



ENVIRONMENTAL NOISE MONITORING

Brandy Hill Quarry, Seaham

FINAL

May 2018



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Prepared by Umwelt (Australia) Pty Limited on behalf of Hanson Construction and Building Materials

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1.0 Introduction

Hanson Construction Materials Pty Ltd (Hanson) engaged Umwelt Australia Pty Limited (Umwelt) to undertake noise monitoring of noise emissions from the Brandy Hill Quarry (the site), located off Seaham Road, in Seaham NSW (refer to **Figure 1.1**).

This Noise Monitoring Report has been prepared by Umwelt on behalf of Hanson as part of the ongoing noise monitoring and reporting requirements under the Environment Protection Licence (EPL) for the site.

1.1 Scope

The noise monitoring and reporting requirements for the site are outlined in the EPL 1879.

This report presents the results of the April 2018 noise monitoring undertaken as part of the ongoing noise monitoring program for the site.

A glossary of terms and abbreviations used in this report is provided in **Appendix 1**.



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FIGURE 1.1 Locality Plan



2.0 Assessment Criteria

2.1 Hanson Construction Materials Pty Ltd, Seaham

The noise impact assessment criteria for the Hanson Seaham Quarry, off Seaham Road, Seaham, are specified in EPL 1879. The noise impact assessment criteria (refer to **Table 2.1**) relate only to the noise contribution from the quarry.

The meteorological conditions under which the noise impact assessment criteria apply are specified in EPL 1879 are summarised in **Table 2.2**.

Table 2.1	Noise Impact Assessment Criteria from EPL 1879 for the Hanson Seaham Qu	Jarry, dB(A)
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Location as described in EPL 1879	Day/Evening/Night ¹ LAeq, 15 min	Night time ¹ LA1, 1 min
R1 – Giles Road, Seaham	36	45
R2 – Brandy Hill Drive, Seaham	36	45
R3 – Mooghin Road, Seaham	36	45
All other noise receiver locations	36	45

1 Day time period is defined as 7.00 am to 6.00 pm Monday to Saturday and 8.00 am to 6.00 pm Sundays and Public Holidays. Evening period is defined as 6.00 pm to 10.00 pm. Night time period is defined as 10.00 pm to 7.00 am Monday to Saturday and 10.00 pm to 8.00 am Sundays and Public Holidays.

Table 2.2 Meteorological Conditions under which the Noise Criteria apply

Parameter	EPL 1879
Rain	Not during rain or hail
Wind speed at microphone	≤ 5m/s
Wind speed at 10 m	≤ 3 m/s
Temperature inversion and/or atmospheric stability ¹	Stability category F and wind speed ≤ 2m/s at 10 m height Stability category G (no wind specified)
Meteorological Data	Data recorded by the Bureau of Meteorology (BoM) Tocal Automatic Weather Station

1 If atmospheric stability category G is measured at any time during the noise monitoring, then it is assumed that the temperature inversion is > 3°C/100m, else it is assumed that the temperature lapse rate is ≤ 3°C/100m for the entire monitoring period



3.0 Compliance Assessment Methodology

The compliance assessment process addresses compliance with the noise impact assessment criteria (**Table 2.1**) and is only undertaken for periods during which the meteorological conditions are consistent with those under which the criteria apply (refer to **Table 2.2**). Attended noise monitoring has been used to quantify and describe the acoustic environment around the quarry. The compliance assessment methodology involved the following activities:

- Attended noise monitoring surveys at each of the monitoring locations, R1 and R3, during the nighttime period and where required the day period to measure the ambient noise levels in the surrounding region and to assess the site contributions (reported as LAeq, 15 minute) to the measured noise levels.
- An unattended noise monitoring survey at monitoring location R2 during the night-time period and where required the day period to measure the ambient noise levels in the surrounding region and to assess the site contributions (reported as LAeq, 15 minute) to the measured noise levels.
- Comparison of the attended noise monitoring results with the relevant noise impact assessment criteria to assess compliance of the site operations with the EPL criteria.
- Comparison of the LA1, 1 minute night-time attended noise monitoring results with the night-time sleep disturbance criteria outlined in the EPL criterion.



