Central Coast Sands Quarry Annual Noise Compliance Survey September 2019



Report Number 10-1720

Hanson Construction

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PARRAMATTA NSW 2150

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APPENDICES

Appendix A Acoustic terminology



1 Introduction

VMS Australia Pty Ltd has been appointed by Hanson Construction Materials Pty Ltd to conduct the annual noise compliance monitoring for the Central Coast Sands Quarry located at Lot 2 Reservoir Road, Somersby (the Project), in order to assess noise emission levels from the quarry's operation. This report presents the findings of the morning shoulder period and daytime measurements conducted at the nearest residential receivers during site activities on 1 October to 3 October 2019.

2 Hours of Operation

The Project operating hours have been limited in the Environmental Protection Licence (EPL) 3751, and shown in **Table 1** below.

Table 1 Hours of Operation

Activity	Day	Time
Extraction and processing	Monday – Friday	6:00am to 6:00pm
Extraction and processing	Saturday	6:00am to 4:00pm
Extraction and processing	Sundays and Public Holidays	Never
Delivery and Distribution (ie. Truck movements)	Monday – Friday	6:00am to 4:00pm
Delivery and Distribution (ie. Truck movements)	Saturday	6:00am to 2:00pm
Delivery and Distribution (ie. Truck movements)	Sundays and Public Holidays	Never
Construction Activities (ie. construction of Noise Bunds)	Monday – Friday	7:00am to 4:00pm
Construction Activities (ie. construction of Noise Bunds)	Saturday	7:00am to 12:00pm
Construction Activities (ie. construction of Noise Bunds)	Sundays and Public Holidays	Never
Maintenance (if inaudible at neighbouring residences)	Any day	Any time

Excerpt from Environmental Protection Licence - 3751 dated 11 November 2016.

3 Environmental Protection Licence Noise Trigger Levels

The Environmental Protection Licence (EPL) 3751 specifies that noise from the premises must comply with the following conditions:

- L4 Noise Limits
- M7 Noise Monitoring



Operational noise criteria for the Project are stipulated in Condition L4.2 of the EPL and are replicated in Table 2.

Table 2 Project Noise Trigger Levels

Location	Day	Evening	Morning S	houlder	
	LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)	
B - 126A Keighley Avenue	37		35		
C - 110 Keighley Avenue	37		35	l	
D - 100 Keighley Avenue	38	9-	35		
G - 87 Keighley Avenue	36	35	35	45	
R - 21 Reservoir Road	36		36		
All other privately-owned land	35		35		

Excerpt from Environmental Protection Licence - 3751 dated 11 November 2016.

4 Quarry Activity

With an annual extraction limit of 310,000 tonnes per annum, the quarry operates primarily as sand extraction that processed on-site and transported off-site to regional and local customers by road. The quarry comprises of fixed plant sand washing and processing, office and amenities.

A summary of the quarry activities and equipment list during this monitoring period are presented in Table 3.

Table 3 Quarry Activities – 10 September to 17 September 2019

Activity	Tuesday 1 October 2019	Wednesday 2 October 2019	Thursday 3 October 2019	
	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)	
Pit Operations	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	
Stock Yard	L180H (Front End Loader)	L180H (Front End Loader)	L180H (Front End Loader)	
Processing Plant	Plant in operation during time of measurement.	Plant in operation during time of measurement.	Plant in operation during time of measurement.	

5 Noise Monitoring Locations

Noise monitoring was conducted at the nearest residential receivers at locations at B, C, D, G and R (refer to **Table 2**) during the morning shoulder period (6.00am to 7.00am) and day-time periods (7.00 am to 6.00 pm). Daytime attended measurements were conducted for 1.5 hours at each location below as per EPL conditions. The noise monitoring locations are presented in **Figure 1**.



Location B

Location C

Location G

Project Site

Location R

Figure 1 Noise Monitoring Locations

Image courtesy of Six Maps

5.1 Instrumentation and Measurement Procedure

The acoustic instrumentation employed during the monitoring programme complied with the requirements of AS 1259.1-1990 "Acoustics - Sound Level Meter - Non-Integrating" and IEC 61672.1-2004 "Electroacoustics - Sound Level Meters - Specifications" and carried current NATA or manufacturer calibration certificates. The schedule of noise monitoring equipment deployed during the programme and attended monitoring is presented in **Table 4**.

Table 4 Noise Monitoring Equipment

Instrumentation	Туре	Serial Number
B&K 2250 SLM	Type 1	3024564
B&K 2250 SLM	Type 1	3023945
B&K 4231 Acoustic Calibrator	Type 1	2574227

In order to determine compliance with the noise limits nominated in **Table 2**, operator-attended 15-minute noise surveys were conducted between 1 October and 3 October 2019 at the nominated receiver locations.

