
Newcrest Cadia

Blast Monitoring Network Report

1st May – 31st May 2022

Report No.: DAT18410

Report issue date: 15th June 2022

Maintenance contract: MC724

Acoem Australasia (Acoem Australasia Pty Ltd). ABN: 32005752081

1492 Ferntree Gully Road Knoxfield VIC 3180 Melbourne Australia

Tel No: +61 3 9730 7800 Fax No: 1300 668 763

Email: info.au@acoem.com WEB: www.acoem.com.au

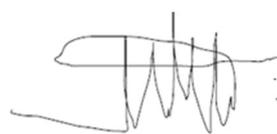
This document shall not be reproduced except for in full, without the written approval of Acoem Australasia.

Customer Details	
Customer	Cadia
Contact name	Kara Hatch
Address	PMB South Orange, NSW 2800
Email	Kara.Hatch@newcrest.com.au
Maintenance Contract Number	MC724

Revision History			
Report	Revision	Date	Analyst
DAT18410	0	15 th June 2022	Taral Madhiwala

Report by:

Taral Madhiwala
(name)



(signature)

Signatory:

Jon ALEXANDER
(name)



(signature)

CONTENTS

1.0 Executive Summary.....	4
1.1 Introduction	4
1.2 Purpose	4
1.3 Summary of Results	4
2.0 Introduction	5
3.0 Monitoring and Data Collection.....	5
4.0 Vibration and Overpressure Goals.....	7
5.0 Results.....	8
5.1 Data Capture	8
5.2 Exceedance Report	10
5.3 Exceedance Charts.....	13
5.4 Event Summary.....	14
6.0 Valid Data Exception Table	14
7.0 Report Summary	14
Appendix 1: Station Parameters	15
Appendix 2: Compliance with Standards.....	15
Appendix 3: Data Validation	15
Appendix 4: Units and Uncertainties	16
Appendix 5: Calibrations and Maintenance.....	17
Glossary.....	18

1.0 Executive Summary

1.1 Introduction

Located in the Central Western region of New South Wales, Cadia comprises two underground gold mines, Ridgeway (including Ridgeway Deeps) and Cadia East. Ridgeway mine is now placed into care and maintenance. Newcrest is responsible for the operation of the mine and have commissioned Acoem Australasia P/L to monitor the vibration and overpressure that result from blasts at the mine. Acoem Australasia P/L commenced monitoring of these sites on June 30th 2011.

1.2 Purpose

Ground vibration and overpressure associated with blasting are known to cause structural damage, and disturbance to human comfort levels. Monitoring of vibration and overpressure assesses potential mining impacts on adjacent sensitive receivers, and determines any breaches of consent conditions specified in the Environmental Protection Licence 5590 (Dated 1st Oct 2021) and Schedule 3 of the Project Approval (06_0295) (Mod 14). Seven Cadia blast monitors were installed around the mine to capture the vibration and overpressure readings at sensitive locations.

1.3 Summary of Results

The data capture for vibration and overpressure data at all stations was 100% for 1st to 31st May 2022.

No overpressure or vibration exceedances were recorded for the month.

2.0 Introduction

Acoem Australasia P/L was commissioned by Newcrest Cadia to provide monitoring and data reporting for the Cadia Valley blast monitoring network of stations, located as detailed in Table 1. Acoem Australasia P/L commenced monitoring of these sites on June 30th 2011. The monitors were upgraded to the NATA standard between October and December 2014.

Acoem Australasia is NATA accredited for compliance with ISO/IEC 17025-Testing and blast monitoring services conform to *AS 2187.2:2006 Appendix J3 Explosives - Storage & Use: Ground Vibration and Airblast Overpressure*.

This report presents the data for 1st – 31st May 22.

The information presented in this report includes:

- Station details
- Blast measurements
- Exceedances

The data in this report has been quality assured by the Acoem Australasia Environmental Reporting Services department.

3.0 Monitoring and Data Collection

Cadia monitoring network consists of seven blast monitoring stations. The details of the monitoring locations are shown in Table 1 and Figure 1.

