

East Guyong Quarry noise and blast monitoring

Quarter 4 - 2022

Prepared for Hanson Australia Pty Ltd

January 2023

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Hanson Australia Pty Ltd

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6 December 2022

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1 Introduction

EMM Consulting Pty Ltd (EMM) has been commissioned by Hanson Construction Materials Pty Ltd (NSW) (Hanson) to complete quarterly noise monitoring for the East Guyong Quarry, as required by the site's approved Noise Management Plan. The quarry is located approximately 22 km southeast of Orange, NSW. Operator-attended noise monitoring was undertaken on 24 November 2022.

The following material was referenced as part of this assessment:

- Environment Protection Authority (EPA), *Industrial Noise Policy* (INP) 2000;
- Environment Protection Authority (EPA), *Industrial Noise Policy - Application notes* 2017;
- Environment Protection Authority (EPA), *Noise Policy for Industry* (NPfI) 2017;
- Environment Protection Authority (EPA), *Approved methods for the measurement and analysis of environmental noise in NSW* 2022; Hanson Construction Materials and R. W. Corkery & Co Pty Limited (RWC), *Noise Management Plan for the East Guyong Quarry* (NMP) – Mod 2 Revision, July 2019;
- Department of Planning and Infrastructure (DP&I), *East Guyong Quarry Project Modification (06_0193 MOD 1) approval* (PA) 2012; and
- Australian and New Zealand Environment Council (ANZEC) 1990, *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*.

Analysis of data from five blast events that occurred on 5 July, 19 July, 11 August, 1 September, 29 September, 17 October and 10 November has also been included in this report.

Several technical terms are discussed in this report and are explained in Appendix A.

2 Methodology

2.1 Site operations

At the time of the attended noise monitoring on 24 November 2022, the quarry's activities comprised of the following:

- dump truck and excavator operating in extraction pit;
- crusher and screen plant processing material;
- sales front end loader (FEL) operating in stockpile area (model CAT980H);
- excavator in the stripping area;
- maintenance and repairs across site machinery; and
- heavy vehicle movements/sales.

The quarry's approved hours of operation are:

- Monday to Friday (non-daylight savings) from 6 am to 6 pm;
- Monday to Friday (daylight savings) from 6 am to 8 pm; and
- Saturdays from 7 am to 1 pm.

Material crushing and screening currently occurs on site from Monday to Thursday. This restriction to approved hours is an operational decision by the quarry and aids in the planning for maintenance and repairs.