4.0 Noise Monitoring

4.1 Noise Monitoring Program

The attended and unattended noise monitoring for the site is conducted in accordance with the NSW Environment Protection Authority (EPA) *Industrial Noise Policy* (INP) (2000) guidelines and the *Australian Standard AS1055-1997, Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures.*

The purpose of the noise surveys is to quantify and describe the ambient noise environment in the region surrounding the site and to estimate the contribution of quarry-related activities to the ambient noise levels.

Attended noise monitoring was undertaken at locations R1 and R3, presented in **Table 4.1** and **Figure 4.1** and provides the following noise-related information:

- noise data that will assist in identifying noise contributions from the site
- noise data that is representative of noise levels at receivers within the localised area
- reference noise data that will assist in determining compliance at other receiver locations.

Unattended noise monitoring was also undertaken at location R2. The results of the attended monitoring at the other locations were used to assess the monitoring results at this location.

Table 4.1	Attended and	unattended	Noise	Monitoring	Locations
	Attenueu unu	anattenaca	110150	i i i i i i i i i i i i i i i i i i i	Locations

Monitoring Location	Monitoring type	Description
N1	Attended	R1 – Giles Road, Seaham
N2	Unattended	R2 – Brandy Hill Drive, Seaham
N3	Attended	R3 – Mooghin Road, Seaham

During the attended monitoring sessions at N1, noise measurements are taken with a Larson Davis LD831 Precision Integrating Sound Level Meter (Serial Number 4379) which is calibrated on site using a Svantek SV 35A Class 1 Acoustic Calibrator (Serial Number 64069). The noise meter is run using three measurement profiles, Z Weighting (linear), C Weighting and A Weighting and records A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period.

During the attended monitoring sessions at N3, noise measurements are taken with a Svantek 959 noise and vibration analyser (Serial Number 12918) which is calibrated on site using a Brüel and Kjær Type 4231 Noise Meter Calibrator (Serial Number 2130702). The noise meter is run using three measurement profiles (Linear, C Weighting and A Weighting) and records A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period.

During the attended monitoring sessions the operator maintains a log of noise-related events that occur including various noise sources contributing to the ambient noise environment. Particular attention is paid to the contribution of the operations associated with the site.



Unattended noise monitoring was undertaken at location R2, presented in **Table 4.1** and **Figure 4.1** and provides the following noise-related information:

- noise data that will assist in identifying noise contributions from the site
- noise data that is representative of noise levels at receivers within the localised area

During the unattended monitoring session at N2, noise measurements are taken with an Acoustic Research Labs Pty Ltd (ARL), Type Ngara S-Pack Environmental Noise Logger (Serial Number 878021) which is calibrated on site using a Brüel and Kjær Type 4231 Noise Meter Calibrator (Serial Number 2130702). The noise meter is run using three measurement profiles (Z Weighting, C Weighting and A Weighting) and records A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period.

Meteorological data for the attended monitoring periods is collected from the Bureau of Meteorology's (BoM) Tocal Automatic Weather Station (Station IDN 60801) as required in EPL 1879, in order to confirm compliance with the requirements shown in **Table 2.2** (except for wind speed at the microphone location).

At location N1, Kestrel 4500 weather monitor (Serial Number 658027), positioned within 5 metres and at a corresponding height to the noise monitoring microphone (approximately 1.3 metres from the ground) was used to determine the wind speed at the microphone height, to confirm compliance with the requirements for wind speed at the microphone location at N2 shown in **Table 2.2**.