Table 1: Cadia monitoring network sites geographical co-ordinates

Station	Geographical Coordinates
Chesterfield	-33.4359, 149.0325
Warrengong	-33.4697, 149.0445
Meribah	-33.5354, 149.0195
Mayburies	-33.502, 148.9582
Chimney	-33.44917, 148.98608
Coorabin	-33.41887, 149.02279
Rosebank	-33.26127,148.57190



Figure 1: Cadia Blast Monitoring Network station locations

4.0 Vibration and Overpressure Goals

This section details the vibration and overpressure Project Approval (CVO Blast monitoring Program Rev 4) and EPL criteria for the Cadia monitoring network sites.

There are separate criteria for:

- Residences located on privately owned land (Table 2), and
- Heritage Sites (Table 3)

Blast and mining -related exceedances of the Project Approval and EPL criteria are included in the annual exceedance summary (“Annual percentage of events above the allowable exceedance criteria”) in Table 6.

Overpressure readings recorded for shots fired in the underground mine are assessed in the following manner:

- 1) Assessment of meteorological data to determine environmental conditions (ie. wind speed) at the time of blasting. Data is provided to Acoem Australasia by Newcrest on a monthly basis.
- 2) Assessment of Acoem Australasia overpressure data and whether elevated noise readings are being experienced before or well after the blast – indicating meteorological factors or other extraneous contributing sources.
- 3) Assessment of any significant peaks in overpressure that must align directly with a confirmed blast vibration waveform to be considered as blast overpressure.

The following exceedances are excluded from the annual exceedance statistics in Table 6:

- Overpressure where data analysis has excluded results based on the above assessment criteria.
- Exceedances caused by meteorological events such as high wind speeds and electrical storms (where verified).
- Exceedances resulting from non-blast related seismicity

Table 2: Cadia Exceedance Criteria – Residence Located on Privately Owned Land

Station	Time	Overpressure (dBL)	Vibration (mm/s)	Exceedance Level
Coorabin Rosebank Chesterfield Meribah Mayburies Warrengong	Any time	120	10	0%
	Day	115	5	5% of total number of blasts over a 12 month period
	Evening	105	2	
	Night, all day Sunday and Public Holidays	95	1	

Table 3: Cadia Ground Vibration Exceedance Criteria – Chimney

Station	Time	Vibration (mm/s) – 5% allowable over 1 month	Vibration (mm/s) – 1% allowable over 1 month	Vibration (mm/s) – 0% allowable over 1 month
Chimney	Any time	25	30	55

Table 4: Definition of Exceedance Criteria Times

Period	Start	Finish
Day	7am	6pm
Evening	6pm	10pm
Night	10pm	7am

5.0 Results

5.1 Data Capture

Data Capture refers to the amount of valid data collected for 1st– 31st May 2022 and is calculated using the following equation:

$$\text{Data Capture} = (\text{Valid blast monitoring data} / \text{Total data}) \times 100\%$$

Where: Valid blast monitoring data = total number of valid events x number of sites within the blast monitoring network

Total data = total number of blast events x number of sites within the blast monitoring network

Valid events = events which have been verified through a quality assured process as appropriate and excludes all data errors and failures.

Table 5: Monthly Data Capture for Cadia Stations for 1st – 31st May 2022

Station	Data Capture (%)
Chesterfield	100%
Warrengong	100%
Meribah	100%
Mayburies	100%
Chimney	100%
Coorabin	100%
Rosebank	100%

Bold values indicate Overall Data Capture below 95%

5.2 Exceedance Report

Annual percentage of blasts above the allowable exceedance criteria are calculated using the below formula:

$$\text{Annual percentage} = 100 \times \left(\frac{\text{Number of Blast exceedances recorded over the past 12 months} + \text{number of Blast or mining induced seismic exceedance}}{\text{Total Number of blasts over past 12 months} + \text{number of Blast or mining induced seismic exceedance events}} \right)$$

The total number of blast events does not include non-blast related events.

Some exceedances are excluded from the annual statistics below, see section 4.0 for details.

Note: The measurement uncertainty is not considered when assessing exceedances.

