

14 September 2021

10-1805 Annual (Q3) 2021 20210914.docx

Hanson Construction Materials Pty Ltd
 Level 5, 75 George Street
 Parramatta NSW 2150

Attention: Ms Belinda Pignone

Dear Belinda

**Annual Noise Compliance Monitoring 2021
 Central Coast Sands Quarry
 Lot 2 Reservoir Road Somersby**

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 between 7 September and 9 September 2021.

2 Hours of Operations

The Project operating hours have been limited in the Project Approval (MP 08_0173) and shown in **Table 1**.

Table 1 Hours of Operation

Activity	Operating Hours
Transportation of quarry products from the site	6:00am to 4:00pm, Monday to Friday, and 6:00am to 2:00pm, Saturday. No transportation of quarry product from the site on Sundays or Public Holidays.
Other Quarrying Operations	6:00am to 6:00pm, Monday to Friday, and 6:00am to 4:00pm, Saturday. No quarrying operations on Sundays or Public Holidays.

Activity	Operating Hours
Construction Activities	7.00 am to 4.00 pm, Monday to Friday; and 7.00 a m to 12.00 pm, Saturday, Unless noise from these activities does not exceed 38dB(A) LAeq(15min) at any privately-owned residence
Maintenance Activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence

Source: Project Approval (MP 08_0173) dated 2014.

3 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 the monitoring periods are presented in **Table 2**.

Table 2 Quarry Activities – 7 September to 9 September 2021

Activity	Tuesday 7 September 2021	Wednesday 8 September 2021	Thursday 9 September 2021
	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)	Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	Komatsu PC450-8 (Excavator) PIT 2/1
Stock Yard	L180H (Front End Loader)	L180H (Front End Loader)	Komatsu WA500-6 (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.

4 Noise Criteria

The Project Approval (MP 08_0173) was granted on 1 August 2014 by the Minister for Planning.

Operational noise criteria for the Project are nominated in Schedule 3, Condition 10 of MP 08_0173 and are reproduced in **Table 3**.

Table 3 Project Operational Noise Criteria

Location	Day	Evening	Morning Shoulder	
	LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
B	37	35	37	47
C	37		38	
D	38		40	
G	38		38	
R	36		38	
All other privately-owned land	35		35	

Note 1: Excerpt from Project Approval 1 August 2014.

5 Noise Monitoring Locations

Noise monitoring was conducted at the nearest residential receivers at locations at B, C, D, G and R during the morning shoulder period (6.00am to 7.00am) and day-time periods (7.00 am to 6.00 pm). Day-time attended measurements were conducted for 1.5 hours at each location as per Condition M7 of the Environmental Protection Licence (EPL 3751) dated 11 November 2016. The noise monitoring locations are presented in Figure 1.