2.2 Noise monitoring

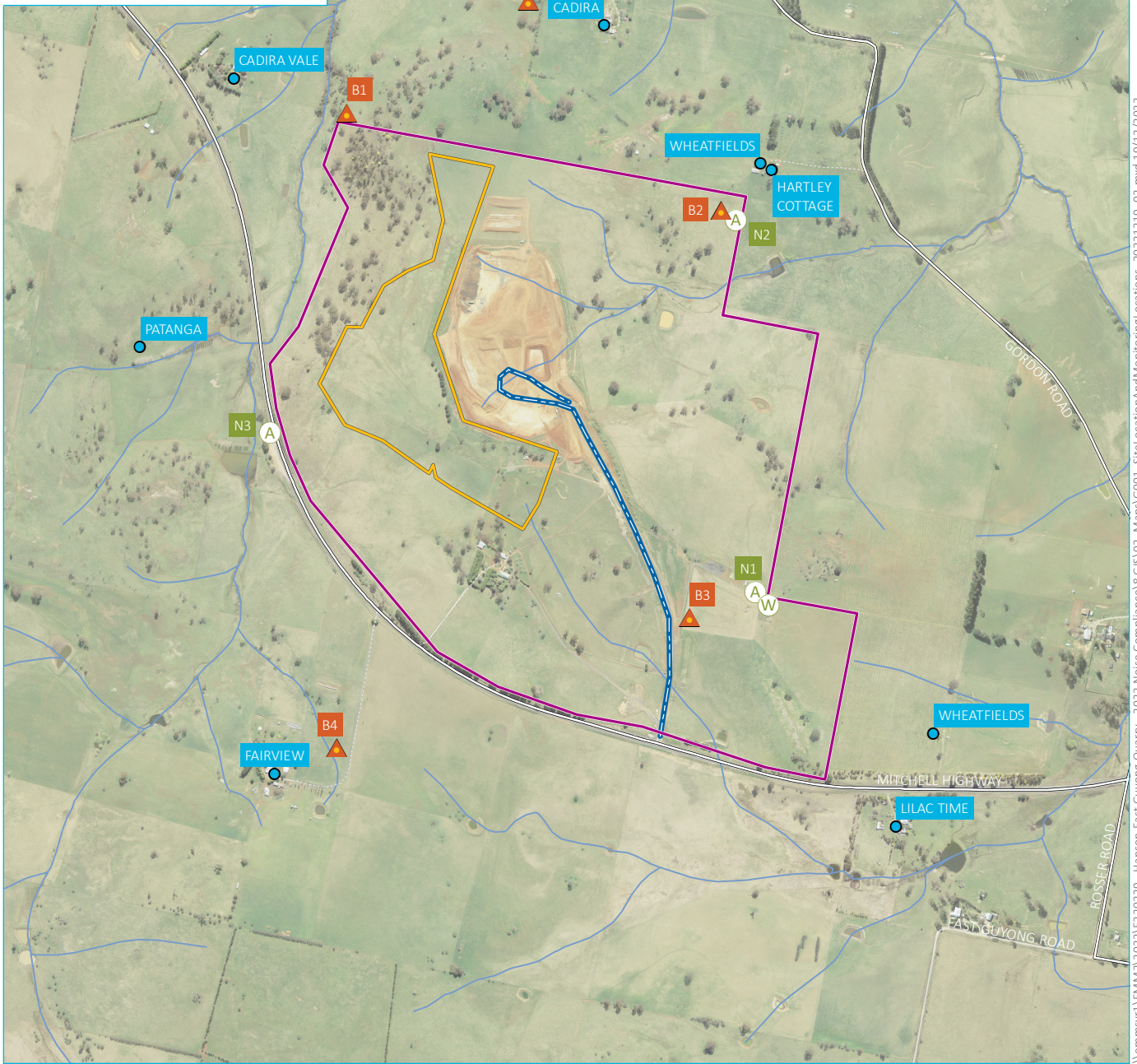
Operator-attended 15-minute noise measurements were conducted at locations N1 and N2, as shown in Figure 2.1, when the quarry was in full operation. The operator quantified the contribution of each significant quarry noise source where possible. Noise monitoring was conducted in general accordance with the INP and Australian Standard AS 1055-2018 *Acoustics - Description and Measurement of Environmental Noise - General Procedures*.

A Svantek 979 sound analyser (s/n 21095) was used for the noise monitoring. The sound analyser was calibrated before and after the completion of the surveys using a Svantek SV36 calibrator (s/n 86311). The instruments were within a current NATA calibration period at the time of the noise monitoring and relevant certificates are provided in Appendix B.

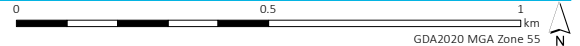
2.3 Assessment locations

The noise monitoring included four 15-minute operator-attended noise measurements during the daytime period on 24 November 2022 to quantify noise emissions from the quarry at locations N1 and N2. Noise monitoring was not conducted prior to 7 am as the quarry was not in operation.

Locations N1 and N2 are near the south-east and north-east boundaries of the site, respectively. Location N1 is approximately 500 m from "Wheatfields", the closest residence situated south-east of the quarry. Location N2 is approximately 150 m from "Hartley Cottage", the closest residence situated north-east of the quarry. These monitoring locations were selected to not inconvenience surrounding residents and are consistent with the approved Noise Management Plan for the East Guyong Quarry (RWC, 2019). Monitoring at these locations, rather than at the residences, also provides a better opportunity to quantify site related noise since they are closer to the operations.