The measurements were guided by the requirements of Australian Standard AS 1055-1997 Acoustics - Description and measurement of environmental noise.



A level calibration check was undertaken using an acoustic calibrator which emitted a 94-dBA calibration tone at 1 KHz. The calibration check was conducted prior and after the surveys with no shift noted during the calibration process.

6 Operational Noise Compliance Monitoring Results

The measured noise emissions from the Project are presented in **Table 5** to **Table 10** during the morning shoulder and daytime periods.

Table 5 Operational Noise Compliance Monitoring Results - Morning Shoulder Period (1 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)		Description of Noise Emission, Typical Maximum Levels	Estimated Project LAeq	Estimated Project LA1	Assessment
		LAeq	LA1	LAmax (dB)	(15minute)	(1minute)	
R – 21 Reservoir Road	1/10/2019 6.00am Wind: Calm Temp: 11ºC	52	64	Birds:40-58 Road Traffic: 78 Site Trucks: 40-58 Sand pump: 36-37	36	42	Complies
G – 87 Keighley Avenue	1/10/2019 6.26am Wind: Calm Temp: 11ºC	50	63	Birds:44-58 Excavator: 41-53 Reverse Alarm: 41-42 Dog Bark: 43-66 Ducks: 41-44 Sand pump: 30-31	41	47	6dB above LAeq(15minute) criterion 2dB above LA1(1minute) criterion
D – 100 Keighley Avenue	1/10/2019 6:28 am Wind: Calm Temp: 11ºC	46	49	Birds: 42-49 People talking: 54-56 Road traffic: 46-49 Excavator: 43-44 Site trucks: 41-44 Excavator bucket: 48-64 Sand pump: 35-36	43	49	8dB above LAeq(15minute) criterion 4dB above LA1(1minute) criterion
C – 110 Keighley Avenue	1/10/2019 6.48am Wind: Calm Temp: 11ºC	46	55	Birds:42-61 Plane: 52-46 Excavator bucket: 57-60 Excavator: 41-43 Excavator horn: 47 Sand pump: 35-36	42	49	7dB above LAeq(15minute) criterion 4dB above LA1(1minute) criterion
B – 126A Keighley Avenue	1/10/2019 6:47 am Wind: Calm Temp: 11ºC	47	54	Birds: 35-51 Plane: 52-54 Road traffic: 47-49 Excavator: 44-45 Excavator bucket: 49-60 Dump trucks: 43-44 Sand pump: 34-35	47	54	12dB above LAeq(15minute) criterion 19dB above LA1(1minute) criterion



Table 6 Operational Noise Compliance Monitoring Results - Morning Shoulder Period (2 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)		Description of Noise Emission, Typical Maximum Levels	Estimated Project LAeq	Estimated Project LA1	Assessment
		LAeq	LA1	LAmax (dB)	(15minute)	(1minute)	
R – 21 Reservoir Road	2/10/2019 6.00am Wind: Calm Temp: 11 ºC	47	55	Dog barking: 47-72 Birds:42-61 Sand pump: 35-36 Horn: 43 Truck exiting:41-45 Excavator: 39-41	35	41	Complies
G – 87 Keighley Avenue	2/10/2019 6.26am Wind: Calm Temp: 11 ºC	40	48	Birds:42-55 Cow: 65-69 Excavator: 38-45 ATV: 42-47 Sand pump: 30-31	35	41	Complies
D – 100 Keighley Avenue	2/10/2019 6:26 am Wind: Calm Temp: 11 ºC	41	46	Birds: 47-53 Plane: 36-37 Road traffic: 36-38 FEL/Truck: 30-34 Reverse Alarm: 39-39 Sand pump: 33-35	35	43	Complies
C – 110 Keighley Avenue	2/10/2019 6.49am Wind: Calm Temp: 11 ºC	44	55	Birds:56-65 Plane: 42-44 FEL: 42-45 Reverse Alarm: 34-36 Sand pump: 33-34	34	43	Complies
B – 126A Keighley Avenue	2/10/2019 6:48 am Wind: Calm Temp: 11 ºC	45	52	Birds: 45-57 Plane: 47-50 FEL: 42-47 Sand pump: 33-35 Reverse Alarm: 37-38	40	46	5dB above LAeq(15minute) criterion 1dB above LA1(1minute) criterion