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Legend

O Noise Monitoring Location

FIGURE 4.1

Noise Monitoring Locations



4.2 Attended Noise Monitoring Results for April 2018

Attended noise monitoring sessions, comprising of night and day time assessment periods, were conducted at locations N1 and N3 (refer to **Table 4.1** and **Figure 4.1**) during April 2018 assessment period.

The monitoring results at locations N1 and N3 are presented graphically in **Appendix 2** and **Appendix 4**, respectively and includes:

- the recorded A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period
- the results of a 1000 Hz low pass filter at 1 second intervals over the 15 minute measurement period
- an assessment of the maximum LA1,1minute noise level recorded over the 15 minute measurement period
- the LAeq, 15 minute, LA10, 15 minute and LA90, 15 minute noise levels for the 15 minute measurement period
- operator comments regarding any extraneous noise sources contributing to the ambient noise levels.

4.3 Unattended noise monitoring results for April 2018

Unattended noise monitoring sessions, comprising of night and day time assessment periods, was conducted at location N2 (refer to **Table 4.1** and **Figure 4.1**) during April 2018 assessment period.

The monitoring results at location N2 are presented graphically in **Appendix 3** and includes:

- the recorded A-weighted 1/3 octave noise levels at 1 second intervals over a 15 minute measurement period
- an assessment of the maximum LA1,1minute noise level recorded over the 15 minute measurement period
- the LAeq, 15 minute, LA10, 15 minute and LA90, 15 minute noise levels for the 15 minute measurement period
- operator comments regarding any extraneous noise sources contributing to the ambient noise levels.

4.4 Monitoring Results Summary

The results of the noise monitoring session, presented in **Appendices 2, 3** and **4** indicate that under the meteorological conditions at the time of monitoring:

- The site was compliant at all monitoring locations during April 2018 monitoring sessions with their respective night time LAeq, 15 minute noise assessment criteria.
- The site was compliant at all monitoring locations during the April 2018 monitoring sessions with the LA1, 1 minute noise assessment criteria.

The noise impact assessment criteria for the sites are summarised in **Table 2.1**.



5.0 Statement of Compliance

5.1 Hanson Construction Materials Pty Ltd, Seaham

The results of the Hanson Seaham Quarry noise monitoring program for April 2018 have been assessed against the noise impact assessment criteria in the project related EPL 1879, for meteorological conditions identified in the relevant consents and licence.

Results of the attended noise monitoring program conducted during April 2018 showed that the site was complying with the relevant noise assessment criteria for each monitoring period, for the meteorological conditions experienced at the time of monitoring.



6.0 References

Environmental Protection Licence 1879, NSW EPA (Licence version date 25 May 2017)

Australian Standard AS1055-1997. *Acoustics – Description and Measurement of Environmental Noise, Part 1 General Procedures*.

NSW Environment Protection Authority, 2000. New South Wales Industrial Noise Policy.

NSW Environment Protection Authority, 2007. Noise Policy for Industry.





Appendix 1 - Glossary and Abbreviations

Abbreviation	Description
1/3 Octave	Single octave bands divided into three parts.
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment background level – A single-figure background noise level representing each assessment period – day, evening and night (that is, three assessment background levels are determined for each 24 hour period of the monitoring period). It is determined by taking the lowest 10th percentile of the L90 level for each assessment period.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A-Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dB(A), dBA	Decibels A-weighted.
dB(L), dB(Lin)	Decibels Linear or decibels Z-weighted.
Decibel (dB)	The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second – one oscillation per second equals 1 hertz.
LA10	The percentile sound pressure level exceeded for 10 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source.
LA90	Background Noise Level. The percentile sound pressure level exceeded for 90 per cent of the measurement period with 'A' frequency weighting calculated by statistical analysis.
LAmax	The maximum of the sound pressure levels recorded over an interval of one second.
LA1,1minute	The measure of the short duration high-level noises that cause sleep arousal. The noise level is measured as the percentile sound pressure level that is exceeded one per cent of measurement period with 'A' frequency weighting calculated by statistical analysis during a measurement time interval of one minute.
LAeq,t	Equivalent continuous sound pressure level – The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. Usually measured in dB with 'A' weighting.
LAn	Percentile level – A measure of the fluctuation of the sound pressure level which is exceeded 'n' per cent of the observation time.
RBL	Rating background level – The overall single figure background level representing each assessment period over the whole monitoring period determined by taking the median of the ABLs found for each assessment period.
SPL (dBA)	Noise: Sound pressure level – The basic measure of noise loudness. The level of the root-mean-square sound pressure in decibels given by: $SPL = 10 \log_{10} (p/p_0)^2$ where p is the rms sound pressure in pascals and p ₀ is the sound reference pressure at 20 µPa. decibels.
SWL	Sound power level – a measure of the energy emitted from a source as sound and is given by: $SWL = 10 \log_{10} (W/W_0)$ where W is the sound power in watts and W ₀ is the sound reference power at 10 ⁻¹² watts.