Figure 1 Noise Monitoring Locations

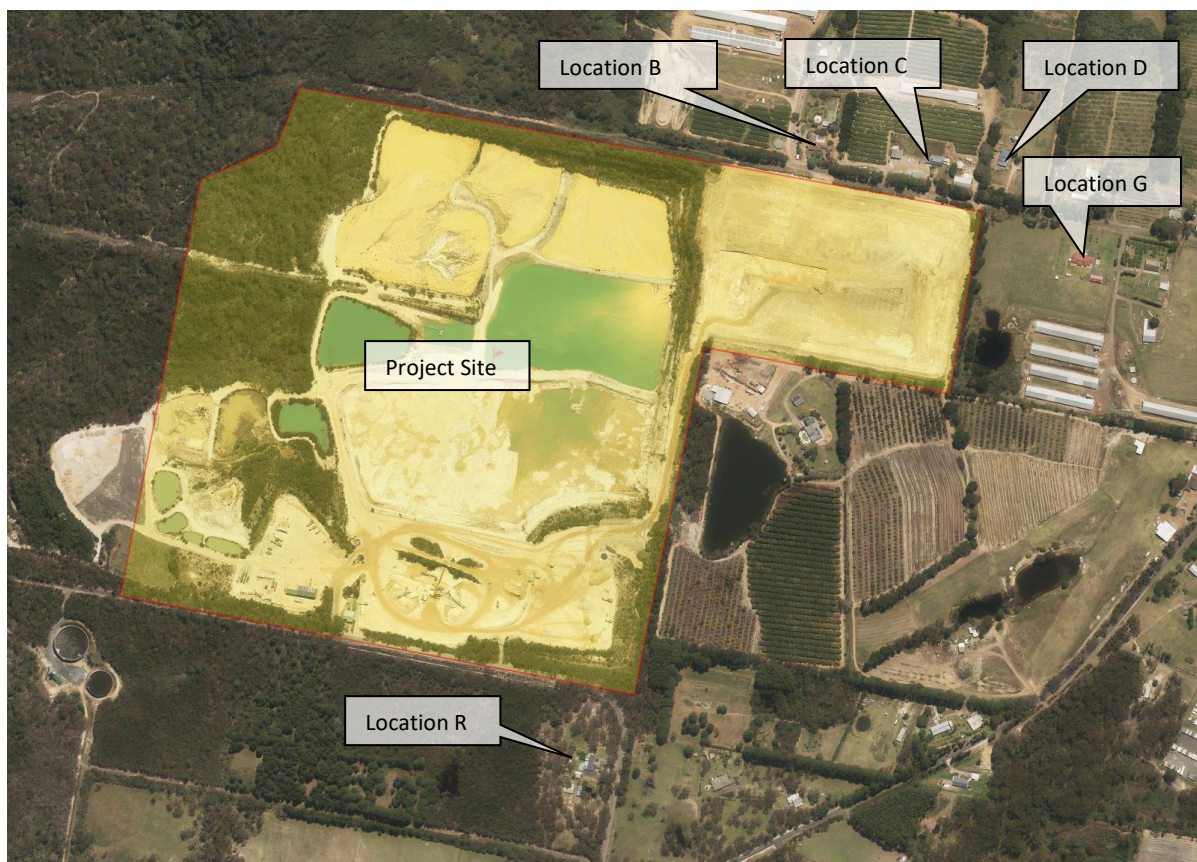


Image courtesy of Six Maps

5.1 Instrumentation and Measurement Procedure

Noise monitoring was conducted in accordance with the procedures specified in the *Central Coast Sands Quarry Project Noise Management Plan* dated 3 January 2018.

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 is presented in **Table 4**.

Table 4 Noise Monitoring Equipment

Instrumentation	Type	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 1**, operator-attended 15-minute noise surveys were conducted between 7 September and 9 September 2021 at the nominated residential receivers.

The measurements were conducted in accordance with 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 survey with no shift noted during the calibration process.

6 Operational Noise Compliance Monitoring Results

The measured noise emission levels from quarry operations are presented in **Table 5** to **Table 10**, during the morning shoulder period and daytime periods.

**Table 5 Operational Noise Compliance Monitoring Results - Morning Shoulder Period
7 September 2021**

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
B – 126A Keighley Avenue	07/09/2021 6:00 am Wind: Calm Temp: 11 °C Humidity: 80% Cloud: 0 okta	40	49	Birds: 47-51 Road traffic: 34-39 Dump truck: 35-36 Excavator: 35-36	35	43	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(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
C – 110 Keighley Avenue	07/09/2021 6:00 am Wind: Calm Temp: 11 °C Humidity: 80% Cloud: 0 okta	46	55	Bird: 45-72 Plane: 38-40 Road traffic: 37-42 Dump truck: 38-44 Excavator: 40-41 Excavator (bucket): 43-49	36	45	Complies
D – 100 Keighley Avenue	07/09/2021 6:21 am Wind: Calm Temp: 11 °C Humidity: 80% Cloud: 0 okta	41	44	Bird: 42-49 Road traffic: 41-43 Excavator: 38-41 Excavator (bucket): 45-49	37	46	Complies
G – 87 Keighley Avenue	07/09/2021 6:23 am Wind: Calm Temp: 11 °C Humidity: 80% Cloud: 0 okta	42	50	Birds: 41-59 Excavator: 38-40 Excavator (bucket): 43-44 Reverse Alarm: 41-42 Dump trucks: 38-41 Distant traffic: 35-38	37	44	Complies
R – 21 Reservoir Road	07/09/2021 6:44 am Wind: Calm Temp: 11 °C Humidity: 80% Cloud: 0 okta	46	52	Birds: 42-57 Road traffic: 44-52 Sand pump: 35-36 Front-end-loader: 37-38	36	43	Complies

Table 6 Operational Noise Compliance Monitoring Results - Morning Shoulder Period 8 September 2021

