Noise Monitoring Assessment

Teven Quarry, Teven, NSW
Quarter 1 Ending March 2020.

Prepared for: Holcim (Australia) Pty Ltd
February 2020
MAC180611-06RP7

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 1 Ending March 2020

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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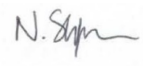
MAC180611-06RP7	Final	10 February 2020	Nicholas Shipman		Oliver Muller	

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 the quarterly period ending March 2020 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 Quarter 1, ending March 2020 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 are primarily rural. 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 Coordinates)

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 29 January 2020. 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

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*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}		
29/01/2020	07:34 (Day)	73	56	36	WD: N WS: 0.1m/s Rain: Nil	Insects <39 Birds 39-56 Distant traffic <39 Local traffic 39-73 Local residential noise 39-45 Aircraft 39-50 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
29/01/2020	07:49 (Day)	73	49	37	WD: N WS: 0.1m/s Rain: Nil	Insects <40 Birds 40-54 Local traffic 40-73 Aircraft 40-58 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
29/01/2020	18:08 (Evening)	69	54	42	WD: N WS: 1m/s Rain: Nil	Wind in trees <49 Birds <49 Local residential noise 49-58 Local traffic 50-69 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	18:23 (Evening)	85	61	51	WD: N WS: 1m/s Rain: Nil	Local residential noise 48-59 Local traffic 50-85 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}		
29/01/2020	08:17 (Day)	89	66	55	WD: N WS: 0.1m/s Rain: Nil	Local traffic 55-89 Insects 55-58 Birds 56-60 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	08:32 (Day)	96	68	54	WD: N WS: 0.1m/s Rain: Nil	Local traffic 55-96 Insects 55-58 Birds 55-59 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	18:52 (Evening)	83	59	36	WD: N WS: 0.1m/s Rain: Nil	Insects 34-38 Birds 34-48 Local traffic 36-83 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	19:07 (Evening)	85	60	41	WD: N WS: 0.1m/s Rain: Nil	Insects 36-38 Local traffic 36-85 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}		
29/01/2020	08:53 (Day)	72	64	62	WD: N WS: 0.1m/s Rain: Nil	Insects 61-63 Aircraft 61-64 Local traffic 60-72 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	09:08 (Day)	66	63	62	WD: N WS: 0.1m/s Rain: Nil	Insects 61-66 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
29/01/2020	19:32 (Evening)	67	48	33	WD: N WS: 1m/s Rain: Nil	Insects <29 Birds 29-67 Aircraft 32-36 Distant traffic 29-33 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	19:47 (Evening)	56	52	49	WD: N WS: 1m/s Rain: Nil	Insects 41-56 Distant traffic <41 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}		
29/01/2020	09:32 (Day)	86	60	47	WD: N WS: 0.1m/s Rain: Nil	Insects 54-58 Local traffic 54-86 Holcim reverse alarm <36 Holcim FEL & Plant <36
Teven Quarry $L_{Aeq(15min)}$ Contribution						36
29/01/2020	09:47 (Day)	81	59	42	WD: N WS: 0.1m/s Rain: Nil	Insects 36-53 Holcim FEL & Plant <33 Local traffic 36-81
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
29/01/2020	20:09 (Evening)	72	59	41	WD: N WS: 0.1m/s Rain: Nil	Insects 44-63 Birds 61-72 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
29/01/2020	20:24 (Evening)	62	43	41	WD: N WS: 0.1m/s Rain: Nil	Insects 41-45 Distant traffic <41 Operator 43-62 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}		
29/01/2020	10:12 (Day)	84	59	48	WD: N WS: 0.1m/s Rain: Nil	Local traffic 48-84 Insects 52-56 Industrial noise 53-56 Birds 48-54 Quarry Inaudible
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<35
29/01/2020	10:27 (Day)	84	62	48	WD: N WS: 0.1m/s Rain: Nil	Traffic 46-84 Insects 46-49 Aircraft 48-53 Birds 48-54 Quarry Inaudible
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<35
29/01/2020	20:43 (Evening)	86	58	39	WD: N WS: 0.5m/s Rain: Nil	Insects 34-38 Distant traffic <36 Aircraft 36-50 Local traffic 42-86 Quarry Inaudible
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry not operational
29/01/2020	20:58 (Evening)	76	48	38	WD: N WS: 0.5m/s Rain: Nil	Insects 36-48 Local traffic 48-76 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

Attended noise measurements were undertaken on Wednesday 29 January 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise, with further discussion of assessment results shown below.

5.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. 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 insects, birds, local residential noise aircraft, wind in trees, local and distant traffic.

5.2 Discussion of Results - Location N2

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. 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 insects, local traffic, and birds.

5.3 Discussion of Results - Location N3

Quarry noise emissions were inaudible during the two daytime noise measurements conducted on Wednesday 29 January 2020. 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 insects, aircraft, local traffic and birds.