Appendix 2 – Attended Monitoring Results at R1

11 April 2018

The results of the attended noise monitoring session at R1 are presented graphically as run charts in **Figure A2.1** to **Figure A2.8**.

The results of the attended noise monitoring session are summarised in Table A2.1.

Night Period Compliance Assessment

During the night period attended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring, the quarry was complying with the respective LAeq, 15minute and LA1, 1minute noise impact assessment criteria.

Day Period Compliance Assessment

During the night period attended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring, the quarry was complying with the LAeq, 15minute noise impact assessment criterion.



Date and Time: 11 April 2018, 05:26 to 05:41

Local Conditions: Calm conditions; clear sky, 15°C, 97% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were local road traffic noise, birds, road traffic noise on the surrounding area arterial road network (Clarence Town Road and Brandy Hill Road), insects and frogs. Other noise contributions included intermittent and barely audible broadband reverse alarms from the quarry and operator movement noise.

The LAeq, 15 minute noise contribution from the site was estimated to be less than 11 dB(A). The maximum LA1,1minute noise contribution from the site was estimated to be 32 dB(A).



Figure A2.1

Night Monitoring Results at R1, 19 April 2018, 05:26 to 05:41



Date and Time: 11 April 2018, 05:45 to 06:00

Local Conditions: Calm conditions; clear sky, 15°C, 97% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, local and distant road traffic noise, insects and frogs. Other noise contributions resulted from broadband reverse alarms from the quarry mobile plant and a low-frequency impact.

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 20 dB(A). The maximum LA1,1minute noise contribution from the quarry was 44 dB(A) resulting from a low-frequency impact.



Figure A2.2

Night Monitoring Results at R1, 19 April 2018, 05:45 to 06:00



Date and Time: 11 April 2018, 06:04 to 06:19

Local Conditions: Calm conditions; Clear sky, 15°C, 99% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were local road traffic noise, birds, distant road traffic noise, insects and frogs. Other noise contributions resulted from low-frequency quarry noise.

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 15 dB(A). The LA1,1minute noise contribution from the quarry was 32 dB(A) resulting from mobile plant activity.



Figure A2.3

Night Monitoring Results at R1, 19 April 2018, 06:04 to 06:19



Date and Time: 11 April 2018, 06:20 to 06:35

Local Conditions: Calm conditions; Clear sky, 15°C, 99% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, local and distant road traffic noise, insects and frogs. Other noise contributions resulted from both fixed and mobile quarry mobile mechanical plant

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 25 dB(A). The LA1,1minute noise contribution from the quarry was less than 44 dB(A) resulting from mechanical plant noise.



Figure A2.4

Night Monitoring Results at R1, 19 April 2018, 06:20 to 06:35



Date and Time: 11 April 2018, 06:41 to 06:56

Local Conditions: Calm conditions; Clear sky, 15°C, 99% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, local and distant road traffic noise, low-frequency quarry noise, insects and frogs. Other noise contributions resulted from jet aircraft activity at Williamtown airport

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 26 dB(A). The LA1,1minute noise contribution from the quarry was less than 40 dB(A) resulting from low-frequency mechanical plant noise.



