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# Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 1 2025

# Teven Quarry Quarterly Noise Monitoring Assessment

## Quarter 1 2025

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Description **Data collected on 10 February 2025 and 17 March 2025 for Teven Quarry during Quarter 1 2025 in Teven, NSW, as part of the noise monitoring program**

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## Abbreviations and Definitions

	Description
$\Delta T$	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAm <sub>ax</sub>	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
NPFI	Noise Policy for Industry 2017

<b>Description</b>	
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023)

## 1. Overview

### 1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (“the quarry”) at Teven, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPI) (NSW EPA, 2017)
- Teven Quarry Noise Management Plan (NMP) (Holcim Australia, 2021)
- Environment Protection Licence (EPL) number 3293 (NSW EPA, 2021)
- Development Consent Application Number SSD\_6422 (Minister for Planning and Environment, 2015)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018)
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Standard, 2017).

This NMA has been undertaken in accordance with the NMP for the quarterly period January to March 2025 and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

### 1.2 Site Location and Sensitive Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

**Table 1-1: Monitoring locations locality and sensitive receptors**

Monitoring Locations	Nearest Receiver	Locality and Sensitive Receivers
<b>NM1</b>	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
<b>NM2</b>	R3/R4	East of the quarry situated at a rural residential property on Teven Road
<b>NM3</b>	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
<b>NM4</b>	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
<b>NM5</b>	R14	Northeast of the quarry situated at a rural residential property of Teven Road

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



**Legend**

- Noise monitoring location
- Residential receiver location



**Figure 1: Noise monitoring locations at Teven Quarry**

## 2. Noise Criteria

**Table 2-1** summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

**Table 2-1: Monitoring locations and noise criteria**

Receivers	Monitoring Locations	Day <sup>1</sup>	Evening <sup>2</sup>
		L <sub>Aeq</sub> (15min)	L <sub>Aeq</sub> (15min)
dB(A)			
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

<sup>1</sup> 7 am–6 pm Monday to Saturday and 8 am–6 pm Sunday and public holidays

<sup>2</sup> 6 pm–10 pm Monday to Sunday

### 3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Monday 10 February and Monday 17 March 2025. The acoustic instrumentation used carries current National Association of Testing Authorities (NATA) calibration and complies with *AS/NZS IEC 61672-1:2019 Class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which also carried a current NATA calibration and complies with IEC 60942:2017. Drift in calibration did not exceed ±0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each monitoring location over three days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

#### 3.1 Meteorological conditions

Meteorology has an important influence on noise monitoring assessment. An onsite meteorological station with data recorded at 10m height has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

**Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)**

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

As stated in the Development Consent, the noise criteria in Table 2-1 applies under all meteorological conditions except the following:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5°C and 3°C/100m and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3°C/100m.

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

## 4. Results and Discussion

### 4.1 Location NM1

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included flora and fauna, aircraft, dog barking, passing vehicles and an aircraft. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring (see Footnotes 2 and 3 below).

**Table 4-1: Noise survey results and observations for Location NM1**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
17-03-25	3:28pm to 3:43pm (Day)	66.2	52.6	44.9	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Background wind/trees/insects 41-60 Car 60-62 Dogs barking 51-53 Aircraft 50-64 Quarry inaudible	<35	37
17-03-25	3:44pm to 3:59pm (Day)	65	54.7	47.6	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Wind/trees/insects/cicadas 41-60 Quarry inaudible	<38 <sup>2,3</sup>	37
10-02-25	6:00pm to 6:15pm (Evening)	66.2	51.8	42.0	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 9 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects/cicadas/trees/birds 38-66 Quarry not operational	n/a <sup>4</sup>	35
10-02-25	6:16pm to 6:31pm (Evening)	84.5	59.3	29.0	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 9 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects/cicadas/trees/birds 37-61 Polaris passing 54-84 Quarry not operational	n/a <sup>4</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Measured LA90 value of 47.6 was dominated by flora and fauna so unable to separate extraneous noise from Holcim noise but estimated be less than 38 dBA at the assessment location.

<sup>3</sup> Negligible exceedance (NPfI 2017 – Table 4.1)

<sup>4</sup> Quarry not operational.

#### 4.2 Location NM2

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-2: Noise survey results and observations for Location NM2**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry L <sub>Aeq</sub> (15min) Contribution	L <sub>Aeq</sub> (15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
17-03-25	4:17pm to 4:32pm (Day)	81.4	61.6	45.3	WD: 26° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Background wind/trees/insects/birds 44-55 Passing cars 71-81 Quarry inaudible	<35	38
17-03-25	4:39pm to 4:54pm (Day)	85.3	61.5	46.5	WD: 26° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Background wind/trees/insects/birds 44-55 Passing cars 71-81 Quarry inaudible	<37	38
10-02-25	7:55pm to 8:10pm (Evening)	85.3	59.5	33.6	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 1.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/insects/cicadas 33-45 Cars passing 64-85 Aircraft 44-50 Quarry not operational	n/a <sup>2</sup>	35
10-02-25	8:12pm to 8:27pm (Evening)	82.6	56.2	34.7	WD: n/a WS: 0 m/s Rain: Nil	WD: SE WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/insects/cicadas 34-41 Cars passing 60-82 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

### 4.3 Location NM3

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and background motorway. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-3: Noise survey results and observations for Location NM3**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
17-03-25	4:59pm to 5:14pm (Day)	51.5	41.6	39.7	WD: 16° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Background wind/trees/insects 40-50 Quarry inaudible	<30	37
17-03-25	5:15pm to 5:30pm (Day)	49.9	41.4	39	WD: 16° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 8 m/s Rain: Nil Stability Category: D <sup>1</sup>	Background wind/trees/insects 40-50 Quarry inaudible	<29	37
10-02-25	8:32pm to 8:47pm (Evening)	56.5	53.7	44.8	WD: n/a WS: 0 m/s Rain: Nil	WD: ESE WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/insects/cicadas 42-57 Quarry not operational	n/a <sup>2</sup>	35
10-02-25	8:48pm to 9:03pm (Evening)	54.5	46.9	43.9	WD: n/a WS: 0 m/s Rain: Nil	WD: ESE WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/insects/cicadas 41-57 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