Source: EMM (2022); ABS (2021); DFSI (2020, 2021); GA (2011)



KEY

- Site boundary
- Extraction area boundary
- ▲ Blast monitoring location
- Residences
- A Attended noise monitoring location
- W Weather station
- Transport route
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

INSET KEY

- Major road
- NPWS reserve
- State forest

Site location and monitoring plan

East Guyong Quarry
Noise and blast monitoring
Figure 2.1



\\emmsvr1\EMM\2022\E220229 - Hanson East Guyong Quarry - 2022 Noise Compliance\GIS\02_Maps\G001_SiteLocationAndMonitoringLocations_20221219_02.mxd 19/12/2022

3 Criteria

3.1 Operational noise

Condition 3(5) of PA 06_0193 states that the noise assessment criteria are $L_{Aeq,15\text{ minute}}$ 35 dB at any residence for all assessment periods. The exception is the "Fairview" residence which has a daytime criterion of $L_{Aeq,15\text{ minute}}$ 36 dB. In accordance with the PA 06_0193, "Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy."

As per Condition 3(5) of PA 06_0193, to demonstrate compliance at residential locations, the noise monitoring results are to be assessed against the following (intermediate) noise criteria for monitoring locations N1 and N2:

- N1 - $L_{Aeq,15\text{ minute}}$ 43 dB; and
- N2 - $L_{Aeq,15\text{ minute}}$ 50 dB.

It is stated in the NMP that by satisfying criteria at these intermediate locations, quarry noise at neighbouring residences would also satisfy residential criteria. This assumes the presence of soil and product stockpiles, bunding and intervening topography between the site and surrounding residences, which provide some degree of attenuation of site noise.

Further to the above, section 11.1.3 of the INP identifies that a development is deemed to be in non-compliance if the monitored noise levels from the development are more than 2 dB above the statutory limit.

It is relevant to note that the INP was superseded by the NSW EPA's Noise Policy for Industry (NPfI) in 2017 with the latter affording all industrial sites with a minimum daytime intrusiveness noise target of 40dB $L_{Aeq,15\text{ minute}}$. Hence, the current condition on noise (35dB $L_{Aeq,15\text{ minute}}$) in the site's PA 06_0193 is highly conservative compared to contemporary government policy.

3.2 Low frequency noise criteria

Section 11.2.3 of the NMP states that modification factors in Section 4 of the INP (EPA 2000) should be applied to the measured noise levels where applicable. The INP application notes state that Section 4 of the INP has been withdrawn and the modifying factor adjustments outlined in Fact Sheet C of the NPfI are to be used when assessing the characteristics of a noise source

Assessment and reporting of modifying factors has been undertaken in accordance with Fact Sheet C of the NPfI.

This method has been applied to this assessment as presented in Section 4.

It is of note that the NPfI (EPA 2017) states that low-frequency noise corrections only apply under the standard and/or noise-enhancing (ie applicable) meteorological conditions.

3.3 Blast monitoring

Blast overpressure and vibration monitoring is managed by Hanson for all blast events. Blast overpressure and ground vibration are monitored at three locations within or at the site's boundary as well as two locations outside of the site's boundary (one south of the Mitchell Highway near the Fairview property and one north of the site near the Cadira property). Monitoring locations are situated closer to blasting locations than the residential structures (refer to Figure 1), and therefore overpressure and vibration levels would likely be lower at the actual residential dwellings than those measured.

Blast emissions criteria for the quarry apply at any residence on privately-owned land surrounding the site and are presented in Table 3.1.

Table 3.1 **Blast overpressure and vibration criteria**

Location	Airblast overpressure criteria (dB (Linear Peak))	Ground vibration criteria (mm/s (Peak velocity))	Allowable exceedance
Any privately-owned residence surrounding the site.	115	5	5% of the total number of blasts in a 12-month period
	120	10	0%

4 Results

4.1 Noise monitoring results

Noise monitoring results for locations N1 and N2 are presented in Table 4.1. Data recorded by the site's weather station (shown in Figure 1) was used to identify weather conditions during the monitoring period and to determine the applicability of noise limits. Wind speed and direction observations are presented in Table 4.1.

Wind speed averages were mostly above 3 m/s (at 10 m above ground) and there was no rain during all measurements at N1 and N2. The noise limits were not applicable during 3 of 4 measurements due to wind conditions. Low frequency noise modifying factors, in accordance with fact sheet C2 of the NPfl (EPA 2017), did not apply to measured site contributions at N2 as measured noise levels did not exceed the relevant LFN thresholds. Given that East Guyong Quarry was not audible during measurements at N1, LFN modifying factors were not applied to site noise levels at N1. All quarry contributions measured at locations N1 and N2 would have satisfied the relevant noise criteria as per the NMP, had they applied. Location N2 was subject to noise enhancing meteorological conditions (ie source to receiver winds) and still satisfied relevant noise criteria. It is therefore expected that relevant criteria for surrounding residential receivers would also have been satisfied.