5.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the two daytime measurements conducted on Wednesday 29 January 2020. Front end loader movements, truck loading activities and reverse alarms were audible during the two daytime measurements with an estimated contribution from 33dBA to 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 insects, local traffic, birds and operator noise.

5.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the two daytime measurements conducted on Wednesday 29 January 2020, 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 local traffic, insects, industrial noise, birds, aircraft and distant traffic.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at 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, ending March 2020.

Attended noise measurements were undertaken on Wednesday 29 January 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise. Notwithstanding, the assessment has identified that noise emissions generated by Teven Quarry complies with relevant noise criteria specified in the Development Consent at all assessed residential receivers.

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Appendix A - Glossary of Terms

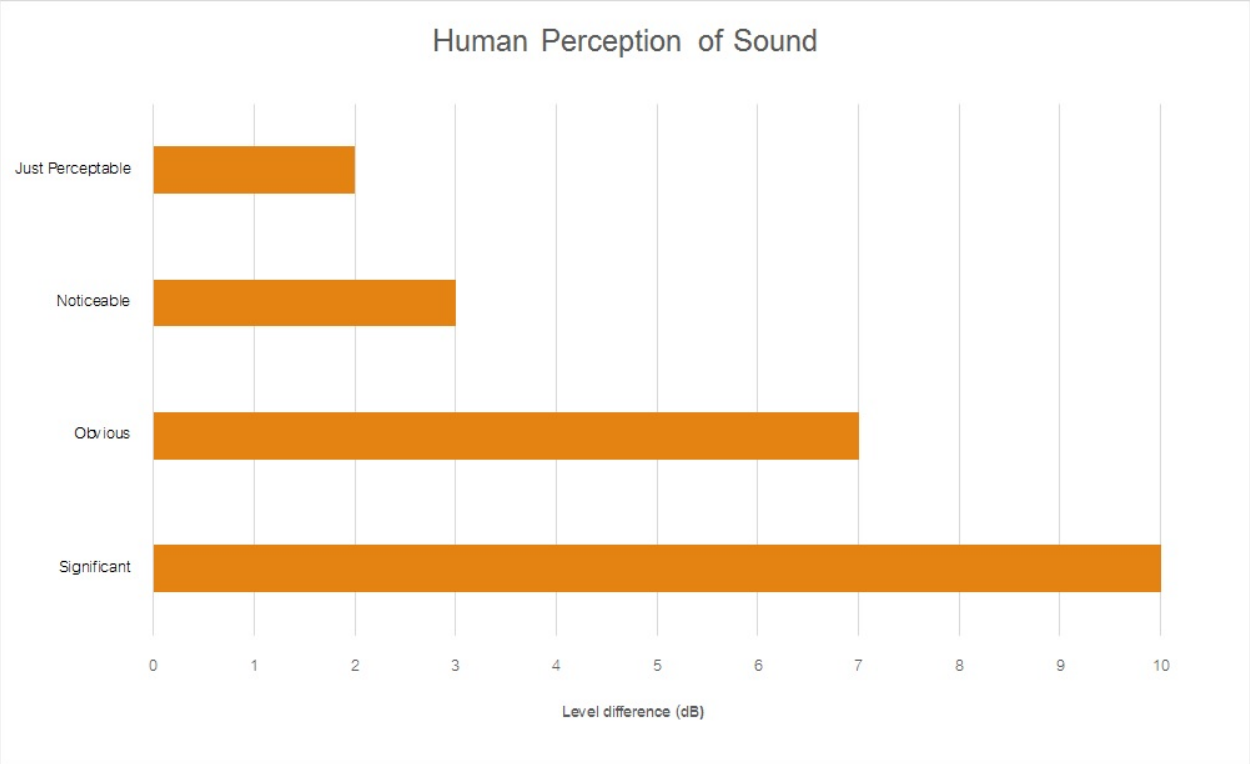
Table A1 provides a number of technical terms have been used in this report.

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 2020.

Prepared for: Holcim (Australia) Pty Ltd
May 2020
MAC180611-06RP8

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 2 Ending June 2020

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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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 the quarterly period ending June 2020 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 Quarter 2, ending June 2020 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 are primarily rural. 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 Coordinates)

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 12 May 2020 and Wednesday 13 May 2020. 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

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}		
13/05/2020	09:53 (Day)	61	38	31	WD: W WS: 1m/s Rain: Nil	Birds 29-61 Insects <29 Traffic <30 Wind 29-38 Aircraft 32-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
13/05/2020	10:08 (Day)	74	47	30	WD: W WS: 1m/s Rain: Nil	Insects <29 Birds 28-65 Traffic 30-74 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
12/05/2020	18:12 (Evening)	74	50	40	WD: W WS: 1.5m/s Rain: Nil	Wind 41-44 Traffic 42-72 Aircraft 42-46 Insects <41 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
12/05/2020	18:27 (Evening)	74	52	42	WD: W WS: 1.5m/s Rain: Nil	Wind 44-48 Insects <44 Traffic 44-74 Aircraft <44 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30