#### 4.4 Location NM4

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-4**. The quarry was inaudible at NM4 during the day. Holcim vehicles entering and exiting the site were observed and measured during both day periods. As these were offsite vehicle movements they did not constitute as a contributor to the quarry contribution. The quarry was not operational during the evening period. The ambient noise environment was dominated by background motorway hum, flora and fauna, aircraft and a passing car. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-4: Noise survey results and observations for Location NM4**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		LAmax	LAeq	LA90					
17-03-25	2:04pm to 2:19am (Day)	75.2	55.9	46.9	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: Nil Stability Category: C <sup>1</sup>	Trees/wind/insects 48-56 Trucks passing 60-74 Quarry inaudible	<37	37
17-03-25	2:20pm to 2:35pm (Day)	82.8	53.2	48.1	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: nil Stability Category: C <sup>1</sup>	Trees/wind/insects 48-69 Trucks passing 54-60 Quarry inaudible	<29 <sup>2,3</sup>	37
10-02-25	7:20pm to 7:35pm (Evening)	61.4	52.0	38.5	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 3.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/cicadas/insects/birds 36-61 Aircraft 40-43 Passing car 44-51 Quarry not operational	n/a <sup>4</sup>	35
10-02-25	7:36pm to 7:51pm (Evening)	72	55.5	39.8	WD: n/a WS: 0 m/s Rain: Nil	WD: S WS: 2 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background motorway hum/cicadas/insects/birds 36-61 Quarry not operational	n/a <sup>4</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Measured LA90 value of 48.1 was dominated by trees, wind and insects and road traffic so unable to estimate contribution for quarry at assessment location.

<sup>3</sup> Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident. Subsequently an estimated quarry contribution of 38 LAeq dBA was adopted for distance correction to receiver using noise emission level (NEL) calculations in Appendix 1.

<sup>4</sup> Quarry not operational.

Location NM5

Noise monitoring at location NM1 was conducted on Monday 10 February 2025 and Monday 17 March 2025 with results presented in **Table 4-5**. The quarry was inaudible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna and a passing tractor. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-5: Noise survey results and observations for Location NM5**

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
17-03-25	2:39pm to 2:54pm (Day)	68	38	40.2	WD: 16° WS: 3.2 m/s Rain: Nil	WD: WNW WS: 9 m/s Rain: Nil Stability Category: C <sup>1</sup>	Background wind/trees/insects/birds 60-65 Passing tractor 60-65 Quarry inaudible	<30	37
17-03-25	2:56pm to 3:09pm (Day)	71.7	48.5	39	WD: 16° WS: 3.2 m/s Rain: Nil	WD: NW WS: 8.5 m/s Rain: Nil Stability Category: C <sup>1</sup>	Background wind/trees/insects/birds 60-65 Passing tractor 60-65 Quarry inaudible	<29	37
10-02-25	6:45pm to 7:00pm (Evening)	68.4	45.1	37.3	WD: 60° WS: 1.9 m/s Rain: Nil	WD: S WS: 8 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects/cicadas/trees/wind/birds 37-58 Quarry not operational	n/a <sup>2</sup>	35
10-02-25	7:00pm to 7:15pm (Evening)	59.4	45.0	38.9	WD: 60° WS: 1.9 m/s Rain: Nil	WD: S WS: 5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects/cicadas/trees/wind/birds 37-59 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational

## 5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Monday 10 February and Monday 17 March 2025 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

No audible noise from quarry operations was observed at any of the five locations during the day and evening periods. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, Teven, NSW.

It is noted that at NM1, the site noise contribution is estimated to be up to 38 dBA during one day period. This indicates that the noise criteria were exceeded by 1 dB which is however deemed negligible when considered against Table 4.1 of the NPfI. It should also be noted that the noise environment during the night-time noise monitoring was affected by extraneous noise sources whilst the site was inaudible. Therefore, it can be concluded that the exceedance was not caused by the site operation.

## 6. References

Holcim Australia (2021) *Teven Quarry, Noise Management Plan*.

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

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## Appendix 1 Noise Emission Level Calculation

### NM4 day monitoring period (1:25PM to 1:40PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	38.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
<b>Distance corrected site contribution at receiver (LAeq dBA)</b>	<b>33.8</b>
Estimated additional attenuation (vegetation & ground absorption)	5
<b>Estimated site contribution at receiver (dBA)</b>	<b>28.8</b>

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# Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 2 2025

# Teven Quarry Quarterly Noise Monitoring Assessment

## Quarter 2 2025

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Date **12/08/2025**  
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## Appendices

### Appendix 1

Noise Emission Level Calculations

## Abbreviations and Definitions

	Description
$\Delta T$	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAm <sub>ax</sub>	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
NPfI	Noise Policy for Industry 2017

<b>Description</b>	
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023)

## 1. Overview

### 1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (“the quarry”) at Teven, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPI) (NSW EPA, 2017)
- Teven Quarry Noise Management Plan (NMP) (Holcim Australia, 2021)
- Environment Protection Licence (EPL) number 3293 (NSW EPA, 2021)
- Development Consent Application Number SSD\_6422 (Minister for Planning and Environment, 2015)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018)
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Electrotechnical Commission, 2017).

This NMA has been undertaken in accordance with the NMP for the quarterly period April to June 2025 and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

### 1.2 Site Location and Sensitive Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

**Table 1-1: Monitoring locations locality and sensitive receptors**

Monitoring Locations	Nearest Receiver	Locality and Sensitive Receivers
<b>NM1</b>	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
<b>NM2</b>	R3/R4	East of the quarry situated at a rural residential property on Teven Road
<b>NM3</b>	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
<b>NM4</b>	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
<b>NM5</b>	R14	Northeast of the quarry situated at a rural residential property of Teven Road

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



**Legend**

- Noise monitoring location
- Residential receiver location



**Figure 1: Noise monitoring locations at Teven Quarry**

## 2. Noise Criteria

**Table 2-1** summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

**Table 2-1: Monitoring locations and noise criteria**

Receivers	Monitoring Locations	Day <sup>1</sup>	Evening <sup>2</sup>
		L <sub>Aeq</sub> (15min)	L <sub>Aeq</sub> (15min)
dB(A)			
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

<sup>1</sup> 7 am–6 pm Monday to Saturday and 8 am–6 pm Sunday and public holidays

<sup>2</sup> 6 pm–10 pm Monday to Sunday

### 3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Tuesday 13 May and Wednesday 14 May 2025. The acoustic instrumentation used carries current National Association of Testing Authorities (NATA) calibration and complies with *AS/NZS IEC 61672-1:2019 Class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which also carried a current NATA calibration and complies with IEC 60942:2017. Drift in calibration did not exceed ±0.3 dBA.