Figure A2.5

Night Monitoring Results at R1, 19 April 2018, 06:41 to 06:56



Date and Time: 11 April 2018, 07:00 to 07:15

Local Conditions: Calm conditions; Clear sky, 16°C, 94% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, low-frequency quarry noise, aircraft noise, local and distant road traffic noise and insects.

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 28 dB(A).



Figure A2.6

Day Monitoring Results at R1, 19 April 2018, 07:00 to 07:15



Date and Time: 11 April 2018, 07:23 to 07:38

Local Conditions: Wind NE at 0 to 0.2 m/s, gusting to 0.5 m/s; Cloudless sky, 17°C, 93% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, aircraft noise, low-frequency quarry noise, local and distant road traffic noise and insects. Other noise sources included operator movement noise.

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 26 dB(A).



Figure A2. 7

Day Monitoring Results at R1, 19 April 2018, 07:23 to 07:38



Date and Time: 11 April 2018, 07:42 to 07:57

Local Conditions: Wind NE at 0.2 to 0.4 m/s, gusting to 0.5 m/s; Cloudless sky, 17°C, 93% RH

Operator Comments:

The dominant noise sources contributing to the noise environment at the monitoring location were birds, low-frequency mechanical plant from the SW, local and distant road traffic noise, low-frequency quarry noise and insects.

The LAeq, 15 minute noise contribution from the quarry was estimated to be less than 25 dB(A).



Figure A2.8

Day Monitoring Results at R1, 19 April 2018, 07:42 to 07:57



	Start Time	Measured Noise Levels			Estimated ¹ Site Contribution			
Location	15 min period	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	Met. Exclusion ^{2,3} (Y/N) [Reason]	Compliant with EPL and PA (Y/N)
Night Perio	d – 19 April 201	8		_		_		_
	05:26	30.3	47.2	65.5	<14	32	Ν	Y
R1	05:45	32.2	46.5	66.7	<20	44	Ν	Y
	06:04	34.2	46.4	65.5	<15	32	Ν	Y
	06:20	35.5	42.7	57.5	<25	44	Ν	Y
	06:41	35.5	41.0	52.5	<26	40	Ν	Ŷ
Day Period	– 19 April 2018							
	07:00	33.7	39.5	56.5	<28	N/A	Ν	Y
R1	07:23	33.1	36.8	45.8	<26	N/A	N	Y
	07:42	33.2	41.8	53.9	<25	N/A	Ν	Y

Table A2.1 – Summary of Attended Noise Monitoring at R1, Giles Road, Seaham – 11 April 2018, dB(A)

1 Meteorological conditions under which the noise exceedance criteria do not apply are defined in in EPL 1879.

2 See Table A2.2 below for specific meteorological data during the monitoring period.



Table A2.2 – Meteorological Conditions During the Monitoring Period – 11 April 2018, dB(A)

			Meteorological Assessment During Monitoring Period ¹					
Location	Start Time	Date	Rain / Hail (mm)	Avg. Wind Speed @ Mic. ² (m/s)	Avg. Wind Speed @ 10m (m/s)	Atmospheric Stability Category ³ (ASC)		
Night Period – 11 April 2018								
	05:26	11/04/18	0	<5	Calm	F		
R1	05:45	11/04/18	0	<5	Calm	F		
	06:04	11/04/18	0	<5	Calm	F		
	06:20	11/04/18	0	<5	Calm	F		
	06:41	11/04/18	0	<5	Calm	F		
Day Period – 11 April 2	018							
R1	07:00	11/04/18	0	<5	Calm	D/F		
	07:23	11/04/18	0	<5	0.0 – 0.2 (calm)	D/F		
	07:42	11/04/18	0	<5	0.2 – 0.4 (calm)	D/F		

1 Meteorological conditions were sourced from the Bureau of Meteorology's (BoM) Tocal Automatic Weather Station (Station IDN 60801) as required in EPL 1879.