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}		
13/05/2020	10:32 (Day)	89	66	36	WD: W WS: 0.5m/s Rain: Nil	Traffic 34-89 Birds 38-52 Dog 35-46 Aircraft 35-46 Holcim processing just audible ~36 Local residential noise 36-48
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<36
13/05/2020	10:47 (Day)	88	65	37	WD: W WS: 0.5m/s Rain: Nil	Traffic 38-88 Birds 36-67 Local residential noise 38-56 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					<30
12/05/2020	18:57 (Evening)	81	54	35	WD: W WS: 0.1m/s Rain: Nil	Insects <34 Aircraft 36-44 Traffic 36-81 Quarry Inaudible
	Teven Quarry $L_{Aeq(15min)}$ Contribution					Quarry not operational
12/05/2020	19:12 (Evening)	81	54	34	WD: W WS: 0.1m/s Rain: Nil	Insects <36 Traffic 36-81 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}		
13/05/2020	11:10 (Day)	55	37	26	WD: W WS: 0.5m/s Rain: Nil	Birds 27-38 Insects <27 Holcim tipping 30-34 Aircraft 32-54
Teven Quarry $L_{Aeq(15min)}$ Contribution						32
13/05/2020	11:26 (Day)	61	38	27	WD: W WS: 0.5m/s Rain: Nil	Birds 27-51 Insects <27 Holcim equipment 30-36 Traffic 32-61
Teven Quarry $L_{Aeq(15min)}$ Contribution						33
12/05/2020	19:32 (Evening)	52	41	39	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-52 Insects <38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
12/05/2020	19:47 (Evening)	45	40	37	WD: W WS: 0.1m/s Rain: Nil	Traffic 36-45 Insects <36 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}		
13/05/2020	11:48 (Day)	82	59	45	WD: W WS: 0.1m/s Rain: Nil	Holcim crushing 47-53 Traffic 45-82 Insects <45 Birds <45
Teven Quarry $L_{Aeq(15min)}$ Contribution						42-43
13/05/2020	12:03 (Day)	77	53	43	WD: W WS: 0.1m/s Rain: Nil	Holcim crushing 43-48 Insects <43 Traffic 43-77
Teven Quarry $L_{Aeq(15min)}$ Contribution						40-41
12/05/2020	20:10 (Evening)	53	36	32	WD: W WS: 0.1m/s Rain: Nil	Traffic 34-53 Insects <34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
12/05/2020	20:25 (Evening)	47	35	32	WD: W WS: 0.1m/s Rain: Nil	Traffic 32-47 Insects <32 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}		
13/05/2020	12:23 (Day)	86	63	41	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-86 Industrial noise 38-46 Insects <38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
13/05/2020	12:38 (Day)	86	63	36	WD: W WS: 0.1m/s Rain: Nil	Traffic 38-86 Birds 38-52 Aircraft 38-59 Insects <38 Industrial noise 38-48 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
12/05/2020	20:45 (Evening)	85	56	34	WD: W WS: 0.1m/s Rain: Nil	Traffic 32-85 Insects <32 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
12/05/2020	21:00 (Evening)	51	36	33	WD: W WS: 0.1m/s Rain: Nil	Insects <34 Traffic 34-51 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

Attended noise measurements were undertaken on Tuesday 12 May 2020 and Wednesday 13 May 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. It is noted that during this survey period, measurements were generally dominated by high levels of insect noise, with further discussion of assessment results shown below.

5.1 Discussion of Results - Location N1

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. 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 birds, insects, traffic, wind in trees and aircraft.

5.2 Discussion of Results - Location N2

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Quarry noise contributions satisfied 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, dogs barking, aircraft, and local residential noise.

5.3 Discussion of Results - Location N3

Quarry noise emissions were audible during the daytime noise measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Quarry noise contributions satisfied 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 birds, insects, aircraft, and traffic.

5.4 Discussion of Results - Location N4

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated contribution from 40dBA to 43dBA, therefore exceeding the daytime criteria. It was observed that the stockpiles we significantly reduced (approximately 30% capacity)than previous surveys which act as a barrier between the plant and the receiver. Typically, the quarry stockpiles around 12,000 tonnes of material on site, however, due to a recent high demand the stockpile has been reduced to less than 5,000 tonnes and will take three to four weeks to replenish the stockpile to full capacity. The plant manager was notified of the exceedance and will investigate other potential factors such as the integrity of plant enclosures and whether access doors are being closed. Over the next quarterly period, stockpile levels will be monitored more frequently and potential permanent solutions will be investigated.

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 traffic, insects, and birds.

5.5 Discussion of Results - Location N5

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 12 May 2020 and Wednesday 13 May 2020, therefore satisfying the daytime 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, industrial noise, insects, birds, and aircraft.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at 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, ending June 2020.