Attended noise monitoring was conducted for 15-minute periods at each monitoring location over two days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

#### 3.1 Meteorological conditions

Meteorology has an important influence on noise monitoring assessment. An onsite meteorological station with data recorded at 10m height has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

**Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)**

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

As stated in the Development Consent, the noise criteria in Table 2-1 applies under all meteorological conditions except the following:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5°C and 3°C/100m and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3°C/100m.

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

## 4. Results and Discussion

### 4.1 Location NM1

Noise monitoring at location NM1 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included background traffic, insects, cicadas, birds, llamas and passing cars. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-1: Noise survey results and observations for Location NM1**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
13-05-25	4:13pm to 4:28pm (Day)	54.6	42.8	37.5	WD: n/a WS: 0 m/s Rain: Nil	WD: SSW WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas/birds 37-46 Llama 47-48 Birds 50-54 Quarry inaudible	<28	37
13-05-25	4:31pm to 4:46pm (Day)	49	42	36.3	WD: n/a WS: 0 m/s Rain: Nil	WD: SSW WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/birds/insects/cicadas 35-46 Bird 40-45 Quarry inaudible	<26	37
14-05-25	6:03pm to 6:18pm (Evening)	52.4	49	45.2	WD: n/a WS: 0 m/s Rain: Nil	WD: WNW WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 48-52 Quarry not operational	n/a <sup>2</sup>	35
14-05-25	6:19pm to 6:34pm (Evening)	60.3	46	44.3	WD: n/a WS: 0 m/s Rain: Nil	WD: WNW WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 44-50 Passing car 56-60 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

## 4.2 Location NM2

Noise monitoring at location NM2 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna, power tools, automotive noise from residence and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-2: Noise survey results and observations for Location NM2**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry L <sub>Aeq</sub> (15min) Contribution	L <sub>Aeq</sub> (15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
13-05-25	1:53pm to 2:08pm (Day)	74.2	61	39.4	WD: 165° WS: 0.9 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind/trees/insects/motor from residence backyard 50-52 Cars passing 80-84 Power tools 60-65 Birds 50-56 Quarry inaudible	<29	38
13-05-25	2:10pm to 2:25pm (Day)	68.3	58.3	37.1	WD: 165° WS: 0.9 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind/trees/insects/motor from residence backyard 50-52 Power tools 59-62 Car passing 68-81 Quarry inaudible	<27	38
14-05-25	8:14pm to 8:29pm (Evening)	56.9	54.5	38.3	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 0.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 38-40 Car passing 57-82 Quarry not operational	n/a <sup>2</sup>	35
14-05-25	8:30pm to 8:45pm (Evening)	43.7	39.8	38.6	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas/frogs 38- 40 Aircraft 40-44 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

### 4.3 Location NM3

Noise monitoring at location NM3 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-3: Noise survey results and observations for Location NM3**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
13-05-25	1:14pm to 1:29pm (Day)	57	45	40	WD: 168° WS: 1.5 m/s Rain: Nil	WD: W WS: 2 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind/trees/insects 42-50 Birds 50-55 Quarry inaudible	<30	37
13-05-25	1:31pm to 1:46pm (Day)	53.3	43	39.5	WD: 168° WS: 1.5 m/s Rain: Nil	WD: WNW WS: 2 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind/trees/insects/birds 42- 47 Quarry inaudible	<30	37
14-05-25	8:51pm to 9:06pm (Evening)	62.1	56.1	48.6	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/frogs/cicadas 50-60 Quarry not operational	n/a <sup>2</sup>	35
14-05-25	9:07pm to 9:22pm (Evening)	63.2	55.5	45.6	WD: n/a WS: 0 m/s Rain: Nil	WD: N WS: 1.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/frogs/cicadas 50-60 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

#### 4.4 Location NM4

Noise monitoring at location NM4 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-4**. The quarry was audible at NM4 during the day. The quarry was not operational during the evening period. The ambient noise environment was dominated by flora, fauna, aircraft and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring (see Footnotes 2, 3 and 4 below).

**Table 4-4: Noise survey results and observations for Location NM4**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		LAm <sub>ax</sub>	LA <sub>eq</sub>	LA <sub>90</sub>					
13-05-25	2:33pm to 2:48pm (Day)	59.2	48.2	45.5	WD: 158° WS: 0.5 m/s Rain: Nil	WD: W WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Machine rumblings/trees/wind/insects 45-50 Quarry audible	<37 <sup>2,3</sup>	37
13-05-25	2:50pm to 3:05pm (Day)	56	46.6	42.3	WD: 158° WS: 0.5 m/s Rain: Nil	WD: W WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Machine rumblings/trees/wind/insects 45-51 Quarry audible	<33 <sup>2,4</sup>	37
14-05-25	7:01pm to 7:16pm (Evening)	55.1	50	44.7	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 44-54 Quarry not operational	n/a <sup>5</sup>	35
14-05-25	7:18pm to 7:33pm (Evening)	56.9	49.6	43.1	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 43-55 Aircraft 50-56 Quarry not operational	n/a <sup>5</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident.

<sup>3</sup> An estimated quarry contribution of 46 LA90 dBA was adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

<sup>4</sup> An estimated quarry contribution of 42 LA90 dBA was adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

<sup>5</sup> Quarry not operational.

Location NM5

Noise monitoring at location NM1 was conducted on Tuesday 13 May 2025 and Wednesday 14 May 2025 with results presented in **Table 4-5**. The quarry was inaudible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna, background traffic, motorcycles and aircrafts. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-5: Noise survey results and observations for Location NM5**

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
13-05-25	3:11pm to 3:26pm (Day)	62.1	43.9	40.7	WD: 130° WS: 2.9 m/s Rain: Nil	WD: W WS: 3.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/wind/trees/insects/birds 40-47 Aircraft 48-56 Bird 60-62 Quarry inaudible	<31	37
13-05-25	3:41pm to 3:56pm (Day)	58.8	42.7	39.9	WD: 130° WS: 2.9 m/s Rain: Nil	WD: W WS: 3 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/wind/trees/insects/birds 40-43 Birds 47-56 Quarry inaudible	<30	37
14-05-25	7:39pm to 7:54pm (Evening)	61.7	49.2	45.8	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 44-48 Motorbike 47-53 Passing car 48-54 Quarry not operational	n/a <sup>2</sup>	35
14-05-25	7:55pm to 8:10pm (Evening)	55.6	51.1	50.2	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: <1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic/insects/cicadas 44-50 Bird 50-54 Passing car 51-54 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational

## 5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Tuesday 13 May 2025 and Wednesday 14 May 2025 at five locations selected as representative to the sensitive receptors at the surroundings to Teven Quarry.

