



50 Junction Street, Nowra, NSW 2541

P: 4421 4583  
M: 0414 315 775

matthew@harwoodacoustics.com.au  
www.harwoodacoustics.com.au

ABN: 71634 997 937

---

# Environmental Noise Compliance Assessment Bass Point Quarry

1 Bass Point Quarry Road,  
Shellharbour, NSW 2529

*Prepared for:-*

Hanson Construction Materials Pty Ltd  
Locked Bag 5260  
Parramatta NSW 2124

Attention: Mr Steve Butcher

Reference: 1903016E-R

*Prepared by:-*

Matthew Harwood MAAS  
21<sup>st</sup> April 2019



Environmental  
Acoustics

Occupational  
Acoustics

Architectural  
Acoustics

Transportation  
Acoustics



# Document Control Page

Revision	Author	Released By	Date
Draft	MH	MH	21/03/2019
Final	MH	MH	21/04/2019

Harwood Acoustics was engaged by Hanson Construction Materials Pty Ltd to carry out quarterly noise compliance testing for its Bass Point Quarry at 1 Bass Point Quarry Road, Shellharbour, NSW.

Accordingly Harwood Acoustics has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics and may not be suitable for use beyond that scope.

Harwood Acoustics undertakes no duty or accepts any responsibility to any third party who may rely upon this report.

The concepts and information within this report are the property of Harwood Acoustics and the content herein should not be copied or reproduced, in whole or in part, without prior written consent.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

## TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY.....	4
2. SITE AND DEVELOPMENT DESCRIPTION.....	5
2.1 Site Description.....	5
2.2 Development Description.....	7
3. NOISE CRITERIA.....	7
3.1 Acceptable Noise Limits .....	7
3.2 Noise Compliance Assessment Methodology .....	8
4. MODIFYING FACTOR ADJUSTMENTS.....	9
5. MEASURED NOISE LEVELS .....	9
6. 66 KILLALEA DRIVE.....	13
7. CONCLUSION .....	13

## 1. INTRODUCTION AND SUMMARY

Hanson Construction Materials Pty Ltd currently operates the Bass Point Quarry at 1 Bass Point Quarry Road, Shellharbour, NSW (the Quarry).

The Quarry is located at the eastern end of Bass Point Quarry Road adjacent to the Killalea State Park. The nearest residences are located toward the north west and west in the village of Shell Cove as shown in Figure 1.

The Quarry operates 24 hours per day, seven days per week under Project Approval 08\_0143 issued by the Minister for Planning and Infrastructure on 28 January 2014 (the Approval).

It was previously a requirement of the Approval that monthly environmental noise compliance monitoring is undertaken. Since late 2017 environmental noise compliance monitoring became a quarterly requirement.

Schedule 3 of the Approval provides specific noise criteria that must be met at specifically identified receptor locations whilst the Quarry is operating. Appendix 6 of the Approval provides guidelines and requirements in relation to compliance noise monitoring methodology.

This report addresses those requirements. The author visited the site and all residential receptors on Thursday 7 and Friday 8 March 2019 to undertake attended noise compliance monitoring.

Noise measurements were taken in accordance with the requirements of the Approval and the level of noise emission from the operation of the Quarry was found to be well below acceptable noise limits at all receptor locations as detailed in this Report.

This Report also provides an assessment of an additional monitoring location at 66 Killalea Drive, Shell Cove. It is understood that comments in relation to noise emission from the quarry have been provided from this residence. Consequently, a compliance assessment was carried out near to this receptor during the evening and night time of the 7<sup>th</sup> and 8<sup>th</sup> of March. This location is located between monitoring location R11 and R12 shown in Figure 1 of this Report. The design noise goal for compliance assessment at this receptor is therefore 45 dBA  $L_{eq, 15 \text{ minute}}$  during the day, evening and night and 55 dBA  $L_{1, 1 \text{ minute}}$  at night, for sleep disturbance assessment. During the noise survey the measured noise levels at this receptor were well below the design noise goals at all times and are therefore acceptable. Subjectively, noise emission from the operation of the quarry was not audible at this location at any time during the survey.