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
B – 126A Keighley Avenue	08/09/2021 6:00 am Wind: Calm Temp: 11 °C Humidity: 78% Cloud: 0 okta	40	49	Birds: 47-55 Road traffic: 34-35	<30	<39	Complies
C – 110 Keighley Avenue	08/09/2021 6:00 am Wind: Calm Temp: 11 °C Humidity: 78% Cloud: 0 okta	37	48	Birds: 39-56 Car horn: 43-44	<30	<38	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(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
D – 100 Keighley Avenue	08/09/2021 6:19 am Wind: Calm Temp: 11 °C Humidity: 78% Cloud: 0 okta	40	48	Birds: 45-59 Dog barking: 43-48 Road traffic: 33-35 Front-end-loader (barely audible): <30	<30	<38	Complies
G – 87 Keighley Avenue	08/09/2021 6:22 am Wind: Calm Temp: 11 °C Humidity: 78% Cloud: 0 okta	47	61	Birds: 41-69 Road traffic: 33-35 Front-end-loader (barely audible): <30	<30	<40	Complies
R – 21 Reservoir Road	08/09/2021 6:42 am Wind: Calm Temp: 11 °C Humidity: 78% Cloud: 0 okta	70	83	Birds: 53-40 Dog barking: 64-91 Road traffic: 38-49 Sand pump: 34-35 Front-end-loader: 37-38 Truck (B-double) (idling): 35-36	36	43	Complies

Table 7 Operational Noise Compliance Monitoring Results - Morning Shoulder Period 9 September 2021

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
B – 126A Keighley Avenue	09/09/2021 6:00 am Wind: 1 m/s (W) Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	56	Birds: 42-59 Rooster: 37-38 Road traffic: 33-37	<30	<46	Complies
C – 110 Keighley Avenue	09/09/2021 6:00 am Wind: 1 m/s (W) Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	56	Birds: 42-61 Rooster: 35-36 Road traffic: 35-38	<30	<46	Complies
D – 100 Keighley Avenue	09/09/2021 6:19 am Wind: 1 m/s (W) Temp: 11 °C Humidity: 70% Cloud: 0 okta	41	51	Birds: 42-60 Dog barking: 35-36 Road traffic: 36-38 Excavator: 34-37 Excavator (bucket): 36-38	35	44	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(15min)	Estimated Project LA1(1min)	Assessment
		LAeq(15min)	LA1(1min)				
G – 87 Keighley Avenue	09/09/2021 6:21 am Wind: 1 m/s (W) Temp: 11 °C Humidity: 70% Cloud: 0 okta	42	51	Birds: 43-60 Dog barking: 37-39 Wind in trees: 33-34 Road traffic: 36-41 Excavator: 34-35 Excavator (bucket): 38-41	36	46	Complies
R – 21 Reservoir Road	09/09/2021 6:44 am Wind: 1 m/s (W) Temp: 11 °C Humidity: 67% Cloud: 1 okta	47	56	Birds: 42-68 Dog barking: 51-53 Water pump: 41-43 Road traffic: 43-51 Sand pump: 33-34 Frond-end-loader: 34-35	36	42	Complies

Table 8 Operational Noise Compliance Monitoring Results - Daytime Period 7 September 2021