No audible noise from quarry operations was observed at locations NM1, NM2, NM3 and NM5 during the day periods. Quarry noise was audible at location NM4 during the day monitoring periods where the quarry was audible with machinery. The quarry was not operational during the evening monitoring periods.

The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, Teven, NSW.

## 6. References

Holcim Australia (2021) *Teven Quarry, Noise Management Plan*.

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

Minister for Planning and Environment (2015) 'Development Consent SSD\_6422, Teven Quarry Project'.

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Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard.

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard.

## Appendix 1 Noise Emission Level Calculations

### NM4 day monitoring period (2:33PM to 2:48PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	46.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
<b>Distance corrected site contribution at receiver (LAeq dBA)</b>	<b>41.8</b>
Estimated additional attenuation (vegetation & ground absorption)	5
<b>Estimated site contribution at receiver (dBA)</b>	<b>36.8</b>

### NM4 day monitoring period (2:50PM to 3:05PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	42.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
<b>Distance corrected site contribution at receiver (LAeq dBA)</b>	<b>37.8</b>
Estimated additional attenuation (vegetation & ground absorption)	5
<b>Estimated site contribution at receiver (dBA)</b>	<b>32.8</b>

Intended for  
**Holcim (Australia) Pty Ltd**

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# Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 3 2025

# Teven Quarry Quarterly Noise Monitoring Assessment

## Quarter 3 2025

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in Teven, NSW, as part of the noise monitoring program**

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## Appendices

### Appendix 1

Noise Emission Level Calculations

## Abbreviations and Definitions

	Description
$\Delta T$	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmx	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
NPFI	Noise Policy for Industry 2017
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023)

## 1. Overview

### 1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Teven Quarry (“the quarry”) at Teven, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPI) (NSW EPA, 2017)
- Teven Quarry Noise Management Plan (NMP) (Holcim, 2021)
- Environment Protection Licence (EPL) number 3293 (NSW EPA, 2021)
- Development Consent Application Number SSD\_6422 (Minister for Planning and Environment, 2015)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018)
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- International Electrotechnical Commission (IEC) 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (IEC, 2017).

This NMA has been undertaken in accordance with the NMP for the quarterly period July to September 2025 and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

### 1.2 Site Location and Sensitive Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

**Table 1-1: Monitoring locations locality and sensitive receptors**

Monitoring Location	Nearest Receiver	Locality and Sensitive Receivers
NM1	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
NM2	R3/R4	East of the quarry situated at a rural residential property on Teven Road
NM3	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
NM4	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
NM5	R14	Northeast of the quarry situated at a rural residential property of Teven Road

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



**Legend**

- Noise monitoring location
- Residential receiver location

**Figure 1: Noise monitoring locations at Teven Quarry**



## 2. Noise Criteria

**Table 2-1** summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

**Table 2-1: Monitoring locations and noise criteria**

Receivers	Monitoring Locations	Day <sup>1</sup>	Evening <sup>2</sup>
		LAeq (15min)	LAeq (15min)
dB(A)			
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

<sup>1</sup> 7 am–6 pm Monday to Saturday and 8 am–6 pm Sunday and public holidays

<sup>2</sup> 6 pm–10 pm Monday to Sunday

### 3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Thursday 14 August 2025. The acoustic instrumentation used carries current National Association of Testing Authorities (NATA) calibration and complies with *AS/NZS IEC 61672-1:2019 Class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which also carried a current NATA calibration and complies with IEC 60942:2017. Drift in calibration did not exceed  $\pm 0.3$  dBA.

Attended noise monitoring was conducted for 15-minute periods at each monitoring location over two days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

#### 3.1 Meteorological conditions

Meteorology has an important influence on noise monitoring assessment. An onsite meteorological station with data recorded at 10m height has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

**Table 3-1: Classification of atmospheric stability (NSW EPA, 2014)**

Stability Classification	Pasquill Stability Category	Ambient temperature change with height ( $^{\circ}\text{C}/100\text{m}$ )
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

As stated in the Development Consent, the noise criteria in Table 2-1 applies under all meteorological conditions except the following:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5 $^{\circ}\text{C}$  and 3 $^{\circ}\text{C}/100\text{m}$  and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3 $^{\circ}\text{C}/100\text{m}$ .

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

## 4. Results and Discussion

### 4.1 Location NM1

Noise monitoring at location NM1 was conducted on Thursday 14 August 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included background traffic, passing cars, wind, flora, fauna and aircraft. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-1: Noise survey results and observations for Location NM1**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
14-08-25	8:31am to 8:46am (Day)	68.3	45.4	35.5	WD: 240° WS: 2 m/s Rain: Nil	WD: ENE WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, trees, wind, distant road noises 36-53 Louder birds 60-63 Cars passing 40-44 Quarry inaudible	<26	37
14-08-25	8:48am to 9:03am (Day)	56.1	36.1	33.3	WD: 240° WS: 2 m/s Rain: Nil	WD: ENE WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, trees, wind, distant road noises 36-53 Louder birds 60-63 Cars passing 40-45 Quarry inaudible	<23	37
14-08-25	9:11pm to 9:26pm (Evening)	47.5	34.3	29.3	WD: n/a WS: 0 m/s Rain: Nil	WD: NNE WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects, frogs, trees 27-38 Quarry not operational	n/a <sup>2</sup>	35
14-08-25	9:26pm to 9:41pm (Evening)	48.1	36.1	30.7	WD: n/a WS: 0 m/s Rain: Nil	WD: NNE WS: 1.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects, frogs, trees 27-38 Aircraft 40-46 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