Table 7 Operational Noise Compliance Monitoring Results - Morning Shoulder Period (3 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum	Estimated Project LAeq	Estimated Project LA1	Assessment
		LAeq	LA1	Levels LAmax (dB)	(15minute)	(1minute)	
R – 21 Reservoir Road	3/10/2019 6.00am Wind: Calm Temp: 16 ºC	46	53	Birds:54-67 Dog barking: 58 Truck Exiting:48 Sand pump:34-35 Residential Water Pump: 44-46	35	42	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)		Description of Noise Emission, Typical Maximum	Estimated Project LAeq	Estimated Project LA1	Assessment
		LAeq	LA1	Levels LAmax (dB)	(15minute)	(1minute)	
G – 87 Keighley Avenue	3/10/2019 6.29am Wind: Calm Temp: 16 ºC	37	44	Birds:37-56 Dog Bark:58 Distant Traffic: 39-42 Sand pump: 30-31	30	34	Complies
D – 100 Keighley Avenue	3/10/2019 6:29 am Wind: Calm Temp: 16 ºC	38	45	Birds: 40-59 Road traffic: 35-42 Sand pump: 34-36	34	36	Complies
C – 110 Keighley Avenue	3/10/2019 6.51am Wind: Calm Temp: 16 ºC	40	50	Birds:51-54 Dog: 46 Plane: 38-55 Crying baby: 40-44 Insects: 41-47 FEL: 37-38 Sand pump: 33-34	33	37	Complies
B – 126A Keighley Avenue	3/10/2019 6:49 am Wind: Calm Temp: 16 ºC	42	51	Birds: 44-65 Plane: 45-51 Water pump (resident): 35-36 Road Traffic: 41-46 Sand pump: 33-34 Dump trucks: 46-50	33	36	Complies

Table 8 Operational Noise Compliance Monitoring Results - Daytime Period (1 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	1/10/2019 9.50am Wind: Calm Temp: 18 ºC	46	Birds: 43-47 Dog barking: 48-59 Trucks in site: 40-47 Sand pump: 36-37 Water pump (resident): 43-46 (constant)	36	Complies
	1/10/2019 10.11am Wind: Calm Temp: 18 ºC	39	Birds: 43-47 Dog barking: 48-59 Sand pump: 36-37 Water pump (resident): 43-46 Plane: 40-42	36	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	1/10/2019 10.28am Wind: Calm Temp: 18 ºC	45	Birds: 41-61 Dog barking: 68 Sand pump: 36-37 Water pump (resident): 43-46 (constant)	36	Complies
	1/10/2019 10.46am Wind: Calm Temp: 18 ºC	42	Birds: 36-62 Sand pump: 36-37 Water pump (resident): 41-46	36	Complies
	1/10/2019 11.03am Wind: Calm Temp: 18 ºC	40	Birds: 36-62 Plane: 38-43 Water pump (resident): 43-46 PP: 36-38	36	Complies
	1/10/2019 12.00pm Wind: slight gust Temp: 18 ºC	41	Birds: 37-61 Plane: 37-45 Water pump (resident): 43-46 Sand pump: 36-37	36	Complies
G – 87 Keighley Avenue	1/10/2019 8.24am Wind: Calm Temp: 12 ºC	41	Birds: 41-64 Excavator bucket: 39-46 Dog Barking: 43 Plane: 40-46 Sand pump: 30-31	35	Complies
	1/10/2019 8.41am Wind: Calm Temp: 12 ºC	41	Birds: 41-54 Dog Barking: 52-60 Excavator: 39-40 Sand pump: 30-31	35	Complies
	1/10/2019 8.57 am Wind: Calm Temp: 12 ºC	38	Birds: 37-57 Plane: 43-47 Excavator: 38-41 Sand pump: 31-32	33	Complies
	1/10/2019 9.14am Wind: Calm Temp: 12 ºC	39	Birds: 41-57 Distant Traffic: 42-44 (trucks) Plane: 40-45 Sand pump: 31-32	32	Complies
	1/10/2019 9.28am Wind: Calm Temp: 12 ºC	38	Birds: 41-49 Plane: 40-44 Distant Traffic: 35-39 Sand pump: 30-31	31	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	1/10/2019 9.43am Wind: Calm Temp: 12 ºC	37	Birds: 41-54 Distant Traffic: 36-37 Plane: 40-42 Sand pump: 30-31	31	Complies
D – 100 Keighley Avenue	1/10/2019 8:21 am Wind: Calm Temp: 12 ºC	39	Birds: 41-61 Plane: 44-46 Road traffic: 36-47 Excavator: 37-38 Excavator bucket: 39-53 Sand pump: 35-36	38	Complies
	1/10/2019 8:36 am Wind: Calm Temp: 12 ºC	39	Birds: 46-52 Excavator: 36-38 Excavator bucket: 42-48 Sand pump: 34-36	37	Complies
	1/10/2019 8:44 am Wind: Calm Temp: 12 ºC	41	Birds: 41-48 Wind in trees: 44-46 Road traffic: 41-48 Excavator: 36-37 Excavator bucket: 45-49 Sand pump: 34-35	38	Complies
	1/10/2019 8:53 am Wind: Calm Temp: 12 ºC	41	Birds: 38-62 Excavator: 36-37 Excavator bucket: 47-49 Excavator reversing alarm: 40-41 Sand pump: 34-35	37	Complies
	1/10/2019 9:30 am Wind: Calm Temp: 12 ºC	41	Birds: 40-55 Wind in trees: 41-42 Car horn: 50-52 Sand pump: 34-36	36	Complies
	1/10/2019 9:45 am Wind: Calm Temp: 20 ºC	39	Birds: 44-53 Road traffic: 38-39 Sand pump: 34-35	35	Complies
C – 110 Keighley Avenue	1/10/2019 7.08am Wind: 0.5m/s Temp: 11 ºC	43	Birds: 43-53 Plane: 41-52 Excavator bucket: 49-51 Horn: 44 Sand pump: 35-36	39	2dB above criterion
	1/10/2019 7.23am Wind: Calm Temp: 11 ºC	46	Birds: 51-65 Plane: 45-46 Excavator bucket: 47-51 Sand pump: 35-36	40	3dB above criterion



