

Dixon Sand (No.1) Pty Ltd

Haerses Road Quarry, Maroota

Noise monitoring report  
June 2024

Doc no. 19020-NV-RP-17-0





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Title	Noise monitoring report
Document no.	19020-NV-RP-17-0
Revision	0
Date	4 June 2024
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#### Revision history

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0	18 September 2024	Draft report to client
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## Table of Contents

<b>Definition of terms</b> .....	<b>ii</b>
<b>1. Introduction</b> .....	<b>1</b>
<b>2. Noise compliance criteria</b> .....	<b>3</b>
<b>3. Monitoring methodology</b> .....	<b>4</b>
<b>4. Monitoring results</b> .....	<b>5</b>
4.1 Attended measurements.....	5
4.2 Modifying factors.....	5
4.3 Extrapolated measurements .....	9
4.4 Compliance summary .....	10



## Definition of terms

<b>Background noise</b>	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
<b>Decibel (dB)</b>	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 (to base 10) of the ratio of a given sound power to a reference power.
<b>dB(A)</b>	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
<b>dB(C)</b>	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
<b>EPA</b>	Environment Protection Authority
<b>Extraneous noise</b>	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
<b>Noise level statistics</b>	<p><math>L_{A90}</math> – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise.</p> <p><math>L_{Aeq}</math> – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period.</p> <p><math>L_{A1}</math> – The A-weighted sound pressure level exceeded 1% of the monitoring period.</p> <p><math>L_{Amax}</math> – The maximum A-weighted noise level associated with the measurement period.</p> 
<b>RBL</b>	The Rating Background Level for each period is the medium value of the ABL values for the period over all the days measured. There is therefore an RBL value for each period (day, evening and night)
<b>Receiver</b>	The land use at which noise is heard
<b>SLM</b>	Sound Level Meter
<b>Sound Power Level (SWL)</b>	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to $10^{-12}$ watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
<b>Sound Pressure Level (SPL)</b>	<p>This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise.</p> <p>A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically <math>20 \mu\text{Pa}</math> equivalent to 0 dB).</p>
<b>Tonal noise</b>	Noise with perceptible and definite pitch or tone



## 1. Introduction

Dixon Sand (No.1) Pty Ltd operates the Haerses Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Wisemans Ferry Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and loading of trucks for shipment.

The Quarry operates under Development Consent DA 165-7-2005 and Environment Protection Licence (EPL) 12513, which set noise limits for its operation. Extraction in the areas described in Modification 1 of the development consent and utilisation of the processing plant area commenced in December 2019 and require attended noise monitoring on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 4 June 2024.