Attended noise measurements were undertaken on Tuesday 12 May 2020 and Wednesday 13 May 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied with relevant noise criteria specified in the Development Consent at all assessed residential receivers, with the exception of N4 during the daytime period which had a noise contribution of 40dBA-43dBA for the daytime measurements over the next quarterly period, noise controls will be investigated including monitoring stockpile heights and integrity of plant enclosures to maintain compliance with noise goals.

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Appendix A - Glossary of Terms

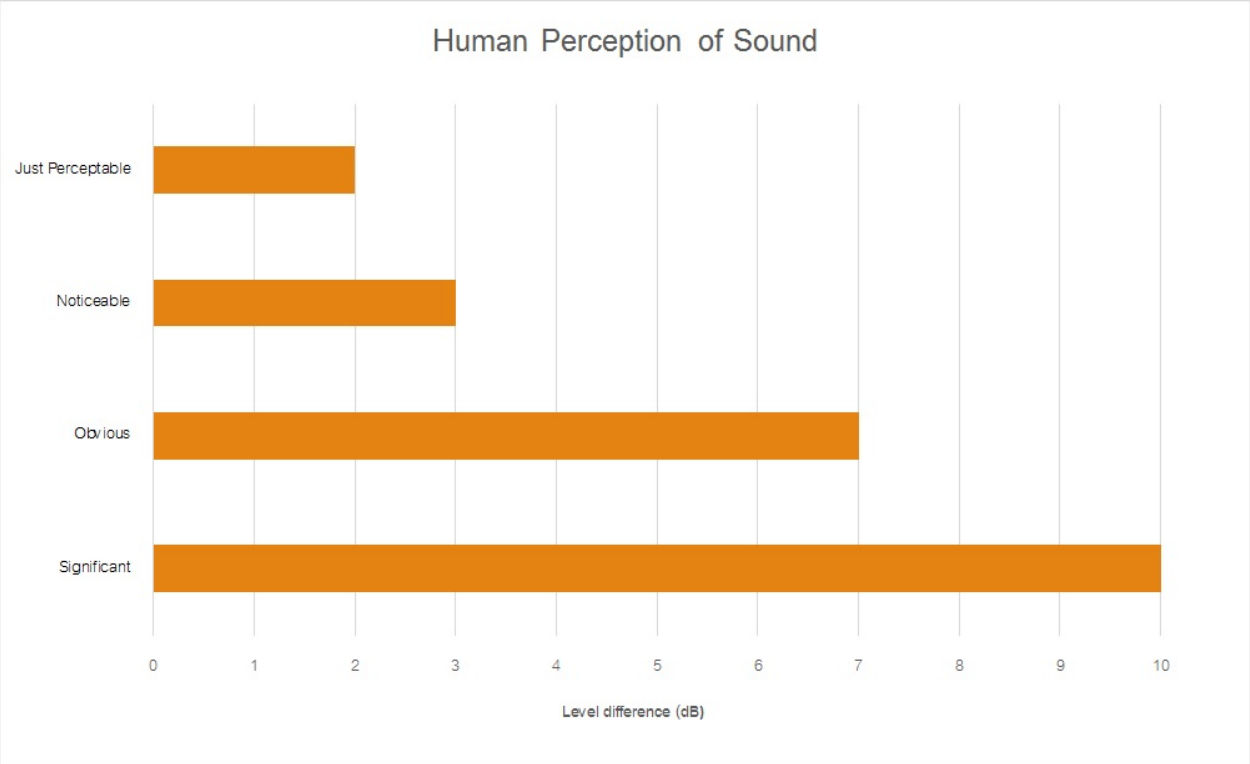
Table A1 provides a number of technical terms have been used in this report.

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 2020.

Prepared for: Holcim (Australia) Pty Ltd
September 2020
MAC180611-06RP9

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 3 Ending September 2020

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
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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 the quarterly period ending September 2020 for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan (NMP) 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 Quarter 3, ending September 2020 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 Environment Protection Authority (EPA), Environmental Protection Licence (EPL 3293);
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015;
- Teven Quarry Noise Management Plan Revision 1, 4 May 2016 (EMM); 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 are primarily rural. 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 Coordinates)

Location	Nearest Receiver	Easting, m	Northing, m
NM1	R7	546737	6809918
NM2	R3/R4	548892	6810285
NM3	R2	547781	6808991
NM4	R10	547576	6810379
NM5	R14	548100	6810792

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 8 September 2020 and Wednesday 9 September 2020. 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