## 2. SITE AND DEVELOPMENT DESCRIPTION

### 2.1 Site Description

The Quarry is located adjacent to the Killalea State Park at the eastern end of Bass Point Quarry Road as shown in Figure 1 below.

The closest receptors to the site are located in Shell Cove to the north west and west of the Quarry. Those identified in the Approval are receptors R4 through to R12 inclusive as detailed below.

Consideration is also given to the residence located at 66 Killalea Drive, shown as R14 following a noise complaint received in December 2018, and the residence at 1 Barque Avenue, shown as receptor R13, following noise complaints in May 2017. All receptors are shown in Figure 1 and as follows:-

R4 – Sloop Avenue (cnr Cutter Parade)	R5 – Apollo Drive (cnr Clipper Avenue)
R6 – 1 Makaha Way	R7 – 44 Mystics Drive
R8 – 29 Hinchinbrook Drive	R9 – 23 Magnetic Ridge
R11 – 7 Joondalup Parkway	R12 – 3 Ranfurlie Parkway
R13 – 1 Barque Avenue	R14 – 66 Killalea Drive



**Figure 1. Location Plan – Bass Point Quarry, Shellharbour, NSW**

*(source: Nearmap © 2019, image date 25/01/19 C/- Hanson Construction Materials Pty Ltd)*

## 2.2 Development Description

Hanson's Bass Point Quarry is an extractive industry (hard rock quarry) supplying a range of products for projects such as building railways, roads, bridges, dams, airports, etc.

Primary activities at the site include the extraction, crushing, sorting and despatching of construction aggregates and this involves the use of the following plant and equipment:-

- Front end loader & dump truck (face loading)
- Vibrating Screens for each crusher
- Additional Front End Loader x 2 (despatch)
- Primary Jaw Crusher x 1 & Secondary Cone Crushers x 2
- Mobile crushers
- Despatch truck movements

The above listed plant and machinery typically operates up until approximately 10 pm and constitutes full operation of the site. Normally, from approximately 10 pm the majority of operations cease with the exception of the secondary crushing plant and despatch loaders and trucks. On occasion, due to increased demand for aggregates, operating hours regularly extended. From March 2017, mobile crushing plant operations increased to include night shift operations. The mobile crushing plant operates on two shifts, from approximately 6 am through to 4 am.

## 3. NOISE CRITERIA

Project specific noise limits and compliance testing conditions and methodology are derived from the Approval, and are as follows.

### 3.1 Acceptable Noise Limits

Schedule 3, Clause 3, Table 2 of the Approval sets noise criteria for each receptor location. Table 2 of the Approval is replicated in Table 1 below.

**Table 1 Noise Criteria (Project Approval, Schedule 3 - Table 2)**

Location	Day / Evening	Night	
	(L <sub>Aeq</sub> , 15 min)	(L <sub>Aeq</sub> , 15 min)	(L <sub>A1</sub> , 1 min)
R4	44	44	54
R5	45	45	55
R6	42	42	52
R7	41	41	51
R8	35	35	45
R9	35	35	45
R11	45	45	55
R12	45	45	55
Any residential property within the Shell Harbour Marina Precinct	48	8	58
Shell Cove Primary School (when in use)	L <sub>Aeq</sub> , 1 hour 40 (internal)	Not Applicable	

- Receptor **R13** is closest to Receptor R4 (see Figure 1) and as such the same noise criteria is applied at this location.
- Receptor **R14** is closest to Receptor R12 (see Figure 1) and as such the same noise criteria is applied at this location.