## 4.2 Location NM2

Noise monitoring at location NM2 was conducted on Thursday 14 August 2025 results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna, thunder, noise from residence, aircraft and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-2: Noise survey results and observations for Location NM2**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
14-08-25	10:03am to 10:18am (Day)	86.6	61.9	41.5	WD: 210° WS: 2.8 m/s Rain: Nil	WD: WNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, rumbblings from residents 44-52 Cars passing 70-85 Aircraft 50-56 Quarry inaudible	<32	38
14-08-25	10:25am to 10:40am (Day)	70.5	49.9	42.4	WD: 210° WS: 2.8 m/s Rain: Nil	WD: WNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, rumbblings from residents 44-53 Cars passing 70-85 Loud bird 60-68 Thunder 60-64 Quarry inaudible	<32	38
14-08-25	8:07pm to 8:22pm (Evening)	82.9	57.4	34.8	WD: n/a WS: 0 m/s Rain: Nil	WD: NNE WS: 1.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Trees, background traffic, birds, insects, people talking 37-40 Car passing 60-82 Quarry not operational	n/a <sup>2</sup>	35
14-08-25	8:33pm to 8:48pm (Evening)	489.3	61.8	36.3	WD: n/a WS: 0 m/s Rain: Nil	WD: NNE WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, residents TV 36-40 Car passing 60-88 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

### 4.3 Location NM3

Noise monitoring at location NM3 was conducted on Thursday 14 August 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna, background traffic and aircraft. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-3: Noise survey results and observations for Location NM3**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
14-08-25	10:53am to 11:08am (Day)	61.4	43	36.8	WD: 210° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, trees, wind, insects 37-44 Aircraft 45-50 Eastern whippbird 58-62 Quarry inaudible	<27	37
14-08-25	11:10am to 11:25am (Day)	59.7	42.1	37.3	WD: 210° WS: 2.3 m/s Rain: Nil	WD: WNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Birds, trees, wind, insects 37-44 Aircraft 45-50 Eastern whippbird 58-60 Quarry inaudible	<27	37
14-08-25	6:01pm to 6:16pm (Evening)	55.1	42.6	40.9	WD: n/a WS: 0 m/s Rain: Nil	WD: NW WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, frogs, birds 40-44 Quarry not operational	n/a <sup>2</sup>	35
14-08-25	6:17pm to 6:32pm (Evening)	49.3	41.8	40	WD: n/a WS: 0 m/s Rain: Nil	WD: NW WS: 2.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, frogs, birds 40-44 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

#### 4.4 Location NM4

Noise monitoring at location NM4 was conducted on Thursday 14 August 2025 with results presented in **Table 4-4**. The quarry was audible at NM4 during the day. The quarry was not operational during the evening period. The ambient noise environment was dominated by flora, fauna, aircrafts, trucks passing, and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring, except for the day period (see Footnotes 2, 3 and 4 below).

**Table 4-4: Noise survey results and observations for Location NM4**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
14-08-25	11:37am to 11:52am (Day)	69.6	52.8	47.1	WD: 180° WS: 2.9 m/s Rain: Nil	WD: NW WS: 3 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind, trees, insects 46-52 Holcim Quarry rumblings 49-51 Truck passing 58-61 Aircraft 58-69 Quarry audible	<42 <sup>2,3,4</sup>	37
14-08-25	11:59am to 12:14am (Day)	63.1	50.9	46.9	WD: 180° WS: 2.9 m/s Rain: Nil	WD: NW WS: 3.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind, trees, insects 46-52 Holcim Quarry rumblings 49-51 Truck passing 58-69 Aircraft 51-59 Quarry audible	<42 <sup>2,3,4</sup>	37
14-08-25	7:21pm to 7:36pm (Evening)	51.8	37.1	35.5	WD: n/a WS: 0 m/s Rain: Nil	WD: N WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicada, frogs 35-37 Quarry not operational	n/a <sup>5</sup>	35
14-08-25	7:37pm to 7:52pm (Evening)	45.8	36.4	35	WD: n/a WS: 0 m/s Rain: Nil	WD: NNW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicada, frogs 34-38 Quarry not operational	n/a <sup>5</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident.

<sup>3</sup> An estimated quarry contribution of 51 LAeq dBA was adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

<sup>4</sup> Moderate exceedance (NPF1 2017 – Table 4.1).

<sup>5</sup> Quarry not operational.

Location NM5

Noise monitoring at location NM1 was conducted on Thursday 14 August 2025 with results presented in **Table 4-5**. The quarry was audible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna, quarry rumblings, background traffic, motorcycles and aircrafts. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-5: Noise survey results and observations for Location NM5**

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
14-08-25	9:22am to 9:37am (Day)	52.5	39.7	36.9	WD: 24° WS: 2.5 m/s Rain: Nil	WD: S WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Trees, wind, birds, insects, cicadas 38-42 Holcim Quarry rumblings 34-36 Car passing 44-46 Quarry audible	<37	37
14-08-25	9:49am to 10:04am (Day)	55.5	39.1	35.6	WD: 24° WS: 2.5 m/s Rain: Nil	WD: ENE WS: 0.5 m/s Rain: Nil Stability Category: E <sup>1</sup>	Trees, wind, birds, insects, cicadas 38-45 Holcim Quarry rumblings 34-36 Car passing 44-46 Thunder 50-51 Quarry audible	<36	37
14-08-25	6:42pm to 6:57pm (Evening)	46.8	40	39.1	WD: n/a WS: 0 m/s Rain: Nil	WD: NW WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects, cicadas, background traffic 40-42 Quarry not operational	n/a <sup>2</sup>	35
14-08-25	6:58pm to 7:13pm (Evening)	43.2	39.9	38.9	WD: n/a WS: 0 m/s Rain: Nil	WD: N WS: 1 m/s Rain: Nil Stability Category: E <sup>1</sup>	Insects, cicadas, background traffic 39-42 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

## 5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Thursday 14 August 2025 at five locations selected as representative of the sensitive receptors surrounding Teven Quarry.

Audible noise identified as emitted from the quarry was recorded during the day monitoring periods at NM4 and NM5. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, Teven, NSW, except for NM4 which exceeded the criteria by up to 5 dBA during both day periods.

These exceedances are considered 'moderate' in the NPfI (NSW EPA, 2017). As no exceedances, determined to be attributed by Holcim, have been recorded since the third quarter of 2023 and the second quarter of 2024, it is recommended that the following 'best management practice' (BMP) be considered to reduce noise emissions from quarry operations in the future.