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq(15min)	Assessment
		LAeq(15min)	LA1(1min)			
B – 126A Keighley Avenue	07/09/2021 8:43 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	40		Birds: 42-47 Dog barking: 64-77 Neighbouring activities (excavator & Truck): 42-52 Car engine start: 52-54 Road traffic: 36-38 Excavator: 36-37 Excavator (bucket): 42-44 Dump trucks: 41-43	37	Complies
	07/09/2021 8:58 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	38		Bird: 41-55 Road traffic: 38-40 Plant not audible	<30	Complies
	07/09/2021 9:13 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	37		Bird: 42-59 Car engine start: 44-49 People talking: 38-40 Car door: 43-45 Road traffic: 38-40 Plant not audible	<30	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	07/09/2021 9:28 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	49	Birds: 41-44 Dog barking: 71-73 Neighbouring activities (excavator & Truck): 42-55 Road traffic: 37-41 Excavator: 36-37 Dump trucks: 38-48	37	Complies
	07/09/2021 9:43 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	Birds: 41-55 Neighbouring activities (excavator & Truck): 44-51 Road traffic: 42-49 Excavator: 34-35 Excavator (bucket): 47-51 Dump trucks: 41-44	37	Complies
	07/09/2021 9:58 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	Birds: 41-59 Neighbouring activities (excavator & Truck): 42-53 Excavator: 34-36 Excavator (bucket): 47-48 Dump trucks: 37-39	36	Complies
C – 110 Keighley Avenue	07/09/2021 8:45 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	44	Birds: 42-62 Dog barking: 57-58 Neighbouring activities (excavator & Truck): 43-51 Road traffic: 37-39 Excavator: 35-38 Excavator (bucket): 45-47	37	Complies
	07/09/2021 9:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	35	Bird: 40-48 People talking: 37-42 Distance traffic: 37-40 Plant not audible	<30	Complies
	07/09/2021 9:15 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	36	Bird: 42-51 Distance traffic: 35-38 Plant not audible	<30	Complies
	07/09/2021 9:30 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	39	Birds: 41-63 Neighbouring activities (excavator & Truck): 42-44 Road traffic: 37-42 Excavator: 36-37 Excavator (bucket): 42-44	36	Complies
	07/09/2021 9:45 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	41	Birds: 42-56 Road traffic: 36-38 Excavator: 36-38 Excavator (bucket): 43-45	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	07/09/2021 10:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	39	Birds: 41-47 Road traffic: 37-38 Excavator: 37-42 Excavator (bucket): 40-44	36	Complies
D – 100 Keighley Avenue	07/09/2021 10:21 am Wind: 1m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 0 okta	40	Birds: 45-48 Wind in trees: 42-45 Road traffic: 37-39 Excavator: 37-39	37	Complies
	07/09/2021 10:36 am Wind: 1m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 41-49 Plane: 42-48 Road traffic: 38-40 Excavator: 37-40 Excavator (bucket): 44-46	38	Complies
	07/09/2021 10:51 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	40	Birds: 45-57 Road traffic: 37-39 Excavator: 37-39 Excavator (bucket): 40-43	37	Complies
	07/09/2021 11:06 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 46-59 Road traffic: 37-38 Excavator: 36-39 Excavator (bucket): 41-43	38	Complies
	07/09/2021 11:21 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	39	Birds: 41-49 Road traffic: 37-38 Excavator: 36-40 Excavator (bucket): 40-44	37	Complies
	07/09/2021 11:36 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 44-52 Road traffic: 37-40 Excavator: 36-47 Excavator (bucket): 42-43	37	Complies
	07/09/2021 10:27 am Wind: 1m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 0 okta	42	Birds: 45-64 Road traffic: 38-40 Excavator: 37-40 Excavator (bucket): 39-42	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	07/09/2021 10:42 am Wind: 1m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 44-51 Plane: 44-48 Road traffic: 37-38 Excavator: 37-39 Excavator (bucket): 38-41	36	Complies
	07/09/2021 10:57 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	42	Birds: 42-68 Road traffic: 37-41 Excavator: 36-38 Excavator (bucket): 40-41 Reversing alarm:38-40	36	Complies
	07/09/2021 11:12 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 39-64 Dog barking: 43-45 Road traffic: 35-38 Excavator: 38-40 Excavator (bucket): 41-45	36	Complies
	07/09/2021 11:27 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	41	Birds: 41-59 Car passby: 48-54 Road traffic: 37-38 Excavator: 38-41 Excavator (bucket): 41-47	36	Complies
	07/09/2021 11:42 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 0 okta	39	Birds: 42-44 Car passby: 48-55 Road traffic: 37-38 Excavator: 38-41 Excavator (bucket): 41-45	36	Complies
R – 21 Reservoir Road	07/09/2021 7:00 am Wind: Calm Temp: 11 °C Humidity: 75% Cloud: 0 okta	40	Birds: 43-56 Local traffic: 45-47 Sand pump: 35-36 Front-end-loader: 36-37 Dump trucks: 38-44	36	Complies
	07/09/2021 7:15 am Wind: Calm Temp: 11 °C Humidity: 73% Cloud: 0 okta	43	Birds: 43-51 Road traffic: 43-47 Sand pump: 35-36 Front-end-loader: 44-47	36	Complies
	07/09/2021 7:30 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	47	Birds: 44-66 Road traffic: 45-49 Sand pump: 35-36 Front-end-loader: 38-40	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	07/09/2021 7:45 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	Birds: 44-59 Road traffic: 40-47 Sand pump: 35-36 Front-end-loader: 37-39	35	Complies
	07/09/2021 8:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	42	Birds: 47-54 Sand pump: 35-36 Front-end-loader (loading truck): 48-50 Excavator (bucket): 39-41 Dump trucks: 42-45	36	Complies
	07/09/2021 8:15 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 0 okta	43	Birds: 44-48 Road traffic: 41-50 Sand pump: 35-36 Dump truck: 40-46	35	Complies

Table 9 Operational Noise Compliance Monitoring Results - Daytime Period 8 September 2021