*“Notes:*

*Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.*

*However, these criteria do not apply if the Proponent has a written agreement with the relevant landowner to exceed the criteria, and the Proponent has advised the Department in writing of the terms of this agreement.”*

### **3.2 Noise Compliance Assessment Methodology**

Appendix 6 of the Approval provides conditions and assessment methodology that is to be adhered to during noise compliance monitoring, and states:-

*“Applicable Meteorological Conditions*

*1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:*

- (a) during periods of rain or hail;*
- (b) average wind speed at microphone height exceeds 5m/s;*
- (c) wind speeds greater than 3 m/s measured at 10 m above ground level; or*
- (d) temperature inversion conditions greater than 3°C/100 m.*

*Determination of Meteorological Conditions*

*2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station on or in the vicinity of the site.*

*Compliance Monitoring*

*3. Unless otherwise agreed with the Director-general, monthly attended monitoring is to be used to evaluate compliance with the relevant conditions of approval.*

*4. Unless otherwise agreed with the Director-General, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:*

- (a) monitoring locations for the collection of representative noise data;*
- (b) meteorological conditions during which collection of noise data is not appropriate;*
- (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and*
- (d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.”*

#### 4. MODIFYING FACTOR ADJUSTMENTS

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

Fact Sheet C of the Noise Policy for Industry 2017 outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- the contribution noise level from the premises when assessed/measured at a receiver location, and
- the nature of the noise source and its characteristics (as set out in this fact sheet).

Table C1 sets out the corrections to be applied. The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

Table C1 of Fact Sheet C is replicated in the attached Appendix B.

In this instance the measured noise levels at all receptor locations during the evening and night time periods did not display characteristics requiring modifying factor adjustments.

#### 5. MEASURED NOISE LEVELS

The author visited the Quarry and each of the receptor locations to carry out attended noise measurements during the evening and night time periods on Thursday 7 and Friday 8 March 2019. Noise measurements were undertaken at each receptor location shown in Figure 1, between the hours of approximately 6.30 pm and 2.00 am.

During the noise survey, the weather was mild and partly cloudy with temperatures of approximately 21 to 18 degrees Celsius and negligible wind (below 5 m/s at microphone height).

The Quarry was in full operation throughout the entire noise survey. All measurements were also paused as trucks passed along the Haul Road, whenever this was practicable.

All measurements were carried out in accordance with Australian Standard AS 1055-1997 *“Acoustics - Description and measurement of environmental noise”* and the instrumentation used during the noise survey is shown in the attached Appendix A.

The results of the survey are shown in Tables 2 and 3 below, where Table 2 shows the measured and predicted  $L_{eq, 15 \text{ minute}}$  noise levels for assessment against the Intrusiveness criteria and Table 3 shows the measured and predicted  $L_{1, 1 \text{ minute}}$  noise levels for assessment against the Sleep Disturbance criteria.

**Table 2 Measured & Estimated  $L_{eq, 15 \text{ minute}}$  Noise Levels at Receptor Locations – 7 / 8 March 2019**

Location / Time / Description	Noise Level (dBA)				Complies
	Measured Noise Level	Typical Extraneous Noise Sound Pressure Level	Estimated Quarry Noise Level $L_{eq, 15 \text{ minute}}$	Acceptable Noise Limit $L_{eq, 15 \text{ minute}}$ Day, Evening & Night	
R4 – Sloop Avenue (9.38 to 9.53 pm) Quarry not audible	38 – 39	Neighbourhood Noise 42 - 44 Lulls 38	<38	44	Yes
R5 – Apollo Drive (9.56 to 10.11 pm) Quarry not audible	38	Traffic 44 Lulls 38	<38	45	Yes
R6 – 1 Makaha Way (8.55 to 9.10 pm) Quarry not audible	36 – 37	Traffic 40 + Lulls 34	<35	42	Yes
R7 – 44 Mystics Drive (9.11 pm to 9.16 pm) Distant hum (surf ?)	35 – 36	Traffic 40 + Lulls 34	<35	41	Yes
R8 – 29 Hinchinbrook Drive (8.35 to 8.50 pm) Quarry not audible	37	Insects 37 - 40 Lulls 34	<35	35	Yes
R9 – 23 Magnetic Ridge (8.16 to 8.31 pm) Distant hum (surf ?)	38	Insects 38 Lulls 33 - 34	<35	35	Yes
R11 – 7 Joondalup Parkway (7.20 pm to 7.35 pm) Quarry not audible	41 – 42	Surf 42 Insects 44 Lulls 39	<39	45	Yes
R12 – 3 Ranfurlie Parkway (7.57 to 8.12 pm) Quarry not audible	41 – 42	Surf 42 Insects 44 Lulls 39	<39	45	Yes
R13 – 1 Barque Ave (9.21 to 9.36) Quarry not audible	38	Distant Traffic 42 Lulls 37	<37	44	Yes
R14 – 66 Killalea Drive (7.40 pm, 10.35 pm & 1.40 am)* Quarry not audible	38 – 41	Surf 42 – 43 Insects 44 – 46 Lulls 37 – 39	<37	45	Yes