- using quieter plant that can complete the required task.
- restricting movement of trucks on ridgelines and exposed haul routes where their noise can propagate over a wide area, especially at night.
- scheduling the use of noisy equipment at the least-sensitive time of day.
- siting noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area; or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise.
- where there are several noisy pieces of equipment, scheduling operations so they are used separately rather than concurrently.
- keeping equipment well-maintained and operating it in a proper and efficient manner
- employing 'quiet' practices when operating equipment such as positioning idling trucks in appropriate areas.
- running staff-education programs and regular toolbox talks on the effects of noise and the use of quiet work practices.

When BMP is not effective to achieve the required noise reduction by itself, the 'best available technology economically achievable' (BATEA) approach can then be considered. Examples include:

- using equipment with efficient muffler design.
- using quieter engines, such as electric instead of internal combustion.
- fitting and maintaining noise reduction packages on plant and equipment.
- using efficient enclosures for noise sources.
- using high-pressure hydraulic systems to split rock, instead of hydraulic or pneumatic hammers.
- damping or lining metal trays or bins.

If applicable, exceedances of the noise criteria in the next round of noise monitoring will be verified and discussed further with Holcim.

## 6. References

- Holcim. (2021). *Teven Quarry Noise Management Plan*.
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- Standards Australia and Standards New Zealand. (2019). *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*.

## Appendix 1 Noise Emission Level Calculations

### NM4 day monitoring period (2:33PM to 2:48PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	51.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
<b>Distance corrected site contribution at receiver (LAeq dBA)</b>	<b>46.8</b>
Estimated additional attenuation (vegetation & ground absorption)	5
<b>Estimated site contribution at receiver (dBA)</b>	<b>41.8</b>

### NM4 day monitoring period (2:50PM to 3:05PM)

Site contribution corrected for distance from monitoring location to receiver

Noise source	Quarry contribution
Estimated site contribution (LAeq) at monitoring location (dBA)	51.0
Approx. distance from monitoring location to site (m)	310
Approx. distance from site to receiver (m)	500
<b>Distance corrected site contribution at receiver (LAeq dBA)</b>	<b>46.8</b>
Estimated additional attenuation (vegetation & ground absorption)	5
<b>Estimated site contribution at receiver (dBA)</b>	<b>41.8</b>

Intended for  
**Holcim (Australia) Pty Ltd**

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# Teven Quarry Quarterly Noise Monitoring Assessment

Quarter 4 2025

# Teven Quarry Quarterly Noise Monitoring Assessment

## Quarter 4 2025

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2025 in Teven, NSW, as part of the noise monitoring program**

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## Appendices

### Appendix 1

Sound Exposure Level and Noise Emission Level Calculations

## Abbreviations and Definitions

	Description
$\Delta T$	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmx	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
NPI	Noise Policy for Industry 2017
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023).

# 1. Overview

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- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- International Electrotechnical Commission (IEC) 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (IEC, 2017).

This NMA has been undertaken in accordance with the NMP for the quarterly period October to December 2025 and forms part of the monitoring program to determine compliance with conditions of the Development Consent.

## 1.2 Site Location and Sensitive Receivers

The quarry is in Teven, NSW, approximately 7 km west of Ballina. Sensitive receivers surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography. Five monitoring locations have been selected as part of the NMA and in accordance with the EPL and Development Consent and are shown in **Table 1-1**.

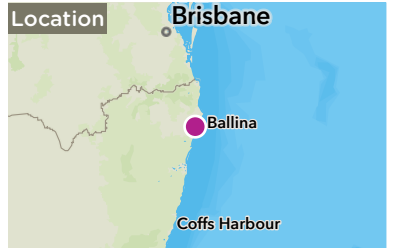
**Table 1-1: Monitoring locations locality and sensitive receptors**

Monitoring Location	Nearest Receiver	Locality and Sensitive Receivers
NM1	R7	West of the quarry situated at a rural residential property at the end of Leadbeatters Lane
NM2	R3/R4	East of the quarry situated at a rural residential property on Teven Road
NM3	R2	South of the quarry situated at a rural residential property at the end of Wellers Road
NM4	R10	North of the quarry situated at a rural residential property adjacent the site off Stokers Lane
NM5	R14	Northeast of the quarry situated at a rural residential property of Teven Road

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**.



- Legend**
- Noise monitoring location
  - Residential receiver location



**Figure 1: Noise monitoring locations at Teven Quarry**

## 2. Noise Criteria

**Table 2-1** summaries the applicable onsite noise criteria outlined in the NMP and Development Consent for residential receivers (NM1, NM2, NM3, NM4, NM5) surrounding the quarry.

**Table 2-1: Monitoring locations and noise criteria**

Receivers	Monitoring Locations	Day <sup>1</sup>	Evening <sup>2</sup>
		L <sub>Aeq</sub> (15min)	L <sub>Aeq</sub> (15min)
dB(A)			
R3, R4, R13, R15, R16, R17, R18, R20	NM2	38	35
All other receivers	NM1, NM3, NM4, NM5	37	35

<sup>1</sup> 7 am–6 pm Monday to Saturday and 8 am–6 pm Sunday and public holidays

<sup>2</sup> 6 pm–10 pm Monday to Sunday

### 3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Wednesday 12 November 2025. The acoustic instrumentation used carries current National Association of Testing Authorities (NATA) calibration and complies with *AS/NZS IEC 61672-1:2019 Class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which also carried a current NATA calibration and complies with IEC 60942:2017. Drift in calibration did not exceed  $\pm 0.3$  dBA.

Attended noise monitoring was conducted for 15-minute periods at each monitoring location over two days. As per the NMP, two sets of measurements were completed during the day, and two sets of measurements were completed during the evening, at each monitoring location. It is noted that the quarry was not operational during the evening periods, however, monitoring was conducted as per requirements of the EPL. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

#### 3.1 Meteorological conditions

Meteorology has an important influence on noise monitoring assessment. An onsite meteorological station with data recorded at 10m height has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

**Table 3-1: Classification of atmospheric stability (NSW EPA, 2014)**

Stability Classification	Pasquill Stability Category	Ambient temperature change with height ( $^{\circ}\text{C}/100\text{m}$ )
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

As stated in the Development Consent, the noise criteria in Table 2-1 applies under all meteorological conditions except the following:

- Wind speeds greater than 3m/s at 10m above ground level
- Temperature inversion conditions between 1.5 $^{\circ}\text{C}$  and 3 $^{\circ}\text{C}/100\text{m}$  and wind speed greater than 2m/s at 10m above ground level
- Temperature inversion conditions greater than 3 $^{\circ}\text{C}/100\text{m}$ .