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
B – 126A Keighley Avenue	08/09/2021 8:42 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	44	Birds: 41-66 Plane: 41-54 Neighbouring activities (excavator & truck): 41-44 Dog barking: 45-46 Excavator: 36-41	36	Complies
	08/09/2021 8:57 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	38	Birds: 41-57 Car door: 51-52 People talking: 33-38 Plant not audible	<30	Complies
	08/09/2021 9:12 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	35	Birds: 39-47 People talking: 33-37 Plant not audible	<30	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	08/09/2021 9:27 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	45	Birds: 40-51 Neighbouring activities (excavator & truck): 50-57 ATV: 44-61 Excavator: 35-38	35	Complies
	08/09/2021 9:42 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	46	Birds: 41-61 Neighbouring activities (excavator & truck): 46-49 Dog barking: 43-45 ATV: 56-58 People talking: 42-44 Road traffic: 38-41 Excavator: 36-41	37	Complies
	08/09/2021 9:57 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	42	Birds: 40-59 Neighbouring activities (excavator & Truck): 45-51 Excavator: 36-39 Dump trucks: 36-38	37	Complies
C – 110 Keighley Avenue	08/09/2021 8:45 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	42	Birds: 49-54 Neighbouring activities (excavator & Truck): 46-55 Excavator: 35-38 Dump truck: 36-37	36	Complies
	08/09/2021 9:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	39	Bird: 40-56 Plant not audible	<30	Complies
	08/09/2021 9:15 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	39	Bird: 41-55 Plant not audible	<30	Complies
	08/09/2021 9:30 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	41	Birds: 41-64 Domestic activities: 33-38 Road traffic: 35-39 Plant not audible	<30	Complies
	08/09/2021 9:45 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	57	Birds: 40-72 Neighbouring activities (excavator & Truck): 46-49 Dog barking: 48-73 People talking: 48-52 Door closing: 55 Excavator: 35-37	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	08/09/2021 10:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	40	Birds: 39-62 Road traffic: 38-41 Excavator: 35-38 Dump truck: 37-39	35	Complies
D – 100 Keighley Avenue	08/09/2021 10:23 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	40	Birds: 44-61 Lawn mover: 31-32 Excavator: 35-37 Dump truck: 38-41	34	Complies
	08/09/2021 10:38 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	37	Birds: 42-51 Domestic activities: 38-43 Lawn mover: 31-32 Road traffic: 38-45 Dump truck: 33-38	35	Complies
	08/09/2021 10:53 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	38	Birds: 41-50 Domestic activities: 38-47 Lawn mover: 31-32 Road traffic: 41-46 Dump truck: 35-37	35	Complies
	08/09/2021 11:08 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	36	Birds: 38-47 Domestic activities: 38-47 Lawn mover: 31-32 Road traffic: 34-47 Dump truck: 34-38	34	Complies
	08/09/2021 11:23 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	37	Birds: 39-52 Domestic activities: 39-42 Lawn mover: 31-32 Road traffic: 38-46 Dump truck: 34-38	34	Complies
	08/09/2021 11:38 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	36	Birds: 38-45 Lawn mover: 31-32 Dump truck: 35-37	34	Complies
	08/09/2021 10:25 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	41	Birds: 38-62 Lawn mover: 32-33 Dump truck: 33-35	33	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	08/09/2021 10:40 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	40	Birds: 38-54 Domestic activities: 41-46 Lawn mover: 32-33 Dump truck: 33-35	34	Complies
	08/09/2021 10:55 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	36	Birds: 39-46 Domestic activities: 38-43 Lawn mover: 32-33 Dump truck: 33-34	33	Complies
	08/09/2021 11:10 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	36	Birds: 39-46 Domestic activities: 38-43 Lawn mover: 32-33 Dump truck: 33-34	33	Complies
	08/09/2021 11:25 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	39	Birds: 39-49 Domestic activities: 38-40 Lawn mover: 32-33 Dump truck: 33-38	34	Complies
	08/09/2021 11:40 am Wind: Calm Temp: 12 °C Humidity: 67% Cloud: 2 okta	38	Birds: 38-45 Lawn mover: 32-33 Reversing alarm from residential property: 38-40 Road traffic: 38-41 Dump truck: 33-5	34	Complies
R – 21 Reservoir Road	08/09/2021 7:00 am Wind: Calm Temp: 11 °C Humidity: 75% Cloud: 0 okta	43	Birds: 41-57 Road traffic: 41-45 Sand pump: 34-35 Truck (idling): 35-36	35	Complies
	08/09/2021 7:15 am Wind: Calm Temp: 11 °C Humidity: 73% Cloud: 0 okta	44	Birds: 42-63 Road traffic: 41-46 Sand pump: 34-35 Truck (idling): 35-36 Fron-end-loader: 38-46	36	Complies
	08/09/2021 7:30 am Wind: Calm Temp: 11 °C Humidity: 71% Cloud: 0 okta	47	Birds: 43-56 Road traffic: 42-45 Sand pump: 34-35 Truck (idling): 35-36 Dump truck: 41-45	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	08/09/2021 7:45 am Wind: Calm Temp: 11 °C Humidity: 72% Cloud: 1 okta	47	Birds: 45-63 Dog barking: 64-78 Road traffic: 42-54 Sand pump: 34-35 Dump truck: 43-48	35	Complies
	08/09/2021 8:00 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	41	Birds: 41-54 Road traffic: 41-52 Sand pump: 34-35 Dump truck: 41-44	36	Complies
	08/09/2021 8:15 am Wind: Calm Temp: 11 °C Humidity: 70% Cloud: 1 okta	41	Birds: 41-68 Air horn: 32-33 Road traffic: 41-44 Sand pump: 34-35 Dump truck: 38-41	35	Complies