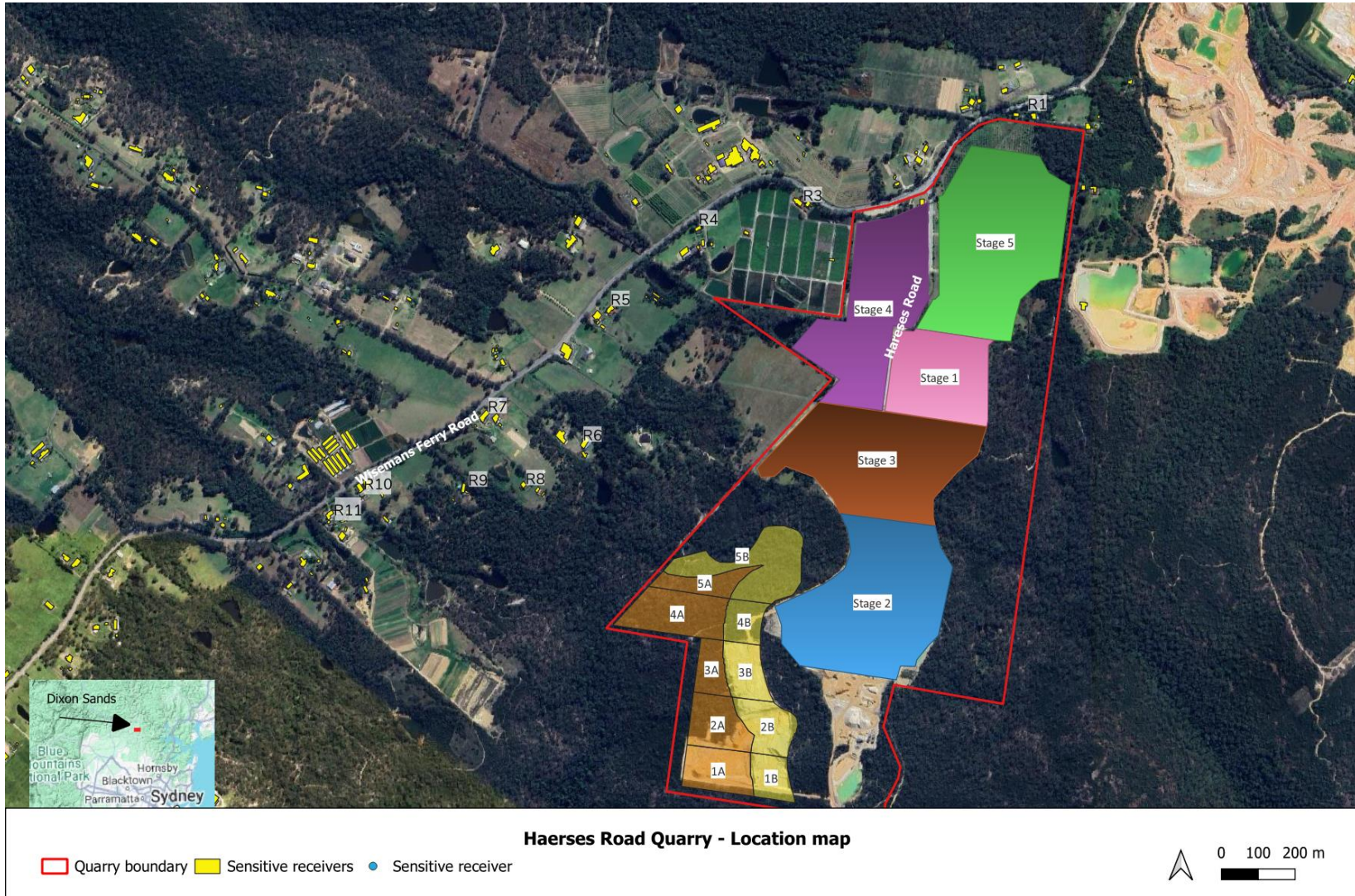


Figure 1 Location of the Quarry



## 2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA 165-7-2005 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance.

1. The Applicant must comply with the operating hours set out in Table 1.

**Table 1 Operating hours**

Activity	Permissible hours
Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck arrival, loading and dispatch	6.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Acoustic bund construction and road and intersection works on Haerses Road and Wisemans Ferry Road	8.00 am to 5.00 pm Monday to Friday. At no time on Saturdays, Sundays, or public holidays
Maintenance	At any time, provided that these activities are not audible at any privately-owned residence outside of permissible hours for quarrying operations.

2. The following activities may be carried out outside the hours specified in condition 1 above:
  - (a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
  - (b) emergency work to avoid the loss of lives, property or to prevent environmental harm.

In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

3. The Applicant must ensure that the noise generated by the development (excluding acoustic bund construction) does not exceed the criteria in Table 2 at any residence on privately-owned land.

**Table 2 Noise criteria dB(A)**

Receiver	Day	Shoulder (6.00 am to 7.00 am)	
	LAeq (15 minute)	LAeq (15 minute)	LAmix
R05, R06	41	35	52
R03	40	37	
R13, R14	40	36	
All other receivers	40	35	

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry.

However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Agreements are currently in place between Dixon Sand and adjacent private landowners including:

- Residential receivers identified as R2 and R12 in the planning consent and
- All identified receivers to the east of Haerses Road quarry on Hitchcock Road



### 3. Monitoring methodology

Operator-attended noise monitoring was undertaken on 7 June 2023 by John Hutchison of Hutchison Weller, an independent acoustic specialist. Monitoring locations were selected in line with the Haerses Road Quarry Noise Management Plan (May 2019), which addresses specific stages of quarry development, as outlined in

**Table 3 Noise monitoring locations for each stage and extraction cell (from Noise and Vibration Management Plan, 2019)**

Location	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Mod 1, Extraction cells 1A to 5B
R1	-	-	-	-	-	-
R3	✓	✓	✓	✓	✓	-
R4	✓	✓	✓	✓	✓	-
R6	-	-	-	-	-	✓
R8	-	-	-	-	-	✓

Monitoring locations are illustrated in Figure 1 and specific addresses are summarised in Table 4.