Table 6: Annual Percentage of Blasts above the Allowable Exceedance Criteria, Recorded for Jun 2021 to May 2022

Month	Total Number of Blast Events	Number of Triggered Blasts and Seismic events	Blast Related Exceedances	Seismic Related Exceedances	Annual Percentage of Blasts Above the Allowable Exceedance Criteria
June-21	99	0	0	0	
July-21	82	1	0	1	0.1
Aug-21	148	0	0	0	0.1
Sep-21	137	2	0	0	0.1
Oct-21	121	0	0	0	0.1
Nov-21	129	0	0	0	0.1
Dec-21	135	0	0	0	0.1
Jan-22	152	0	0	0	0.1
Feb-22	126	0	0	0	0.1
Mar-22	115	0	0	0	0.1
Apr-22	124	0	0	0	0.1
May-22	110	0	0	0	0.1

Table 7: Exceedances of Project Approval Criteria Recorded for 1st – 31st May 22

Date Time	Event Code	Location Exceeded	Exceedance Criteria		Level of Exceedance	
			Max R (mm/sec)	Max AB (dBL)	Max R (mm/sec)	Max AB (dBL)
-	-	-	-	-	-	-

Table 8: Exceedances of Heritage Criteria Recorded for 1st – 31st May 22

Date Time	Event Code	Station Exceeded	Exceedance Criteria		Level of Exceedance	
			Max R (mm/sec)	Max AB (dBL)	Max R (mm/sec)	Max AB (dBL)
-	-	-	-	-	-	-

Table 9: Mining Related Seismic Events Recorded for 1st – 31st May 22

Date Time	Event Code	Local Magnitude	Station	Exceedance Criteria		Results	
				Max R (mm/sec)	Max AB (dBL)	Max R (mm/sec)	Max AB (dBL)
-	-	-	-	-	-	-	-

Table 9 contains information on readings recorded above the CVO exceedance criteria.

Table 10: Exceedances Resulting from Meteorological Events for 1st – 31st May 22

Date Time	Event Code	Meteorological Event	Station	Exceedance Criteria		Results	
				Max R (mm/sec)	Max AB (dBL)	Max R (mm/sec)	Max AB (dBL)
-	-	-	-	-	-	-	-

Table 10 contains information on reading recorded above the Cadia exceedance criteria.

Table 11 contains the wind speed data provided to Acoem Australasia by Newcrest. No validation has been performed on this data.

Table 11: Wind speed data relating to elevated overpressure events in Table 10

	Ridgeway Weather Station	Southern Lease Boundary (SLB) Weather Station
Date / Time	Mean Wind Speed (m/s)	Mean Wind Speed (m/s)
-	-	-

Table 12: Non mine Related events recorded for 1st – 31st May 22

Date Time	Event Code	Local Magnitude	Station	Exceedance Criteria		Results	
				Max R (mm/sec)	Max AB (dBL)	Max R (mm/sec)	Max AB (dBL)
-	-	-	-	-	-	-	-

Table 12: contains information on readings recorded above the CVO exceedance.

5.3 Exceedance Charts

The below chart expresses the combined rolling 12 monthly vibration and overpressure exceedances recorded across the Cadia blast monitoring network from Jun 2021 to May 2022