Based on the preceding information, noise levels from the quarry satisfy the relevant residential criteria at all assessment locations identified in Condition 3(5) of PA_0193.

Table 4.1 Attended noise monitoring summary – 24 November 2022

Location	Start time	Attended noise monitoring results dB						NMP Criteria dB	Meteorological conditions ¹		Criteria Applies? (Y/N)	Exceedance	Comments
		Total measured			Site contribution				Wind speed (m/s)	Wind direction ²			
		L _{Amin}	L ₉₀	L _{Aeq}	L _{Amax}	LFN mod. factor	L _{Aeq}						
N2	10:35 am	38	41	45	67	Nil	43	50	3.8	213	N	N/A	Site audible throughout including engine revs, FEL managing the stockpile/dropping material, trucks being loaded, excavator in the stripping area, and consistent noise from the crusher. Other sources included occasional traffic noise from Mitchell Highway, and frequent noise from birds.
N2	10:53 am	39	41	45	59	Nil	44	50	3.9	227	N	N/A	Site audible throughout including engine revs, trucks being loaded, FEL managing the stockpile, excavator in the stripping area, and consistent noise from the crusher. Other sources included frequent noise from birds, and occasional noise from the Mitchell Highway.
N1	11:28 am	34	37	42	56	Nil	IA	43	3.5	190	N	N/A	Site inaudible. It is noted that total LAeq (all sources) is lower than the criteria. Traffic noise from Mitchell Highway was dominant. Other sources include frequent noise from birds.
N1	11:43 am	34	38	43	59	Nil	IA	43	2.9	241	Y	N/A	Site inaudible. It is noted that total LAeq (all sources) is equal to the criteria. Traffic noise from Mitchell Highway was dominant. Other sources include frequent noise from birds.

- Notes:
1. Meteorological data was obtained from the site weather station at a height of 10 m above ground.
 2. Wind direction reported in degrees from north (0°)
 3. N/A = Not Applicable.
 4. IA = inaudible.

4.2 Blast overpressure and ground vibration

Seven blast events occurred at the quarry since the last quarterly noise monitoring in June 2022. The blast overpressure and vibration monitoring results were provided by Hanson and are presented in Table 4.2. The monitoring results show the relevant criteria were satisfied at all monitoring locations (refer to Figure 1).

Table 4.2 Blast emissions monitoring results

Date	Monitoring location	Airblast overpressure level (dB(Linear Peak))		Ground vibration - Peak particle velocity (mm/s)	
		Measured	Criteria ²	Measured	Criteria ²
05/07/2022	B1	110.4	115	0.22	5
	B2	98.9	115	1.45	5
	B3	95.9	115	0.58	5
	B4	100.9	115	0.54	5
	B5	98.9	115	1.45	5
19/07/2022	B1	113	115	0.52	5
	B2	100.2	115	0.56	5
	B3	101.9	115	0.24	5
	B4	103.1	115	2.16	5
	B5 ¹¹	-	115		5
11/08/2022	B1	103.7	115	0.67	5
	B2	105.9	115	0.97	5
	B3 ¹	-	115	-	5
	B4 ¹	-	115	-	5
	B5	106	115	1.36	5
01/09/2022	B1	105.1	115	0.87	5
	B2	114.9	115	1.75	5
	B3 ¹	-	115	-	5
	B4 ¹	-	115	-	5
	B5	112.3	115	1.8	5
29/09/22	B1	107.4	115	0.69	5
	B2 ¹	-	115	-	5
	B3 ¹		115	-	5
	B4	108	115	1.87	5
	B5 ¹	-	115	-	5
17/10/22	B1	107.2	115	1.28	5

Table 4.2 Blast emissions monitoring results

Date	Monitoring location	Airblast overpressure level (dB(Linear Peak))		Ground vibration - Peak particle velocity (mm/s)	
		Measured	Criteria ²	Measured	Criteria ²
	B2 ¹	-	115	-	5
	B3 ¹	-	115	-	5
	B4 ¹	-	115	-	5
	B5	107.9	115	1.09	5
10/11/22	B1 ¹	-	115	-	5
	B2 ¹	-	115	-	5
	B3 ¹	-	115	-	5
	B4 ¹	-	115	-	5
	B5	102.9	115	0.09	5

Notes: 1. There was no trigger for this blasting event.
 2. Criteria applies at the nearest residential location and not at the monitoring location.

