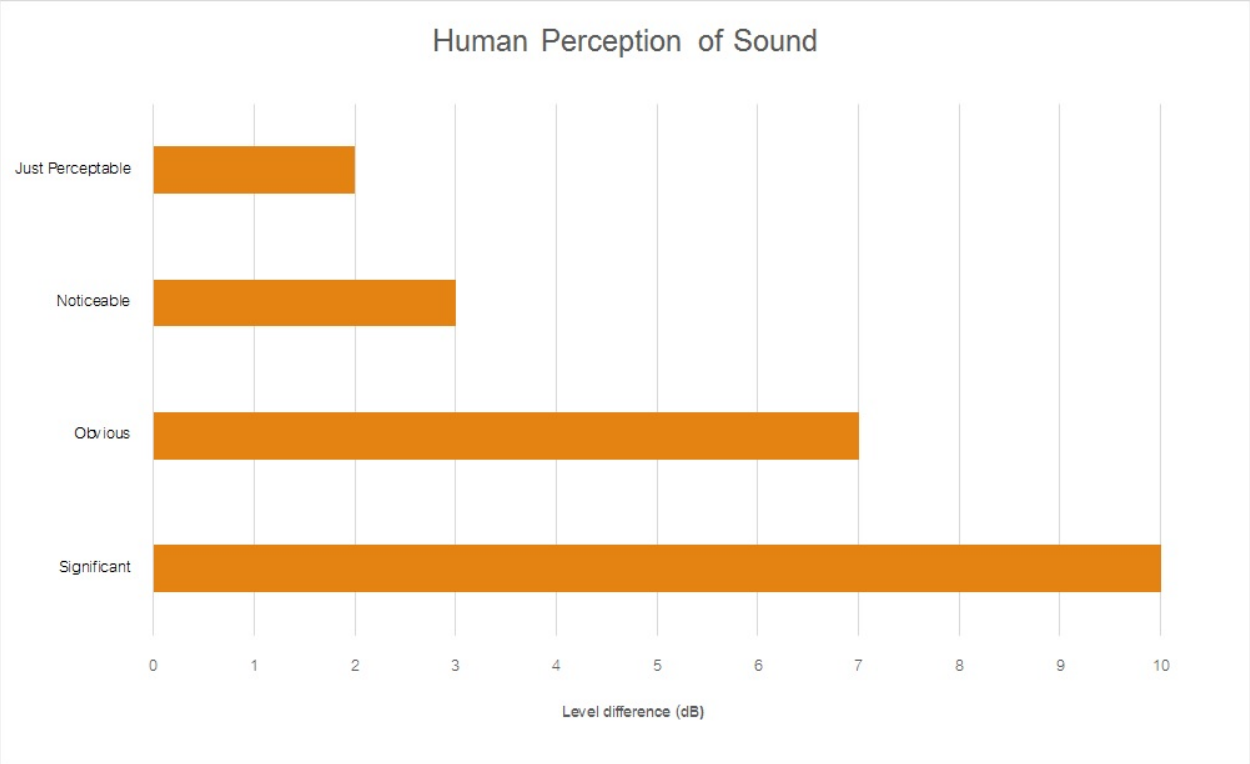
Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd
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ABN: 36 602 225 132
P: +61 2 4920 1833
www.mulleracoustic.com

MAC
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