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	1/10/2019 7.38am Wind: Calm Temp: 11 ºC	43	Birds: 41-54 Excavator: 40-41 Excavator bucket: 45-51 Excavator reversing alarm: 40-42 Sand pump: 34-35	40	3dB above criterion
	1/10/2019 7.53am Wind: Calm Temp: 11 ºC	53	Birds: 45-60 Excavator: 39-41 Excavator bucket: 43-47 Excavator reversing alarm: 37-39 Truck horn: 39-40 Sand pump: 34-35	41	4dB above criterion
	1/10/2019 8.08am Wind: Calm Temp: 11 ºC	47	Birds: 38-47 Dog barking: 71-73 Excavator: 40-41 Excavator bucket: 42-46 Trucks: 45-46 Sand pump: 34-35	40	3dB above criterion
	1/10/2019 8:23 am Wind: Calm Temp: 11 ºC	44	Birds: 42-64 Excavator: 41-42 Excavator bucket: 42-47 Trucks: 40-42 Truck horn: 41-42 Sand pump: 34-35	41	4dB above criterion
B – 126A Keighley Avenue	1/10/2019 7:01 am Wind: Calm Temp: 11 ºC	47	Birds: 45-62 Plane: 34-37 Excavator: 41-43 Excavator bucket: 48-63 Sand pump: 34-35	47	10dB above criterion
	1/10/2019 7:16 am Wind: Calm Temp: 11 ºC	44	Birds: 41-68 Plane: 43-45 Excavator: 39-44 Excavator bucket: 44-53 Excavator reversing alarm: 36-38 Trucks: 34-36 Sand pump: 34-35	43	6dB above criterion
	1/10/2019 7:32 am Wind: Calm Temp: 11 ºC	43	Birds: 40-56 Excavator: 41-42 Excavator bucket: 48-52 Excavator reversing alarm: 42-43 Sand pump: 34-35	41	4dB above criterion



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq	Assessment
		LAeq(15minute)	LAMAX (UD)	(15minute)	
	1/10/2019 7:47 am Wind: Calm Temp: 11 ºC	53	Birds: 45-60 Dog barking: 71-78 Excavator: 41-42 Excavator bucket: 43-47 Excavator reversing alarm: 39-41 Truck horn: 39-40 Sand pump: 34-35	41	4dB above criterion
	1/10/2019 8:02 am Wind: Calm Temp: 11 ºC	47	Birds: 38-47 Dog barking: 71-73 Excavator: 40-41 Excavator bucket: 42-46 Trucks: 45-46 Sand pump: 34-35	40	3dB above criterion
	1/10/2019 8:17 am Wind: Calm Temp: 11 ºC	44	Birds: 42-64 Excavator: 41-42 Excavator bucket: 42-47 Trucks: 40-42 Truck horn: 41-42 Sand pump: 34-35	41	4dB above criterion