5 Conclusion

EMM has completed an assessment of noise and blasting emissions from East Guyong Quarry operations. Noise monitoring was undertaken at locations around the site on 24 November 2022 as required by, and in accordance with, the site's approved NMP.

Noise limits were not applicable for 3 out of 4 measurements due to wind speeds greater than 3m/s. The results demonstrated that the received site noise levels at all monitoring locations satisfied the relevant noise criteria as per the PA_0193 and in accordance with the NMP for the East Guyong Quarry, had they applied. Location N2 monitoring was subject to noise enhancing meteorological conditions (ie source to receiver winds) and still satisfied relevant noise criteria. Therefore, it is concluded that noise levels from quarry operations would have satisfied the relevant criteria at all assessment locations identified in Condition 3(5) of PA_0193 if applicable meteorological conditions occurred at the time of measurement.

The blast overpressure and ground vibration monitoring results satisfied the relevant criteria at all monitoring locations for the seven blast events that occurred since the previous quarterly noise monitoring.

Appendix A

Glossary of acoustic terms

A number of technical terms are required for the discussion of noise. These are explained in Table A.1.

Table A.1 Glossary of acoustic terms

Term	Description
dB	Noise is measured in units called decibels (dB).
A-weighting	There are several scales for describing noise, the most common being the 'A-weighted' scale. This is an adjustment made to sound-level measurement to approximate the response of the human ear.
C-weighting	This is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.
L _{A90}	Commonly referred to as the background noise level. The A-weighted noise level exceeded 90% of the time.
L _{Aeq}	The A-weighted, energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The L _{Aeq} (15-min) descriptor refers to an L _{Aeq} noise level measured over a 15-minute period.
L _{Amax}	The A-weighted maximum root mean squared sound pressure level received during a measuring interval.
Day period	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening period	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night period	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 pm.
L _{peak}	The maximum instantaneous sound pressure during a measurement period or noise event.
PPV	The greatest instantaneous particle velocity during a given time interval.

It is useful to have an appreciation of decibels, the unit of noise measurement. Table A.2 gives an indication as to what an average person perceives about changes in noise levels:

Table A.2 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
1 to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times (or quarter) as loud

Examples of common noise levels are provided in Figure A.1.