**Table 10 Operational Noise Compliance Monitoring Results - Daytime Period
9 September 2021**

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
B – 126A Keighley Avenue	09/09/2021 7:00 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 1 okta	40	Birds: 39-52 Road traffic: 37-39 Excavator: 35-36 Excavator (bucket): 39-47	37	Complies
	09/09/2021 7:15 am Wind: 1 m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 2 okta	41	Birds: 42-52 Road traffic: 42-44 Excavator: 35-36 Excavator (bucket): 37-44	37	Complies
	09/09/2021 7:30 am Wind: 1 m/s (N) Temp: 12 °C Humidity: 65% Cloud: 2 okta	44	Birds: 45-57 Road traffic: 34-38 Excavator: 35-36 Excavator (bucket): 37-41	37	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	09/09/2021 7:45 am Wind: 1 m/s (N) Temp: 12 °C Humidity: 65% Cloud: 2 okta	41	Birds: 37-56 Road traffic: 37-41 Excavator: 33-37 Excavator (bucket): 38-39	35	Complies
	09/09/2021 8:00 am Wind: 1 m/s (N) Temp: 13 °C Humidity: 65% Cloud: 3 okta	43	Birds: 39-66 Excavator: 34-36 Excavator (bucket): 38-50	34	Complies
	09/09/2021 8:15 am Wind: Calm Temp: 13 °C Humidity: 64% Cloud: 3 okta	45	Birds: 39-62 Road traffic: 36-38 Plant not audible	<30	Complies
C – 110 Keighley Avenue	09/09/2021 8:39 am Wind: 1 m/s (N) Temp: 14 °C Humidity: 64% Cloud: 4 okta	41	Birds: 41-62 Wind in trees: 37-39 Road traffic: 33-34 Fron-end-loader: <30	<30	Complies
	09/09/2021 8:54 am Wind: 1 m/s (N) Temp: 14 °C Humidity: 64% Cloud: 5 okta	41	Bird: 37-57 ATV: 37-40 Wind in trees: 38-41 Plant not audible	<30	Complies
	09/09/2021 9:09 am Wind: 1 m/s (NW) Temp: 14 °C Humidity: 64% Cloud: 6 okta	43	Bird: 38-62 Wind in trees: 37-39 Plant not audible	<30	Complies
	09/09/2021 9:24 am Wind: 1 m/s (W) Temp: 15 °C Humidity: 60% Cloud: 6 okta	39	Bird: 41-57 People talking: 37-38 Wind in trees: 37-40 Plant not audible	<30	Complies
	09/09/2021 9:39 am Wind: 1 m/s (W) Temp: 16 °C Humidity: 60% Cloud: 6 okta	39	Birds: 44-46 Wind in trees: 36-38 ATV: 39-44 Dog barking: 36-41 Road traffic: 38-42 Front-end-loader: 35-37 Dump truck: 36-40	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	09/09/2021 9:54 am Wind: Calm Temp: 16 °C Humidity: 60% Cloud: 6 okta	41	Birds: 38-51 Wind in trees: 34-36 Road traffic: 38-42 Excavator (tracking): 37-42	37	Complies
D – 100 Keighley Avenue	09/09/2021 8:56 am Wind: 1 m/s (N) Temp: 14 °C Humidity: 60% Cloud: 6 okta	39	Birds: 39-51 Wind in trees: 36-39 Plant not audible	<30	Complies
	09/09/2021 9:11 am Wind: 1 m/s (NW) Temp: 14 °C Humidity: 64% Cloud: 6 okta	40	Birds: 42-56 Wind in trees: 37-39 Plant not audible	<30	Complies
	09/09/2021 9:26 am Wind: 1 m/s (W) Temp: 15 °C Humidity: 60% Cloud: 6 okta	40	Birds: 43-48 Wind in trees: 37-43 Road traffic: 37-39 Plant not audible	<30	Complies
	09/09/2021 9:41 am Wind: 1 m/s (W) Temp: 16 °C Humidity: 60% Cloud: 6 okta	39	Birds: 45-61 Wind in trees: 35-37 Road traffic: 37-42 Front-end-loader: 36-41 Dump truck: 34-35	36	Complies