2 Wind speed at microphone height was measured using a weather monitor (Kestrel 4500, serial number 658027) positioned within five metres and at a corresponding height of the noise monitoring microphone (except where otherwise noted)

3 Atmospheric stability category derived during the 15 minute interval of the monitoring period





Appendix 3 – Unattended Monitoring Results

11 April 2018

The results of the unattended noise monitoring session are summarised in **Table A3.1**. The meteorological conditions during the period of unattended noise monitoring are summarised in **Table A3.2**.

The ambient noise environment at the monitoring location was dominated by road traffic noise from the adjacent arterial road, Brandy Hill Road, as well as road traffic noise from the surrounding arterial road network including Clarence Town Road. Other noise sources contributions included local rural noise sources such as including insects, frogs, birds, dogs and cattle. The noise contribution from the quarry was not measurable at the monitoring location.

Night Period Compliance Assessment

During the night period unattended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring, the quarry was complying with the respective LAeq, 15minute and LA1, 1minute noise impact assessment criteria at the monitoring.

Day Period Compliance Assessment

During the day period unattended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring, the quarry was complying with the respective LAeq, 15minute noise impact assessment criterion at the monitoring location.



	Start Time	Measured Noise Levels			Estimated ¹ Site Contribution				
Location	15 min period	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	Met. Exclusion ^{2,3} (Y/N) [Reason]	Compliant with EPL and PA (Y/N)	
Night Period – 19 April 2018									
R1	05:26	36	62	79	<30	Not measurable	Ν	Y	
	05:45	38	65	80	<30	Not measurable	Ν	Y	
	06:04	40	65	82	<30	Not measurable	Ν	Y	
	06:20	42	65	82	<30	Not measurable	Ν	Y	
	06:41	44	65	82	<30	Not measurable	Ν	Y	
Day Period – 19 April 2018									
R1	07:00	44	66	83	<30	N/A	Ν	Y	
	07:23	42	65	83	<30	N/A	N	Y	
	07:42	38	66	81	<30	N/A	N	Y	

Table A3.1 – Summary of the Unattended Noise Monitoring at R2, Brandy Hill Road, Brandy Hill – 11 April 2018, dB(A)

1 Meteorological conditions under which the noise exceedance criteria do not apply are defined in in EPL 1879.

2 See Table A3.2 below for specific meteorological data during the monitoring period.



Table A3.2 – Meteorological Conditions During the Monitoring Period – 11 April 2018, dB(A)

			Meteorological Assessment During Monitoring Period ¹					
Location	Start Time	Date	Rain / Hail (mm)	Avg. Wind Speed @ Mic. ² (m/s)	Avg. Wind Speed @ 10m (m/s)	Atmospheric Stability Category ³ (ASC)		
Night Period – 11 April 2018								
R1	05:26	11/04/18	0	<5	Calm	F		
	05:45	11/04/18	0	<5	Calm	F		
	06:04	11/04/18	0	<5	Calm	F		
	06:20	11/04/18	0	<5	Calm	F		
	06:41	11/04/18	0	<5	Calm	F		
Day Period – 11 April 2018								
	07:00	11/04/18	0	<5	Calm	D/F		
R1	07:23	11/04/18	0	<5	0.0 – 0.2 (calm)	D/F		
	07:42	11/04/18	0	<5	0.2 – 0.4 (calm)	D/F		

1 Meteorological conditions were sourced from the Bureau of Meteorology's (BoM) Tocal Automatic Weather Station (Station IDN 60801) as required in EPL 1879.