Table 9 Operational Noise Compliance Monitoring Results - Daytime Period (2 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	2/10/2019 10.00am Wind: Calm Temp: 21 ºC	45	Birds: 43-51 PP: 37-38 Site trucks: 41-45 Sand pump: 36-37	36	Complies
	2/10/2019 10.15am Wind: Calm Temp: 21 ºC	42	Birds: 43-55 Sand pump: 35-36	36	Complies
	2/10/2019 11.10am Wind: Calm Temp: 21 ºC	40	Birds: 46-56 Sand pump: 36-37	36	Complies
	2/10/2019 11.25am Wind: Calm Temp: 21 ºC	41	Birds: 42-56 Sand pump: 36-37	36	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	2/10/2019 11.45am Wind: Calm Temp: 21 ºC	40	Birds: 48-59 Sand pump: 35-36 Site trucks: 41-45	36	Complies
	2/10/2019 12.00pm Wind: Calm Temp: 21 ºC	40	Birds: 47-56 Sand pump: 35-36	35	Complies
G – 87 Keighley Avenue	2/10/2019 8.28am Wind: Calm Temp: 14 ºC	38	Birds: 42-48 Plane: 42-48 ATV: 41-45 FEL: 38-42 Sand pump: 30-31	34	Complies
	2/10/2019 8.44am Wind: Calm Temp: 14 ºC	38	Birds: 42-49 Dog barking: 44-47 Plane: 41-43 ATV: 46-47 Reverse Alarm: 38 Sand pump: 30-31	35	Complies
	2/10/2019 9.00 am Wind: Calm Temp: 14 ºC	37	Birds: 40-51 Plane: 41-46 Reverse Alarm: 38 FEL: 36-38 Sand pump: 31-32	35	Complies
	2/10/2019 9.16am Wind: Calm Temp: 14 ºC	49	Birds: 46-63 FEL: 38-40 Water cart: 39 Dog barking: 43-58 Sand pump: 31-32	34	Complies
	2/10/2019 9.32am Wind: Calm Temp: 14 ºC	41	Birds: 44-49 Plane: 48-50 Dog barking: 39 Sand pump: 31-32	32	Complies
	2/10/2019 9.47am Wind: Calm Temp: 14 ºC	39	Birds: 46-53 Blower: 46-47 Sand pump: 31-32	31	Complies
D – 100 Keighley Avenue	2/10/2019 8:30 am Wind: Calm Temp: 18 ºC	43	Birds: 38-53 Road traffic: 38-40 FEL: 36-42 FEL bucket: 42-43 Reverse Alarm: 44-45 Sand pump: 34-35	35	Complies
	2/10/2019 8:15 am	39	Birds: 41-47 Plane: 48-56 Sand pump: 33-34 Reverse Alarm: 45-48	36	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	Wind: Calm Temp: 18 ºC 2/10/2019 9:00 am Wind: Calm Temp: 18 ºC	37	Birds: 44-49 Dog barking: 35-39 Sand pump: 33-34 Road traffic: 36-38	33	Complies
	2/10/2019 9:15 am Wind: Calm Temp: 18 ºC	42	Birds: 43-44 Plane: 45-52 Sand pump: 33-34	33	Complies
	2/10/2019 9:30 am Wind: Calm Temp: 18 ºC	43	Birds: 49-62 People talking: 37-42 (quarry staff) Sand pump: 33-34	33	Complies
	2/10/2019 9:45 am Wind: Calm Temp: 20 ºC	44	Birds: 46-60 Plane: 44-55 Sand pump: 33-34 FEL: 38-41 Reverse Alarm: 42-43	35	Complies
C – 110 Keighley Avenue	2/10/2019 7.07am Wind: Calm Temp: 12 ºC	43	Birds: 41-58 Plane: 42-44 Insects: 43-46 Water cart: 42 FEL: 41-43 Sand pump: 33-34	36	Complies
	2/10/2019 7.29am Wind: Calm Temp: 12 ºC	43	Birds: 42-56 Plane: 42-44 Insects: 41-46 ATV: 42 Dog barking: 48-49 FEL: 41-47 Sand pump: 33-34	37	Complies
	2/10/2019 7.45am Wind: Calm Temp: 12 ºC	40	Birds: 45-57 Tractor starting: 47 Insects: 41-43 ATV: 42 Reverse Alarm: 39-44 FEL: 42-46 Sand pump: 33-34	35	Complies
	2/10/2019 7.47am Wind: Calm Temp: 12 ºC	41	Birds: 41-55 Distant traffic: 41-42 Tractor starting: 47 Plane: 41-47 Car starting: 47-58 FEL: 42-49 Sand pump: 33-34	36	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels	Estimated Project LAeq	Assessment
		LAeq(15minute)	LAmax (dB)	(15minute)	
	2/10/2019 8.02am Wind: Calm Temp: 12 ºC	41	Birds: 42-45 Water cart: 36-42 Sand pump: 33-34	36	Complies
	2/10/2019 8:17 am Wind: Calm Temp: 12 ºC	41	Birds: 44-55 Water cart: 36-41 Sand pump: 33-34	35	Complies
B – 126A Keighley Avenue	2/10/2019 7:00 am Wind: Calm Temp: 12 ºC	44	Birds: 51-67 Plane: 38-40 FEL: 40-44 FEL idle: 35-36 Sand pump: 33-34	37	Complies
	2/10/2019 7:15 am Wind: Calm Temp: 12 ºC	46	Birds: 46-73 Plane: 42-44 Road traffic: 40-42 FEL: 34-38 Sand pump: 33-34	36	Complies
	2/10/2019 7:30 am Wind: Calm Temp: 19 ºC	43	Birds: 47-64 Road traffic: 40-46 Reverse Alarm: 41-42 Sand pump: 33-34	36	Complies
	2/10/2019 7:45 am Wind: 1-2 m/s (Northerly Wind) Temp: 12 ºC	44	Birds: 41-59 Road traffic: 41-46 Reverse alarm: 45-47 FEL: 38-45 Sand pump: 33-34	36	Complies
	2/10/2019 8:00 am Wind: Calm Temp: 12 ºC	44	Birds: 49-60 Road traffic: 38-40 Truck: 41-42 FEL: 38-43 Sand pump: 33-34	37	Complies
	2/10/2019 8:15 am Wind: Calm Temp: 12 ºC	43	Birds: 42-57 Domestic fan: 36-37 Road traffic: 38-48 Reversing Alarm: 39-40 FEL: 36-38 Sand pump: 33-34	36	Complies