Appendix 5 of the Development Consent also specifies that except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by a suitable meteorological station operating in the vicinity of the site.

## 4. Results and Discussion

### 4.1 Location NM1

Noise monitoring at location NM1 was conducted on Wednesday 12 November 2025 with results presented in **Table 4-1**. The quarry was inaudible at NM1 during the day. The quarry was not operational during the evening. Measured predominant ambient noise sources included background traffic, passing cars, wind, flora and fauna. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-1: Noise survey results and observations for Location NM1**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
12-11-25	9:29am to 9:44am (Day)	59.9	43.7	39.2	WD: 175° WS: 2.8 m/s Rain: Nil	WD: NW WS: 4 m/s Rain: Nil Stability Category: F <sup>1</sup>	Background traffic, wind, trees, birds 43-58 Quarry inaudible	<29	37
12-11-25	9:50am to 10:05am (Day)	60.8	45.1	40	WD: 175° WS: 2.8 m/s Rain: Nil	WD: NW WS: 4 m/s Rain: Nil Stability Category: F <sup>1</sup>	Background traffic, wind, trees, birds, cicadas 44-57 Quarry inaudible	<30	37
12-11-25	6:04pm to 6:19pm (Evening)	59.5	38	34.4	WD: 110° WS: 0.8 m/s Rain: Nil	WD: SW WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind, trees, birds, insects, cicadas 35-37 Car passing 40-45 bird 50-54 Quarry not operational	n/a <sup>2</sup>	35
12-11-25	6:21pm to 6:36pm (Evening)	56.9	40.3	34.5	WD: 110° WS: 0.8 m/s Rain: Nil	WD: SW WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Wind, trees, birds, insects, cicadas 35-40 Car passing 40-48 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

#### 4.2 Location NM2

Noise monitoring at location NM2 was conducted on Wednesday 12 November 2025 results presented in **Table 4-2**. The quarry was inaudible at NM2 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by included background traffic, wind, flora and fauna and passing cars on Teven Road. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-2: Noise survey results and observations for Location NM2**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry L <sub>Aeq</sub> (15min) Contribution	L <sub>Aeq</sub> (15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
12-11-25	1:13pm to 1:28am (Day)	84.6	58.8	44.4	WD: 161° WS: 2.8 m/s Rain: Nil	WD: NW WS: 6 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, insects 47-52 Cars passing 50-62 bird whistle 60-82 Quarry inaudible	<34	38
12-11-25	1:36pm to 1:51pm (Day)	86.3	59.7	44.4	WD: 161° WS: 2.8 m/s Rain: Nil	WD: W WS: 3 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, insects, cicadas 40-48 Cars passing 72-86 plover 60-65 Quarry inaudible	<34	38
12-11-25	8:08pm to 8:23pm (Evening)	77.6	49.8	39.9	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 40-43 Passing cars 45-77 Quarry not operational	n/a <sup>2</sup>	35
12-11-25	8:25pm to 8:40pm (Evening)	81.4	52.4	39.4	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 40-43 Passing car 54 - 81 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

### 4.3 Location NM3

Noise monitoring at location NM3 was conducted on Wednesday 12 November 2025 with results presented in **Table 4-3**. The quarry was inaudible at NM3 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated by flora, fauna and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-3: Noise survey results and observations for Location NM3**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
12-11-25	8:29am to 8:44am (Day)	53.3	41.5	39.7	WD: 172° WS: 2.8 m/s Rain: Nil	WD: NW WS: 4 m/s Rain: Nil Stability Category: F <sup>1</sup>	Background traffic, trees, wind, birds, insects 40-46 Quarry inaudible	<30	37
12-11-25	8:47am to 9:02am (Day)	55.9	41.5	38.3	WD: 172° WS: 2.8 m/s Rain: Nil	WD: NW WS: 4 m/s Rain: Nil Stability Category: F <sup>1</sup>	Background traffic, trees, wind, birds, insects 39-49 Quarry inaudible	<28	37
12-11-25	8:44pm to 8:59pm (Evening)	50	43.1	41.8	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 43-47 Quarry not operational	n/a <sup>2</sup>	35
12-11-25	9:01pm to 9:16pm (Evening)	49.7	43.5	41.5	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 43-47 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

#### 4.4 Location NM4

Noise monitoring at location NM4 was conducted on Wednesday 12 November 2025 with results presented in **Table 4-4**. The quarry was audible at NM4 during the day. The quarry was not operational during the evening period. The ambient noise environment was dominated by flora, fauna, trucks passing, site machinery and background traffic. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring, except for the day period (see Footnotes 2, 3 and 4 below).

**Table 4-4: Noise survey results and observations for Location NM4**

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq (15min) Contribution	LAeq (15min) Criteria (dBA)
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
12-11-25	11:44am to 11:59am (Day)	62.9	50.7	43.4	WD: 166° WS: 2.8 m/s Rain: Nil	WD: NW WS: 5 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, conveyor 49-59 (consistent) Truck passing 54-62 Quarry audible	<40 <sup>2,3,4</sup>	37
12-11-25	12:16pm to 12:31pm (Day)	60.9	47.5	42.1	WD: 166° WS: 2.8 m/s Rain: Nil	WD: NW WS: 7 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, insects, cicadas, loader 42-45 Wind gusts 47-50 Louder birds 45-51 Water truck 46-54 (once for 7 mins) Quarry audible	<35 <sup>2,3</sup>	37
12-11-25	7:31pm to 7:46pm (Evening)	59.1	55.2	40	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 46-58 Kookaburra 59 Quarry not operational	n/a <sup>5</sup>	35
12-11-25	7:48pm to 8:03pm (Evening)	58.6	48.3	41.3	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas 42-58 Quarry not operational	n/a <sup>5</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Monitoring was completed close to Stokers Lane at the entrance to the residence as to not disturb the resident, which places the attended noise monitoring location in direct line-of-sight of the quarry rather than near the sensitive receptor, i.e., the resident.