**Table 4 Monitoring locations**

Receiver	Address	Description
R3	1643 Wisemans Ferry Road	Private residence adjacent to plant nursery
R4	1617 Wisemans Ferry Road	No access granted – levels extrapolated from site measurements
R6	1543 Wisemans Ferry Road	Private residence. Monitoring conducted on the southeastern side of the residence facing the quarry.
R8	1521 Wisemans Ferry Road	Private residence. Monitoring conducted at boundary between R7 and R8 since no access granted to R8.
HAS1	Haerses Road Quarry	Close to equipment within Haerses Road boundary

Monitoring was conducted in general accordance with the Noise Policy for Industry and Section 6 of the Noise Management Plan. At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation was a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2026.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LMax statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity, and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish whether meteorological conditions were suitable for monitoring.

Where extraneous noise such as road traffic or insects were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlined in *Noise Policy for Industry*. This involved extrapolation from the near-distance location to the sensitive receiver location.





## 4. Monitoring results

### 4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 5.

Quarry operations were inaudible at all residential receivers prior to 7am, with traffic noise on Wisemans Ferry Road in all cases the dominant source of noise. No L<sub>Amax</sub> noise levels were attributable to the quarry in the shoulder period.

During the day period, quarry noise was inaudible or barely audible at monitoring locations. Again, ambient noise masked noise from the quarry.

Based on measured noise at each location, the Haerses Road quarry was compliant with the project noise objectives.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken to establish representative sound pressure levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.3.

### 4.2 Modifying factors

No tonal, impulsive, or low frequency noise characteristics were observed at any residential monitoring location during the monitoring period. Therefore, application of modifying factors is not appropriate in this instance.



**Table 5 Monitoring results**

Monitoring period	Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
				LAeq	LA90	LAmix			
At-receiver measurements									
Shoulder (6.00am to 7.00am)	6:04 AM	R3	37	50.9	35.0	64.8	<35	Traffic on Wisemans Ferry Road is dominant source of noise with pass-bys of around 55-62 dBA for HV and 49-52 dBA for LV. During break in flow, dropped to 33-34 dBA. No quarry-related activity audible. No tones or Low Frequency No LAmix attributable to the quarry.	Calm to light breeze from N @ <10 km/h Temperature 8°C Clear sky Moderately unstable conditions (B class)
	6:25 AM	R6	35	44.5	41.9	59.0	<35	Local creek a steady noise ~ 42 dBA (LA90) Road traffic not as dominant here, ~40-44 dBA Kookaburras started ~ 53 – 59 (LAmix) Quarry not audible	
	6.46 AM	R7 (R8)	35	47.6	38.8	62.3	<35	Traffic on Wisemans Ferry Road is dominant and constant source of noise ~ 50-56 dBA , some HVs up to 59 dBA and a motorcycle 60 dBA Dog barking ~ 57-59 dBA When traffic dropped away for a moment – 39 dBA Quarry not audible throughout most of measurement, although a tonal alarm was briefly audible No LAmix values attributable to the quarry	



Monitoring period	Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
				LAeq	LA90	LAmix			
Onsite measurements									
Onsite	7:33 AM	OAS1	N/A	74.0	72.4	76	-	Stage 2 – stockpile area Excavator on stockpile loading screen, with FEL servicing spoil. 74.0 dBA. Screen is dominant source and reflected by LA90.	Light breeze from NNW @ 1-8 km/h Temperature 9-12°C Clear sky Extremely unstable conditions (A class)
	7:58 AM	OAS2		55.3	51.7	69.0	-	Stage 2 Pit Rock saw, FEL and excavator with grinder in pit – visibility blocked by pit wall Saw operating alone ~ 55 dBA All equipment together ~ 60 dBA	
	8:29 AM	OAS3		80.3	77.2	84.7	-	Area 1A Saw 81-82 dBA, 76 dBA when saw stops Grinding and ripping around 80-100m east of saw not audible over saw	
	9:27 AM	OAS4		69.9	56.4	87.1	-	Area 3A D11 pushing ~ 60dBA Excavator with rock breaker – intermittent use. Hammer ~ 66-67 dBA Moxys loaded by excavator on rotation around 3-4 mins Moxies passing monitoring position ~ 82 dBA	
	10:54AM	OAS5		70.5	69.4	78.9	-	Processing area Screens loaded by excavator ~70 dBA 2 x FEL operating Washplant active	