Table 10 Operational Noise Compliance Monitoring Results - Daytime Measurement (3 October 2019)

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	2/10/2019 10.20am Wind: Calm Temp: 24 ºC	41	Birds: 41-52 Trucks onsite: 42 FEL: 37-39 Trucks dumping onsite: 49-58 Sand pump: 34-35	36	Complies
	2/10/2019 10.35am Wind: Calm Temp: 26 ºC	44	Birds: 45-56 FEL: 38-39 Water pump (resident): 44-45 Dog barking: 70 Sand pump: 34-35	36	Complies
	2/10/2019 10.50am Wind: Calm Temp: 26 ºC	58	Birds: 48-81 FEL: 37-45 Dog barking:71-79 Truck movements:45-48 Sand pump: 34-35	36	Complies
	2/10/2019 11.05am Wind: Calm Temp: 26 ºC	41	Birds: 44-49 Water pump (resident): 43-44 FEL:37-42 Sand pump: 34-35	36	Complies
	2/10/2019 11.20am Wind: Light gust Temp: 26 ºC	42	Birds: 44-49 Water pump (resident): 42 (constant) FEL:36-44 Dog bark: 53 Sand pump: 34-35	36	Complies
	2/10/2019 11.35pm Wind: Calm Temp: 26 ºC	44	Birds: 44-56 Water pump (resident): 44 (constant) FEL:36-38 Helicopter:44-45 Sand pump: 34-35	36	Complies
G – 87 Keighley Avenue	2/10/2019 8.41am Wind: 1 m/s (Northerly Wind) Temp: 22 ºC	50	Birds: 41-60 Dog barking: 76-77 Sand pump: 34-36 Ducks: 49-54	34	Complies
	2/10/2019 8.56am Wind: Calm Temp: 21 ºC	36	Birds: 38-45 Dog barking: 76-77 Sand pump: 33-35	34	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Descriptor dB re 20 μPa) Emission, Typical Maximum Levels LAmax (dB)		Assessment
	2/10/2019 9.18 am Wind: 1-2 m/s (Northerly) Temp: 21 ºC	41	Birds: 42-60 Plane: 44-55 Road traffic: 39-47 Excavator bucket: 39-44 Sand pump: 33-34	34	Complies
	2/10/2019 9.33am Wind: Calm Temp: 21 ºC	42	Birds: 52-73 Wind in trees: 41-46 Ducks: 39-56 Sand pump: 33-34	34	Complies
	2/10/2019 9.48am Wind: Calm Temp: 21 ºC	37	Birds: 41-49 Plane: 41-46 Ducks: 37-42 Sand pump: 33-34	33	Complies
	2/10/2019 10.04am Wind: Calm Temp: 21 ºC	38	8 Birds: 41-67 Sand pump: 33-34		Complies
D – 100 Keighley Avenue	3/10/2019 8:30 am Wind: Calm Temp: 20 ºC	40	Birds: 42-60 Dog barking: 54-57 Road traffic: 39-42 Sand pump: 33-34	33	Complies
	3/10/2019 9:00 am Wind: Calm Temp: 21 ºC	37	Birds: 38-54 Sand pump: 33-34	34	Complies
	3/10/2019 9:15 am Wind: Calm Temp: 21 ºC	37	Birds: 42-59 Road traffic: 36-38 Sand pump: 33-34	34	Complies
	3/10/2019 9:30 am Wind: Calm Temp: 22 ºC	42	Birds: 39-48 Plane: 42-45 Sand pump: 33-34	33	Complies
	3/10/2019 9:45 am Wind: Calm Temp: 22 ºC	39	Birds: 40-50 Plane: 38-49 Road traffic: 38-42 Sand pump: 33-34	34	Complies
	3/10/2019 10: am Wind: Calm Temp: 22 ºC	39			Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
C – 110 Keighley Avenue	3/10/2019 7.07am Wind: Calm Temp: 16 ºC	41	Birds: 41-57 Helicopter: 40-46 Dog barking: 41-45 Sand pump: 35-36	35	Complies
	3/10/2019 7.22am Wind: Calm Temp: 16 ºC	42	Birds: 45-53 Plane: 44-46 Sand pump: 35-36	35	Complies
	3/10/2019 7.37am Wind: Calm Temp: 16 ºC	45	Birds: 48-59 Plane: 41-43 Sand pump: 34-35	34	Complies
	3/10/2019 7.52am Wind: Calm Temp: 16 ºC	43	Birds: 38-64 Plane: 40-43 Insects: 40-42 Car starting: 43 Garbage truck: 43-54 Sand pump: 34-35	34	Complies
	3/10/2019 8.08am Wind: Calm Temp: 16 ºC	46	Birds: 43-69 PP: 35-36 Insects: 37-42 Planes: 45-52	35	Complies
	3/10/2019 8:26 am Wind: Calm Temp: 16 ºC	49	Birds: 48-73 Plane: 45-52 Sand pump: 35-36 Road traffic: 46-47 Insects: 37-42	35	Complies
B – 126A Keighley Avenue	3/10/2019 7:01 am Wind: Calm Temp: 16 ºC	42	Birds: 47-63 Plane: 41-44 Residential pump: 35-36 Road traffic: 33-38 Sand pump: 33-34	34	Complies
	3/10/2019 7:15 am Wind: Calm Temp: 16 ºC	64	Birds: 44-52 Plane: 44-52 Residential pump: 33-34 Sand pump: 33-34 Dog barking: 48-93	34	Complies
	3/10/2019 7:30 am Wind: Calm Temp: 16 ºC	49	Birds: 48-77 Plane: 43-47 Residential pump: 34-35 Sand pump: 33-34	34	Complies
	3/10/2019 7:45 am Wind: Calm Temp: 16 ºC	40	Birds: 41-53 Plane: 41-43 Residential pump: 34-35 Sand pump: 33-34	34	Complies