Site Locality

MAC180611-06

Holcim Teven Quarry

KEY

Noise Monitoring Locations

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location NM1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	07:14 (Day)	67	44	34	WD: S WS: 0.5m/s Rain: Nil	Birds 36-54 Wind 34-37 Traffic 34-67 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
09/09/2020	07:29 (Day)	70	46	33	WD: S WS: 0.5m/s Rain: Nil	Birds 33-63 Traffic 33-70 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
08/09/2020	18:18 (Evening)	48	36	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 36-48 Insects <36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	18:33 (Evening)	70	43	29	WD: S WS: 0.1m/s Rain: Nil	Insects 28-30 Traffic 28-70 Dogs 28-34 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 NM2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location NM2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	07:56 (Day)	87	65	38	WD: S WS: 0.1m/s Rain: Nil	Birds 35-56 Traffic 35-87 Dogs 35-44 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
09/09/2020	08:11 (Day)	85	65	36	WD: S WS: 0.1m/s Rain: Nil	Birds 38-54 Traffic 33-85 Aircraft 36-52 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
08/09/2020	19:01 (Evening)	83	59	34	WD: S WS: 0.1m/s Rain: Nil	Dogs 41-64 Birds 38-44 Traffic 37-83 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	19:16 (Evening)	90	61	36	WD: S WS: 0.1m/s Rain: Nil	Traffic 34-90 Dogs 34-46 Insects <38 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 NM3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location NM3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	08:31 (Day)	61	42	29	WD: S WS: 0.1m/s Rain: Nil	Birds 38-61 Traffic 29-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
09/09/2020	08:46 (Day)	58	40	26	WD: S WS: 0.1m/s Rain: Nil	Birds 25-58 Traffic 25-34 Aircraft 29-34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<30
08/09/2020	19:37 (Evening)	55	36	34	WD: S WS: 0.1m/s Rain: Nil	Traffic 32-55 Insects 28-34 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	19:52 (Evening)	48	37	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 29-48 Insects 29-33 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 NM4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location NM4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	09:09 (Day)	64	42	34	WD: S WS: 0.1m/s Rain: Nil	Birds 36-64 Traffic 34-36 Aircraft 36-50 Insects <32 Holcim crushing 32-36
Teven Quarry $L_{Aeq(15min)}$ Contribution						34
09/09/2020	09:24 (Day)	59	38	33	WD: S WS: 0.1m/s Rain: Nil	Birds 36-59 Traffic <33 Insects <31 Holcim crushing 31-37
Teven Quarry $L_{Aeq(15min)}$ Contribution						34
08/09/2020	20:14 (Evening)	60	56	53	WD: S WS: 0.1m/s Rain: Nil	Insects 30-54 Traffic 52-60 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
08/09/2020	20:29 (Evening)	60	56	54	WD: S WS: 0.1m/s Rain: Nil	Insects 47-52 Traffic 47-60 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 NM5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location NM5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
09/09/2020	09:49 (Day)	49	33	29	WD: S WS: 0.1m/s Rain: Nil	Birds 28-49 Insects <28 Traffic 28-42 Holcim loading 28-30 Holcim reverse alarms <29
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<30
09/09/2020	10:04 (Day)	63	36	29	WD: S WS: 0.5m/s Rain: Nil	Birds 34-63 Insects <32 Traffic 28-34 Holcim loading 28-31 Holcim crushing <30
		Teven Quarry $L_{Aeq(15min)}$ Contribution				<30
08/09/2020	20:49 (Evening)	84	56	33	WD: S WS: 0.1m/s Rain: Nil	Traffic 29-84 Insects 29-31 Quarry Inaudible
		Teven Quarry $L_{Aeq(15min)}$ Contribution				Quarry not operational
08/09/2020	21:04 (Evening)	83	55	32	WD: S WS: 0.1m/s Rain: Nil	Traffic 28-83 Insects 28-30 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 NM1

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. 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 birds, wind in trees, traffic, insects, and dogs barking.

5.2 Discussion of Results - Location NM2

Quarry noise emissions were inaudible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. 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 birds, traffic, dogs barking, aircraft, and insects.

5.3 Discussion of Results - Location NM3

Quarry noise emissions were inaudible during the daytime noise measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. 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 birds, traffic, aircraft, and insects.

5.4 Discussion of Results - Location NM4

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated

contribution of 34dBA during the measurement period, 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 birds, traffic, aircraft, and insects.

5.5 Discussion of Results - Location NM5

Quarry noise emissions were audible during the daytime measurements conducted on Tuesday 8 September 2020 and Wednesday 9 September 2020. Front end loader movements, truck loading activities, and processing plant were audible during the two daytime measurements with an estimated contribution of <30dBA during the measurement period, 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 quarry noise sources observed during the measurements included birds, traffic, and insects.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for the relevant surrounding residential receivers during Quarter 3, ending September 2020.