<sup>3</sup> An estimated quarry contribution was calculated using SEL calculations in Appendix 1. The result of the SEL calculation was then adopted for distance correction to receiver using NEL calculations in **Appendix 1**.

<sup>4</sup> Moderate exceedance (NPI 2017 – Table 4.1).

<sup>5</sup> Quarry not operational.

#### 4.5 Location NM5

Noise monitoring at location NM1 was conducted on Wednesday 12 November 2025 with results presented in **Table 4-5**. The quarry was inaudible at NM5 during the day. The quarry was not operational during the evening. The ambient noise environment was dominated flora, fauna, passing cars and aircrafts. The results satisfy the established noise criteria and indicate that noise emissions from Teven Quarry did not contribute to noise nuisance at the time of the monitoring.

**Table 4-5: Noise survey results and observations for Location NM5**

Date	Time (hrs)	Descriptor (dBA)			Meteorology (Handheld at microphone height)	Onsite Met Station (at 10m)	Apparent Noise Source, Description and SPL (dBA)	Teven Quarry LAeq(15min) Contribution	LAeq(15min) Criteria
		L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>A90</sub>					
12-11-25	10:36am to 11:01am (Day)	61.8	47.6	43.3	WD: 164° WS: 2.8 m/s Rain: Nil	WD: NW WS: 3 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, insects 45-58 Quarry inaudible	<33	37
12-11-25	11:04am to 11:19am (Day)	61	47.6	42.5	WD: 164° WS: 2.8 m/s Rain: Nil	WD: NW WS: 2 m/s Rain: Nil Stability Category: F <sup>1</sup>	Wind, trees, birds, insects 45-52 Strong wind gusts 54-60 Quarry inaudible	<33	37
12-11-25	6:54pm to 7:09pm (Evening)	53.3	38.5	35.5	WD: 100° WS: 0.8 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas, birds 36-40 Passing car 45-50 Quarry not operational	n/a <sup>2</sup>	35
12-11-25	7:10pm to 7:25pm (Evening)	52.2	44.3	38.4	WD: 100° WS: 0.8 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: Nil Stability Category: E <sup>1</sup>	Background traffic, insects, cicadas, birds 36-40 Power tools 40-45 Aircraft 42-51 Quarry not operational	n/a <sup>2</sup>	35

<sup>1</sup> Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

<sup>2</sup> Quarry not operational.

## 5. Conclusion

This NMA completed by Ramboll at the Holcim Teven Quarry, Teven, NSW as a quarterly requirement of the NMP. Noise monitoring was completed on Wednesday 12 November 2025 at five locations selected as representative of the sensitive receptors surrounding Teven Quarry.

Audible noise identified as emitted from the quarry was recorded during the day monitoring periods at NM4. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Teven Quarry, except for NM4 which exceeded the criteria by up to 3 dBA for one day period.

This exceedance is considered 'moderate' in the NPfI (NSW EPA, 2017). Subsequently, potential specific recommended noise management measures are as follows:

- Keeping equipment well-maintained and operating it in a proper and efficient manner. Regular maintenance prevents vibrations and rattling noises.
- Running staff-education programs and regular toolbox talks on the effects of noise and the use of quiet work practices – this is a typical measure for most industries.
- Loading techniques and considering height of material falling from the loader into the trucks during loading.
- Using 'smart' or broadband reversing alarms instead of tonal alarms, if not already.
- Using efficient enclosures for noise sources, e.g., the crushers and screeners which can contribute to the noise during loading activities.

For more significant noise reduction, permanent noise barriers or enclosures are recommended along the northern boundary of the site. These structures are lined with sound-absorbing materials and can reduce noise emissions more effectively than stockpiled material.

If applicable, exceedances of the noise criteria in the next round of noise monitoring will be verified and discussed further with Holcim.

## 6. References

- Holcim. (2021). *Teven Quarry Noise Management Plan*.
- IEC. (2017). *International Electrotechnical Commission. 60942:2017 Electroacoustics - Sound calibrators*.
- Minister for Planning and Environment. (2015). *Development Consent SSD\_6422, Teven Quarry Project*.
- NSW EPA. (2014). *Discussion Paper. Validation of Inversion Strength Estimation Method*.
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- NSW EPA. (2021). *Environment Protection Licence number 3293*.
- NSW EPA. (2023). *Noise Guide for Local Government*.
- Standards Australia. (2018). *AS 1055:2018 Acoustics—Description and measurement of environmental noise*.
- Standards Australia and Standards New Zealand. (2019). *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*.

## Appendix 1 Sound Exposure Level and Noise Emission Level Calculations

**NM4 day monitoring period (11:44AM to 11:59AM)**

<b>Holcim Conveyor</b>	
measurement duration (s)	536
measured LAeq (dB)	54
<b>Calculated Sound Exposure Level (dB)</b>	<b>81</b>
number of events in 15 minute period	1
<b>Total LAeq (15min)</b>	<b>52</b>

**NM4 day monitoring period (12:16PM to 12:31PM)**

<b>Holcim Water Truck</b>	
measurement duration (s)	420
measured LAeq (dB)	50
<b>Calculated Sound Exposure Level (dB)</b>	<b>76</b>
number of events in 15 minute period	1
<b>Total LAeq (15min)</b>	<b>47</b>

### NM4 day monitoring period (11:44AM to 11:59AM)

Site contribution corrected for distance from monitoring location to receiver

Holcim Conveyor	
estimated site contribution (LAeq) at monitoring location (dBA)	52.0
approximate distance from monitoring location to site (m)	310
approximate distance from site to receiver (m)	500
<b>Distance Corrected Site Contribution at Receiver (LAeq dBA)</b>	<b>47.8</b>
estimated additional attenuation (vegetation & ground absorption)	8
<b>Estimated Site Contribution at Receiver (dBA)</b>	<b>39.8</b>

### NM4 day monitoring period (12:16PM to 12:31PM)

Site contribution corrected for distance from monitoring location to receiver

Holcim Water Truck	
estimated site contribution (LAeq) at monitoring location (dBA)	47.0
approximate distance from monitoring location to site (m)	310
approximate distance from site to receiver (m)	500
<b>Distance Corrected Site Contribution at Receiver (LAeq dBA)</b>	<b>42.8</b>
estimated additional attenuation (vegetation & ground absorption)	8
<b>Estimated Site Contribution at Receiver (dBA)</b>	<b>34.8</b>