2 Wind speed at microphone height was measured using a weather monitor (Kestrel 4500, serial number 658027) positioned within five metres and at a corresponding height of the noise monitoring microphone (except where otherwise noted)

3 Atmospheric stability category derived during the 15 minute interval of the monitoring period





Appendix 4 – Attended Monitoring Results at R3

19 April 2018

The results of the attended noise monitoring session are presented graphically as run charts in **Figure A4.1** to **Figure A4.8**.

The results of the attended noise monitoring session are summarised in Table A4.1.

Night Period Compliance Assessment

During the night period attended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring the quarry was complying with the respective LAeq, 15minute and LA1, 1minute noise impact assessment criteria.

Day Period Compliance Assessment

During the night period attended noise monitoring, the results indicated that under the meteorological conditions at the time of monitoring, the quarry was complying with the LAeq, 15minute noise impact assessment criterion.



Date and Time: 19 April 2018, 05:18 to 05:33

Local Conditions: Wind WNW to NW at 1.6 to 1.9 m/s, gusting to 1.9 m/s; Clear sky, 12°C, 97% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects and frogs as well as distant arterial road traffic noise from Clarence Town Road. Other noise sources included intermittent birds, cattle and operator movement noise.

Noise from the quarry was not audible during the attended monitoring period.



Figure A4.1

Night Monitoring Results at R3, 19 April 2018, 05:18 to 05:33



Date and Time: 19 April 2018, 05:40 to 05:55

Local Conditions: Wind WNW to NW at 1.6 to 1.9 m/s, gusting to 1.9 m/s; Clear sky, 12°C, 97% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects and frogs, as well as birds. Other intermittent noise sources included distant arterial road traffic noise and cattle.

Noise from the quarry was not audible during the attended monitoring period.



Figure A4.2

Night Monitoring Results at R3, 19 April 2018, 05:40 to 05:55



Date and Time: 19 April 2018, 06:03 to 06:18

Local Conditions: Wind NNW at 0.8 to 1.4 m/s, gusting to 1.8 m/s; Clear sky, 12°C, 98% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects, frogs and birds, as well as distant arterial road traffic noise from Clarence Town Road. Other noise sources included aircraft noise and a domestic impact from the North.

Noise from the quarry was not audible during the attended monitoring period.



Figure A4.3

Night Monitoring Results at R3, 19 April 2018, 06:03 to 06:18



Date and Time: 19 April 2018, 06:26 to 06:41

Local Conditions: Wind NNW at 0 to 0.8 m/s, gusting to 1.7 m/s; Clear sky, 12°C, 98% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects, frogs and birds, as well as distant road traffic noise from the surrounding arterial road network. Other noise sources included aircraft noise and intermittent noise from the quarry.

The LAeq, 15 minute noise contribution from the quarry site was estimated to be less than 10 dB(A). The maximum LA1, 1 minute noise contribution from the quarry site was estimated to be 30 dB(A) resulting from low-frequency site noise below 315 Hz.



Figure A4.4

Night Monitoring Results at R3, 19 April 2018, 06:26 to 06:41



Date and Time: 19 April 2018, 06:46 to 07:01

Local Conditions: Wind N at 0 to 0.2 m/s, gusting to 0.5 m/s; Clear sky, 13°C, 95% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects, frogs and birds, as well as distant road traffic noise from the surrounding arterial road network. Other noise sources included operator noise and intermittent noise from the quarry.

The LAeq, 15 minute noise contribution from the quarry site was estimated to be less than 10 dB(A). The maximum LA1, 1 minute noise contribution from the quarry site was estimated to be 30 dB(A) resulting from low-frequency site noise below 315 Hz.



Figure A4.5

Night Monitoring Results at R3, 19 April 2018, 06:46 to 07:01



Date and Time: 19 April 2018, 07:12 to 07:27

Local Conditions: Wind N at 0 to 0.2 m/s, gusting to 0.5 m/s; Clear sky, 14°C, 92% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects, frogs and birds, as well as distant road traffic noise from the surrounding arterial road network. Other noise sources included local traffic (farm access track) and barely audible intermittent noise from the quarry.