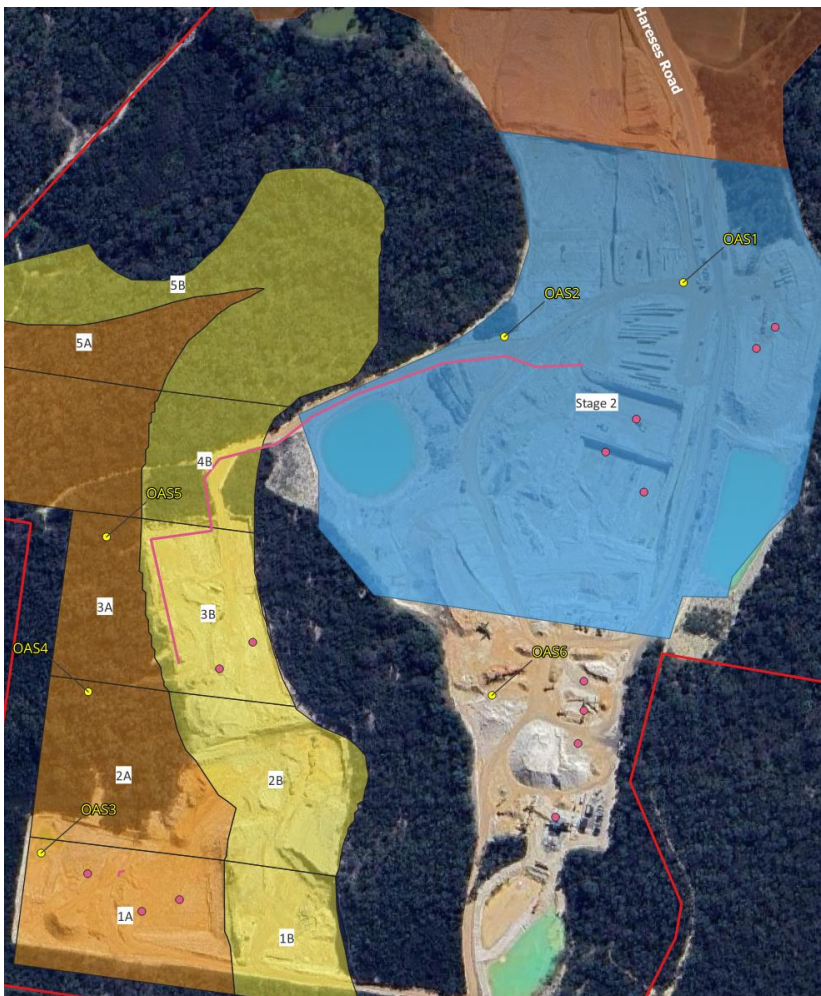
Monitoring period	Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
				LAeq	LA90	LAmx			
At-receiver measurements									
Day (7.00am to 6.00pm)	11:25 AM	R3	40	47.4	34.9	63.6	<40 (See Section 4.3)	Wisemans Ferry Road remains dominant noise source at 56-59 dBA for LVs and 59-60 dBA for HVs Quarry inaudible over traffic Traffic dropped away with levels decreasing to 37-38 – quarry not audible. Distant tractor just audible.	Calm to light breeze from NNe @ 1-4 km/h Temperature 12°C Clear sky Extremely unstable conditions (A class)
	11:25 AM	R6	41	N/A	N/A	N/A	<41 (See Section 4.3)	Not accessible	
	11:51 AM	R8	40	52.3	38.3	69.2	<40 (See Section 4.3)	Traffic on Wisemans Ferry Road ~ 56-59 Dogs ~ 64 Lmax Quarry intermittently just audible at ambient – some engine revs, potentially moxy No saw or hammering audible. Estimate 37-38 dBA	

### 4.3 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels affected by other ambient sounds including road traffic. Therefore, measurements captured on-site without substantial influence from traffic were used to calculate sound pressure levels at each receiver.