\* Discussed in detail in Section 5 below.

**Table 3 Measured & Calculated L<sub>1, 1 minute</sub> Noise Levels at Receptor Locations – 7 / 8 March 2019**

Location / Description	Noise Level (dBA)				Complies
	Measured Noise Level L <sub>1, 1 minute</sub>	Typical Extraneous Noise Sound Pressure Level	Estimated Quarry Noise Level L <sub>1, 1 minute</sub>	Acceptable Noise Limit L <sub>1, 1 minute</sub> at night	
R4 – Sloop Avenue (9.54 pm)* Quarry not audible	39	-	<39	54	Yes
R5 – Apollo Drive (10:12 pm) Quarry not audible	41	-	<41	55	Yes
R6 – 1 Makaha Way (10:15 pm) Quarry not audible	42	-	<42	52	Yes
R7 – 44 Mystics Drive (10:18 pm) Quarry not audible	40	-	<40	51	Yes
R8 – 29 Hinchinbrook Drive (10:25 pm) Quarry not audible	35 – 36	-	<35	45	Yes
R9 – 23 Magnetic Ridge (10:32 pm) Quarry not audible	38	-	<38	45	Yes
R11 – 7 Joondalup Parkway (10:39 pm) Distant hum (surf)	40	-	<40	55	Yes
R12 – 3 Ranfurlie Parkway (10:42 pm) Distant hum (surf)	41	-	<41	55	Yes
R13 – 1 Barque Ave (9.36 pm) * Quarry not audible	40	-	<40	54	Yes
R14 – 66 Killalea Drive (10:36 pm) Quarry not audible	39 – 40	-	<39	55	Yes

\* considered equivalent to after 10 pm

### *Discussion*

Extraneous noise levels are excluded from Table 3 as the measured  $L_{1, 1 \text{ minute}}$  noise level is well below the acceptable noise limit at each location, in each instance, irrespective of the contribution of quarry noise. Subjectively, the quarry was either not audible or barely audible and, in every instance, the measured level is dominated by extraneous noise.

During all noise measurements, ambient and extraneous noise from, for example, insects, distant and local traffic, barking dogs and general neighbourhood noise within homes dominated the acoustical environment.

No measured noise levels are considered to be enhanced by meteorological conditions outlined in Appendix 6 of the Approval and Section 3.2 of this Report, thus representing an acoustically worst-case scenario.

The contribution of Quarry noise emission to the measured levels has been estimated based on observations of the sound pressure level during lulls in extraneous and ambient noise, whilst the Quarry was operating, and the subjective audibility of the Quarry.

The contribution of noise from the Quarry to the actual measured noise levels is likely to be lower still, often considerably, than those levels estimated in Tables 2 and 3.

In any event, the measured noise levels were below the acceptable noise limits, irrespective of the contribution from the Quarry, during all measurements at all receptor locations, with the exception of receptor R8 and R9 in the evening (see Table 2).