The LAeq, 15 minute noise contribution from the quarry site was estimated to be less than 10 dB(A). The maximum LA1, 1 minute noise contribution from the quarry site was estimated to be 28 dB(A) resulting from low-frequency site noise below 315 Hz.



Figure A4.6

Day Monitoring Results at R3, 19 April 2018, 07:12 to 07:27



Date and Time: 19 April 2018, 07:36 to 07:51

Local Conditions: Wind N at 0.2 to 0.4 m/s, gusting to 0.5 m/s; Clear sky, 15°C, 91% RH

Operator Comments:

The ambient noise environment at the monitoring location was dominated by local rural noise sources including insects, frogs and birds, as well as distant road traffic noise from the surrounding arterial road network. Other noise sources included intermittent noise from the quarry.

The LAeq, 15 minute noise contribution from the quarry site was estimated to be less than 13 dB(A). The maximum LA1, 1 minute noise contribution from the quarry site was estimated to be 28 dB(A) resulting from low-frequency site noise below 500 Hz.



Figure A4.7

Day Monitoring Results at R3, 19 April 2018, 07:36 to 07:51



	Start Time	Measured Noise Levels			Estimated ¹ site contribution			
Location	15 min period	LA90, 15min	LAeq, 15min	LA1, 1 min	LAeq, 15min	LA1, 1 min	Met. Exclusion ^{2,3} (Y/N) [Reason]	Compliant with EPL and PA (Y/N)
	05:18	28.8	35	51.2	Not Audible	Not Audible	Ν	Y
	05:40	28.9	35.1	45.5	Not Audible	Not Audible	Ν	Y
R3	06:03	28.9	41.3	61.3	Not Audible	Not Audible	N	Y
	06:26	31.3	38	58.2	< 10	30	Ν	Y
	06:46	31.4	40.2	59.5	< 10	30	Ν	Y
Day Period – 19 April 2018								
R3	07:12	30.3	42	64.2	< 10	N/A	N	Y
	07:36	28.9	39.8	56.2	< 13	N/A	N	Y

Table A4.1 – Summary of Attended Noise Monitoring at R3, 19 April 2018, dB(A)

1 Meteorological conditions under which the noise exceedance criteria do not apply are defined in in EPL 1879.

2 See Table A4.2 below for specific meteorological data during the monitoring period.



Table A4.2 – Meteorological Conditions During the Monitoring Period at R3, 19 April 2018, dB(A)

	Start Time	Date	Meteorological Assessment During Monitoring Period ¹					
Location			Rain / Hail (mm)	Avg. Wind Speed @ Mic. ² (m/s)	Avg. Wind Speed @ 10m (m/s)	Atmospheric Stability Category ³ (ASC)		
Night Period – 19 April 2018								
	05:18	19/04/18	0	<5	1.6 - 1.9	F		
R3	05:40	19/04/18	0	<5	1.6 - 1.9	F		
	06:03	19/04/18	0	<5	0.8 - 1.4	F		
	06:26	19/04/18	0	<5	0.0 - 0.8	F		
	06:46	19/04/18	0	<5	0.0 – 0.2 (calm)	F/D		
Night Period – 19 April 2018								
83	07:12	19/04/18	0	<5	0.0 – 0.2 (calm)	D		
K3	07:36	19/04/18	0	<5	0.2 – 0.4 (calm)	D		

1 Meteorological conditions were sourced from the Bureau of Meteorology's (BoM) Tocal Automatic Weather Station (Station IDN 60801) as required in EPL 1879.

2 Wind speed at microphone height was measured using a weather monitor (Kestrel 4500, serial number 658027) positioned within five metres and at a corresponding height of the noise monitoring microphone (except where otherwise noted)

3 Atmospheric stability category derived during the 15 minute interval of the monitoring period



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