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
		LAeq(15minute)		(13millate)	
	3/10/2019 8:00 am Wind: Calm Temp: 16 ºC	44	Birds: 41-67 People talking: 61-65 Residential pump: 34-35 Sand pump: 33-34	34	Complies
	3/10/2019 8:15 am Wind: Calm Temp: 16 ºC	43	Birds: 45-54 Plane: 42-49 Residential pump: 36-36 Sand pump: 33-35	35	Complies

7 Assessment and Findings

Based on the measured noise emissions presented in **Section 6**, the estimated Project related noise contributions for each location are summarised in **Table 11** to **Table 13**, together with an assessment against the corresponding EPL Operational Noise Trigger Levels.

Table 11 Morning Shoulder and Daytime Period 1 October 2019

Period	Location		Estimated Project Noise Level Contribution dBA		Project Noise Trigger Level	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)	
Morning Shoulder	B – 126A Keighley Avenue	47	54	+12	+9	
	C – 110 Keighley Avenue	42	49	+7	+4	
	D – 100 Keighley Avenue	43	49	+8	+4	
	G – 87 Keighley Avenue	41	47	+6	+2	
	R – 21 Reservoir Road	36	42	Pass	Pass	
Day	B – 126A Keighley Avenue	40 - 47		+3 to +10	N/A	
	C – 110 Keighley Avenue	39 - 41		+2 to +4		
	D – 100 Keighley Avenue	35 - 38		Pass		
	G – 87 Keighley Avenue	31-35		Pass		
	R – 21 Reservoir Road	36		Pass		

Table 12 Morning Shoulder and Daytime Period 2 October 2019

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Trigger Level	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	40	46	+5	+1
	C – 110 Keighley Avenue	34	43	Pass	Pass



Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Trigger Level	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
	D – 100 Keighley Avenue	35	43	Pass	Pass
	G – 87 Keighley Avenue	35	41	Pass	Pass
	R – 21 Reservoir Road	35	41	Pass	Pass
Day	B – 126A Keighley Avenue	36 - 37	N/A	Pass	N/A
	C – 110 Keighley Avenue	35 - 37		Pass	
	D – 100 Keighley Avenue	33 - 36		Pass	
	G – 87 Keighley Avenue	34 - 35		Pass	
	R – 21 Reservoir Road	34 - 36		Pass	

Table 13 Morning Shoulder and Daytime Period 3 October 2019

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Trigger Level	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	33	36	Pass	Pass
	C – 110 Keighley Avenue	33	37	Pass	Pass
	D – 100 Keighley Avenue	34	36	Pass	Pass
	G – 87 Keighley Avenue	30	34	Pass	Pass
	R – 21 Reservoir Road	35	42	Pass	Pass
Day	B – 126A Keighley Avenue	34 - 35	N/A	Pass	N/A
	C – 110 Keighley Avenue	34 - 35		Pass	
	D – 100 Keighley Avenue	33 - 34		Pass	
	G – 87 Keighley Avenue	33-34		Pass	
	R – 21 Reservoir Road	36		Pass	

Based on the operator-attended noise survey results presented in **Table 11** to **Table 13**, on 1 October 2019, the morning shoulder LAeq(15min) project Trigger Levels were exceeded by up to 12 dB, 7 dB, 8 dB and 6 dB at Location B, C, D and G, respectively. The morning shoulder LA1(1min) project Trigger Levels were exceeded by up to 9 dB, 4 dB and 2 dB at Location B, C, D and G, respectively. The daytime LAeq(15min) project Trigger Levels were exceeded by up to 10 dB and 4 dB at Location B and C. The measured noise levels at Location D, G and R comply with the daytime project Trigger Levels.