	09/09/2021 9:56 am Wind: 1 m/s (W) Temp: 16 °C Humidity: 60% Cloud: 6 okta	37	Birds: 40-43 Dog barking: 44-52 Wind in trees: 35-37 Road traffic: 35-38 Dump truck: 33-36	35	Complies
	09/09/2021 10:11 am Wind: 1 m/s (W) Temp: 16 °C Humidity: 60% Cloud: 6 okta	41	Birds: 38-53 Dog barking: 46-50 Wind in trees: 36-37 Road traffic: 36-37 Dump truck: 35-39	36	Complies
	09/09/2021 10:47 am Wind: 1 m/s (NW) Temp: 17 °C Humidity: 60% Cloud: 7 okta	37	Birds: 39-48 People talking: 34-37 Wind in trees: 34-35 Plant not audible	<30	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	09/09/2021 11:02 am Wind: 1 m/s (NW) Temp: 18 °C Humidity: 60% Cloud: 7 okta	37	Birds: 41-45 Wind in trees: 34-37 ATV: 42-44 Domestic activities: 38-46 People talking: 35-37 Plant not audible	<30	Complies
	09/09/2021 11:17 am Wind: 1 m/s (NW) Temp: 18 °C Humidity: 60% Cloud: 7 okta	37	Birds: 37-63 Wind in trees: 37-39 Domestic activities: 46 Road traffic: 37-39 Reversing alarm: 33-34	<30	Complies
	09/09/2021 11:32 am Wind: 1 m/s (NW) Temp: 18 °C Humidity: 60% Cloud: 7 okta	39	Birds: 40-53 Wind in trees: 35-37 Road traffic: 33-35 Front-end-loader: 33-35 Reversing alarm: 32-34	<30	Complies
	09/09/2021 11:47 am Wind: 1 m/s (NW) Temp: 18 °C Humidity: 60% Cloud: 7 okta	39	Birds: 42-66 Wind in trees: 34-37 Road traffic: 33-34 Plant not audible	<30	Complies
	09/09/2021 12:02 am Wind: 1 m/s (NW) Temp: 18 °C Humidity: 60% Cloud: 7 okta	35	Birds: 39-48 Wind in trees: 35-37 Plant not audible	<30	Complies
R – 21 Reservoir Road	09/09/2021 7:10 am Wind: Calm Temp: 12 °C Humidity: 65% Cloud: 1 okta	46	Birds: 44-61 Residence door: 51-52 Road traffic: 44-48 Sand pump: 34-35 Front-end-loader: 37-42	36	Complies
	09/09/2021 7:25 am Wind: 1 m/s (NW) Temp: 12 °C Humidity: 65% Cloud: 2 okta	46	Birds: 41-49 Dog barking: 48-52 Water pump: 41-42 Wind in tree: 36-37 Road traffic: 46-55 Sand pump: 34-35 Front-end-loader: 37-39	36	Complies
	09/09/2021 7:40 am Wind: 1 m/s (N) Temp: 12 °C Humidity: 65% Cloud: 2 okta	45	Birds: 42-56 Road traffic: 42-51 Sand pump: 34-35 Front-end-loader: 35-38	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels L _{Amax} (dB)	Estimated Project L _{Aeq} (15min)	Assessment
		L _{Aeq} (15min)			
	09/09/2021 7:55 am Wind: 1 m/s (N) Temp: 12 °C Humidity: 65% Cloud: 2 okta	45	Birds: 46-57 Wind in tree: 38-40 Road traffic: 44-48 Sand pump: 34-35 Front-end-loader: 36-41	36	Complies
	09/09/2021 8:10 am Wind: 1 m/s (N) Temp: 13 °C Humidity: 65% Cloud: 3 okta	46	Birds: 44-60 Road traffic: 43-52 Sand pump: 34-35 Front-end-loader: 38-53	35	Complies
	09/09/2021 8:25 am Wind: Calm Temp: 13 °C Humidity: 64% Cloud: 3 okta	48	Birds: 44-54 Road traffic: 53-53 Sand pump: 34-35 Dump truck: 37-41	36	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 Project Approval Noise Criteria.