Based on observations close to the quarry and processing area, the following plant and equipment was in use during the monitoring period. Measurements close to these plant items were undertaken to establish a representative noise model of the quarry operations. A summary of noise emission data for these items is presented in Appendix A. See Figure 2 for work locations.

1. Processing plant – Washplant, 2 screens, front end loader, excavator, haulage trucks
2. Quarry -  
 Stage 2: in Pit - Rock saw, grinder, FEL and excavator; stockpiling area – screen, excavator and FEL  
 Area 1A: Rock saw, grinder and excavator ripping  
 Area 3b: Excavator ripping stone, Dozer pushing up and excavator loading moxies



Haerses Road modelled work areas

- Quarry boundary
- Intermediate receiver
- Plant location
- Work area

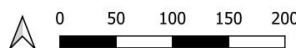


Figure 2 Work areas and noise sources included in the model



Predictions of noise at nearby receivers were based on measured onsite noise levels and propagation methods described in ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*, which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on the above, modelled noise levels for each monitoring location are presented in Table 6. Results are shown for equipment operating in each quarry area and processing plant. Modelled noise levels are within 2 dB of measured values indicating the model is sufficiently accurate to represent operating conditions.

**Table 6 Extrapolated monitoring results to intermediate measurement locations**

Location	Modelled noise level, dBA	Measured noise level, LAeq, 15 minute, dBA
OAS1	72.4	72.4
OAS2	54.3	55.3
OAS3	78.7	80.3
OAS4	69.4	69.9
OAS5	69.8	70.5

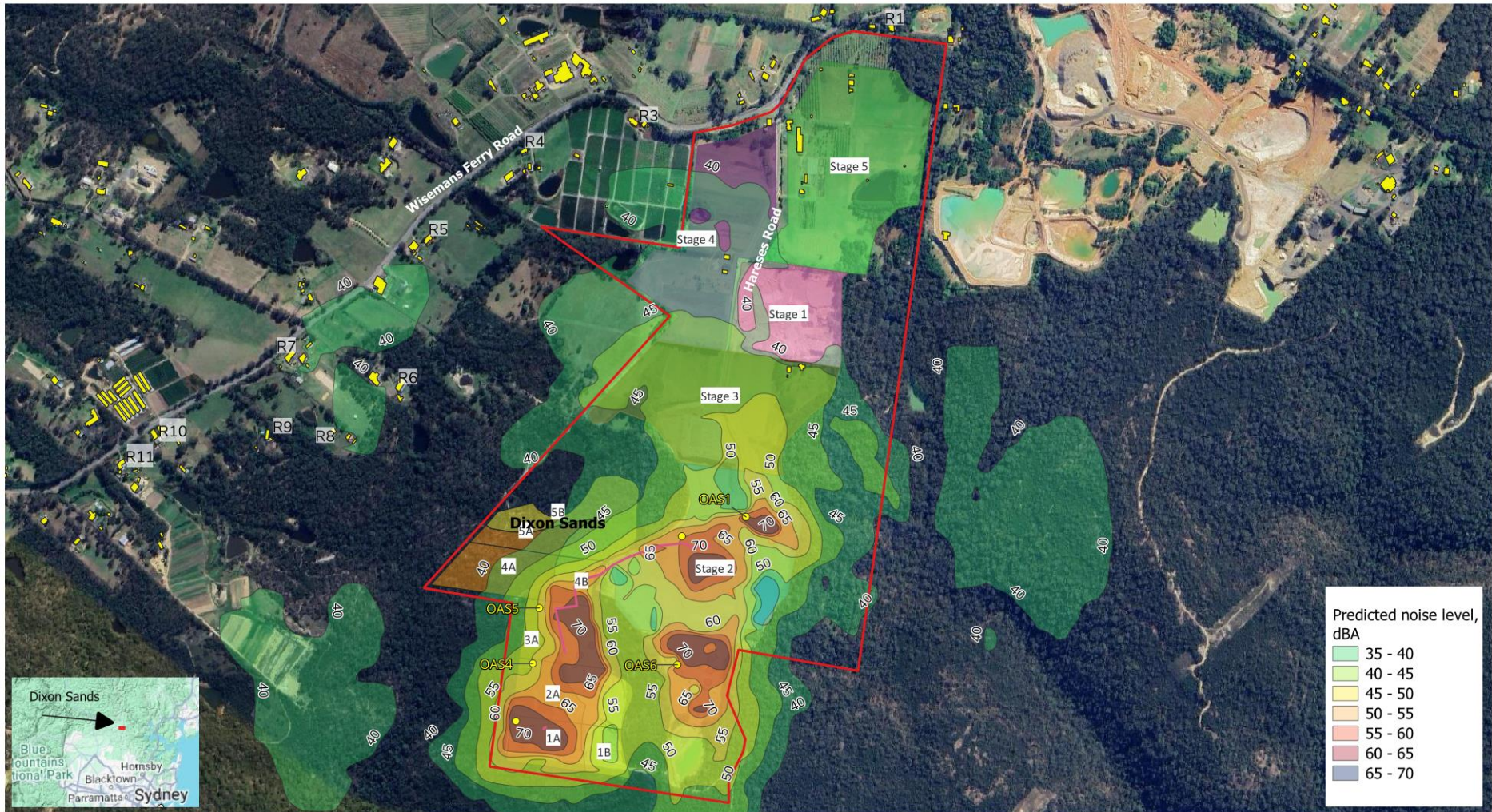
Based on measurements described in Table 5, extrapolated noise results for each receiver are presented in Table 7. Results are shown for all equipment operating. Extrapolated results demonstrate the Quarry is compliant with the criteria for shoulder and daytime operations when all observed equipment is operating.