Attended noise measurements were undertaken on Tuesday 8 September 2020 and Wednesday 9 September 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied 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.
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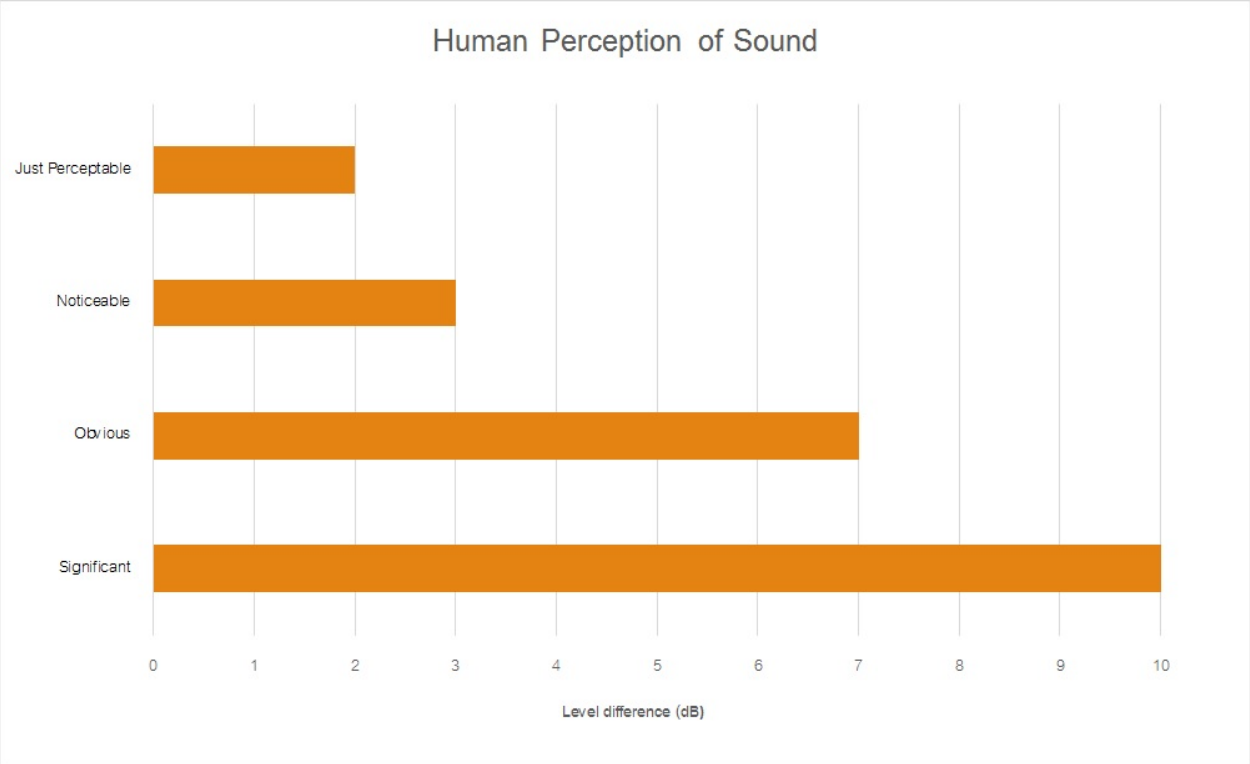
Table A2 provides a list of common noise sources and their typical sound level.

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 2020.

Prepared for: Holcim (Australia) Pty Ltd
December 2020
MAC180611-06RP10

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Teven Quarry, Teven, NSW

Quarter 4 Ending December 2020

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

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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 the quarterly period ending December 2020 for Teven Quarry (the 'quarry'), Teven, NSW.

The monitoring has been conducted in accordance with the Teven Noise Management Plan (NMP) 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 Quarter 4, ending December 2020 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 Environment Protection Authority (EPA), Environmental Protection Licence (EPL 3293);
- NSW Department of Planning and Environment, Development Consent (SSD 6422), 2015;
- Teven Quarry Noise Management Plan Revision 1, 4 May 2016 (EMM); 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 are primarily rural. 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 Coordinates)

Location	Nearest Receiver	Easting, m	Northing, m
NM1	R7	546737	6809918
NM2	R3/R4	548892	6810285
NM3	R2	547781	6808991
NM4	R10	547576	6810379
NM5	R14	548100	6810792

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 25 November 2020 and Thursday 26 November 2020. 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

Site Locality

MAC180611-06

Holcim Teven Quarry

KEY

Noise Monitoring Locations

0 100 200 300 400 500 m

N

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4 Results

4.1 Assessment Results - Location NM1

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM1 are presented in **Table 3**.

Table 3 Operator-Attended Noise Survey Results – Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	12:12 (Day)	53	41	38	WD: S WS: 1.5m/s Rain: Nil	Birds 33-53 Wind 33-45 Insects 36-41 Distant Traffic <33-39 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	12:27 (Day)	66	43	38	WD: S WS: 1.5m/s Rain: Nil	Birds 33-54 Wind 33-46 Insects 36-41 Distant Traffic <33-37 Residential Noise 40-66 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	18:05 (Evening)	53	34	29	WD: E WS: 1.0m/s Rain: Nil	Wind 23-43 Distant Traffic 26-38 Residential Noise 35-53 Birds 23-46 Insects <23-26 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	18:20 (Evening)	71	44	28	WD: E WS: 1.0m/s Rain: Nil	Wind 25-38 Distant Traffic 25-36 Residential Noise 25-71 Birds 25-33 Insects <25 Dogs 30-35 Aircraft 30-48 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 NM2

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM2 are presented in **Table 4**.