The measured energy average sound pressure levels over 15 minutes ( $L_{\text{eq}, 15 \text{ minute}}$ ) at these receptors were affected by extraneous noise that was higher than the acceptable noise limit of 35 dBA. As is often the case at these receptors, it is often not practicable to be able to measure a  $L_{\text{eq}, 15 \text{ minute}}$  noise level below 35 dBA during the evening time period (prior to 10 pm) due to extraneous noise.

However, the contribution of Quarry noise at both receptors during the measurement period is predicted to be less than the acceptable limit and is therefore acceptable. For example, instantaneous sound pressure levels in lulls of neighbourhood noise (whilst the quarry was operating) were below 35 dBA at both receptors. When filtering out the cricket and cicada noise from the measured spectrum, the measured noise level in the absence of insects was well below 35 dBA.

It should be noted that compliance with the acceptable intrusiveness noise limits during the full operation of the quarry in the evening prior to 10 pm, also demonstrate compliance during the night time, with the same intrusive noise limits during either the same or reduced operations as the night goes on.

Measurements and calculations therefore show that the level of noise emission from the operation of the Quarry during the noise survey was below the acceptable noise limits at all receptor locations at all times.

## 6. 66 KILLALEA DRIVE

Noise measurements and subjective assessments were carried out at this receptor location, being opposite the dwelling on the road edge, adjacent to Killalea State park pedestrian entrance. The site was visited at approximately 7.40 pm, 10.30 pm and again at 1.30 am. At no time was noise emission from the quarry audible at this location and the measured and were predicted noise levels were well below the design noise goals at all times.

Subjectively the noise levels at this location were dominated by distant surf noise and nearby insect noise as well as palm trees rustling in the breeze.

## 7. CONCLUSION

Monthly Environmental Noise Compliance testing has been undertaken at Hanson's Bass Point Quarry in accordance with the requirements of the Project Approval 08\_0143.

The level of noise emission from the Quarry was found to be below the acceptable noise limits at all times, at all receptor locations.



**Matthew Harwood**, MAAS

Principal Acoustical Consultant

Attachments:-

Appendix A – Noise Survey Instrumentation

Appendix B – Modifying Factor Corrections (EPA NPI 2017)

<b>Noise Survey Instrumentation</b>	<b>Appendix A</b>
-------------------------------------	-------------------

The instrumentation used during the noise survey consisted of the following:-

<b>Description</b>	<b>Model No.</b>	<b>Serial No.</b>
Svantek Sound Level Meter	957	15395
Svantek Acoustical Calibrator	B&K 4321	3003242

The sound level meter conforms to Australian Standards AS IEC 61672.1-2004 : 'Electroacoustics - Sound level meters – Specifications' as a Class 1 precision sound level meter.

The calibration of the meters was checked before and after the measurement period. No significant system drift occurred over the measurement period. The sound level meter and calibrator have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates.

<b>Modifying Factor Corrections (EPA 2017)</b>	<b>Appendix B</b>
--	-------------------

**Table C1 Modifying Factor Corrections** (from Table C.1 of the NSW Noise Policy for Industry 2017)

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method ( <i>ISO1996.2-2007 – Annex D</i> ).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: <ul style="list-style-type: none"> <li>• 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz</li> <li>• 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz</li> <li>• 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.</li> </ul>	5 dB	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. <b>Note:</b> Narrow-band analysis using the reference method in <i>ISO1996-2:2007, Annex C</i> may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: <ul style="list-style-type: none"> <li>• where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period</li> <li>• where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.</li> </ul>	2 or 5 dB	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

**Table C1 Modifying Factor Corrections** (from Table C.1 of the NSW Noise Policy for Industry 2017) *Cont...*

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Intermittent Noise	Subjectively Assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for <b>night-time only</b> .
Duration	Single-event noise duration may range from 1.5 m to 2.5 h	One event in any 24-hour period	0 to -20dBA	The acceptable noise trigger level may be increased by an adjustment depending on duration of noise (see Table C.3)
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10 dBA <sup>2</sup> (excluding duration correction)	

**Notes:**

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.
3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.