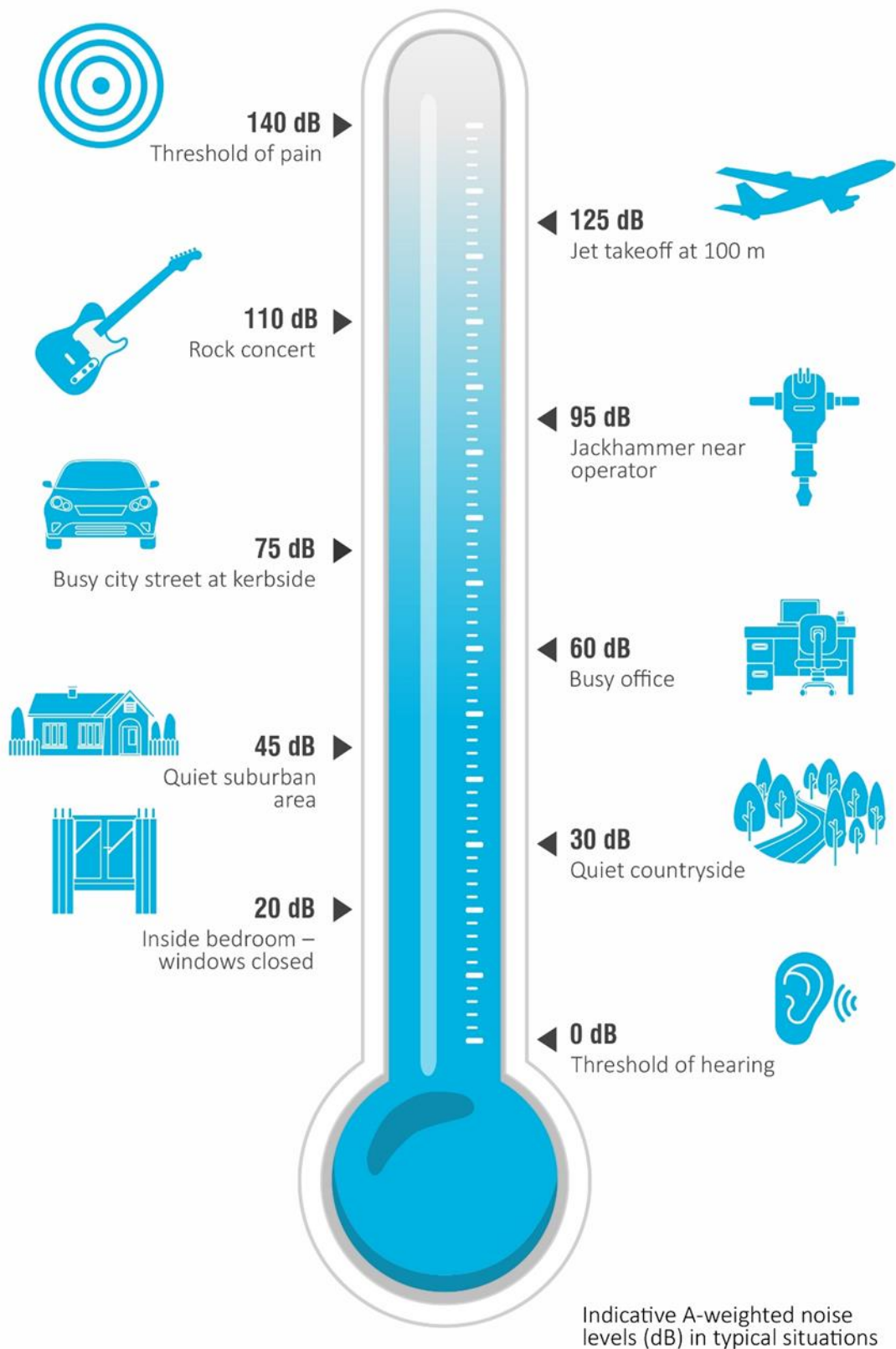


Figure A.1 Common noise levels

Appendix B

Calibration certifications

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM32962**

EQUIPMENT TESTED: Sound & Vibration Analyzer

Manufacturer: Svantek
Type No: Svan-979 **Serial No:** 21095
Mic. Type: 40AE **Serial No:** 120711
Pre-Amp. Type: SV17 **Serial No:** 25110
Filter Type: 1/3 Octave **Test No:** F032963

Owner: EMM Consulting Pty Ltd
L 13, 175 Scott Street
Newcastle, NSW 2300

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1008 hPa ±1 hPa	Date of Receipt :	22/06/2022
Temperature	22 °C ±1° C	Date of Calibration :	22/06/2022
Relative Humidity	41 % ±5%	Date of Issue :	23/06/2022

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: **AUTHORISED SIGNATURE:**
Hein Soc

Accredited for compliance with ISO/IEC 17025 - Calibration
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Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C30881

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV-36 Serial No: 86311
Owner: EMM Consulting
Suite 01, 20 Chandos St
St Leonards NSW 2065

Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.05 dB	999.99 Hz	1.00 %
Level2:	NA	N	114.05 dB	999.99 Hz	1.00 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %

Uncertainty (at 95% c.l.) k=2

CONDITION OF TEST:

Ambient Pressure 1002 hPa ±1 hPa Date of Receipt : 20/10/2021
Temperature 23 °C ±1° C Date of Calibration : 20/10/2021
Relative Humidity 41 % ±5% Date of Issue : 20/10/2021

Acu-Vib Test AVP02 (Calibrators)
Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY:  AUTHORIZED SIGNATURE: 
Jack Kiehl

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