Table 4 Operator-Attended Noise Survey Results – Location NM2

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	09:48 (Day)	82	58	40	WD: SE WS: 2.0m/s Rain: Nil	Birds 34-74 Traffic 34-82 Wind 37-49 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	10:03 (Day)	82	59	41	WD: SE WS: 2.0m/s Rain: Nil	Birds 35-56 Traffic 35-82 Wind 38-51 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	20:02 (Evening)	74	54	47	WD: SE WS: <0.5m/s Rain: Nil	Birds 45-62 Insects <43 Traffic 45-74 Agricultural Noise 46-53 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	20:17 (Evening)	75	54	46	WD: SE WS: <0.5m/s Rain: Nil	Insects <40 Traffic 40-75 Agricultural Noise 44-52 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 NM3

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM3 are presented in **Table 5**.

Table 5 Operator-Attended Noise Survey Results – Location NM3

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	09:09 (Day)	63	44	36	WD: SE WS: 1.5m/s Rain: Nil	Birds 30-63 Wind 30-45 Distant Traffic 33-40 Insects <30-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	09:24 (Day)	78	55	37	WD: SE WS: 2.0m/s Rain: Nil	Birds 32-68 Wind 32-49 Distant Traffic 35-40 Insects <32-36 Aircraft 38-78 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	20:39 (Evening)	54	48	43	WD: SE WS: <0.5m/s Rain: Nil	Insects 41-54 Distant Traffic 38-46 Agricultural Noise <38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	20:54 (Evening)	54	48	43	WD: SE WS: <0.5m/s Rain: Nil	Insects 41-54 Distant Traffic <38-44 Agricultural Noise <38 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 NM4

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM4 are presented in **Table 6**.

Table 6 Operator-Attended Noise Survey Results – Location NM4

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
26/11/2020	07:35 (Day)	79	55	42	WD: NE WS: 0.5m/s Rain: Nil	Insects <38-42 Traffic 40-79 Birds 38-49 Agricultural Noise 40-68 Holcim Processing <35-42 (10-15 minute duration) Holcim Loader <38-44 (2-4 minute duration) Holcim Haul Truck <40-47 (1-2 minute duration) Holcim Reverse Alarms <38-44 (multiple 5-10 second durations)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<37
26/11/2020	07:50 (Day)	82	62	43	WD: NE WS: 0.5m/s Rain: Nil	Insects 40-43 Traffic 40-82 Agricultural noise 45-60 Holcim Processing <35-40 (10-15 minute duration) Holcim Loader <40-44 (3-5 minute duration) Holcim Haul Truck <40-46 (2-4 minute duration) Holcim Reverse Alarms <39-43 (multiple 5-10 second durations)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<37
25/11/2020	19:27 (Evening)	59	54	38	WD: SE WS: 0.5m/s Rain: Nil	Insects 36-59 Distant Traffic 33-38 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	19:42 (Evening)	62	55	51	WD: SE WS: <0.5m/s Rain: Nil	Insects 44-62 Distant Traffic <40 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 NM5

The monitored noise level contributions and observed meteorological conditions for each day and evening survey period at Location NM5 are presented in **Table 7**.

Table 7 Operator-Attended Noise Survey Results – Location NM5

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
25/11/2020	11:16 (Day)	66	45	39	WD: SE WS: 3.0m/s Rain: Nil	Wind 37-58 Insects <32 Traffic 34-51 Aircraft 38-66 Holcim Processing <35 (6-9 minute duration)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	11:31 (Day)	61	42	37	WD: SE WS: 3.0m/s Rain: Nil	Wind 35-61 Insects <30 Traffic 32-46 Agricultural Noise 35-40 Birds 32-41 Holcim Processing <35 (6-9 minute duration)
Teven Quarry $L_{Aeq(15min)}$ Contribution						<35
25/11/2020	18:51 (Evening)	55	38	33	WD: SE WS: 0.5m/s Rain: Nil	Birds 28-55 Traffic 31-41 Insects <28-36 Quarry Inaudible
Teven Quarry $L_{Aeq(15min)}$ Contribution						Quarry not operational
25/11/2020	19:06 (Evening)	62	39	34	WD:SE WS: 0.5m/s Rain: Nil	Birds 28-62 Taffic31-37 Insects 28-36 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 NM1

Quarry noise emissions were inaudible during the daytime measurements conducted on Wednesday 25 November 2020. 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 birds, wind in trees, distant traffic, insects, residential noise, aircraft, and dogs barking.

5.2 Discussion of Results - Location NM2

Quarry noise emissions were inaudible during the daytime measurements conducted on Wednesday 25 November 2020. 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 birds, traffic, wind in trees, agricultural activities, and insects.