Table 11 Morning Shoulder and Daytime Period - 7 September 2021

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Criteria	
		L _{Aeq} (15min)	L _{A1} (1min)	L _{Aeq} (15min)	L _{A1} (1min)
Morning Shoulder	B – 126A Keighley Avenue	35	43	Pass	Pass
	C – 110 Keighley Avenue	36	45	Pass	Pass
	D – 100 Keighley Avenue	37	46	Pass	Pass
	G – 87 Keighley Avenue	37	44	Pass	Pass
	R – 21 Reservoir Road	36	43	Pass	Pass
Day	B – 126A Keighley Avenue	<30-37	N/A	Pass	N/A
	C – 110 Keighley Avenue	<30-37		Pass	
	D – 100 Keighley Avenue	37-38		Pass	
	G – 87 Keighley Avenue	36		Pass	
	R – 21 Reservoir Road	35-36		Pass	

Table 12 Morning Shoulder and Daytime Period - 8 September 2021

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Limit	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	<30	<39	Pass	Pass
	C – 110 Keighley Avenue	<30	<38	Pass	Pass
	D – 100 Keighley Avenue	<30	<38	Pass	Pass
	G – 87 Keighley Avenue	<30	<40	Pass	Pass
	R – 21 Reservoir Road	36	43	Pass	Pass
Day	B – 126A Keighley Avenue	<30-37	N/A	Pass	N/A
	C – 110 Keighley Avenue	<30-36		Pass	
	D – 100 Keighley Avenue	34-35		Pass	
	G – 87 Keighley Avenue	33-34		Pass	
	R – 21 Reservoir Road	35-36		Pass	

Table 13 Morning Shoulder and Daytime Period - 9 September 2021

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Limit	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	<30	<46	Pass	Pass
	C – 110 Keighley Avenue	<30	<46	Pass	Pass
	D – 100 Keighley Avenue	35	44	Pass	Pass
	G – 87 Keighley Avenue	35	46	Pass	Pass
	R – 21 Reservoir Road	36	42	Pass	Pass
Day	B – 126A Keighley Avenue	<30-37	N/A	Pass	N/A
	C – 110 Keighley Avenue	<30-37		Pass	
	D – 100 Keighley Avenue	<30-36		Pass	
	G – 87 Keighley Avenue	<30		Pass	
	R – 21 Reservoir Road	35-36		Pass	

Based on the operator-attended noise survey summary presented in **Table 11** to **Table 13**, on 7 September 2021, 8 September 2021 and 9 September 2021, the project contributed LAeq(15min) and LA1(1min) noise levels at locations B,C,D,G and R comply with the project morning shoulder noise criteria. The project contributed LAeq(15min) noise levels at locations B,C,D,G and R also comply with the daytime project noise criteria as nominated in the Project Approval (MP 08_0173).

8 Conclusion

VMS has conducted operator-attended noise monitoring for Central Coast Sands Quarry operations over a three-day period between 7 September 2021 and 9 September 2021 during the morning shoulder and daytime periods. Measurements conducted during the morning shoulder and daytime periods did not exceed the project LAeq(15min) or LA1(1min) noise criteria. VMS conclude that the project is in compliance with the project operational noise criteria as nominated in the Project Approval (MP 08_0173).

Yours sincerely

A handwritten signature in black ink that reads "Liu Yang". The signature is written in a cursive style with a long, sweeping tail on the letter 'g'.

Yang Liu
Principal - Acoustics and Vibration

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 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Sound Power Level (SWL)	The Sound Power Level is the sound power relative to a standard reference pressure of 1pW (20x10 ⁻¹² Watts) on a decibel scale. The SWL of a simple point source may be used to calculate the SPL at a given distance (r) using the following formula: $SPL = SWL - 10 \times \text{Log}_{10}(4 \times \pi \times r^2)$ 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 log ₁₀ (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 20µPa.
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 of a notional steady sound that would contain the same amount of sound energy as the actual, possibly 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 wave. The greatest instantaneous velocity of a particle during this displacement is called the Peak Particle 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. VDV's are typically measured in the units of m/s ^{1.75} .