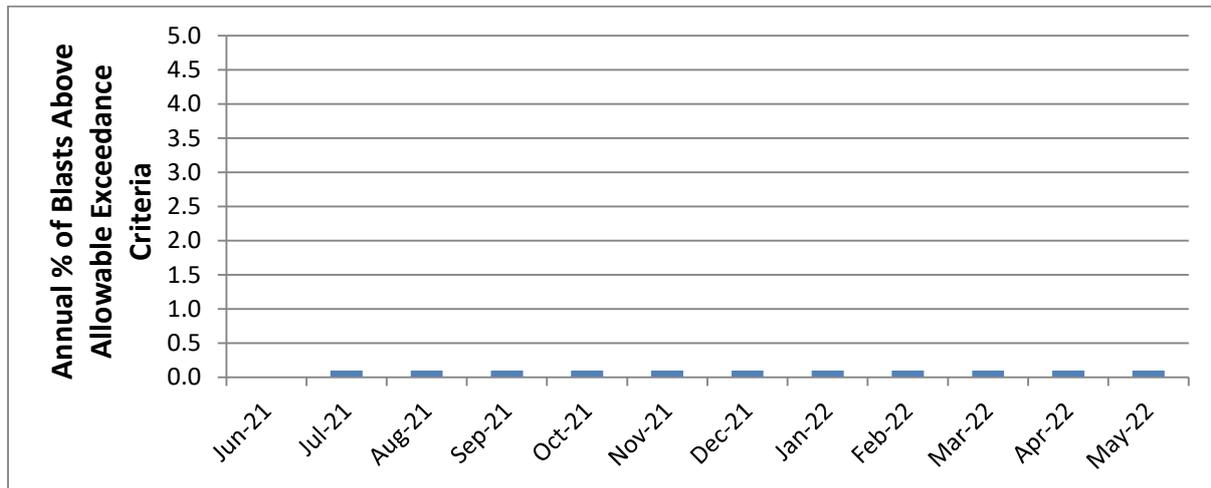


Figure 2: Annual Percentage of Blasts Above Allowable Exceedance Criteria

5.4 Event Summary

Table 13: Events recorded at Cadia 1st – 31st May 22

Date/Time	Event Code	Cadia Shot Code ¹
-	-	-

¹ Cadia Shot codes provided by Newcrest

6.0 Valid Data Exception Table

Table 14: CVO Valid Data Exception Table

Date	Event Code	Reason	Station affected
-	-	-	-

7.0 Report Summary

- The data capture for vibration and overpressure data at all stations was 100% for May 2022.
- No overpressure or vibration exceedances were recorded for the month.

-----END OF REPORT-----

Appendix 1: Station Parameters

This section details the parameters monitored and the instruments used at the Cadia Blast Monitoring Network. Any abbreviations are explained in Appendix 1.

Table 15: Parameters measured at Cadia blast monitoring stations

Parameter Measured	Instrument	Method Used
Overpressure (Pa/dBL)	ACO Pacific 7052 microphone	AS 2187.2-2006 Appendix J3 Explosives – Storage and use
Ground vibration (PPV in mm/s)	IO Sensor SM-6 4.5Hz geophone (Tri-axial in L,V,T)	AS 2187.2-2006 Appendix J3 Explosives – Storage and use

Appendix 2: Compliance with Standards

Unless stated below, parameters are monitored according to the methods detailed in Table 15.

- The wind speed data in the appendix of this report is supplied by Newcrest and no validation by Acoem Australasia has been performed on this data. The wind speed data is not covered by Acoem Australasia 's NATA scope of accreditation.

Appendix 3: Data Validation

The Acoem Australasia ERS department perform daily operational and event checks to ensure maximum data capture rates are maintained. This includes overnight download tests, checking the monitor connection throughout the day and battery/solar power checks. Triggered event waveforms are reviewed and validated on a daily basis to ensure complete blast capture. Any equipment failures are communicated to the responsible field engineers for urgent rectification.

Appendix 4: Units and Uncertainties

The uncertainties for each parameter have been determined by the manufacturer’s tolerance limits of the instrument’s parameters. The reported uncertainties are expanded uncertainties, calculated using coverage factors which give a level of confidence of approximately 95%.

Table 16: Units and Uncertainties

Parameter	Units	Resolution	Uncertainty	Frequency Range	Measurement Range
Overpressure (ACO Pacific 7052 microphone)	dB	0.1 dB	+/- 0.9 dB (k=2.1)	2 – 250Hz	65 - 135 dBL (Peak)
Ground vibration PPV per axis (IO Sensor 4.5Hz Geophone)	mm/s	0.01 mm/s	+/- 7.1% (k=1.98)	2 – 250Hz	up to 24 mm/s ^a

^a Max Resultant Ground Vibration = 41.6mm/s

Appendix 5: Calibrations and Maintenance

The last calibrations for the following parameters have been performed on the indicated date. Data supplied after this time is subject to verification to be performed at the next calibration cycle.

Note: Maintenance and calibration dates may differ, as calibrations may be less frequent than scheduled maintenance visits.

Table 17: Cadia Maintenance Table 1st – 31st May 22

Station	Parameter	Instrument	Last Maintenance Performed	Last Calibration Date ¹	Next Maintenance Planned
Chesterfield	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Warrengong	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Meribah	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Mayburies	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Chimney	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Coorabin	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022
Rosebank	Vibration	Geophone	10/03/2022	10/03/2022	10/06/2022
	Overpressure	Microphone	10/03/2022	10/03/2022	10/06/2022

¹ A calibration check was performed on this date

Glossary

dB SPL – Decibels Sound Pressure Level

dB L – Decibels linear

Pa – Pascal

AB – Airblast (AKA overpressure)

PVS – Peak vector Sum vibrations

ML – local magnitude (of a seismic event)

mm/sec – Millimeters per second

ms - Milliseconds

m/s – metres per second

L – Longitudinal

V – Vertical

T – Transverse