**Table 7 Extrapolated monitoring results**

Receiver	Noise criteria	Extrapolated noise level, LAeq, 15 minute	Comment
R3	40	39	All locations comply with noise limits.
R4	40	39	
R6	41	38	
R8	40	39	
All other receivers	40	See Figure 3	

#### 4.4 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate observed operations during shoulder and day periods were compliant with the noise criteria at each receiver under the meteorological conditions at the time.



Predicted noise level, dBA	
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70

Quarry boundary
  Sensitive receivers
 ● Monitoring location

**Haerses Road Quarry - Predicted noise levels**

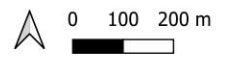


Figure 3 Extrapolated noise levels from Haerses Road quarry based on on-site measurements.



## Appendix A. On-site measurements

Plant item	Height, m	Sound Power Level, (third octave, Hz), dBA																													
		Sum	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k
Exc with hammer	1.5	120	52	58	58	65	74	83	88	92	95	101	99	104	96	99	102	100	105	110	107	109	112	110	111	109	108	104	100	94	88
Excavator loading moxy	2	109	38	43	47	54	58	64	81	78	80	87	86	88	85	86	90	97	100	99	98	99	99	100	99	98	97	94	90	87	82
Excavator with grinder	1.5	109	38	43	47	54	58	64	81	78	80	87	86	88	85	86	90	97	100	99	98	99	99	100	99	98	97	94	90	87	82
Moxy	2	109	26	34	43	54	66	66	70	84	83	86	88	88	90	95	94	97	97	98	101	99	99	98	97	95	94	91	87	84	80
Excavator ripping	1.5	115	40	47	53	59	70	80	86	91	95	99	101	103	98	97	102	102	102	105	105	105	104	104	106	104	101	99	95	92	89
Rock saw stage 1	1	118	29	38	44	50	61	74	78	84	87	92	88	91	101	103	105	109	111	111	108	104	105	105	104	101	98	95	92	87	82
Rock saw Stage 2	1	107	46	52	55	58	72	76	78	82	80	86	88	90	87	85	92	96	95	99	99	98	97	96	94	91	88	85	82	77	71
Screen loaded by excavator Processing	2	118	46	63	56	59	71	82	86	90	95	97	98	100	100	105	111	108	108	106	103	105	108	109	107	103	100	97	94	90	83
Screen loaded by excavator Stage 2	2	114	42	49	48	59	69	78	82	85	86	94	91	95	102	100	106	106	104	103	102	101	101	101	102	102	99	94	91	86	81
Washplant	1.5	105	27	37	53	48	56	62	67	74	90	92	84	89	82	92	90	90	92	93	95	93	94	95	94	93	92	93	88	86	82