The morning shoulder LAeq(15min) and LA1(1min) project Trigger Levels were exceeded by up to 5 dB and 1 dB at Location B only on 2 October 2019. The measured noise level from the Project comply with the morning shoulder and daytime Trigger Levels at all monitoring locations on 3 October 2019.



The noise exceedances on 1 October 2019 were attributed to sporadic noise from the excavator which was the result of excessive bucket slap. The noise source was clearly audible and appreciably higher at the location closest to the tailings dam at Location B (126A Keighley Avenue) and progressively quieter at location further from the tailings dam. Hanson were made aware of the exceedances caused by the excavator bucket and after further discussions, have indicated that they were aware of the issue and a warranty resolution was underway to resolve the fault.

Subsequent measurements on 2 October 2019 and 3 October 2019 reveal compliance at the majority of the locations with the exception of 126 Keighley Avenue which registered intermittent noise from the excavator.

8 Conclusion

VMS has conducted operator-attended noise monitoring for Central Coast Sands Quarry operations over a three-day period between 1 October 2019 and 3 October 2019 during the morning shoulder and daytime periods. Measurements conducted during the morning shoulder and daytime periods on 1 October 2019 have found the project Trigger Levels were exceeded at location B, C, D and G due to intermittent noise caused by excessive slack on the excavator bucket . VMS have raised concerns regarding this issue with Hanson and upon further discussion, it has been determined that currently, the excavator is undergoing warranty claim to resolve the excessive slack in the bucket and is anticipated to comply once the issue has been resolved.

The subsequent noise measurements conducted on 2 October and 3 October 2019 demonstrates that the Project is generally in compliance with the EPL project Trigger Levels. Furthermore, it was noted that noise emission from the guarry were not discernible at times at locations further away from the guarry.

Yours sincerely

Zul Khasmuri

Technical Director - Acoustics



Terminology Relating to Noise and Vibration

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.		
Sound Power	Sound Power is the rate at which sound energy is emitted, reflected, transmitted, or received, per unit time. Unlike sound pressure, sound power is neither room-dependent nor distance-dependent.		
Sound Pressure Level (SPL)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu Pa$ ($20x10^{-6}$ For a decibel scale.		
Sound Power Leve (SWL)	The Sound Power Level is the sound power relative to a standard reference pressure of 1pW ($20x10^{-1}$ Watts) on a decibel scale. The SWL of a simple point source may be used to calculate the SPL at a giver distance (r) using the following formula: $SPL = SWL - 10 \times Log_{10}(4 \times \pi \times r^2)$		
	Note that the above formula is only valid for sound propagation in the free-field (see below).		
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μ Pa.		
A-weighting, dBA	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.		
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined according to how the averaging or statistics are carried out.		
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level a notional steady sound that would contain the same amount of sound energy as the actual, possib fluctuating, sound that was recorded.		
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.		
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.		
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.		
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m		
Fast/Slow Time Weighting	Averaging times used in sound level meters.		
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.		
DnT,w	The single number quantity that characterises airborne sound insulation between rooms over a range of frequencies.		
Rw	Single number quantity that characterises the airborne sound insulating properties of a material or building element over a range of frequencies.		
Reverberation	The persistence of sound in a space after a sound source has been stopped.		
PPV	The particles of a medium are displaced from their random motion in the presence of a vibration way The greatest instantaneous velocity of a particle during this displacement is called the Peak Partic Velocity (PPV) and is typically measured in the units of mm/s.		
Hertz, Hz	The unit of Frequency (or Pitch) of a sound or vibration. One hertz equals one cycle per second 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.		
Acceleration	Acceleration is defined as the rate of change of Velocity of a particle over a period of time and is typically measured in the units of m/sec ² .		
Vibration Dose, VDV	When assessing intermittent vibration, it is necessary to use the vibration dose value (VDV), a cumulative measurement of the vibration level received over an 8-hour or 16-hour period. The VDV formulae uses the RMS Acceleration raised to the fourth power and is known as the Root-mean-quad method. This technique ensures the VDV is more sensitive to the peaks in the acceleration levels. VDVs are typically measured in the units of m/s ^{1.75} .		