5.3 Discussion of Results - Location NM3

Quarry noise emissions were inaudible during the daytime noise measurements conducted on Wednesday 25 November 2020. 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 birds, traffic, aircraft, wind in trees, agricultural activities and insects.

5.4 Discussion of Results - Location NM4

Quarry noise emissions were audible during the daytime measurements conducted on Wednesday 25 November 2020. However due to meteorological conditions being outside the EPL parameters (ie >3m/s @10m AGL) measurements were suspended. Measurements were resumed on Thursday 26 November 2020 when winds <3.0m/s allowing a contribution to be determined within the EPL parameters. Insect noise dominated background levels during both measurements, with an estimated quarry contribution of <37dBA during the measurement period, 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.

Quarry noise sources observed during the measurements included front end loader and haul truck movements, vehicle reverse alarms and the processing plant. Non quarry noise sources included birds, aircraft, traffic, and insects.

5.5 Discussion of Results - Location NM5

Quarry noise emissions were audible during the daytime measurements conducted on Wednesday 25 November 2020. Although wind speeds at ground level exceeded 3m/s at times the estimated quarry contribution was below 35dBA during the measurement period, 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.

Quarry noise sources observed during the measurements included the processing plant. Non-quarrying sources included insects, birds, traffic, and aircraft.

6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Teven Quarry, Teven, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in their Development Consent for the relevant surrounding residential receivers during Quarter 4, ending December 2020.

Attended noise measurements were undertaken on Wednesday 25 November 2020 and Thursday 26 November 2020 at representative monitoring locations with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Teven Quarry generally complied 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.

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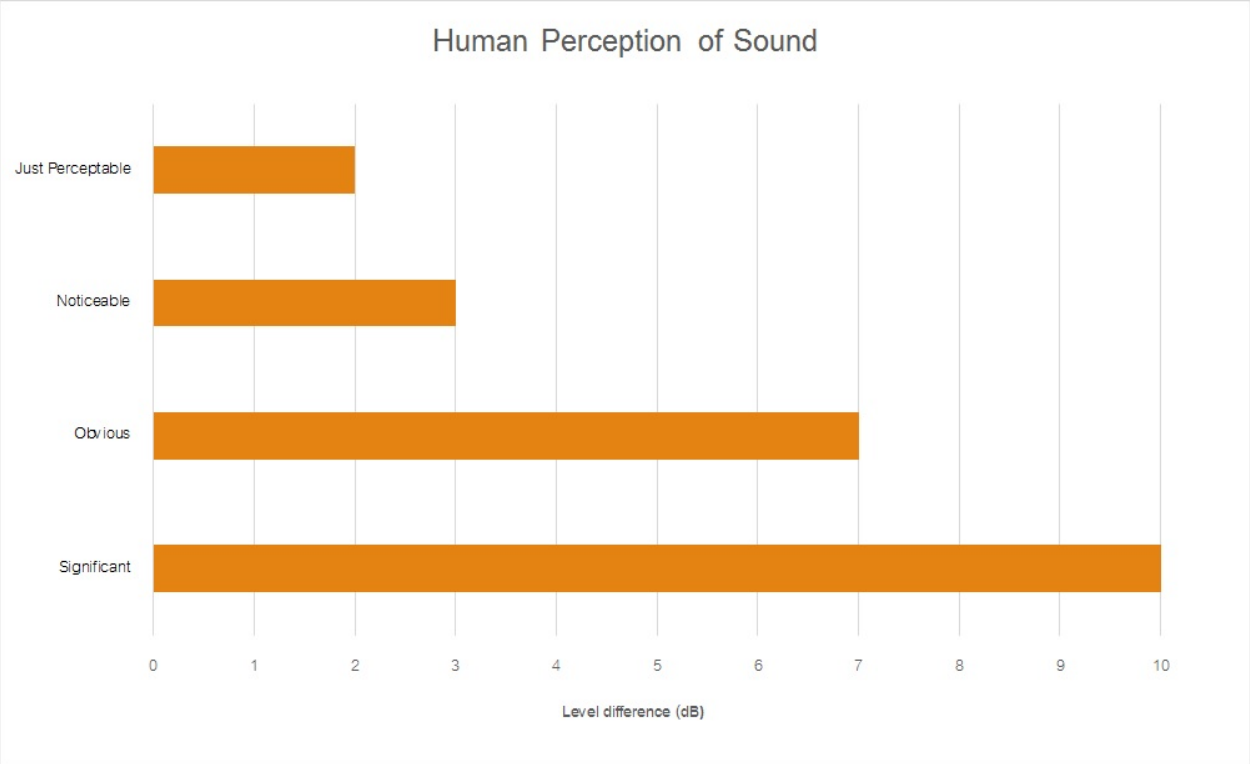

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P: +61 2 4920 1833
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